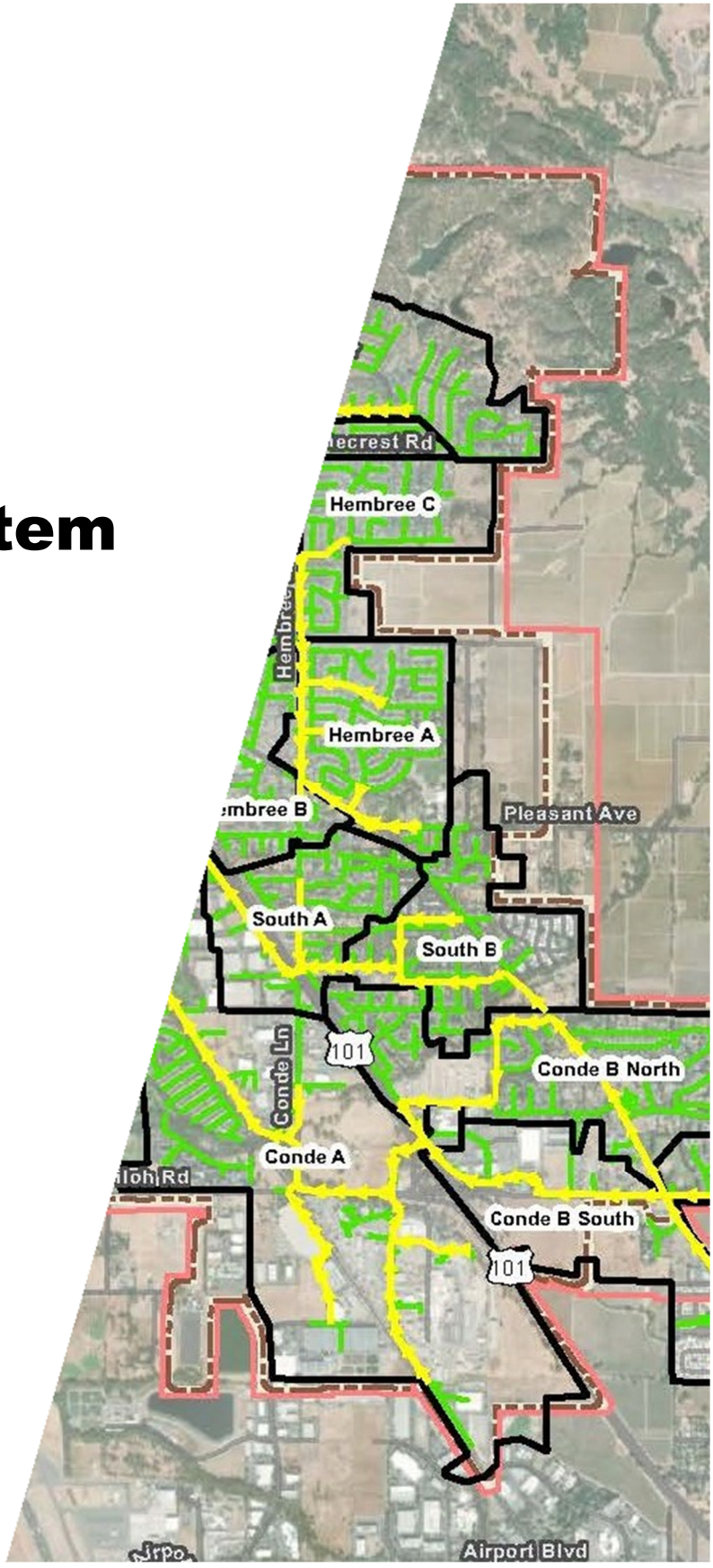
Draft
Collection System Master Plan



TOWN OF WINDSOR

July 2020

Town of Windsor

Draft Collection System Master Plan

Project No. 11151247

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Draft Document – For Discussion Only – Final Version May Differ From Draft

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Executive Summary

This 2020 Collection System Master Plan (CSMP) provides the Town of Windsor (Town) with an evaluation of the sewer (collection) system capacity under the existing and future *Town of Windsor 2040 General Plan* (2040 General Plan) buildout condition and provides recommendations to address hydraulic deficiencies and planned growth. The Town contracted with GHD to complete the CSMP over multiple phases from late 2010 to present. The CSMP is based on the latest planning information for land use and known development projects in the planning and approval stages.

Background and Purpose

The Town of Windsor (Town), incorporated in 1992, is located in central Sonoma County approximately seven miles northwest of the City of Santa Rosa and 20 miles east of the Pacific Ocean. Highway 101 bisects the Town and provides regional access by connecting California's northern coastal counties with the San Francisco metropolitan area 60 miles to the south.

Windsor's current sewer collection system includes approximately 100 miles of public and private branch- and trunk-gravity sewers and force mains, 1,700 manholes, 750 cleanouts, two small Town-owned and operated lift stations, and a water reclamation facility (WRF) with a current average dry weather flow (ADWF) of 1.4 million gallons per day (mgd) and a permitted average peak wet weather flow of 7.2 mgd. Existing pipelines range in diameter from 4 to 48 inches, and include two inverted siphons. Approximately 80 percent of the existing collection system is comprised of pipelines with diameters 8 inches and smaller. The wastewater collection system and sewer basins are shown in Figure ES-1.

Phase I

The initial phase of this master planning effort was an I/I study conducted by Winzler & Kelly (now part of GHD) in 2011. That report set the foundation for informed discussions regarding infrastructure planning and associated budgeting of Town funds. Phase I work included nighttime flow monitoring, field reconnaissance to identify sources of inflow and infiltration (I/I), preparation of GIS resources, coordination with the Town for sewer system resource documents, and planning with the Town for future phases of the master planning effort. Completion of Phase I enabled the Town to continue with development of the Master Plan by using a cost-effective and methodical approach.

Phase II

The second phase of the master planning effort, completed by GHD in 2014, included a condition assessment, discussions of hydraulic design criteria, and preliminary evaluations of basin hydraulics. Phase II master planning efforts built upon previous Town planning documents for the sanitary sewer collection system, including the April 2000 Master Trunk Sewer Plan, prepared by Brelje and Race (2000 MTSP) and the June 2009 Sewer System Management Plan (SSMP) prepared by RMC Water and Environment. The 2000 MTSP focused on hydraulics for trunk sewers and associated capital improvement needs. Some of the trunk sewer capital improvements identified in the 2000 MTSP have been completed. Many of the best management practices identified in the SSMP are currently being carried out by the Town for management of its collection system and associated resources. Phase II of the master planning effort did not replace information presented in

those previous planning documents, but rather, provided further context for recommendations and conclusions presented therein.

Phase III

Phase III includes two parts. The first began in 2015 substantially covering field data collection and initial set up of the collection system hydraulic model. The second part (the current effort) includes determination of flow rates for hydraulic modeling, completion of the hydraulic model, preparation of recommended sewer improvement projects, inclusion of the 2040 General Plan, recent land use, and collection system growth. Phase III also includes preparation of this Master Plan report detailing the entirety of the master planning process. This document is consistent with other planning documents completed by GHD for the Town, namely the *2020 Storm Drainage Master Plan* (GHD 2020), which is also consistent with the 2040 General Plan.

Hydraulic evaluation of the sewer collection system is based on billing records from 2010 to 2014 and flow metering data recorded by V&A Consulting Engineers (V&A) in 2011 within the service area. Measured flows were used in a hydraulic model to assess the performance of the collection system under various flow conditions including average dry weather flow (ADWF), peak dry weather flow (PDWF), and peak wet weather flow (PWWF). Average dry weather flow is the average flow rate over a 24-hour period during dry weather months, and PDWF is the peak flow rate occurring within that same 24-hour period. The PWWF is the peak dry weather flow plus the peak infiltration and inflow (I/I) rate resulting from a 24-hour, 10-year return frequency design storm.

Sewer Collection System Improvement Project Recommendations

The primary goal of having adequate conveyance capacity in the collection system is to minimize the chance of having a sanitary sewer overflow (SSO) during peak flow events. This can be achieved using two approaches: 1) minimize I/I entering the collection system; and 2) eliminating flow restrictions by replacing undersized pipes and pumps with larger facilities that can handle the peak flows. The recommended projects addressing hydraulic deficiencies in this master plan are for replacement of undersized pipes; however, GHD analyzed I/I reduction as an alternative and made recommendations to further investigate (and evaluated the potential) to mitigate the impacts of I/I where they might be feasible alternatives to a pipe replacement project.

The recommended improvement projects address current deficiencies and needed capacity increases to accommodate planned growth. Projects are grouped by priority of high to low and projects within each group are equal priority, regardless of their identification (ID) number (i.e. SS-1 through SS-5 are equally high priority). Project priority is based on risk including consideration of flow, level of hydraulic deficiency (measured as Q max/Q cap, i.e. the ratio of maximum modeled flow to the pipe capacity flow), and depth as well as number and type of customers impacted and proximity to water bodies. Detailed descriptions of each of these considerations for each project are described in the Recommended Project Descriptions in Appendix G.

Table ES-2 lists the high priority recommended projects for the Town. These projects are prioritized based on need and benefits to the Town. The project drivers and opinion of project cost are provided for each project. The Fix Existing Costs column lists the costs to fix existing capacity deficiencies for each project; the Fix Future Cost column contains the additional cost to include further upsizing the pipes to address future (General Plan 2040 buildout) deficiencies while also addressing existing deficiencies. Note that if a project is completed as two separate projects (fix

existing deficiency and later fix future deficiency), the total project cost would be greater. The total cost of the high priority recommended projects (fixing both existing and future deficiencies at the same time) is $9,680,000.

Table ES-1 Sewer Collection System High Priority Capital Improvement Projects[1]

Project	Driver	Fix Existing Cost	Fix Future Cost
SS-1 Windsor Road North of Plant Road	Existing 10- and 15-inch gravity sewer in Windsor River Road is undersized to convey existing PWWF. Potential to result in SSO. Traffic at the high school will have an impact on construction; therefore, suggest construction during the summer.	$4,530,000	$0
SS-2 Starr Road	Existing 10-inch gravity sewer in Starr Road which is routed eventually along the SMART Railway is undersized to convey existing PWWF. Potential to result in SSO. Narrow construction area. If the Town desires relocating the pipe outside of the railroad, this project presents a good opportunity to do so.	$2,870,000	$0
SS-3 Hembree Lane	Existing 6-inch gravity sewer in Hembree Lane is undersized to convey existing PWWF. Potential to result in SSO. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$950,000	$240,000
SS-4 Windsor Road North of Windsor River Road	Existing 10-inch gravity sewer in Windsor Road is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a good chance to eliminate or reduce scope of capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$1,090,000	$0
	Total Cost of High Priority Projects	**$9,440,000**	**$240,000**

1. The project cost consists of the construction cost, design and technical effort, construction management, and a contingency fund. Land acquisition and/or Town degradation fees are not included. Construction costs are based on a Class 5 (planning-level) estimate of probable cost as defined by the Association for the Advancement of Cost Engineering, International (AACE).

All of the high priority recommended projects address upsizing pipes that are currently undersized to convey PWWF.

Project SS-1 has high priority due to the proximity of this project to the high school, Public Works and Fire Station No. 2. The high flow (5.39 mgd) and very high ratio of maximum modeled flow to pipe capacity flow (q/Q) of 9.35, meaning the maximum modeled flow was 9.35 times greater than the pipe capacity flow), combined with sewer depths of almost 8 ft to under 13 ft,, have a high chance of resulting in an SSO, which makes this deficiency a high risk overall. Traffic at the high school will have an impact on construction; therefore, GHD suggests that construction occur during the summer.

Consideration for Project SS-2 should include whether the Town desires to relocate the pipeline. The narrow easement along the railroad track affects not only construction but also regular maintenance activities. The Town may also want to consider the impacts of the SMART rail upgrades to the railroad tracks as well.

Preliminary analysis finds that I/I reduction has the potential to eliminate or reduce the scope of Projects SS-3 and SS-4. Predesign for the projects should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. For SS-4, upstream Project SS-12 and downstream Projects SS-1 and SS-11 should be evaluated together to understand the impact of I/I reduction on these other capacity projects.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. Infiltration and inflow reductions as part of Project SS-4 may also be combined with related Project projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. For example, such I/I reduction may result in a reduced scope of improvements for downstream Projects SS-1 and SS-11.

Improvement projects that are medium to low priority are desirable to address existing deficiencies and accommodate planned growth, but are not as urgent as the high priority projects. Projects SS-14, SS-15, SS-16, SS-17, and SS-18 are solely development-driven, and project planning and construction should correspond to the timing of development.

The recommended projects represent capacity upgrades. Where I/I reduction has the potential to reduce or eliminate the capacity upgrade project, I/I investigation is recommended in the planning stages of the project and it is noted in the project description. Medium and low priority recommended projects are listed in Table ES-2 along with the project drivers and estimated cost for each project. The recommended project locations are shown in Figure ES-2 and detailed summaries are provided in Appendix G.

Table ES-2 Sewer Collection System Medium and Low Priority Capital Improvements Projects

Project	Driver	Fix Existing Cost	Fix Future Cost
Medium Priority Projects			
SS-5 Victory and Hembree Lanes	Existing 10-inch gravity sewer in Victory Lane and Hembree Lane is undersized to convey existing PWWF. Potential to result in SSO. This is a hot spot area (per Town). Additional project benefits could include reduced maintenance.	$900,000	$1,360,000
SS-6 Lake Drive	Existing 14-inch gravity sewer in Lake Drive from Conde Lane to Bell Road is undersized to convey existing PWWF. Potential to result in SSO. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$2,170,000	$2,660,000
SS-7 Enzos Way	Existing 24-inch gravity sewer in Enzos Way and Oakfield Lane is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction is not viable option to reduce the scope of the capacity upgrade project.	$870,000	$0
SS-8 Bluebird Drive	Existing 12-inch gravity sewer in Bluebird Drive South of Old Redwood Highway is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction is likely to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$480,000	$140,000
SS-9SMART Railway	Existing 15-inch gravity sewer in Wild Oak Drive and along the SMART Railway is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$1,240,000	$0

Project	Driver	Fix Existing Cost	Fix Future Cost
Low Priority Projects			
SS-10 WRF	Existing 20-inch gravity sewer in Plant Road leading to the WRF is undersized to convey existing PWWF. Potential to result in SSO.	2,320,000	$0
SS-11 Public Works Corporation Yard	Existing 20-, 21-, and 24-inch gravity sewer in the Public Works Corporation Yard is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$440,000	$1,140,000
SS-12 Old Redwood Highway and Windsor Road	Existing 8-inch gravity sewer in Old Redwood Highway and Windsor Road is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction is likely to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$2,130,000	$0
SS-13 Fawn Lily Court	Existing 8-inch gravity sewer in Fawn Lily Court is undersized to convey existing PWWF. Potential to result in SSO.	$210,000	$0
SS-14 Conde Lane	Existing 14-inch gravity sewer in Conde Lane from Denbeste Court to Lake Drive is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a high potential to eliminate the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$0	$3,870,000
SS-15 Edgewood Place	Existing 18-inch gravity sewer in Edgewood Place is undersized to convey existing PWWF. Potential to result in SSO.	$0	$830,000

Project	Driver	Fix Existing Cost	Fix Future Cost
SS-16 Windsor River Road	Existing 8-inch gravity sewer in Windsor River Road from Honsa Avenue to Windsor Road is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$0	$1,020,000
SS-17 Winemaker Way	Existing 15-inch gravity sewer in Winemaker Way is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$0	$460,000
SS-18 Robbins Park	Existing 6-inch gravity sewer on the West edge of Robbins Park is undersized to convey existing PWWF. Potential to result in SSO. I/I reduction has a high potential to eliminate the capacity upgrade project. Project predesign should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources.	$0	$660,000
Total Cost of Medium and Low Priority Projects		**$10,760,000**	**$12,140,000**

1. The project cost consists of the construction cost, design and technical effort, construction management, and a contingency fund. Land acquisition and/or Town degradation fees are not included. Construction costs are based on a Class 5 (planning-level) estimate of probable cost as defined by the Association for the Advancement of Cost Engineering, International (AACE).

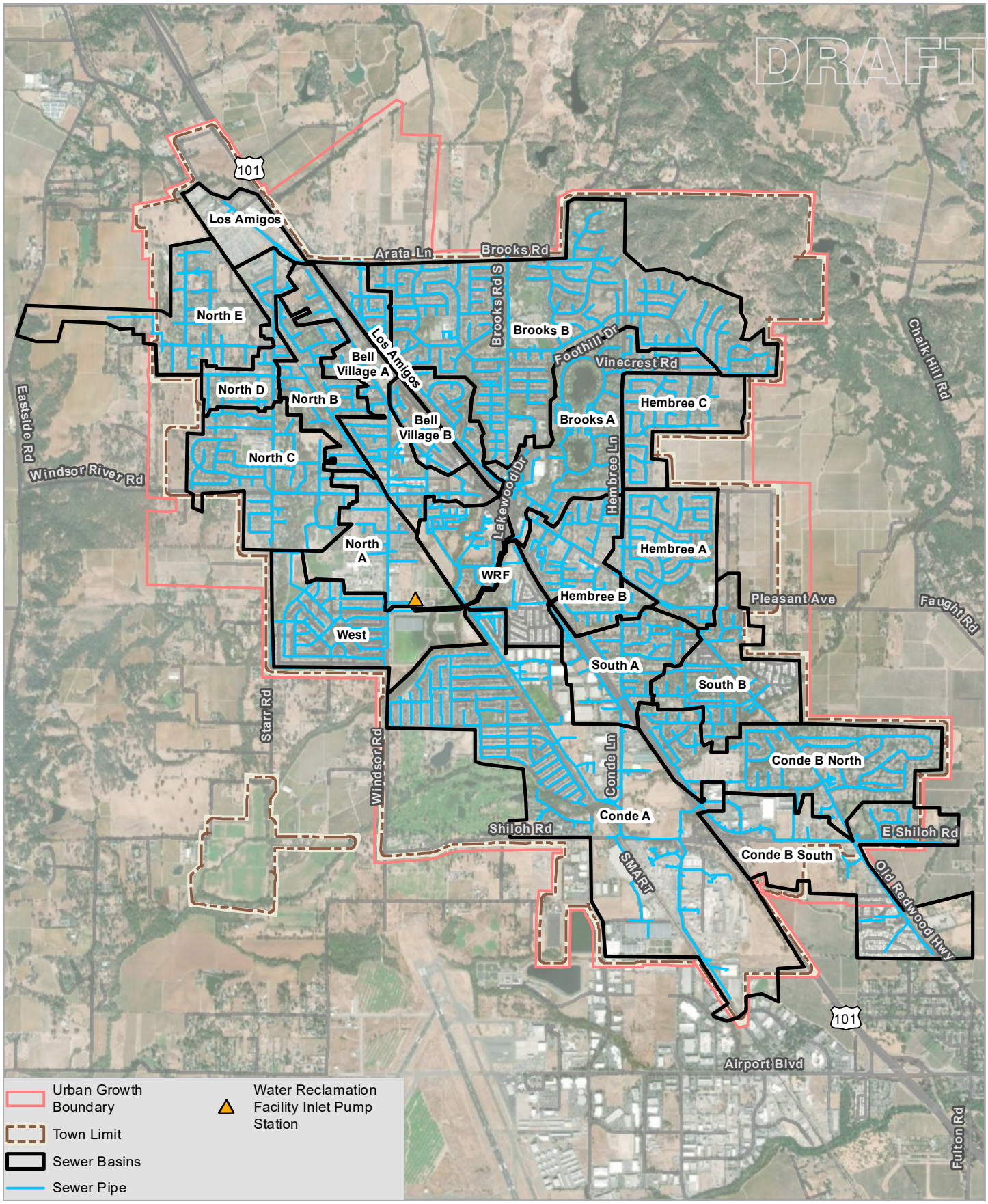
Preliminary design for each project should include an evaluation of the feasibility for I/I rehabilitation in lieu of upsizing existing infrastructure. Reduction of I/I has multiple benefits for the Town's sewer system, including the following:

- Alleviating hydraulic conditions within the collection system
- Reducing the scope and cost of downstream projects
- Reducing energy costs and other infrastructure costs associated with pumping excess I/I at the WRF

This master plan document and model can be updated as needed. The Town may update the hydraulic model as the following needs occur:

- Updating the model as CIP projects are implemented
- Reviewing hydraulic impacts or expanding the model during review of proposed development projects
- Updates to the General Plan

Figure ES-1 Sewer Basins



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 2
Date 8/18/2020

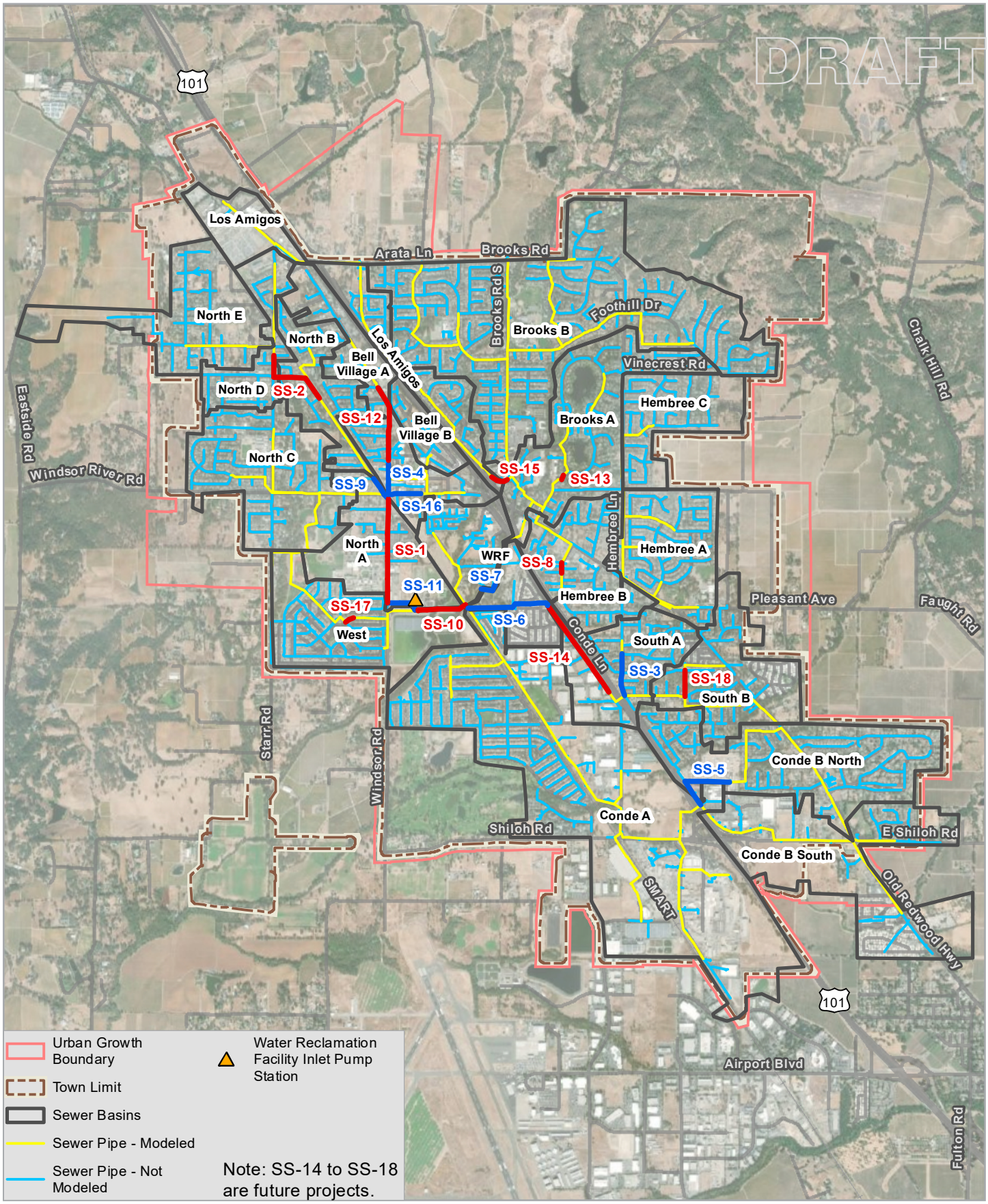
Sewer Basins

FIGURE ES-1

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure ES-2 Recommended Sewer Capital Improvement Projects



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

Recommended Improvement Projects

FIGURE ES-2

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Acronyms and Abbreviations

2000 MTSP	*2000 Master Trunk Sewer Plan*
2011 V&A Report	*Inflow/Infiltration Reconnaissance Investigation*
ADWF	average dry weather flow
CCTV	closed circuit television
CIPP	cured-in-place pipe
CIP	capital improvement plan
CSMP	*2020 Collection System Master Plan (Phase III Report)*
d/D	ratio of depth of flow to pipe diameter
du/ac	dwelling units per acre
ADWF	average dry weather flow
FAR	floor area ratio
FOG	fats, oils and grease
fps	feet per second
GIS	geographic information system
gpd	gallons per day
gpapd	gallons per acre per day
I/I	infiltration and inflow
MFD	multi-family dwelling
mgd	million gallons per day
n/a	not applicable
2040 General Plan	*Town of Windsor 2040 General Plan Revised Public Review Draft*
PDWF	peak dry weather flow
PWWF	peak wet weather flow
rehab	rehabilitation
q/Q	ratio of maximum modeled flow to pipe capacity flow
sf	square foot (feet)
SFD	single-family dwelling
SSMP	*2009 Sewer System Management Plan*
SSO	sanitary sewer overflow
Town	Town of Windsor
V&A	V&A Consulting Engineers
WRF	water reclamation facility
yr	year(s)

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1. Introduction

1.1 Background

The Town of Windsor (Town), incorporated in 1992, is located in central Sonoma County approximately seven miles northwest of the City of Santa Rosa and 20 miles east of the Pacific Ocean. Highway 101 bisects the Town and provides regional access by connecting California's northern coastal counties with the San Francisco metropolitan area 60 miles south of Windsor.

The Town's sewer collection system service area includes residential, commercial, and industrial customers within the Town limits as shown in Figure 1-1.. The current area served is approximately 6.7 square miles.

Windsor's current sewer collection system includes approximately 100 miles of public and private branch- and trunk-gravity sewers and force mains, 1,700 manholes, 750 cleanouts, two small Town-owned and operated lift station, and a wastewater treatment plant, which is referred to as the Water Reclamation Facility (WRF). WRF, with a current average dry weather flow (ADWF) of approximately 1.4 million gallons per day (mgd). Existing pipelines range in diameter from 4 to 48 inches, and include two inverted siphons. Approximately 80 percent of the existing collection system is comprised of pipelines with diameters 8 inches and smaller. The wastewater collection system is shown in Figure 1-1, with trunk sewers, which formed the basis of the Master Trunk Sewer Plan (2000 MTSP) (Brelje & Race 2000), highlighted. Sewer basins are also shown.

WRFConstructed in 1964, the WRFWRF has a permitted capacity for ADWF conditions of 1.9 mgd, but the treatment design capacity is 2.25 mgd. The Town currently recycles almost two-thirds of its tertiary treated wastewater, with almost half of that amount used for energy production at the Geysers Steamfields. The remaining wastewater effluent is discharged to Mark West Creek. The current permitted peak week wet weather flow (PWWF) capacity is 7.2 mgd. The location of the WRFWRF is shown in Figure 1-1.

Over time, the WRFWRF and the sewer collection system expanded from serving an initial population within the Town's service area of 772 in 1964 to approximately 27,500 in the Town and surrounding areas today. Expansion of the Town's sewer system primarily served to meet this growth. Some areas, particularly the Bell Village A, North A, and North D basins, have aged and deteriorated, such that peak flows have increased due to the influence of infiltration and inflow (I/I) caused by rainwater and groundwater. Increased flows have caused a reduction in available hydraulic capacity within the collection system and reduced capacity to accommodate growth.

1.2 Purpose

The purpose of master planning is to provide a comprehensive evaluation of the collection system, including planning documents, flow records, field observations, engineering evaluation of future projects. This Collection System Master Plan (Master Plan) identifies deficiencies in the collection system caused by existing and projected hydraulic limitations, I/I, structural defects, and operations and maintenance considerations such as fats, oils and grease (FOG), debris, roots, etc. The Master Plan provides guidance for short and long-term collection system planning for both repair and rehabilitation (R&R) and recommended capital improvement plan (CIP) projects. The geographic

information system (GIS) resources developed as part of this master planning effort provide a detailed planning resource for future system assessment.

GHD prepared this Master Plan for the Town over three phases under separate contracts. The initial phase of this master planning effort was an I/I study conducted by Winzler & Kelly (now part of GHD) in 2011. The *Collection System Infiltration and Inflow Study (Phase I)* (Winzler and Kelly 2011) report set the foundation for informed discussions regarding infrastructure planning and associated budgeting of Town funds. Phase I work included flow monitoring, field reconnaissance to identify sources of I/I, preparation of GIS resources, and planning with the Town for future phases of the master planning effort. Through the Phase I field work, some system defects were identified that can still be addressed by the Town through its capital improvement or operation and maintenance repair programs. Completion of Phase I enabled the Town to continue with development of the Master Plan by using a cost-effective and methodical approach.

The second phase of the master planning effort, completed by GHD in 2014, included a condition assessment, discussions of hydraulic design criteria, and preliminary evaluations of basin hydraulics. Also included was a review of the Town's April 2000 Master Trunk Sewer Plan (2000 MTSP) prepared by Brelje & Race. Phase II master planning efforts built upon previous Town planning documents for the sanitary sewer collection system, including the 2000 MTSP and June 2009 Sewer System Management Plan (SSMP), the most current at the time this work was completed, prepared by RMC Water and Environment. The 2000 MTSP focused on hydraulics for trunk sewers and associated capital improvement needs. Some of the trunk sewer capital improvements identified in the 2000 MTSP have been completed. Many of the best management practices identified in the SSMP are currently being carried out by the Town for management of its collection system and associated resources. The *Report for Sewer Master Plan (Phase II)* (GHD 2014) did not replace information presented in those previous planning documents, but rather, provided further context for recommendations and conclusions presented therein.

This Phase III includes two parts. The first began in 2015 substantially covering field data collection and initial set up of the collection system hydraulic model. The second part (the current effort) includes determination of flow rates for hydraulic modeling, completion of the hydraulic model, preparation of recommended CIP projects, review of the *Town of Windsor 2040 General Plan Revised Public Review Draft* (2040 General Plan), land use, and collection system growth. Phase III also includes preparation of this Master Plan report detailing the entirety of the master planning process to date.

The hydraulic model and master plan document are intended to be evolving documents updated over time as projects are implemented, as new data becomes available, and as other planning documents, such as the 2040 General Plan, are updated.

This Master Plan document should be used together with technical documents and reports prepared under Phase I and Phase II of the master planning process. This document does not provide any substantial changes to the overall collection system metrics provided in the Phase I and II reports (i.e., pipe lengths and diameters and flow monitoring data).

1.3 Scope of Work

This section briefly describes the following activities conducted for Phase III of the master planning effort:

- information gathering
- model development
- improvement project development

Activities performed and e information gathered in Phase I and Phase II are incorporated.

1.3.1 Information Gathering

This project relies on information gathered over multiple phases of work as follows:

- **Phase I:** In 2010-2011, wet weather flow monitoring and I/I nighttime reconnaissance information was collected in strategic locations. Data was also gathered for selected portions of the sanitary sewer collection system, including manholes included in the hydraulic model.
- **Phase II:** Peaking factors were established in Phase II and were used to calculate peak dry weather flow (PDWF) rates and to compare theoretical PWWF (water billing data plus peaking factors) to design storm event synthetic hydrographs prepared by V&A Consulting Engineers (V&A 2011b) at flow monitoring locations. This information was used to develop flow rates and in the modeling analysis. Surveying was conducted to collect rim and invert data and to confirm pipe diameters for population in the GIS database which was eventually used in the model.
- **Phase III:** Flow rates, model calibration, and modeling of scenarios were developed and refined. Existing condition model flows were developed using five years (2010-2014) of monthly water billing records provided by the Town. Additionally, GHD reviewed projects completed within the collection system since 2010-2014 water billing data was provided to incorporate more recent development. Future condition flows were developed primarily based on buildout of the planned land uses in the *Town of Windsor 2040 General Pla*n (Revised Public Review Draft dated October 2017) (2040 General Plan).

This document presents the information gathering process as part of the overall model development and master planning process, without complicating the discussion with references to the specific supporting phase in which it was gathered. Additional information on the data gathering effort is described in Chapter 3.

1.3.2 Model Development

The sanitary sewer collection system hydraulic model was developed using Innovyze H20 Map Sewer (a static model). This section summarizes the model development. A more detailed description of the model and model development can be found in Section 7.1.

The Town's GIS geodatabase, updated with field survey data, was used to construct the hydraulic model. The hydraulic model includes pipelines of 10-inch diameter and larger, with 8-inch pipelines included to provide model connectivity and further assessment of certain sewer basins. The Town's two pump stations are not included in the hydraulic model or in this report due to their small size and locations.

Model flow rates are based on water billing records, peaking factors established during Phase II, review of I/I data provided by V&A through its 2010-11 flow monitoring and field reconnaissance efforts, and through meeting with the Town to review projects completed within the collection system since the 2010-11 flow monitoring effort. The model was calibrated for basin flows by matching modeled flows to the 10-year 24-hour design storm flow rates prepared by V&A at each flow monitoring location, as adjusted through the review of completed sewer system projects.

Modeling analysis was performed first for existing condition, wherein system deficiencies currently identified by the Town were compared with initial model results. With agreement on an approach to address current hydraulic deficiencies identified in modeling the existing condition, the model was then run with projected future condition and flows to identify additional deficiencies due tofuture land development according to the 2040 General Plan. Four model runs were completed as follows:

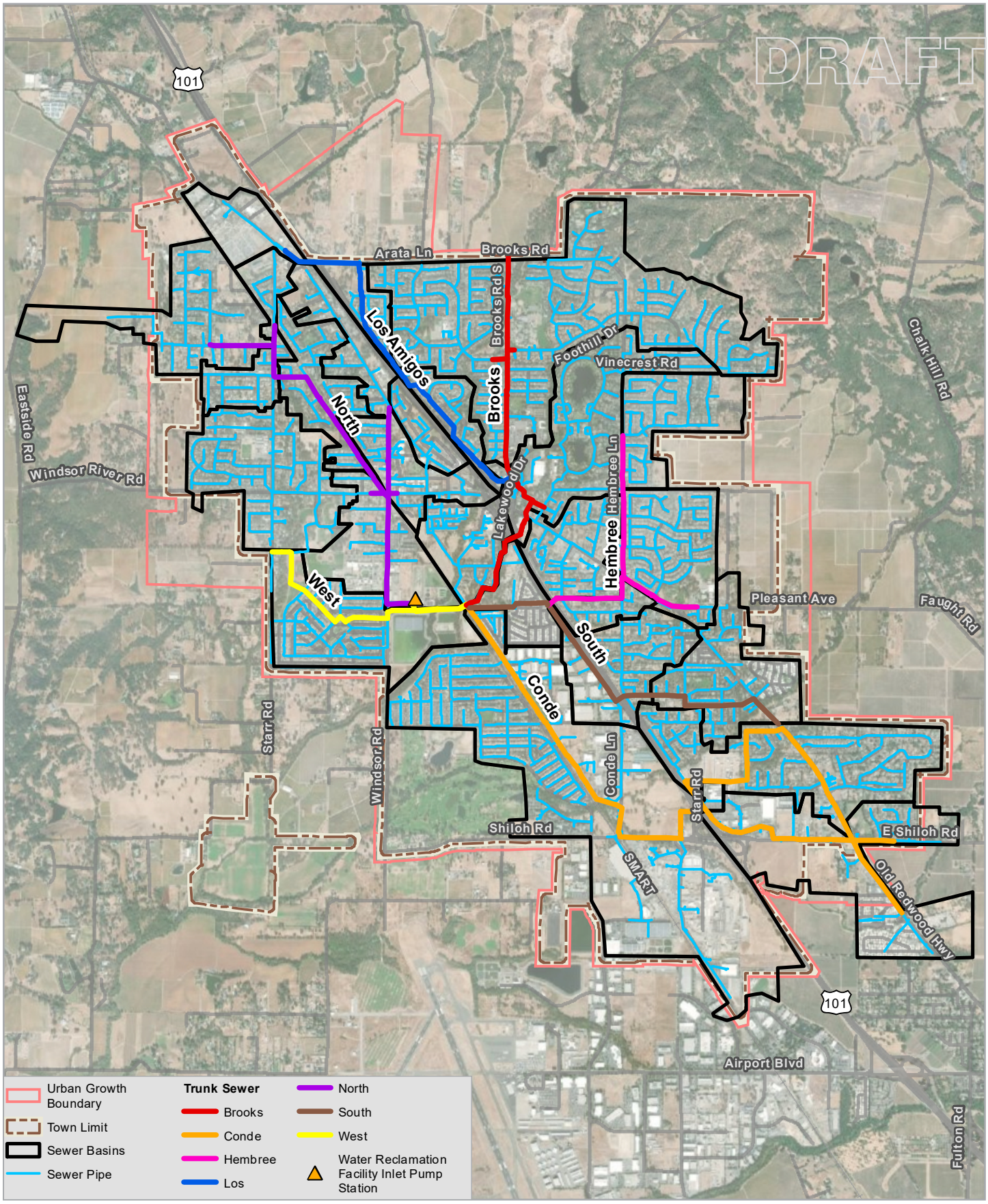
1) Existing condition
2) Existing condition with CIP fixes implemented that address existing collection system hydraulic deficiencies
3) Future condition
4) Future condition with CIP fixes implemented that address existing and future collection system hydraulic deficiencies

1.3.3 Capital Improvement Projects Evaluation

Projects were identified based on the results from the hydraulic evaluation and analysis of condition assessment data. Conceptual-level planning opinions of probable project costs were prepared and segregated to estimate benefits to new customers (new development) versus existing customers, to enable the Town to accurately assess the cost obligations to the different customer types. Further details on CIP project identification can be found in Chapter 8; Chapter 9 provides information on the process of prioritizing projects and preparing opinions of probable cost.

GHD met with Town engineering and operations and maintenance staff to discuss service levels, develop decision strategies, and identify potential risks and consequences to be considered in developing and prioritizing the recommended projects for the CIP. Prioritization of projects was based substantially on discussion and input received from the Town during meetings to review recommended projects. The recommended improvement projects were evaluated to develop a phased/prioritized implementation plan to guide construction through buildout. Screening for environmental considerations was incorporated and is presented in the California Environmental Quality Act (CEQA) Technical Memorandum in Appendix H.

Figure 1-1 Sewer System



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

Sewer System

FIGURE 1-1

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Print date: 20 Aug 2020 - 10:23

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

2. Summary of Existing Collection System

This chapter summarizes the existing sewer collection system and the sewer basins. Figure 2-1 depicts these basins and how flow is directed through the collection system. The figure notes pipelines included in the hydraulic model.

2.1 Sewer Basins

The Town's collection system service area was divided into 19 sanitary sewer basins based on the seven primary trunk sewers identified in the 2000 MTSP. Each trunk sewer connects the furthest reaches of the collection system to the Town's WRF, which is located along Windsor Road near the geographic center of the Town. The collection area for each trunk sewer, except West and Los Amigos, was divided into smaller basins for targeted investigations. The existing trunk sewers, their associated basins, and brief recommendations for future I/I investigation are described in the following sections. More detailed recommendations are also presented in Chapter 8.

2.1.1 North Trunk Sewer

The 10- to 15-inch diameter North Trunk sewer was constructed in 1964 as a part of the Town's original wastewater collection system. The trunk sewer extends between the WRFWRF and the North Basins (the original single North Basin was spilt into seven basins [North Basins A through E and Bell Village Basins A and B] in 2011 to better study I/I sources), which are generally located to the north of Windsor River Road and west of Highway 101. The North Trunk also serves the Town Green and the Bell Village (also known as Vintage Oaks) area. Flow monitoring data and Town observations suggest that the lower portion of this trunk sewer is hydraulically limited. Basins comprising the Town Green/Bell Village are referred to as Bell Village A and B. These two basins contribute approximately 48 percent of the total I/I into the existing sanitary sewer collection system, yet only make up approximately 24 percent of the total acreage served by the collection system. Since the completion of V&A's flow monitoring work, Bell Village B basin has been redeveloped. The modelled flow rates were updated to reflect improvements to the system in Bell Village B and associated reduction in I/I. These basins should be more closely evaluated by the Town during the CIP planning phases for I/I rehabilitation projects in lieu of or in conjunction with CIP improvement projects.

2.1.2 Los Amigos Trunk Sewer

The Los Amigos Trunk Sewer extends between Brooks Road on the east side of Highway 101 and Old Redwood Highway on the west side of the highway. The 12- to 18-inch diameter trunk sewer serves the Los Amigos Basin. The portion of the trunk sewer between Brooks Road and Arata Lane was constructed between 1989 and 1996, while the uppermost reach of the Los Amigos Trunk was constructed after 2000. The Los Amigos Basin exhibits moderate levels of I/I. Field reconnaissance suggests that the significant source of infiltration could be at the upstream end of the basin, beyond the intersection of Arata Lane and Los Amigos Road.

2.1.3 Brooks Trunk Sewer

The Brooks Trunk Sewer follows Brooks Road between the WRF and the Town boundary at Arata Lane. The 12- to 24-inch diameter trunk sewer was constructed in 1986-87 and serves the Brooks Basin, which for the purposes of this study was split into two parts: Brooks Basin A and Brooks Basin B. Both Basins A and B, contribute a relatively low amount of I/I into the collection system. The Brooks Basins were not investigated during Phase 1 nighttime field reconnaissance due to the low amount of I/I identified in V&A's 2010-11 flow monitoring effort.

2.1.4 South Trunk Sewer

The South Trunk serves the eastern portion of the Town between the Hembree Basin and Conde Basin. The 12- to 14-inch diameter sewer main that serves this basin was constructed in 1970-71 and extends from Old Redwood Highway near Deanna Place to its convergence with the Hembree Trunk within Conde Lane adjacent to Highway 101. The South Basin was split into two portions for the 2011 I/I study: South A and South B. Flow monitoring data suggests that both South basins contribute an average amount of I/I to the collection system compared to other basins. Nighttime field reconnaissance identified a few specific system defects that should be targeted by the Town for potential repairs. These defects are described in the *Inflow/Infiltration Reconnaissance Investigation* report (V&A 2011a).

2.1.5 Hembree Trunk Sewer

The Hembree Trunk Sewer was constructed between 1988 and 1990 and serves the eastern portion of the Town between the Brooks Basin to the north and South Basin to the South. The overall basin is split into two portions: Hembree A Basin is located at the lower end and is served by a 12-inch diameter sewer main; Hembree B Basin is upstream of Hembree A is served by a separate 10- to 24-inch diameter trunk sewer that passes through the Hembree A Basin. The portion of the Hembree B located within Cock Robin Avenue did exhibit high levels of I/I during nighttime reconnaissance, and should be targeted by the Town to identify and potentially remove the I/I source.

2.1.6 Conde Trunk Sewer

The Conde Trunk begins at the convergence of several trunk sewers at the east side of the Town's WRF. This 12- to 42-inch diameter trunk sewer was primarily constructed in 1987 and runs south and parallel to the railroad right-of-way. The overall Conde Basin is the largest of the sewer basins at approximately 32 percent of the total area of the Town. As a whole, the basin produces a relatively low amount of I/I compared to its size. During the 2011 flow monitoring period, the basin was split into three basins to better understand sources of I/I. The largest basin, Conde A produces a relatively low amount of I/I, whereas the two smaller basins, Conde B South and Conde B North, produce higher amounts. Flow monitoring data suggests that the Conde B South Basin produces the third highest amount of I/I relative to other basins, only behind the North A Basin and Bell Village A Basin. Nighttime field reconnaissance in the Conde B South Basin identified a few system defects that should be targeted by the Town for potential repairs. These defects are described in the *Inflow/Infiltration Reconnaissance Investigation* report (V&A 2011a).

2.1.7 West Trunk Sewer

While the West Trunk currently only serves the residential development located to the west of the Town's WRF, the 2000 MTSP includes plans for extension of the West Trunk to eventually serve a portion of the North Basin, extending the current 12- to 24-inch diameter trunk sewer via 10- to 12-inch diameter sewers northward to Gumview Road. Subsequent analysis described in the *West Trunk Sewer Analysis* (GHD 2019) does not recommend serving the North Basin with the West Trunk.

The Town has constructed Phases 1 and 2 of the West Trunk, as described in the 2000 MTSP. The first phase extended the trunk sewer from Windsor Road to Starr Road, primarily serving the West Basin. Phase 2 was completed in 2013, extending the trunk sewer north through Keiser Park to Windsor River Road. The primary purpose of this phase was to decommission the former Deer Creek Lift Station and convey flow from the North C basin into the West Trunk, alleviating some of the hydraulic load on the North Trunk in Windsor Road. The West Basin currently contributes only a small amount of I/I into the collection system, which is consistent with it being the most recently-constructed trunk sewer in the Town. Nighttime field reconnaissance was not conducted for the West Basin due to the flow monitoring results.

2.2 Pipelines and Lift Stations

The sewer collection system includes gravity pipelines that range in size from 6- to 48-inches in diameter. The length of gravity pipeline by pipe diameter is presented in Table 2-1. Note that the pipe lengths are for the entire system and that not all pipes are modeled. For a summary of modeled pipes, see section 7.1 Hydraulic Model Construction. Also note, the current Town of Windsor *Design and Construction Standards* (2015) do not recommend sewer mains less than 8 inches in diameter.

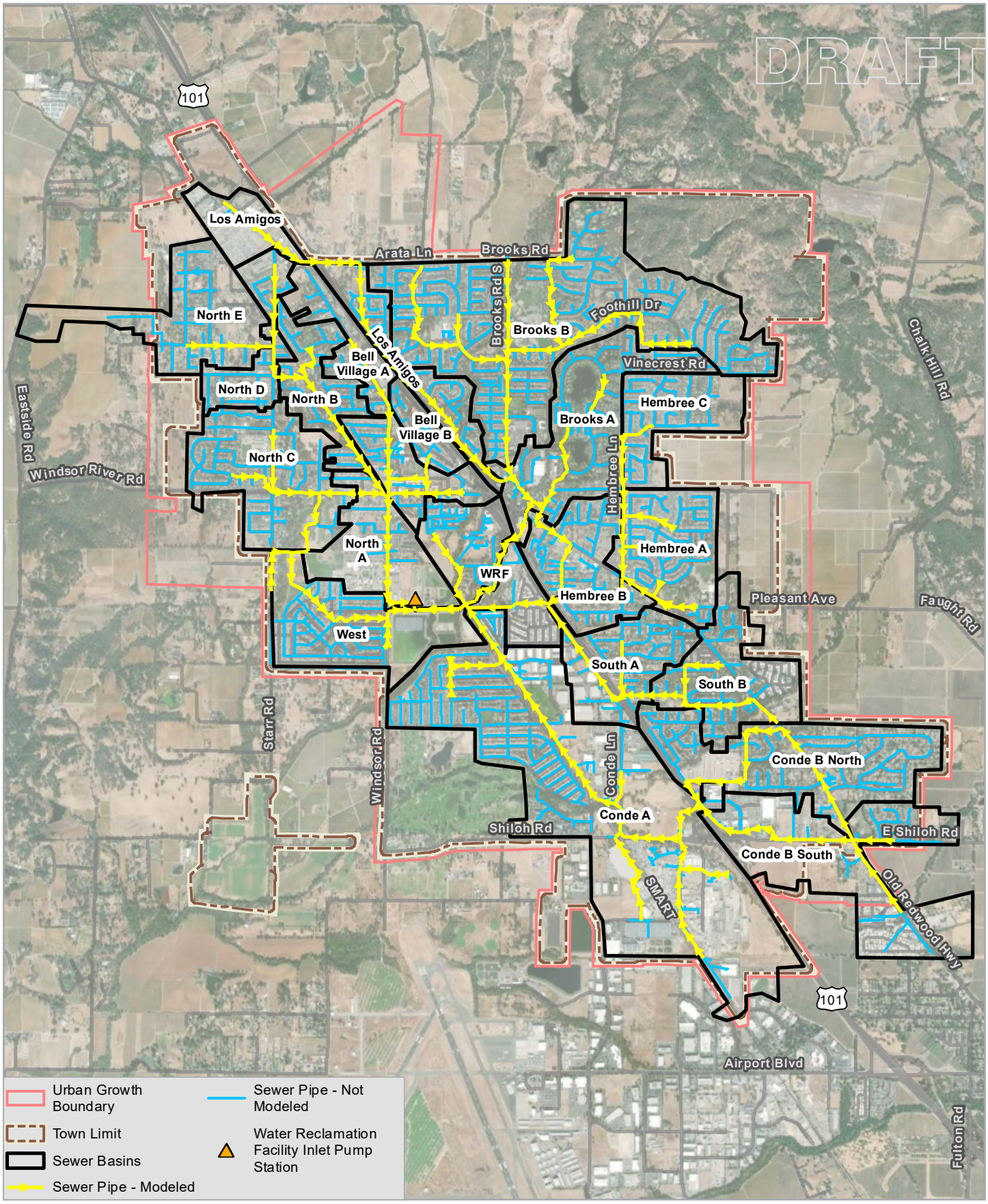
The Town of Windsor operates only two small lift stations; one associated with the golf course and another nearby in the Vintage Greens housing development. Neither of these lift stations are situated along a main trunk sewer and they are not located within the modeled pipe network.

The Town's previous Deer Creek lift station, located on Windsor River Road near Keiser Park, was replaced by a gravity main in 2013 as per the recommendation in the 2000 MTSP.

Table 2-1 Gravity Pipeline Lengths by Diameter

Diameter	Length
< 6-inches	14,709 ft
6-inches	238,047 ft
8-inches	170,673 ft
10-inches	30,095 ft
12-inches	26,604 ft
14-inches	4,739 ft
15-inches	10,479 ft
18-inches	11,377 ft
20-inches	1,474 ft
21-inches	2,813 ft
24-inches	9,634 ft
27-inches	3,674 ft
30-inches	39 ft
33-inches	1,311 ft
42-inches	1,162 ft
48-inches	25 ft
Total	**526,856 ft**

Figure 2-1 Sewer Basins and Flow Direction



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

Sewer Basins and Flow Direction

FIGURE 2-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 2-1 - Sewer Basins and Flow Direction.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

3. Data Collection and Field Survey

This chapter summarizes the review of available data and field survey data collection efforts. Work completed as part of Phase I, Phase II, and Phase III that contributed to the master planning effort is summarized below.

3.1 Review of Existing Available Data

This section describes Town sanitary sewer collection system maps, drawings, and other planning documents that were used to prepare the hydraulic model and master plan.

3.1.1 Town Sewer System Utility Basemap

The Town sewer system utility basemap was used to verify and correct the Town's GIS data.

3.1.2 Town GIS Geodatabase

The Town's GIS geodatabase provided the pipe network for the hydraulic model. The Town's GIS geodatabase does not include information regarding the date of installation or pipe material.

3.1.3 General Plan Update

The 2040 General Plan was used for future condition modeling. The future condition assumes build out of all vacant parcels in accordance with the 2040 General Plan land use designations. Where details for specific developments were known, flows were calculated based on the specific development plan rather than the 2040 General Plan. Specific developments are described in Section 4 and modelled flow rates are presented in Section 6.

3.2 Field Investigation

This section describes the data collection techniques employed from 2011-2016. Table 3-1 summarizes the investigation, dates, length of pipeline, and basin evaluated during each activity. For more detailed information on the field investigations, including locations and extents, refer to the *Inflow/Infiltration Investigation 2011-2016* (V&A 2016) report included in Appendix B, the *Collection System Infiltration and Inflow Study (Phase I)* (Winzler & Kelly 2011) and the *Report for Sewer Master Plan (Phase II)* (GHD 2014).

Table 3-1 Summary of Field Investigation

Investigation	Activity Description	Dates	Basin	Pipeline Length
V&A Flow Monitoring and I/I Study (Phase I)	12 flow monitors rotated during the flow monitoring period to capture flow from 20 different open channel flow monitoring sites and effectively isolating 19 different monitoring basins	Dec. 16, 2010 – Mar 16, 2011	19 basins	N/A
V&A Field Reconnaissance (Phase I)	Nighttime field reconnaissance of basins to establish baseline flows and quantify I/I	Feb. 17-18, 2011	North B Los Amigos Hembree B	N/A
V&A Field Reconnaissance (Phase I)	Nighttime field reconnaissance of basins to establish baseline flows and quantify I/I	Mar. 6, 2011	Bell Village	N/A
V&A Field Reconnaissance (Phase I)	Nighttime field reconnaissance of basins to establish baseline flows and quantify I/I	Mar. 24, 2011	South Conde B	N/A
Roy's Sewer CCTV (Phase II)	Identify sources of I/I by CCTV of pipe reaches identified in V&A flow monitoring	Apr. 8-9, 2013	Bell Village B Bell Village North A North B	5,384 feet
V&A Field Reconnaissance (Phase III)	Nighttime field reconnaissance of basins to establish baseline flows and quantify I/I	Mar. 14, 2016	Brooks A Conde B North Conde B South	N/A
Roy's Sewer CCTV (Phase III)	Identify sources of I/I by CCTV of pipe reaches identified by V&A flow monitoring	Mar. 14-16, 2016	Hembree B Conde B	5,736 feet
GHD Surveying (Phase III)	Survey of rim and invert elevations for modeled pipes (10-inches and greater)	Mar. – Dec. 2015	19 Basins	N/A

3.2.1 Flow Monitoring

An initial step for flow monitoring involved identifying strategic locations within the collection system to monitor wastewater flows during the wet season. Locations were selected based on the following criteria:

1) Monitor flows at the downstream end of each trunk sewer
2) Monitor flows for targeted basins located at the upstream end of trunk sewers

Twelve flow meters were installed by V&A on December 16, 2010. The location of these flow meters is shown in Figure 2 of the *Collection System Infiltration and Inflow Study (Phase I)* (Winzler & Kelly 2011), which is included in Appendix A. Many of these flow meters remained at the same location for the entire duration of the flow monitoring period, which ended on March 16, 2011. However, some meters were relocated midway through the flow monitoring period following preliminary evaluation of I/I for each monitored basin.

Meters within basins with low I/I rates were generally relocated to basins with high I/I rates, or where the size of the basin was large enough such that the portion of the basin contributing I/I could not be identified without splitting the basin. For example, the Conde Basin is the largest overall basin in the Town and it was not clear at the time of the preliminary evaluation if the amount of I/I from that basin was uniformly distributed or concentrated to one area. Flow meters were subsequently installed at the upstream reaches of the basin, which showed relatively high levels of I/I contribution in the Conde B South Basin.

Flow meters captured flow from 20 different open channels, effectively isolating 19 different monitoring basins. Area-velocity flow meters were installed in manholes to monitor flow. The flow meters had a pressure transducer that collected depth readings and an ultrasonic sensor that recorded velocity. A complete description of the flow monitoring effort is provided in the *Inflow/Infiltration Investigation 2011-2016* (V&A 2016) completed in Appendix B.

3.2.2 Night-time Inflow/Infiltration Reconnaissance

GHD retained the services of V&A to investigate and look for evidence of I/I in selected manhole structures, sewer alignments, and other related sewer basin components. This work was conducted in basins identified as having the greatest I/I contribution during the low-flow hours between 1:00 am and 4:30 am, when I/I flow is most evident (“clear-water” flow). Evidence of I/I revealed during the investigations included, but was not limited to, the following items: structural defects within manholes, visible tracking of I/I flow during a storm event, suspicious storm crossings, and direct connections from roof leaders into sanitary sewer clean-outs. A complete description of the field reconnaissance effort is provided in the *Inflow/Infiltration Investigation* 2011-2016 (V&A 2016) report in Appendix B.

3.2.3 Closed Circuit Television Inspection (2013, 2016)

Closed circuit television inspection was performed by Roy’s Sewer Service April 8-9, 2013 and again between March 14-15, 2016. The areas included in the 2013 CCTV inspection were based on recommendations from V&A’s April 2011 *Inflow/Infiltration Reconnaissance Investigation* (V&A 2011a) report and included portions of the Town’s sanitary sewer collection system within the North Basin. The April 2011 V&A Report also recommended CCTV inspection in other Town sewer basins,

including the Conde B and South Basins. The North Basin was selected for CCTV inspection during the 2012-13 wet weather season for the following two reasons: 1) the North Basin exhibited the highest levels of I/I during V&A's 2011 field investigation; and 2) to provide additional field data for the evaluation of the North Trunk sewer system. Conde B Basin was later inspected with CCTV during the 2016 effort along with Hembree B Basin.

The 2013 CCTV inspection was conducted following a moderate rainfall event; however, the 2012-13 wet season produced generally poor results region-wide for flow monitoring and observation efforts. In an average wet season, it is anticipated that the rainfall event that preceded the CCTV work would have produced higher levels of I/I, as the ground in the vicinity of the observed pipelines would be more saturated. The quantity of returns (i.e., an instance of clear water flow that is suspected to be I/I generated through a defect in the sewer collection system) and flow estimate results of the 2013 CCTV inspection likely underestimated the I/I contribution to the sewer collection system compared to an average rainfall year.

Additional wet weather reconnaissance work was completed in 2016 to affirm the 2013 CCTV inspection data used in the hydraulic analysis for this master plan, particularly in the Conde B Basin and for targeted areas within the Hembree B, Los Amigos, and South Basins.

Figure 2 and Figure 3 in the *Report for Sewer Master Plan (Phase II)* (GHD 2014) shows the location of the CCTV inspections. These figures are included in Appendix A.

3.2.4 Pipeline Data Gap Assessment

As a preliminary step, a gap assessment was conducted for the Town's current GIS geodatabase to identify data needs (i.e., invert elevations, pipe sizes, and other missing information relevant for model construction). At the time, the GIS geodatabase did not include invert or rim elevations, which are needed to construct the model. GHD conducted a field survey using GPS-enabled devices to collect rim and invert elevations.

3.2.5 Pipeline Network Field Survey

The field survey began by determining the extents of the sewer model, which defined the scope of the field survey. This included most of the pipes 10-inches in diameter and larger, plus some 6-inch and 8-inch pipes to provide complete connectivity of the sewer model.

Once the field survey extents were identified, a GHD employee, equipped with a highly accurate GPS unit (Trimble Geo7X Centimeter edition with real-time correction and sub-inch accuracy) conducted the field survey with the assistance of a Town staff member. At each manhole, the rim was recorded along with all pipe inverts. Where possible, pipe diameter was confirmed. The manhole location was also corrected, if needed, and condition data recorded. The data was post processed and then incorporated into the Town's GIS and imported into the sewer model.

4. Land Use Classifications

Land use classifications were used to estimate sewer demands (i.e., flow rates) for the future condition based on the assumption that undeveloped parcels will be developed in accordance with the land use classification designations in the 2040 General Plan. An example of the importance for using specific land uses is sewer flow rates from a high-density residential land use will differ significantly from sewer flow rates from low-density residential, commercial, or industrial land uses. Where specific land use information was available for new development or redevelopment of a property (i.e., type of commercial use provided by the Town), that information was used in place of 2040 General Plan designations.

4.1 Service Area

The Town currently provides sewer service to customers located within the sphere of influence as shown in Figure 4-1. The sphere of influence extends west towards Eastside Road to the northwest of the Town and along Old Redwood Highway to the southeast of the Town. The current area served is approximately 6.7 square miles.

4.2 Land Use Classifications

To simplify the process of generating sewer demands for this master plan, the 24 land use categories in the Town's 2040 General Plan were consolidated into 11 utility land use classifications by combining those classifications for which flow rates do not significantly differ. Table 4-1 shows the 11 utility land use classifications.

Table 4-1 Land Use Classifications

Utility Land Use Classification	Land Use Classification(s) from 2040 General Plan[1]
Commercial	Retail Commercial (0.0-16.0 DU/Ac[2]; 0.0-0.8 FAR[3]) Service Commercial (0.0-0.8 FAR) Gateway Commercial (0.0-0.8 FAR) General Business (0.0-1.0 FAR) Neighborhood Center/Mixed Use (8.0-16.0 DU/Ac; 0.25-1.5 FAR) Boulevard Mixed Use (16.0-32.0 DU/Ac; 0.50-2.0 FAR) Town Center - Mixed Use (16.0-32.0 DU/Ac; 0.75-2.5 FAR)
Heavy Industrial	Heavy Industrial (0.0-0.5 FAR)
Light Industrial	Light Industrial (0.0-0.6 FAR)
Public Institutional	Parks and Recreation (0.0-0.1 FAR) Open Space (0.0-0.05 FAR) Public/Quasi-Public (0.0-1.0 FAR)
Rural Residential	Rural Residential (0.0-0.2 DU/Ac)
Estate Residential	Estate Residential (0.2-3.0 DU/Ac)
Very Low Density Residential	Very Low-Density Residential (3.0-6.0 DU/AC)
Low Density Residential	Low-Density Residential (5.0-8.0 DU/AC)

Utility Land Use Classification	Land Use Classification(s) from 2040 General Plan[1]
Medium Low Density Residential	Low-Medium-Density Residential
Medium Density Residential	Medium-Density Residential (8.0-16.0 DU/AC) Mobile Home Park (8.0-12.0 DU/AC)
High Density Residential	High-Density Residential (16.0-32.0 DU/AC) Medium-High-Density Residential

1. DU/Ac = dwelling units per acre.
2. FAR = floor area ratio and refers to the ratio of building floor space compared to the square footage of the property.

4.3 Existing Condition

Hydraulic modeling of existing condition relied primarily on flow monitoring work performed by V&A during the winter of 2010-2011 (Phase I) and billing records obtained from the Town for the 2013-14 winter months (December through February) . Wastewater flows from development and redevelopment projects constructed since 2014 were added to bring the existing condition model up to date with current conditions (2018). The most recent water billing records for these developments were used, where available; otherwise utility land use classifications and unit flows were used to estimate wastewater flows. The utility land use classification was selected for each existing development based on the calculated dwelling units-per-acre intensity, when applicable; otherwise the presumed land use/utility classification was used. These projects are presented in Table 4-2 and Figure 4-2.

Table 4-2 Development Projects Completed Since Winter 2013-2014[1]

Project Name	Intensity	Utility Land Use Classification
Victoria Oaks	89 SFD[2]	Low Density Residential
Esposti Park Place	36 MFD[3]	Medium Density Residential
Holiday Inn	104-room hotel and restaurant	Commercial
Grand Cru Winery	Custom crush facility and event space	Light Industrial
Encore Events	56,754-sf warehouse for party rental equipment	Light Industrial
Russian River Brewery	Brewery, 4,397-sf restaurant, and 1,287-sf retail (discharges 4,940 gpd[4] per permit, excluding restaurant)	Light Industrial and Commercial
Bell Village Commercial	Approximately 6 acres of commercial retail including a grocery store, salon and restaurants	Commercial

1. Source: Public Works engineering staff, Town of Windsor
2. SFD = single family dwelling
3. MFD = multi family dwelling
4. gpd = gallons per day

4.3.1 Victoria Oaks

Victoria Oaks is a development of 89 single family detached homes under construction east of Highway 101 in the southern portion of the Town. It is anticipated to be built out and occupied by 2020. Wastewater flows are based on unit flows developed for single family detached homes.

4.3.2 Esposti Park Place

Esposti Park Place is a 36-unit apartment building completed in mid-summer 2017 and is located along Old Redwood Highway in the southeast part of Town. Because the project was completed and occupied following the 2013-14 winter, wastewater flows from Esposti Park Place are based on water billing data provided by the Town.

4.3.3 Holiday Inn

Holiday Inn is a 104-room hotel with an on-site restaurant located in the southeast corner of the Old Redwood Highway and Highway 101 crossing. The hotel was completed in 2017 and is therefore included in the existing condition model. The unit flow rate for hotels is used to estimate existing flows on a per room basis with additional flows for the restaurant based on commercial land use classification.

4.3.4 Grand Cru Winery

Completed in 2017, Grand Cru Winery is a custom crush facility with an alternating proprietor facility/event space. It is located in the southwest part of Town west of Highway 101. Actual wastewater flows since opening were obtained from the Town and compared to the estimates previously made based on winter 2013-14 water billing data.

4.3.5 Encore Events

Encore Events, a 56,754 square foot party rental distribution center with approximately 100 eventual employees, was approved for construction in 2019. It is located in the southwest part of Town west of Highway 101. The space is essentially a warehouse for storing party supplies such as tents, chairs, tables, dishes, and more. Dish washing may be done on site as well. Existing sewer flows for this development are based on the square footage unit flows for the light industrial utility land use classification.

4.3.6 Russian River Brewery

Russian River Brewery opened for business in 2018 and consists of 4,397 square feet of dining and 1,287 square feet of non-dining. It is located in the southwest part of the Town west of Highway 101. Previous Town estimates for wastewater generation at the Brewery of 1 to 4 million gallons/year are considered current. Russian River Brewery has a wastewater discharge holding tank to control the release of wastewater into the sanitary sewer. The Brewery is also reusing process water on site for non-potable uses such as landscaping and wash-down in order to offset potable water demand. Per its discharge permit, Russian River Brewery discharges approximately 504,500 gallons/year (4,940 gpd), which accounts for internal reuse but does not include the restaurant. Additional existing flows for the 4,397 square feet of dining are based on square footage unit flows for the commercial utility land use classification.

4.3.7 Bell Village Commercial

This commercial property has been developed since 2015 and is located in the northwest corner of the Old Redwood Highway and Highway 101 crossing. It includes an Oliver's grocery store and other commercial space. Water billing data provided by the Town since project completion was used to determine wastewater flows for inclusion in the existing condition model.

4.4 Future Condition

The future condition assumes that development projects in the planning and approval stages will be completed and that all other undeveloped land will be developed in accordance with the land use classifications in the Town's 2040 General Plan, as shown in Figure 4-3.

4.4.1 Planned and Approved Projects

Proposed projects in the planning and approval stages as of May 2018 are listed in Table 4-3. The utility land use classification for each project was selected based on calculated dwelling unit per acre intensity where applicable; otherwise, the 2040 General Plan land use classification was used. Table 4-1 was used to translate the 2040 General Plan land use classification (shown in Figure 4-3) to the corresponding utility land use classification (presented in Table 4-3) for each development project. These projects have been incorporated into the future condition scenario for this master plan. The locations of the projects included in the future condition scenario are shown on Figure 4-4. A detailed description of each development project is provided in Appendix C.

Table 4-3 Proposed Development Projects in the Planning and Approval Phase[1]

Project Name	Intensity	Utility Land Use Classification
Vintage Oaks on the Town Green	387 apartments	High Density Residential
Overlook	12 SFD, Large lots	Very Low Density Residential
6100 Old Redwood Highway (at Merner Drive)	12 units plus 12 secondary units (24 total)	High Density Residential
Richardson Street Mixed Use	30 apartments and 4,200 sf retail (possibly a restaurant)	High Density Residential
280 Arata Lane	6 SFD (with one existing house on site)	Very Low Density Residential
330 Arata Lane	6 SFD	Very Low Density Residential
6500 Old Redwood Highway	8 SFD	Estate Residential
Den Beste Warehouse	34,880 sf warehouse located at 1145 Kittyhawk	Light Industrial
The Oaks	31 apartments	Medium Density Residential
Creekwalk	24 residential units	Low Density Residential
Draper Estates	5 SFD, Estate lots (approximately 5 acres) with 2nd unit on each lot	Estate Residential
Duncan Village	16 low income units (attached), Habitat for Humanity	Medium Density Residential

Project Name	Intensity	Utility Land Use Classification
Mill Creek Apartments	360 apartments (with clubhouse and pool)	High Density Residential
Windsor Veteran Village	60 apartments	High Density Residential
Chevron Remodel	2 new retail stores, expanding existing gas station and car wash	Commercial
LaFort	19,732 sf warehouse for wine equipment	Light Industrial
Heritage Park	31 apartment units (affordable housing)	High Density Residential

1. Source: Public Works engineering staff, Town of Windsor

4.4.2 Other Development Projects

In addition to the projects in the planning and approved stages listed in Table 4-3, other projects have been identified as potential projects but have not been formally submitted to the Town. These projects warrant individual sewer flow estimates and are incorporated into the future condition scenario for the sewer master plan. These projects are summarized in Table 4-4 and shown on Figure 4-5. A more detailed description of each anticipated development project is provided in Appendix C. The utility land use classification was selected based on dwelling unit per acre intensity where applicable; otherwise, the 2040 General Plan land use classification was used.

Table 4-4 Other Proposed Development Projects that have not been Submitted[1]

Project Name	Planned Intensity	Utility Land Use Classification
Hembree Lane Subdivision	21 units including 8 duplexes and 13 SF detached	Very Low Density Residential
Sky	20 MFD and commercial	High Density Residential
Jensen Lane Annexation and Subdivision	275 SFD	Very Low Density Residential
Wine Country RV Park	40 RV spots	Medium Density Residential
REVEL	Lightly assisted living (159 units and dining room)	High Density Residential
Town Green Hotel	104 rooms, pool, and restaurant (limited menu bistro - 1,667sf gross area/1,344 sf seating)	Commercial
North of Arata Annexation	850 units (mixed apartments, SFD), commercial	Low Density Residential
North Annexation School	500 students	Public Institutional

Project Name	Planned Intensity	Utility Land Use Classification
Carnation/ATP	22.5 acres Carnation expansion, ATP expansion of warehouse, Waterworks relocation from Pruitt, wrestling center, Junior College expansion of Public Safety Training Facility	Light Industrial
Lytton	147 SFD	Very Low Density Residential
Civic Center Block A	100+ rooms, restaurant, conference space. Site of Huerta Gymnasium.	Commercial
Town Hall expansion	Town Hall rebuild; move library to accommodate new use; Performing Arts Center; School District move to Windsor Creek Elementary; Police move TBD	Public Institutional
Micro-Vu expansion	Relocation and expansion from 2 acres to 15-20 acres	Light Industrial
Vicini	12.5-acre development including hotel, assisted living, 20,000 sf retail, multi-story buildings, and parking structure	Commercial
Winery south of Wilson Park soccer fields	Tasting room/restaurant anticipated, 250,000 cases/yr	Light Industrial
Mini-Storage	No expected change to wastewater flows	Light Industrial
The Artisan	64-unit assisted living facility	High Density Residential

1. Source: Public Works engineering staff, Town of Windsor

4.4.3 General Development

Vacant parcels that are not under any current plan for development are assumed to be developed in the future conditions model following the zoning in the 2040 General Plan. For these parcels, sewer flows were estimated using gpd per acre based on average demands/flows for developed properties with the same land use classification. Table 4-5 summarizes the acreage of vacant parcels based on the utility land use classification. Figure 4-6 shows these vacant parcels spatially with the associated 2040 General Plan land use classification.

Table 4-5 Vacant Parcels

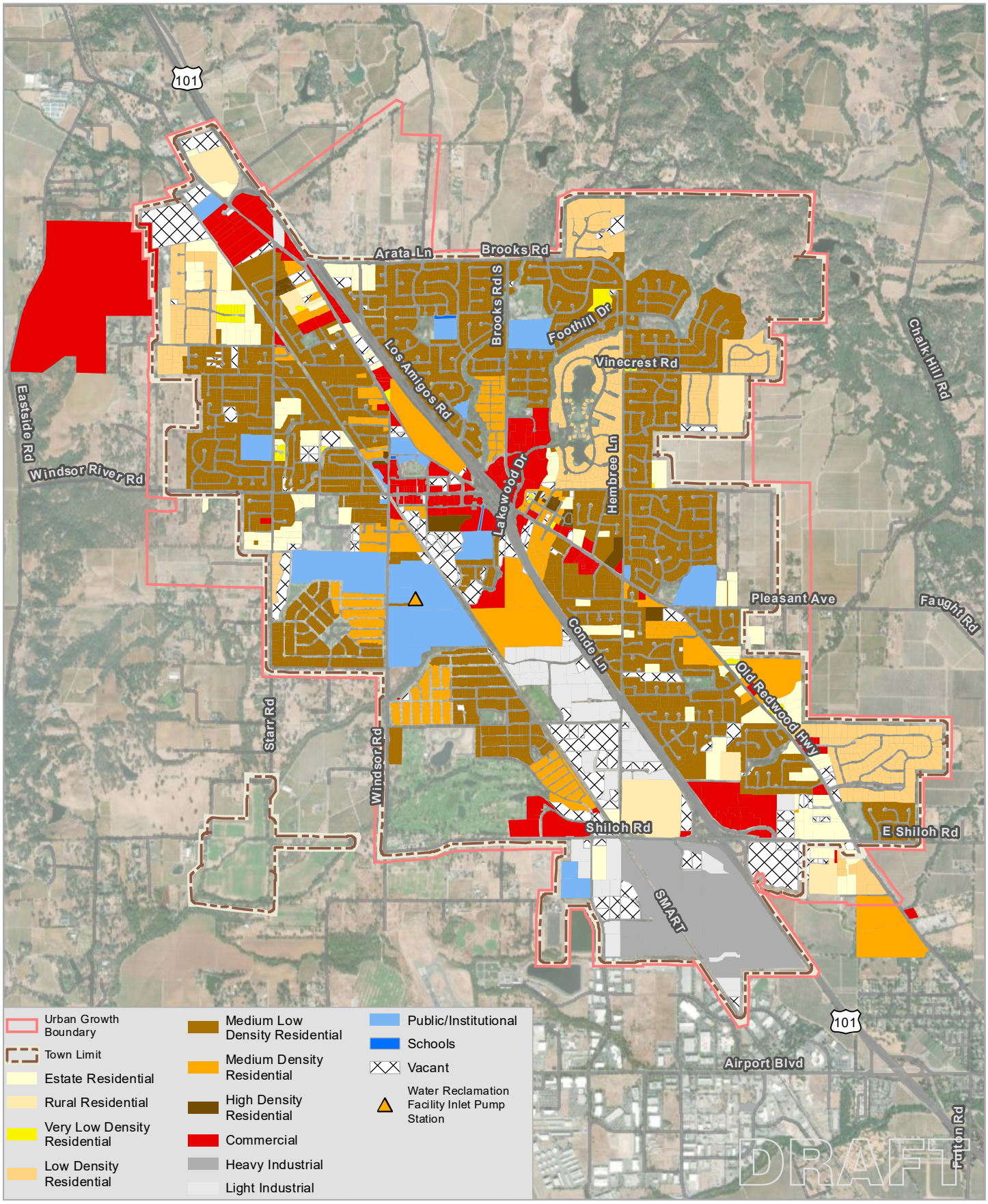
Utility Land Use Classification	Acres
Commercial	43.83
Heavy Industrial	8.64
Light Industrial	21.55
Public Institutional	0.34
Rural Residential	0.00
Estate Residential	6.48
Very Low Density Residential[1]	23.00

Low Density Residential	11.38
Medium Low Density Residential	0.00
Medium Density Residential	6.66
High Density Residential	3.78
Total	**126.72**

1. Vacant parcels that are undevelopable are not included in this table or in the future flows calculation.

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Figure 4-1 Existing Land Use



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **2**
Date **8/18/2020**

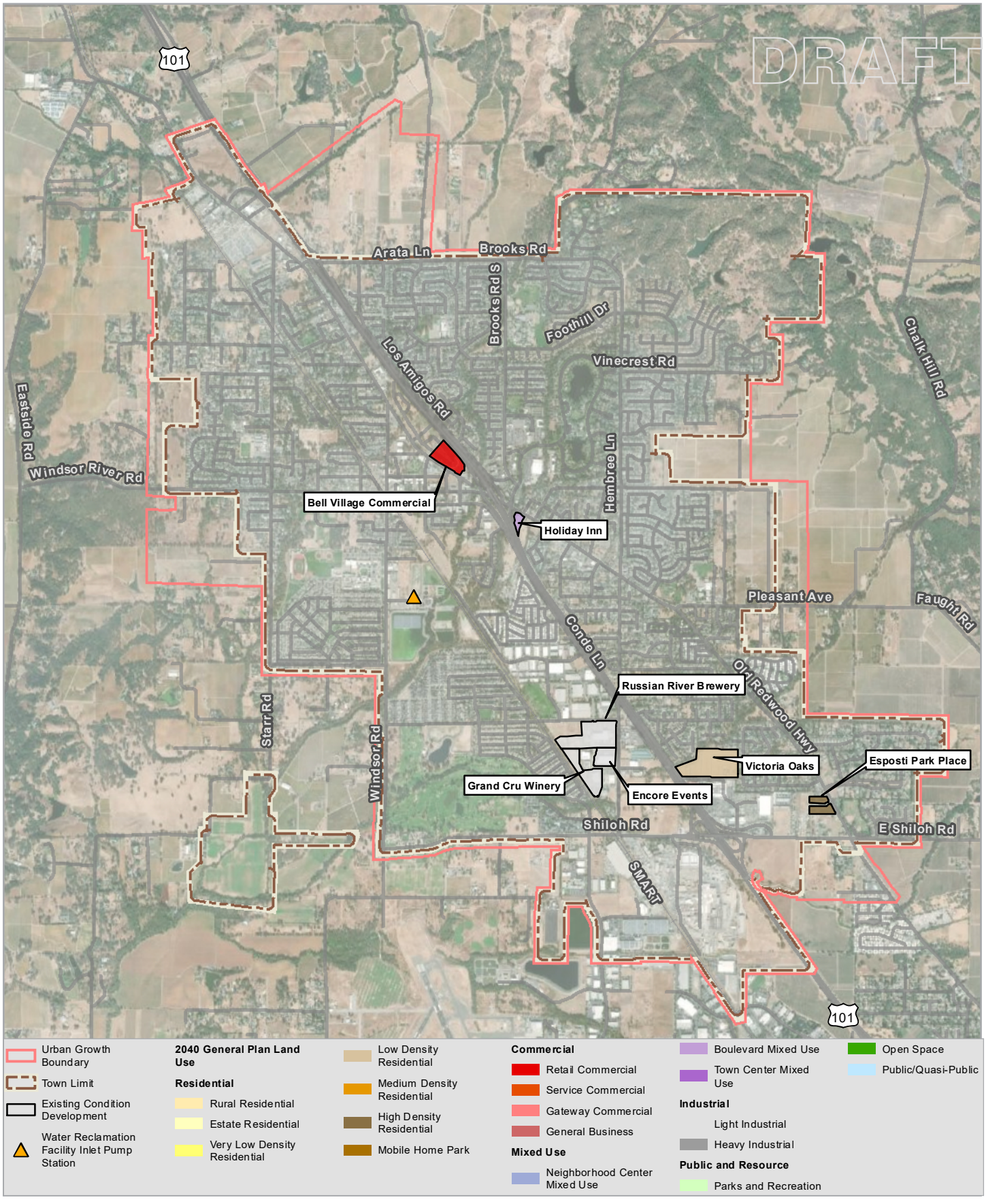
Existing Land Use

FIGURE 4-1

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Print date: 20 Aug 2020 - 10:25

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 4-2 Existing Condition Developments



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
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Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **2**
Date **8/20/2020**

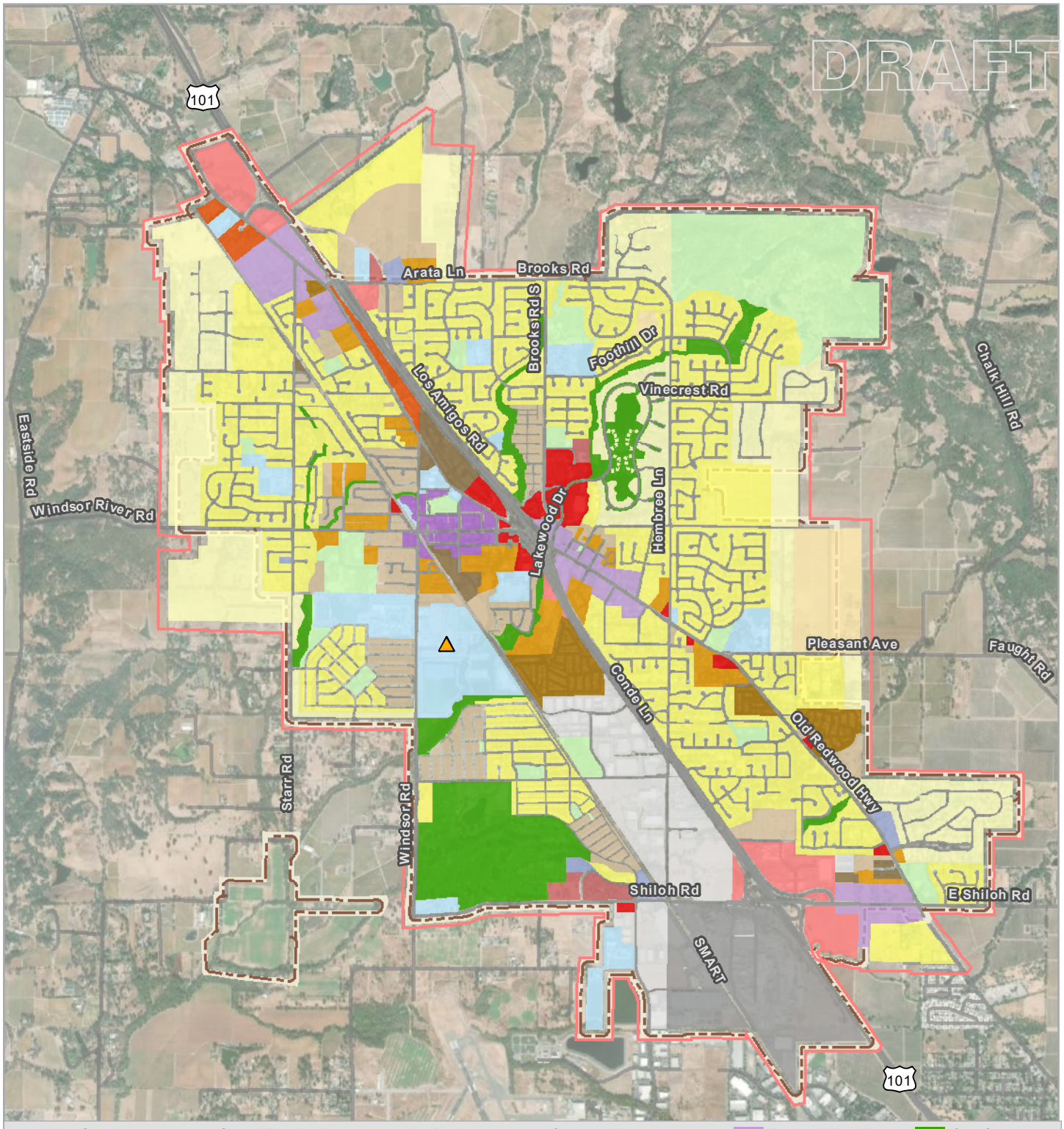
Existing Condition Developments

FIGURE 4-2

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Print date: 20 Aug 2020 - 10:29

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 4-3 General Plan Land Use



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **0**
Date **8/18/2020**

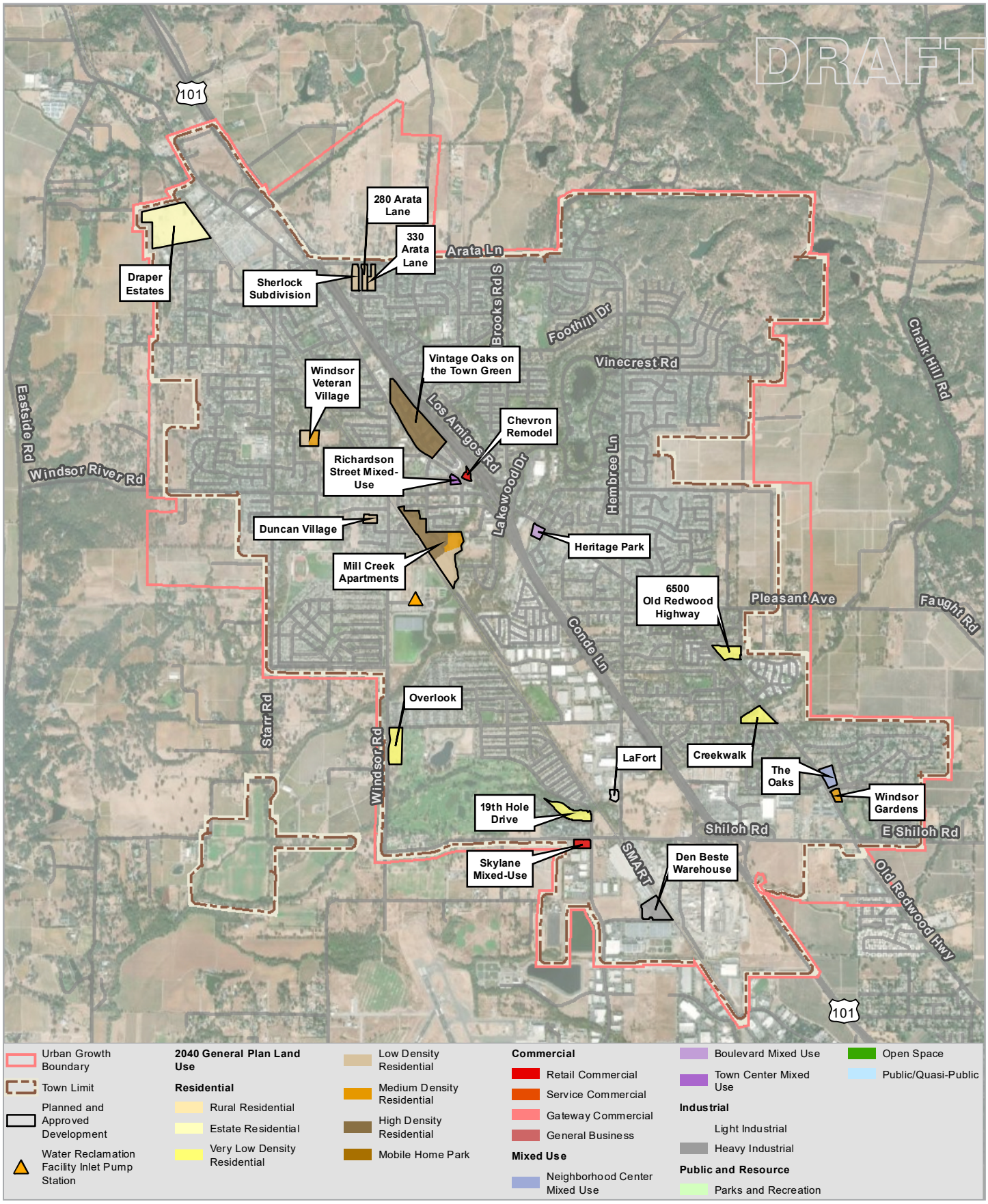
2040 General Plan Land Use

FIGURE 4-3

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Print date: 20 Aug 2020 - 10:30

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 4-4 Planned and Approved Development Projects



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 3
Date 8/18/2020

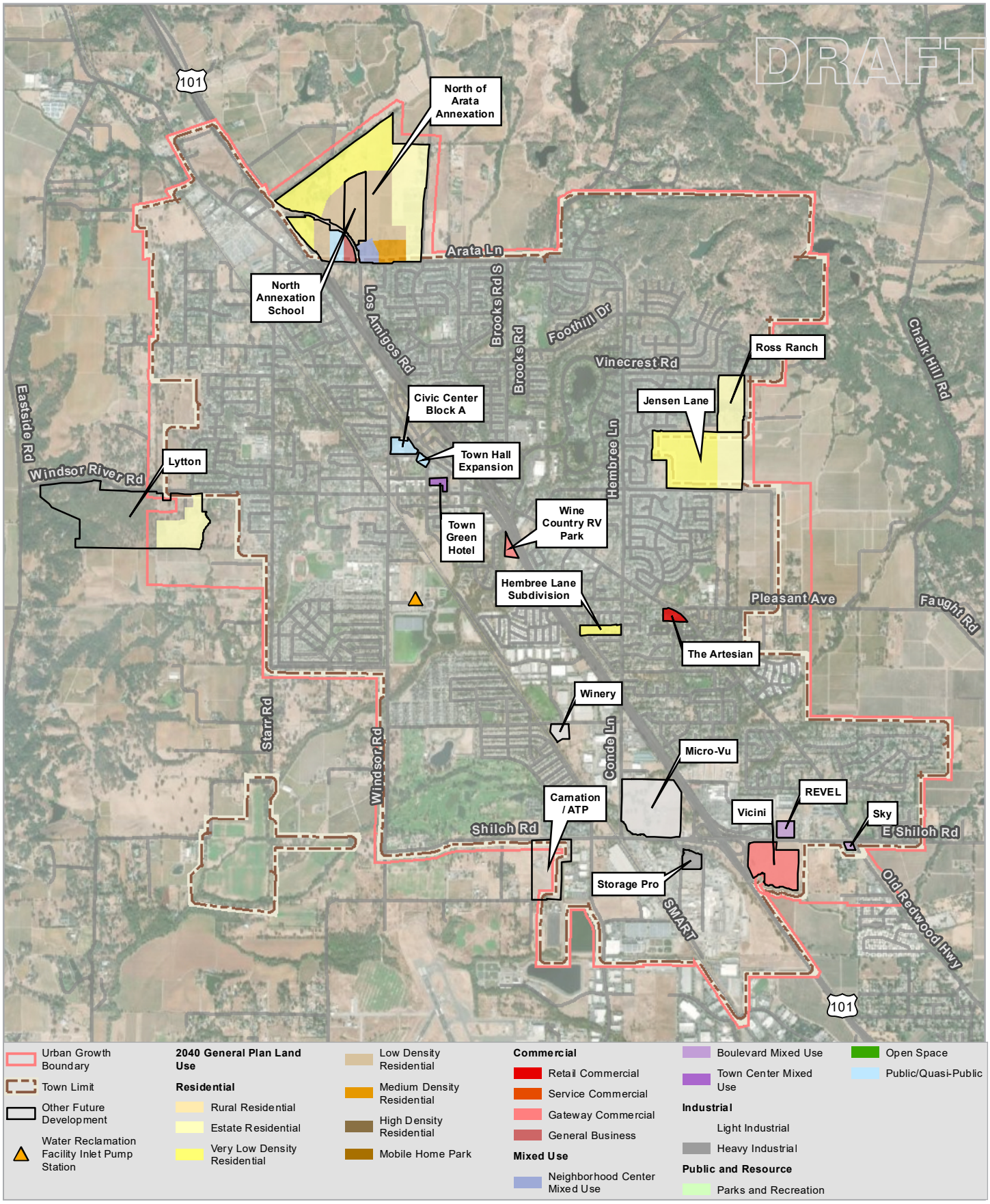
Planned and Approved Development Projects

FIGURE 4-4

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 4-5 Other Development Projects



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 2
Date 8/18/2020

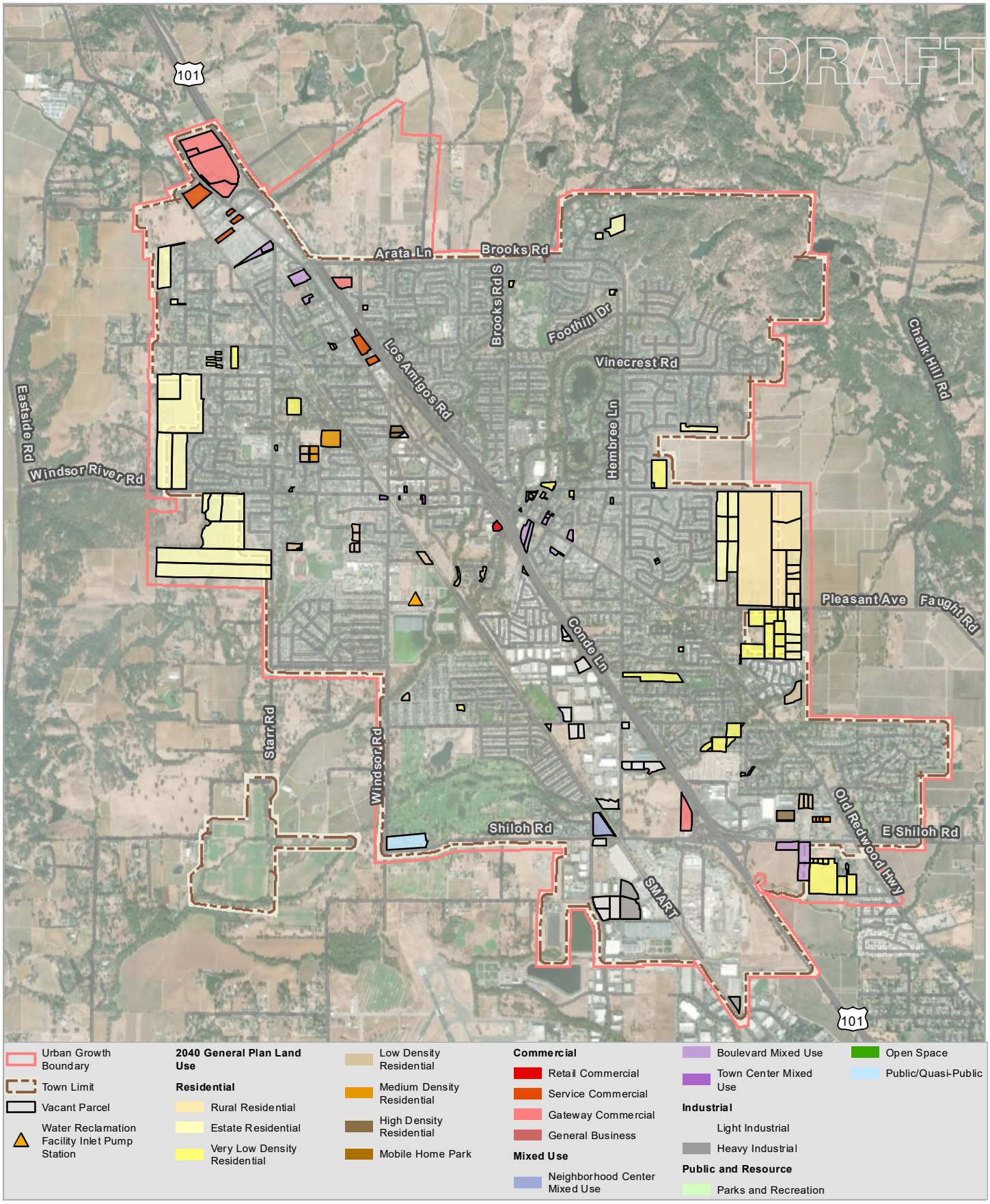
Other Future Development Projects

FIGURE 4-5

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 4-6 Vacant Parcels



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Vacant Parcels

Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

FIGURE 4-6

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 4-6 - Vacant Parcels.mxd
Print date: 20 Aug 2020 - 10:33

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

5. Planning and Evaluation Criteria

Planning and evaluation criteria are needed to guide the evaluation of deficiencies in the sewer collection system and assessment of the effectiveness of planned improvements. Specifically, for this master plan, the criteria were used to determine sewer system flow rates (Section 6) and to develop the hydraulic evaluation (Section 7). Planning and evaluation criteria include the following:

- Determination of peak flows
- Pipe flow depth to diameter ratio (d/D)
- Pipe material coefficients
- Minimum and maximum pipe slope and flow velocity
- Design rainfall event
- System reliability goals

The criteria presented here were developed from the findings of Phase II of the master planning effort (Section 4 of *Report for Sewer Master Plan* [GHD 2014]) by reviewing the 2014 model results. As a starting point, the service level for any portion of the Town's sewer infrastructure was based on pre-established criteria; if a given criterion did not meet the Town's desired level of service, then additional consideration was given to establish revised criteria. For example, the established criteria stated that ADWF should have a flow velocity of 2 ft/second. Upon reviewing model results, that was found to be impractical given the overall flat slope of the sewer system and generally adequate performance of the current system; PDWF is now the recommended basis to establish the minimum flow velocity criteria.

5.1 Planning Criteria

Planning criteria establish the minimum design standards for infrastructure improvements in the sewer collection system. Table 5-1 lists the planning criteria established for the Town's sewer collection system.

Table 5-1 Sewer Collection System Planning Criteria

Item	Criteria
Flow Scenarios	• ADWF – the average dry weather wastewater flows (base flow) • PDWF – the highest diurnal base flow • PWWF – the highest rainfall-induced wet weather flow
Wastewater Flow Peaking Factors	• Dry weather peaking factor = PDWF/ADWF • Wet weather peaking factor = PWWF/ADWF; also expressed as the I/I component of wet weather flow
Pipe Material Coefficient (Manning's "n" Value)	• N = 0.013 for new and existing pipes
Design Rainfall Event	• NOAA Atlas 2 ten-year, 24-hour recurrence event

5.1.1 Flow Scenarios and Sewer Flow Peaking Factors

Sewer peak flows were developed by V&A and presented in its May 2011 report and further refined in Phases II and III. This included the development of the ratios of ADWF to PDWF and PWWF, which were used to develop flow rates for the hydraulic model. Peaking factors were then determined as the ratio between the ADWF, PDWF, and PWWF. These peaking factors were used in lieu of reference standards as they are based on actual Town sewer collection system performance as measured during the 2011 season.

Hydraulic modeling for the existing condition used the flows and corresponding peaking factors determined by V&A. The peaking factors were then used to determine PDWF and PWWF for modeling the future condition; ADWF was determined through analysis of flow monitoring data, and that base flow was adjusted using the peaking factors.

The following discussion describes each V&A flow rate used in the hydraulic modeling for this master plan.

Average Dry Weather Flow

Average dry weather flow is the normal anticipated dry weather sewer flow. ADWF was determined for each sewer basin by V&A through its flow monitoring analysis of the sewer system.

Peak Dry Weather Flow

Peak dry weather flow is the peak base flow that occurs during a typical diurnal variation. PDWF typically occurs in the morning and evening hours in residential land use and the middle of the day in commercial and industrial land uses. PDWF was determined by V&A through its flow monitoring analysis of the sewer collection system. Comparing average dry weather flow data from the Town's WRF to the peak average dry weather flow rate from V&A flow monitoring data from the 2011 season yielded a ADWF to PDWF peaking factor of 2.5.

Peak Wet Weather Flow

Peak wet weather flow is the sum of the PDWF and peak I/I flow. PWWF was determined by V&A through its flow monitoring analysis of the sewer collection system conducted in Phases I and III.

Per V&A's analysis of the January 5, 2008 storm event (provided in Appendix B), the 10-year, peak wet weather flow rate for the WRF is 15.65 mgd unattenuated. The PDWF portion of that flow rate is 3.22 mgd, which leaves 12.43 mgd as the I/I contribution.

PDWF to PWWF peaking factor is then calculated as follows: 12.43 mgd/3.22 mgd ~ 3.9. This peaking factor represents the ratio of PDWF to PWWF for the overall sewer collection system. Peaking factor is typically higher in smaller portions of the collection system where I/I contribution is disproportionately higher compared to base flow.

For future flow projections of new development connected to the collection system, it is useful to express future I/I as gallons per acre per day (as is the Town's 2000 MTSP).

New pipe materials and construction methods should result in less future I/I in new developments compared to the to the system as a whole, therefore GHD identified basins that were generally constructed in the last 40 years (information was provided by GHD employees who have a personal

history with Windsor). Five basins met that criteria (Conde A, Hembree A, Hembree C, Brooks A, and West). These basins have a ratio of peak I/I to acres, ranging from 840 gallons per acre per day (gpdpa) to 1,673 gpapd, with an average of 1,212 gpapd. While the basins identified generally have newer pipes, they do contain some old pipes also which don't accurately represent new pipe materials and construction, therefore, it is assumed that the overall I/I rate is discounted 30% to account for the old pipes. That results in an I/I rate of 848 gpapd which is rounding up to 850 gpapd for analysis of new developments. Note that this value is more than twice the value used in the previous 2000 MTSP (400 gpapd).

Note: the analysis provided here in the Peak Wet Weather Flow section supersedes previous analysis in earlier master planning phases.

5.1.2 Pipe Material Coefficient (Manning's "n" Value)

Pipe capacities depend on many factors including slope, pipe roughness, and pipe shape. The Continuity Equation and the Manning Equation for steady-state flow are used to calculate flow in a sewer pipe. The Manning coefficient 'n' is a friction coefficient and varies with respect to pipe material, size of pipe, depth of flow, smoothness of pipe and joints, and extent of root intrusion. For sewer pipes, the Manning coefficient 'n' typically ranges between 0.011 and 0.017.

The typical Mannings' 'n' coefficient found during research was n=0.013. This factor is relatively conservative for new sewers and accepted by general engineering practice for evaluation of existing sewers. The following sewer agencies use a Mannings' 'n' of 0.013: City of Santa Rosa (2018), Napa Sanitation District (2012), City of Rohnert Park (2009), City of Healdsburg (2008), Dublin San Ramon Services District (2020), Union Sanitary District (2017), and City of Vacaville (1990).

The Sonoma County Water Agency (2009) also uses n=0.013 for collector pipes; however n=0.014 is used for trunk sewers, per the Design and Construction Standards for Sanitation Facilities dated February 3, 2009.

The Town's current Design and Construction Standards (2011 and revised in 2015) states: "Use n=0.011 for new pipe and n=0.015 for the existing system or manufacturer's recommendation, whichever is higher." The 2000 MTSP utilizes a value of n=0.011.

After evaluating the above resources, for conservative purposes and to be consistent with surrounding municipalities (and within the Town's range of current standards), Manning's "n" value of 0.013 is used in this master plan for new and existing pipelines.

5.1.3 Design Rainfall Event

The typical standard found through research of various sewer agencies' master planning documents is a 10-year return frequency event, though some agencies consider a 20-year event for larger diameter trunk sewers. The duration of the event used for modeling purposes can vary from 4 to 24 hours, or longer. The 2011 flow monitoring and analysis prepared by V&A found that a 24-hour duration rainfall event best fit the flow characteristics for the Town (V&A 2011b). A NOAA Rainfall Frequency Atlas 2 (NOAA Atlas 2) 10-year, 24-hour design storm event is used for this master plan.

The NOAA Atlas 2, used for the design rainfall event, classifies a 10-year, 24-hour storm event in Windsor as 5.60 inches. At the time of V&A's flow monitoring and I/I investigation, the online storm frequency return values had not been updated. In performing a comparison, the current NOAA

Rainfall Frequency Atlas 14 (NOAA Atlas 14) classifies the 10-year, 24-hour storm event in Windsor (at the Central Windsor Rain Gauge) as 5.87 inches. This represented a 4.5% increase in rainfall intensity. In addition, the nature of the static hydraulic model used in the CSMP does not account for attenuation of flows within the sewer network, thereby artificially increasing flows in the model, especially in downstream basins. For these reasons, it was determined that V&A's previous analysis was still relevant for the purposes of the scope of the CSMP and a recalculation and reissue of the V&A report was not completed.

5.2 Evaluation Criteria

Evaluation criteria set the minimum conditions that must be met for sewer collection system performance, include pipe capacity and flow velocity. Table 5-2 lists the evaluation criteria established for the Town's sewer collection system.

Table 5-2 Sewer Collection System Evaluation Criteria

Item	Criteria
Pipe Capacity (d/D Ratio)	• Capacity of gravity sewers calculated by the Manning Equation • d/D = 0.7 for new sewer mains • d/D = 0.9 for existing sewer mains
Minimum and Maximum Pipe Slopes and Flow Velocities	• Minimum velocity = 2.0 feet per second (fps) for peak dry weather flow • Maximum velocity shall not exceed 8 fps • Minimum and maximum pipe slopes are not established in Town design standards

5.2.1 Pipe Capacity (d/D Ratio)

The design capacity of a pipeline is often determined by a set ratio of the design flow depth "d" to the pipeline diameter "D" or "d/D". When designing gravity sewer pipelines, it is common practice to set flow depth criteria by the size of the pipeline. Design d/D ratios typically range from 0.5 to 0.9. The maximum capacity of gravity sewers occurs at a d/D ratio of about 0.9, but using 0.7 provides a safety factor for the potential buildup of solids before scheduled maintenance can occur, regardless of the pipe diameter.

The Town's 2000 MTSP and current Design and Construction Standards (2011) do not provide specific guidance for the selection of a target d/D ratio, though both documents state that all gravity sewers shall be designed to achieve a minimum velocity of 2 fps when flowing full (d/D=0.9). To date, the Town has established the use of the City of Santa Rosa's d/D ratio for its hydraulic analyses, where the d/D ratio for existing sewers is 0.9. A specific d/D ratio for new sewers is not included in Santa Rosa's standards; however, the standards do require a 2-fps minimum velocity when the pipe is flowing full, which translates to a d/D ratio of 0.9.

In accordance with Public Works staff, this master plan uses d/D (new) = 0.7 and d/D (existing) = 0.9; minimum velocity should be 2 fps.

5.2.2 Minimum and Maximum Pipe Slopes and Flow Velocities

For this master plan, new pipes should have a minimum slope adequate to achieve a flow velocity of 2 fps for PDWF, which is similar to Town standards. Also consistent with Town standards, maximum velocity shall not exceed 8 fps, unless otherwise approved by the Town Engineer. Flow velocities for average and peak flow conditions should be demonstrated through engineering hydraulic analysis.

For the CIP projects developed as part of this master plan, the minimum velocity criterion was not used to design the projects as existing inverts and slopes had to be matched. Rather, the minimum velocity criterion is used to show the locations of low velocity to assist with planning and implementing a cleaning schedule.

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6. Sewer System Flows

Collection system flows for the existing and future conditions are presented in this chapter. Existing condition wastewater flow rates are based on V&A flow monitoring results and Town water billing records. Future condition wastewater flow rates consider buildout of known or anticipated development projects as well as buildout of undeveloped parcels.

6.1 Methodology

Estimated flows for the Town's sewer collection system are based on various data including flow monitoring, water billing records, I/I reconnaissance data collected by V&A between 2010 and 2016, and land use classification information for planned developments provided by the Town.

For hydraulic evaluation of the wastewater collection system, design storm PDWF and PWWF were loaded into model scenarios for existing and future conditions. The design storm PDWF and PWWF for the existing condition were based on the flow monitoring work performed by V&A with the PWWF normalized to a design storm event. The PDWF for each basin was distributed throughout each basin based on the distribution of indoor potable water demand established from winter water billing records. Estimated design storm I/I was distributed by inch-diameter-mile of pipe in each basin and, in basins where V&A conducted I/I reconnaissance, the I/I was distributed proportionally to the measured nighttime flows. Once the base and peak flows were established for the existing condition, estimated base and peak flows for future development were then added to simulate the future condition.

The sewer collection system is split into 19 sewer basins shown on Figure 6-1. As described in Section 2.1, the primary purpose of splitting the system into basins was to locate and evaluate specific areas within the Town's collection system with high levels of I/I. Sewer flow patterns vary in each sewer basin, with the base and peak flows variance depending on several factors including land use classification (i.e., industrial vs. residential customers) for base flows and the condition of the existing sewer mains for peak flows. Therefore, each basin has its own unique base flows and peaking factors that are established from measured flows.

6.2 Existing Sewer System Flows

6.2.1 Base Flow Distribution - Water Billing Records

Water billing records from December 2013 through February 2014 were used to establish water demand patterns. These winter months were selected due to minimal anticipated outdoor water usage, resulting in the majority of the water demand directly correlating to sewage generation and the basis for ADWF. Additional analysis was performed to eliminate irrigation, fountain, and similar demands that do not contribute to the sanitary sewer collection system. From this analysis, estimated indoor water demands were established for each account. These winter flows were then geocoded by address, then manually corrected to associate the billing account to a parcel for which no address was found or for which there was an obvious mistake with the address. Note that these estimated indoor water demands for each customer were used as the basis for distributing ADWF sewer flows within each basin, as described in section 6.2.3. The basis of the modeled sewer flow

rates is the V&A flow monitoring data, described in section 6.2.2 below and modified per section 6.2.4 for I/I reduction projects and 6.2.5 existing developments.

6.2.2 Peak Flow Determination - Flow Meter Data

Flow meter data provides the basis for the base flows (ADWF) and peak flows (PDWF and PWWF) in each sewer basin. V&A prepared design storm estimates for, PDWF, and PWWF for 19 basins following the flow monitoring effort that was conducted between December 16, 2010 and March 16, 2011. Results from the flow monitoring effort are provided in Appendix B.

The V&A flow meter data captured various storm events utilizing 12 flow meters that were installed throughout the collection system in December 2010. Following an evaluation of early flow monitoring data, some flow meters were relocated to better isolate I/I sources and divide basins. This resulted in the creation of the 19 basins (i.e., the Conde B Basin was divided into Conde B North Basin and Conde B South Basin) as described in Section 2.1.

In order to compare results between different storm events and flow meter locations within the collection system, V&A prepared a synthetic hydrograph for each meter location. Synthetic hydrographs normalize flows to a common design storm event. The synthetic I/I hydrograph analysis used a 10-year return frequency, 24-hour duration design storm event, with National Oceanic and Atmospheric Administration (NOAA) data providing the basis for the 10-year, 24-hour rainfall total. Having established the normal dry weather diurnal flow patterns in each basin from the flow monitoring effort, the peak wet weather I/I component for the design storm was added to the PDWF to establish the PWWF.

Table 6-1 summarizes V&A's results for each design storm on a basin-by-basin basis. Peak I/I rate is the maximum flow rate attributed to I/I. Addition of the peak I/I rate to the peak dry weather base flow results in the peak flow estimate for each basin. The total volume of flow generated from I/I for the design storm event is also shown. The results shown in Table 6-1 formed the basis for the hydraulic model; however, these values are modified by GHD, as later described in this section, to account for I/I mitigation performed over the subsequent years and additional development which has occurred since the V&A field study.

Table 6-1 Unmodified Existing Condition Sewer Flow Rates (as measured)[1]

Sewer Basin	PDWF[2] (mgd)	Peak I/I Rate[2,3] (mgd)	Peak Flow[2,3] (mgd)	Total I/I[2,3] (gallons)
North A	0.46	1.16	1.61	671,000
North B	0.19	0.67	0.86	413,000
North C	0.11	0.63	0.74	649,000
North D	0.094	0.82	0.92	678,000
North E	0.049	0.36	0.41	343,000
Bell Village A	0.15	1.46	1.60	1,508,000
Bell Village B	0.013	0.23	0.25	273,000
Los Amigos	0.086	0.78	0.87	742,000
Brooks A	0.56	0.34	0.90	44,000
Brooks B	0.50	0.45	0.95	542,000

Sewer Basin	PDWF[2] (mgd)	Peak I/I Rate[2,3] (mgd)	Peak Flow[2,3] (mgd)	Total I/I[2,3] (gallons)
Hembree A	0.21	0.13	0.34	104,000
Hembree B	0.28	0.62	0.90	800,000
Hembree C	0.10	0.11	0.20	67,000
West	0.12	0.29	0.41	209,000
South A	0.23	0.45	0.68	361,000
South B	0.14	0.57	0.70	455,000
Conde A	0.40	1.16	1.56	325,000
Conde B North	0.14	0.53	0.66	906,000
Conde B South	0.12	0.97	1.09	931,000

1. Adapted from V&A report (2011b) provided in Appendix B.
2. Value does not include development projects included in the existing condition model.
3. I/I in this table does not factor in the I/I reductions from repairs to the system (see Section 6.1.2).

6.2.3 Hydraulic Model Flow Distribution

Flows within the collection system were distributed in the hydraulic model as follows:

1) Measured base flows (ADWF and PDWF) for each sewer basin were distributed based on indoor water use determined from evaluation of water billing data.

2) I/I flows were distributed within each sewer basin based on inch/diameter-mile of pipe, and in basins where V&A did I/I reconnaissance, the I/I was distributed proportionally to the measured night-time flows.

Base flows were aggregated into model nodes by the nearest associating nodes (i.e., manholes or cleanout) with contributing parcels. The PDWF was calculated by using the peaking factors measured by V&A in each basin and applying these to the ADWF for the associated node. The I/I component was added directly to the pipelines. All pipes, nodes, parcels, and water billing records were assigned to a specific sewer basin to ensure that flows were applied to the correct location within the sewer system. Some flows were manually moved to correct the location where flows were assigned incorrectly due to proximity (i.e. some flows were initially assigned to the closest node, but that is not where they actually contribute to the sewer system).

6.2.4 Modifications to Sewer Flows for Existing Developments since Flow Monitoring

Existing sewer flows as measured by V&A during flow monitoring (presented in Table 6-1) were modified to account for developments that were built since flow monitoring was completed in February 2015. For development projects completed since February 2015, billing records (where available) were used to include those developments in the existing condition ADWF. This includes Esposti Park Place (completed mid-summer 2017), Grand Cru Winery (opened September 2017), and Bell Village commercial area, among others. Water billing records were also used to determine unit flows (for example, gpd/dwelling or gpd/1,000 sf or gpapd), which was used for estimating flow from future developments, based on the estimated ADWF and the land use classification. For a list

of existing developments, the basis of the flow calculation for each development, and the location of existing developments, refer to section 4.3, Table 4-2 and Figure 4-2.

6.2.5 Modifications to Sewer Flows for Collection System Repairs

Collection system repairs can reduce the I/I experienced by the system. Therefore, repairs made to the collection system after the I/I reconnaissance work was completed in 2011 were factored into the analysis. Repair information, including repair description and location, were provided by the Town. Because I/I is assigned to the pipelines, an assumed reduction in flow due to the repairs were also applied directly to pipelines. I/I reduction impacts PWWF, not ADWF or PDWF. If a repair was completed on a manhole or clean-out, the repair was assigned to a pipe segment in the vicinity of that manhole or clean-out in order for that repair and associated reductions in I/I were removed from the I/I flows. Repairs were categorized by repair types, and an I/I reduction was assigned based on the assumptions presented in Table 6-2. The actual I/I reduction for each repair location is unknown and likely vary from the percentages presented in the table. However, the I/I reductions shown below and used in the model are conservative estimates so that the assignment of reduced I/I used in the model are not overstated.

Table 6-2 Modeled I/I Reduction by Repair Type

Repair Type	% I/I Reduction
Manhole Repair (includes raising, repairing, clearing, or sealing the manhole)	20%
Manhole Replacement	40%
Cleanout Repair (includes replaced or repaired)	20%
Pipe Repair (includes offset point, separated Y)	20%
Pipe Lining	40%

Table 6-3 presents the resulting I/I reductions as well as the updated peak flows for the basins. The estimated reduction in I/I due to system repairs is less than 1 percent of the total peak flow.

Table 6-3 I/I Reductions from Repairs and Updated ADWF by Basin

Basin	I/I Reduction (mgd)	I/I Reduction (% of Final PWWF)
North A	0.013	0.8%
North B	0.004	0.5%
North C	0.010	1.4%
North D	0.002	0.2%
North E		
Bell Village A	0.028	1.8%
Bell Village B		
Los Amigos		
Brooks A	0.003	0.3%
Brooks B	0.000	0%
Hembree A		

Basin	I/I Reduction (mgd)	I/I Reduction (% of Final PWWF)
Hembree B	0.033	3.8%
Hembree C		
West		
South A	0.000	0%
South B		
Conde A	0.016	1.0%
Conde B North		
Conde B South	0.013	1.2%
Total	**0.11**	

6.2.6 Summary of Existing Sewer Flows

The following section provides a summary of existing sewer flows for each sewer basin. Flows are presented as ADWF, PDWF, and PWWF. Various factors are also provided to give context to these base and peak flows, including the estimated quantity of wet weather flow contribution (peak I/I) and the ratio between PWWF and ADWF. Sewer flow unit demands are also provided for each utility land use classification to provide a basis for determining future condition flows.

Sewer flow rates for each sewer basin are presented in Table 6-4. V&A (2011b) estimated I/I flow by evaluating metered flows and analyzing the 10-year, 24-hour design storm synthetic hydrographs for each basin. I/I reductions due to repairs of the collection system were factored into peak flows by GHD. Flow rates for the existing condition projects (post V&A fieldwork) have been added. The ratio between PWWF and ADWF, often referred to as the "peaking factor," provides insight regarding general collection system capacity within a sewer basin, wherein the higher the ratio, the higher the likelihood for capacity deficiencies. Note that due to attenuation in the collection system (which is a result pipe capacity deficiencies, friction, slope, and the timing of peak flow throughout the system), total ADWF, PDWF, and PWWF are not intended to equal observed flows at the WRF.

Table 6-4 Existing Condition Sewer Flow Rates per Basin

Sewer Basin	ADWF (mgd)	PDWF (mgd)	Peak I/I (mgd)	PWWF (mgd)	PWWF/ ADWF
North A	0.140	0.46	1.14	1.60	11.4
North B	0.071	0.19	0.67	0.86	12.1
North C	0.044	0.11	0.62	0.73	16.6
North D	0.044	0.09	0.82	0.92	20.9
North E	0.017	0.05	0.36	0.41	24.1
Bell Village A	0.110	0.15	1.42	1.57	14.3
Bell Village B	0.015	0.03	0.24	0.27	18.3
Los Amigos	0.045	0.09	0.78	0.87	19.3
Brooks A	0.295	0.60	0.34	0.94	3.2
Brooks B	0.260	0.50	0.45	0.95	3.7
Hembree A	0.110	0.21	0.13	0.34	3.1

Sewer Basin	ADWF (mgd)	PDWF (mgd)	Peak I/I (mgd)	PWWF (mgd)	PWWF/ ADWF
Hembree B	0.180	0.28	0.59	0.87	4.8
Hembree C	0.040	0.10	0.10	0.20	5.0
West	0.058	0.12	0.29	0.41	7.1
South A	0.120	0.23	0.45	0.68	5.7
South B	0.063	0.14	0.56	0.70	11.1
Conde A	0.129	0.42	1.17	1.59	12.3
Conde B North	0.112	0.21	0.54	0.75	6.6
Conde B South	0.069	0.12	0.97	1.09	15.8

6.2.7 Evaluation of Unit Flows by Land Use Classification

Unit flows are developed to use to calculate future flow projections. Existing base sewer flow rates (ADWF) by utility land use classification are provided in Table 6-5 on a per-1,000-sf, per-housing-unit, or per-acre basis. The utility land use classifications used to generate sewer demands are the same as those presented in Section 4.2. These unit flows represent the average of the ADWF per acre, per housing unit, and per 1,000 sf, for each parcel served within the utility land use category. This analysis was based upon flow monitoring analysis and verified and scaled accordingly using water billing records,

Existing sewer unit flows were compared with Town standards from the 2000 MTSP. Where the existing unit flow did not equal the Town standard, or a standard was not available, GHD applied a flow value based on professional judgement and using flow data from other nearby municipalities. Further explanation of the flow values is provided in the table notes.

Table 6-5 Existing ADWF by Land Use Classification

Utility Land Use Classification	Units	Existing Unit Flow	Town Standard	GHD Applied Flow
Commercial	gpd/acre	1,400	1,350	1,400
	gpd/1,000 sf	175	124[1]	175
Heavy Industrial	gpd/acre	136	400	200[2]
	gpd/1,000 sf	45	31[3]	35
Light Industrial	gpd/acre	260	600	300
	gpd/1,000 sf	32	46[3]	45
Public Institutional	gpd/acre	172	600	600
	gpd/1,000 sf	29	n/a	135[4]
Residential Rural	gpd/acre	15	n/a	245[5]
	gpd/unit	253	185	365[5]
Residential Estate	gpd/acre	241	n/a	245
	gpd/unit	358	185	365
Residential Very Low Density	gpd/acre	689	n/a	690
	gpd/unit	368	185	365

Utility Land Use Classification	Units	Existing Unit Flow	Town Standard	GHD Applied Flow
Residential Low Density	gpd/acre	640	296[6]	640
	gpd/unit	290	185	290
Residential Medium Low Density	gpd/acre	1,219	839[7]	1,220
	gpd/unit	210	185	210
Residential Medium Density	gpd/acre	1,535	1,202[8]	1,535
	gpd/unit	252[10]	185	200
Residential High Density	gpd/acre	1,688	2,241[9]	1,700
	gpd/unit	357[10]	185	190

1. From the Windsor Master Trunk Sewer Plan (April 2000), commercial sq ft = 25 percent of acreage.
2. Data shows that the unit flow is lower than the existing standard; however, because it's a variable category depending upon use, selecting a value between the results and the standard is reasonably conservative.
3. From the Windsor Master Trunk Sewer Plan (April 2000), industrial sq ft = 30 percent of acreage.
4. Few records and no existing unit flow, use number developed for local community (Rohnert Park).
5. Low number of records, use Residential Estate values.
6. From the Windsor Master Trunk Sewer Plan (April 2000), units = 1.6 x acres.
7. From the Windsor Master Trunk Sewer Plan (April 2000), units = 4.5 x acres.
8. From the Windsor Master Trunk Sewer Plan (April 2000), units = 6.5 x acres.
9. From the Windsor Master Trunk Sewer Plan (April 2000), units = 12.0 x acres.
10. The calculated unit flow is artificially high as these include multi-family, so the number of units used in the calculations are low. For this reason, the GHD applied flow is lower.

Table 6-6 presents the total acres served and ADWF by utility land use classification in the existing condition. The existing condition includes data from water billing record analysis and from analysis of existing projects built after the water billing record analysis was completed. The future condition ADWF includes estimated flows from vacant parcels which are assumed to be developed according to the 2040 General Plan land use classifications.

Table 6-6 Existing Condition Sewer Flow Rates per Utility Land Use Classification

Utility Land Use Classification	Existing Condition	
	Acres Served	ADWF (mgd)
Commercial	418	0.28
Heavy Industrial	180	0.01
Light Industrial	150	0.02
Public Institutional	230	0.02
Rural Residential	311	0.00
Estate Residential	301	0.03
Very Low Density Residential	18	0.01
Low Density Residential	308	0.17
Medium Low Density Residential	1068	1.07
Medium Density Residential	304	0.30
High Density Residential	22	0.03

6.3 Future Sewer Flows

Future flows are based on already-planned development projects (Section 4.4) and buildout of undeveloped parcels in accordance with the Town's 2040 General Plan. Anticipated development included in the future sewer flows are discussed in Section 4.4. Figures 4-3 through 4-5 show the locations of the projects and parcels contributing to future sewer flows. Figure 6-2 shows the locations of future flow connections to the existing system in the model. ADWF unit flows were converted to PDWF based on the system-wide peaking factor of 2.5 determined by V&A for the existing condition.

Peak I/I flows for the design storm were assumed to remain constant within each sewer basin.

6.3.1 Future Condition Model Flow Distribution

The future condition model assumes buildout according to the 2040 General Plan. Existing wastewater flows were updated to account for:

- Specific already-planned future development projects (see Sections 4.4.1 and 4.4.2), and
- Unplanned and undeveloped parcels (in accordance with the 2040 General Plan land use classifications).

Development projects in the planning and approval phase as of May 2018 were identified by Town engineering staff (and are described in Section 4.4.1 and 4.4.2).

Flows were projected based on unit flows estimated from indoor water demands by utility land use classification. In aggregate, these modified wastewater flows represent the buildout scenario. Timing for the cumulative development of land within the Town's planning area was not considered in the hydraulic analyses, other than all anticipated development is assumed to be completed for the buildout scenario.

Once ADWF was estimated for each future development, a peaking factor of 2.5 was applied to determine the PDWF and an I/I of 850 gpd per acre was added based on V&A's analysis and GHD's recommendations for future developments as presented in the *Report for Sewer Master Plan Phase II* (GHD 2014).

6.3.2 ADWF Unit Flows for Future Development by Land Use Classification

ADWF unit flows for future developments are presented in Table 6-5. These unit flows were applied to all cases of new development except for development projects in the planning and approval stages for which projected flows have already been estimated by the Town (See Table 6-7 and 6-8).

Unit flows were applied to undeveloped parcels on a per-acre basis according to their land use classifications. Unit flows were assumed to be zero for open space and parks and recreation land use classifications.

6.3.3 ADWF Unit Flows for Future Development for Special Uses

In a few instances, unit flows that are more specific to the intended purpose provide better ADWF flow estimates than the land use classifications. Some special use unit flows are presented in Table 6-7. Where applicable, these values supersede the GHD-applied unit flows presented Table 6-5.

Table 6-7 ADWF Unit Flows for Special Uses – Future Conditions

Unit Classification	Unit	Unit Flow
Elementary School[1]	Gallons per student per day	4
Middle School[1]	Gallons per student per day	4
High School[1]	Gallons per student per day	5
Hotel Room[2]	Gallons per room per day	125

1. Town of Windsor Standard from the Windsor Master Trunk Sewer Plan (April 2000)
2. City of Rohnert Park Standard

6.3.4 Specific Projects - Future Conditions

This section summarizes the ADWF for the anticipated developments presented in Section 4.4 and described in detail in Appendix C, which are included in the future flows model. The ADWF is based on the unit flow rates presented in Table 6-3. For each project, unit flow was applied on a per-1,000-sf or per-unit basis, where square footage and unit information was available, or based on land use classifications. ADWF results are summarized in Table 6-8 for approved projects and submitted projects and in Table 6-9 for other known projects that have not been submitted at the time of this planning effort.

Table 6-8 Estimated Future ADWF for Approved or Submitted Projects

Anticipated Development Projects	Acres	ADWF (gpd)
Vintage Oaks on the Town Green	19.68	73,530
Overlook	5.76	4,380
6100 Old Redwood Highway (at Merner Drive)	1.17	4,560
Richardson Street Mixed Use	0.87	6,435
280 Arata Lane	1.84	2,190
330 Arata Lane	1.99	2,190
6500 Old Redwood Highway	3.74	2,920
Den Beste Warehouse	5.60	1,570
The Oaks	2.92	6,200
Creekwalk	4.53	6,960
Draper Estates	23.44	3,650
Duncan Village	1.38	3,200
Mill Creek Apartments	20.46	68,400
Windsor Veteran Village	3.68	11,400
Chevron Remodel	0.89	1,253
LaFort	1.06	888
Heritage Park	1.61	5,890

Table 6-9 Estimated Future ADWF for Other Known Future Projects

Other Known Development Projects	Acres	ADWF (gpd)
Hembree Lane Subdivision	4.97	7,665
Sky	0.77	3,800
Jensen Lane Annexation and Subdivision	57.26	100,375
Wine Country RV Park	2.07	8,000
REVEL	3.62	30,210
Town Green Hotel	1.91	13,292
North of Arata Annexation	155.35	246,500
North Annexation School	16.33	2,000
Carnation/ATP	23.71	6,750
Lytton	100.06	53,655
Civic Center Block A	4.25	5,957
Town Hall expansion	1.27	760
Micro-Vu expansion	20.00	6,000
Vicini	12.00	16,800
Winery South of Wilson Park Soccer Fields	3.25	976
Mini-Storage	4.03	1,208
The Artisan	2.74	12,160

6.3.5 Undeveloped Parcels

This section presents estimates for future sewer flows from undeveloped parcels that might be developed in the future but for which no specific project is planned. The future condition model assumes development of the vacant parcels presented in Table 4-5 according to the 2040 General Plan Land Use Classification. Table 6-10 shows the combined acreage and ADWF for all vacant parcels within each utility land use classification.

Table 6-10 Estimated Future Sewer Flow ADWF for Undeveloped Parcels by Land Use Classification

Land Use Classification	Acres	ADWF (gpd)
Commercial	43.83	61,368
Heavy Industrial	8.64	1,728
Light Industrial	21.55	6,464
Public Institutional	0.34	202
Rural Residential	0.00	0.00
Estate Residential	6.48	1,589
Very Low Density Residential	23.00	15,867
Low Density Residential	11.38	7,283
Medium Low Density Residential	0.00	0.00
Medium Density Residential	6.66	10,222
High Density Residential	3.78	6,429

6.3.6 Summary of Future Sewer Flows

Table 6-11 presents the future condition sewer flow rates used in the hydraulic model. The future development flows are aggregated and presented at the basin level.

Table 6-11 Future Condition Sewer Flow Rates

Sewer Basin	ADWF (mgd)	PDWF (mgd)	Peak I/I (mgd)	PWWF (mgd)	PWWF/ ADWF
North A	0.146	0.47	1.14	1.62	11.1
North B	0.071	0.19	0.67	0.86	12.0
North C	0.120	0.30	0.72	1.01	8.5
North D	0.044	0.09	0.82	0.92	20.9
North E	0.023	0.06	0.38	0.45	19.5
Bell Village A	0.149	0.25	1.44	1.69	11.3
Bell Village B	0.089	0.22	0.26	0.48	5.3
Los Amigos	0.318	0.77	0.95	1.71	5.4
Brooks A	0.300	0.61	0.34	0.95	3.2
Brooks B	0.263	0.51	0.46	0.96	3.7
Hembree A	0.110	0.21	0.13	0.34	3.1
Hembree B	0.189	0.30	0.59	0.89	4.7
Hembree C	0.141	0.35	0.15	0.50	3.6
West	0.058	0.12	0.29	0.41	7.1
South A	0.144	0.29	0.46	0.75	5.2
South B	0.075	0.17	0.57	0.74	9.9
Conde A	0.173	0.53	1.26	1.79	10.3
Conde B North	0.125	0.24	0.54	0.78	6.3
Conde B South	0.137	0.29	1.00	1.29	9.4
WRF[1]	0.078	0.19	0.02	0.21	2.8

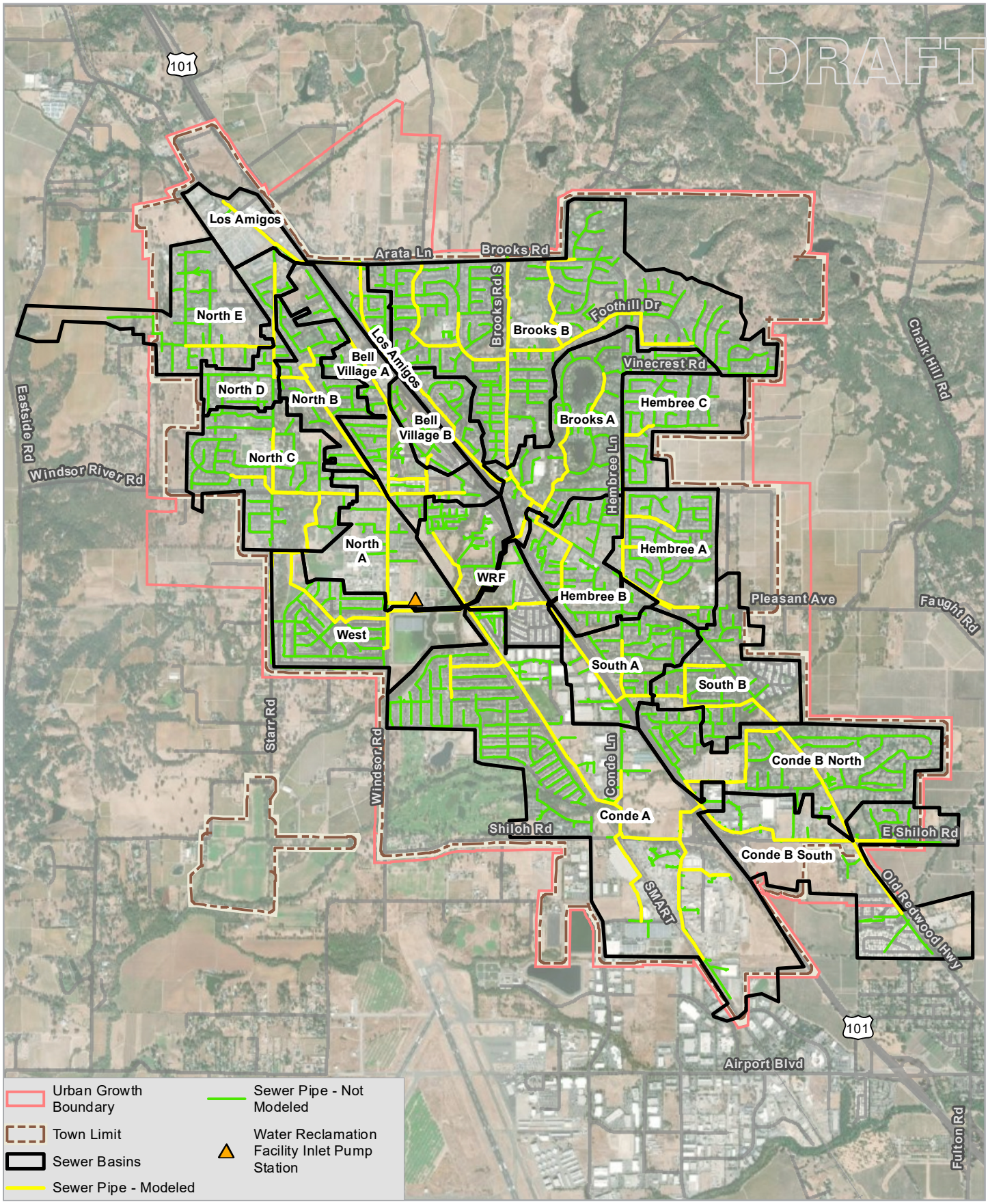
1. The WRF basin is not included in the existing sewer flows by basin because there were no existing flows contributing to the basin in the model.

Table 6-12 presents the total acres served and ADWF by utility land use classification in the future condition. The future condition ADWF includes estimated flows from vacant parcels which are assumed to be developed according to the 2040 General Plan land use classifications.

Table 6-12 Future Condition Sewer Flow Rates by Utility Land Use Classification

Utility Land Use Classification	Future Condition	
	Acres Served	ADWF (mgd)
Commercial	488	0.37
Heavy Industrial	189	0.01
Light Industrial	248	0.05
Public Institutional	252	0.03
Rural Residential	311	0.00
Estate Residential	335	0.04
Very Low Density Residential	213	0.20
Low Density Residential	479	0.43
Medium Low Density Residential	1068	1.07
Medium Density Residential	317	0.339
High Density Residential	81	0.25

Figure 6-1 Sewer Basins



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 2
Date 8/18/2020

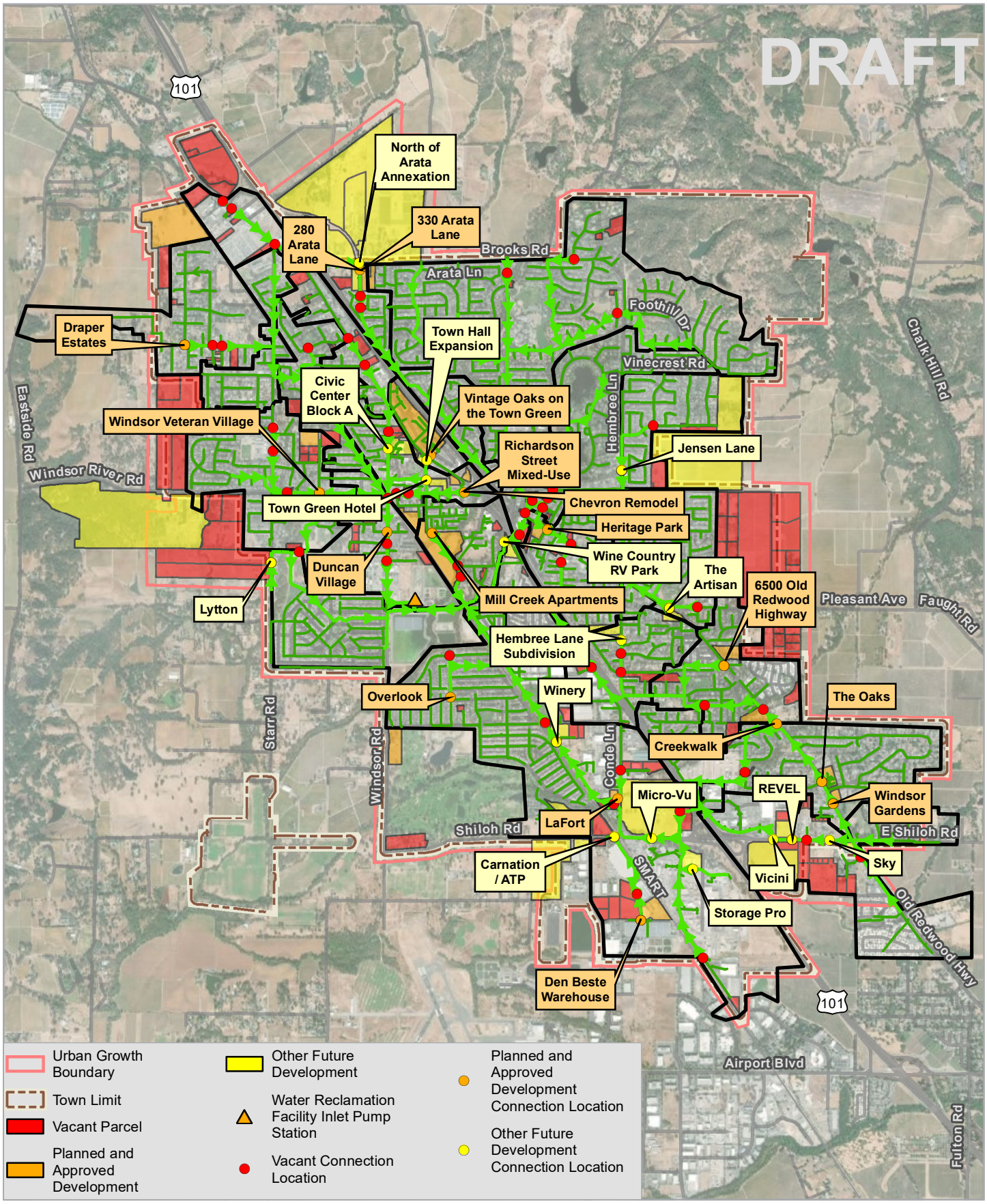
Sewer Basins

FIGURE 6-1

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Print date: 20 Aug 2020 - 10:35

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 6-2 Future Connection Locations



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 1
Date 8/18/2020

Modeled Future Connection Locations

FIGURE 6-2

C:\Users\jkjellsson\Desktop\BSMP\InfoAsset Planner\Figure 6-2 - Future Connection Locations_r2.mxd
Print date: 20 Aug 2020 - 14:59

Data source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: jkjellsson

7. Hydraulic Evaluation

A hydraulic model of the Town's sewer collection system was created for this master plan to evaluate the existing and proposed future conditions. The evaluation identifies hydraulic deficiencies and is used to prepare for future system expansions by evaluating the effects of potential capital improvement projects

7.1 Hydraulic Model Construction

The hydraulic model is a critical part of the master planning process as it provides the basis for understanding existing peak flows within the Town's sanitary sewer collection system and the impacts of future development. This section documents the selection of the modeling software and construction of the hydraulic model.

Modeling for the previous 2000 MTSP was done through a spreadsheet analysis and is not convertible to a packaged modeling platform. For this master plan, Innovyze H2OMap Sewer (10.5 SP1 Update #7) was selected to construct and analyze the Town's wastewater collection system. This program has the features needed for the current master plan and allows for future modeling capabilities, including, GIS integration, and scenario management. The model was run as a steady-state model for the analysis.

Model construction begins with inputting the sanitary sewer system physical geometry (i.e., pipe diameter, pipe inverts, pipe length, and manhole rim elevations). This physical geometry provides the backbone for the hydraulics in the sewer model. Inputs for the Town's physical geometry came from the Town's GIS geodatabase and field investigations outlined in Section3.2.

In 2011, the Town contracted with Woolpert Inc. to develop a digital terrain model (DTM) based on aerial imagery prepared by Woolpert for the United States Geologic Survey (USGS). In 2013, the Town contracted with Geographic Technologies Group (GTG) to create a GIS geodatabase using the DTM for the Town's sanitary sewer collection system.

The network created by GTG contained horizontal data (manhole locations, pipe locations, and pipe length), but did not have vertical data (manhole rims and pipe inverts). While the manhole rim data could be extracted from the DTM prepared by Woolpert, the pipe invert data needed to come from record drawings and/or field survey. Through other recent sanitary sewer projects in the Town, it was found that record drawing invert data was often incorrect (which is common among municipalities); therefore, GHD and the Town conducted a field survey to obtain pipe inverts.

The field survey included most of the pipes 10-inches in diameter and larger, plus some 6-inch and 8-inch pipes to provide complete connectivity of the sewer model. Table 7-1 provides a summary of the pipes in the modeled sanitary sewer collection system compared to the complete physical system. Figure 7-1 shows the modeling/field survey extents.

Table 7-1 Town of Windsor Sanitary Sewer Pipelines

Pipe Diameter	Total Length	Modeled Length	Portion of System Modeled by Length
< 6-inches	14,709 ft	0 ft	0.00%
6-inches	238,047 ft	14,126 ft	5.93%
8-inches	170,673 ft	25,575 ft	14.98%
10-inches	30,095 ft	24,010 ft	79.78%
12-inches	26,604 ft	25,195 ft	94.70%
14-inches	4,739 ft	4,586 ft	96.77%
15-inches	10,479 ft	10,422 ft	99.46%
18-inches	11,377 ft	11,377 ft	100.00%
20-inches	1,474 ft	1,266 ft	85.89%
21-inches	2,813 ft	2,697 ft	95.88%
24-inches	9,634 ft	9,634 ft	100.00%
27-inches	3,674 ft	3,674 ft	100.00%
30-inches	39 ft	39 ft	100.00%
33-inches	1,311 ft	1,311 ft	100.00%
42-inches	1,162 ft	1,162 ft	100.00%
48-inches	25 ft	25 ft	100.00%
Total	**526,856 ft**	**135,099 ft**	**25.64%**

7.2 System Performance

Once the hydraulic backbone is built in the model, flow simulations can be used to evaluate system performance. The performance of the Town's sewer collection system was analyzed using static flow simulations under PDWF and PWWF scenarios for the existing and future conditions. The goal of the hydraulic analysis was to identify system improvements that would be required to address current and future system flow inadequacies.

This section presents the results of the hydraulic model for the following four scenarios:

- Existing condition
- Existing condition with CIP fixes implemented that address existing collection system hydraulic deficiencies
- Future condition
- Future condition with CIP fixes implemented that address existing and future collection system hydraulic deficiencies

By running the model for each of these scenarios, the impact of planned development could be understood by comparing the future condition results with that of the existing condition results. Similarly, impact of CIP fixes on the future condition could be determined.

7.2.1 Existing Condition

The existing sewer collection system was analyzed using two flow scenarios (PDWF and PWWF) with the current flows as discussed in Section 6. The existing modeled pipes and junctions were evaluated using the pipe capacity (d/D) ratio and minimum and maximum pipe slope and velocity criteria presented in Section 5. The hydraulic model results for the existing condition are included in Appendix D.

In general, the velocities in a majority of the existing pipelines were below the recommended minimum of 2 fps for the PDWF scenario, which primarily results from minimal pipe slopes throughout the system. Existing PDWF velocity and future PDWF velocity is shown in Figures 7-1 and 7-2. This may contribute to additional cleaning of pipelines to clear blockages and reduce odors. Velocities are improved for the PWWF scenario, with I/I contributing additional flow in the collection system.

Collection system hydraulic capacity was assessed using the PWWF scenario. Pipelines that exceeded hydraulic evaluation criteria were primarily located in the North A Basin, North B Basin, and Bell Village A, in the northwest part of Town. The model also identified hydraulic deficiencies in the southeastern portion of the Town including South A Basin and Conde B North. Figures 7-3 and 7-4 show the existing condition capacity deficiencies and severity of capacity deficiencies, respectively.

7.2.2 Existing Condition After Completed Recommended Improvement Projects

For this scenario, the PWWF existing condition scenario was updated to incorporate the recommended improvement projects identified to alleviate existing hydraulic deficiencies. The hydraulic model results for the existing condition scenario with implemented improvement projects are included in Appendix E. Recommended improvement projects are described in Section 8.0 and Appendix H.

Because the recommended improvement projects are modeled to address the existing condition capacity deficiencies, by definition, there are no remaining capacity deficiencies once they are implemented in the model with the existing PWWF.

7.2.3 Future Condition

The future condition scenario assumes buildout of the Town in accordance to the 2040 General Plan and implementation of the recommended improvement projects which address current deficiencies within the collection system. This future condition was analyzed using two flow scenarios (PDWF and PWWF) with the future flows as discussed in Section 6. The future condition modeled pipes and junctions (assuming upsizing of pipes identified to address existing condition hydraulic deficiencies are implemented) were evaluated using the pipe capacity (d/D) ratio and minimum and maximum pipe slope and velocity criteria presented in Section 5. The hydraulic model results for the future condition are included in Appendix F.

A few locations within the sewer collection system exceeded the pipe capacity limit of 0.9 d/D under the future condition, including approximately 2,441 linear feet of the 14-inch gravity sewer in Conde Lane between Denbeste Court and Lake Drive in the South A Basin. Figures 7-5 and 7-6 show the future condition capacity deficiencies and severity of capacity deficiencies, respectively.

7.2.4 Future Condition After Completed Recommended Future Improvement Projects

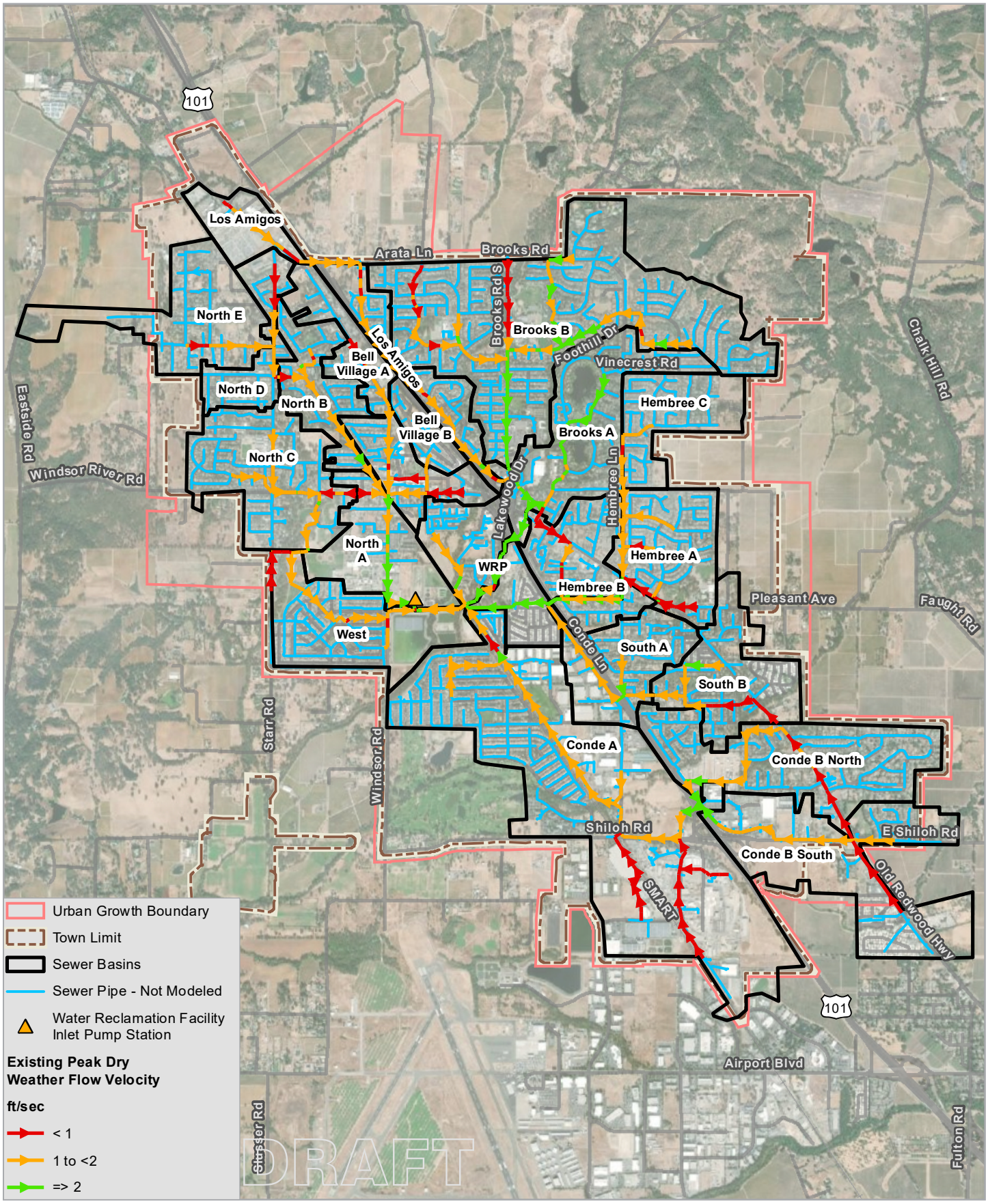
The future condition with recommended future improvement projects assumes buildout of the 2040 General Plan with implementation of the recommended projects to alleviate existing and future hydraulic deficiencies. The hydraulic model results for the future condition with recommended improvement projects scenario are included in Appendix G. Recommended future improvement projects are detailed in Section 8.0 and Appendix H.

7.3 Maintaining the Hydraulic Model

The model, as constructed serves the purpose and scope of this CSMP. The Town may also want to maintain the hydraulic model in the future by:

- Updating the model as CIP projects are implemented
- Reviewing hydraulic impacts from proposed development projects
- Expanding the model by adding additional pipelines and nodes

Figure 7-1 Existing Peak Dry Weather Flow Velocity



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Existing Peak Dry Weather Flow Velocity

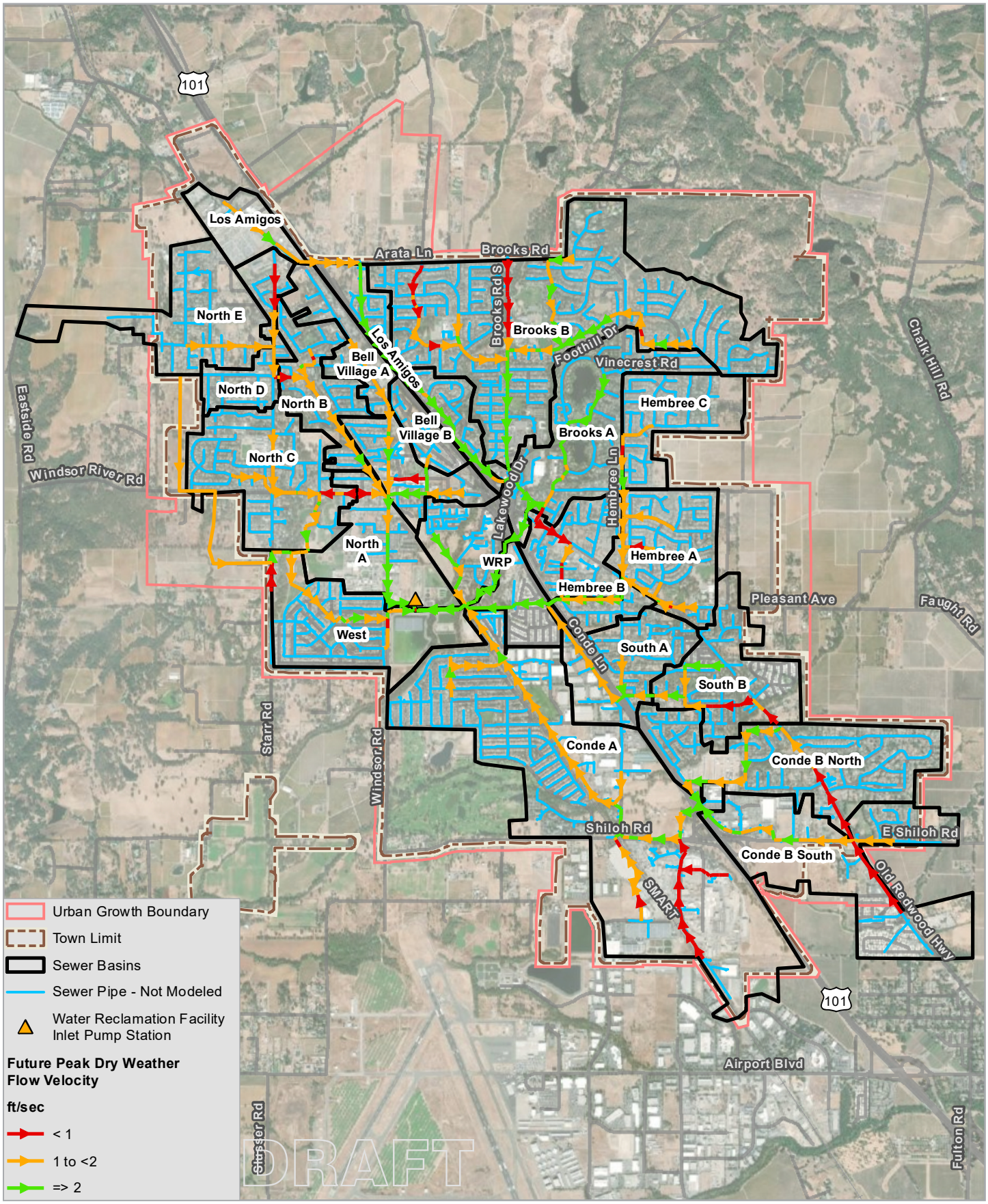
Project No. 11151247
Revision No. 1
Date 8/20/2020

FIGURE 7-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 7-1 - Existing Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 7-2 Future Peak Dry Weather Flow Velocity



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System Master Plan

Future Peak Dry Weather Flow Velocity

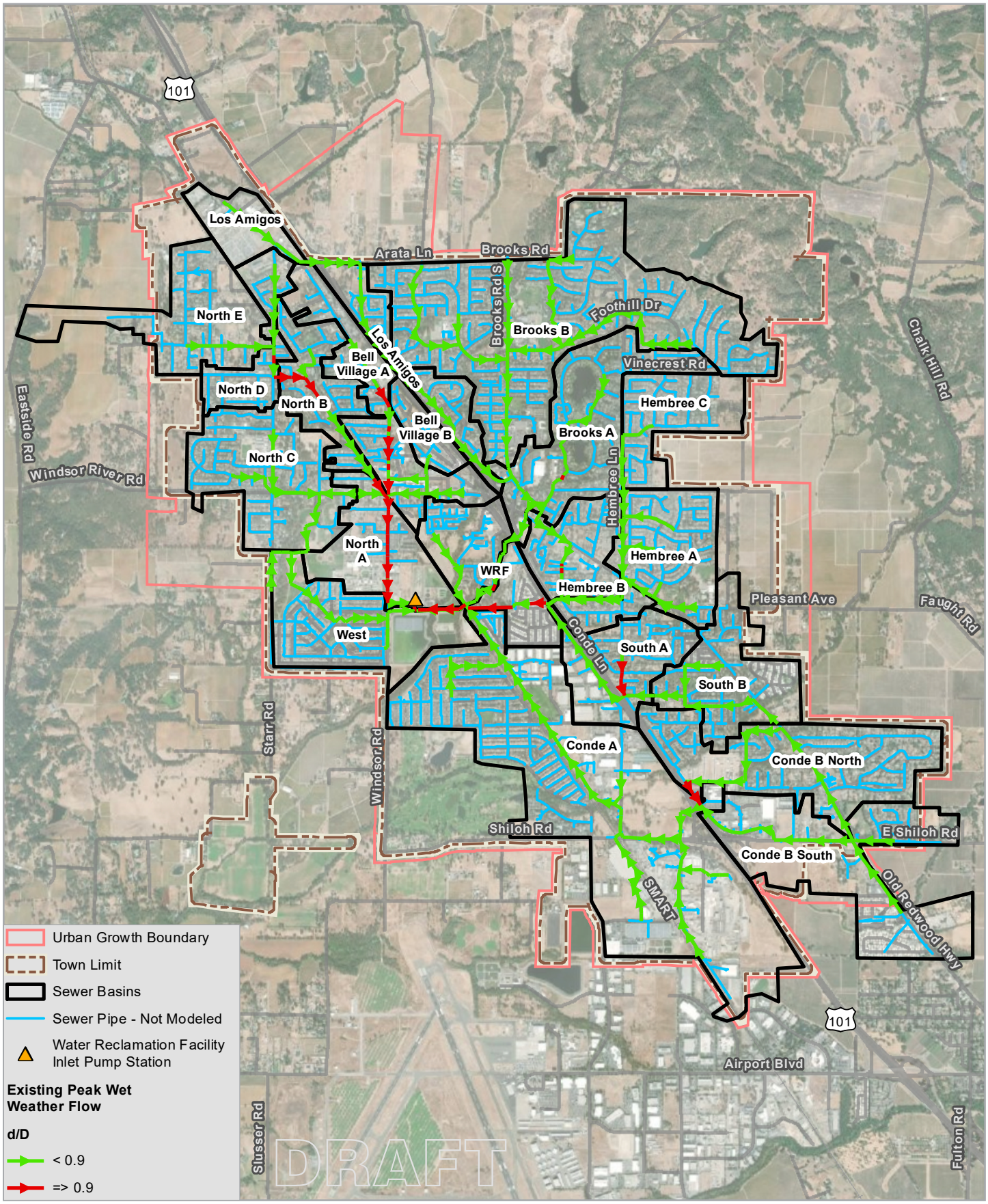
Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

FIGURE 7-2

N:\US\Santa Rosa\Projects\11\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 7-2 - Future Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 7-3 Existing Peak Wet Weather Flow Capacity Deficiencies



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System Master Plan

Existing Peak Wet Weather Flow Capacity Deficiencies

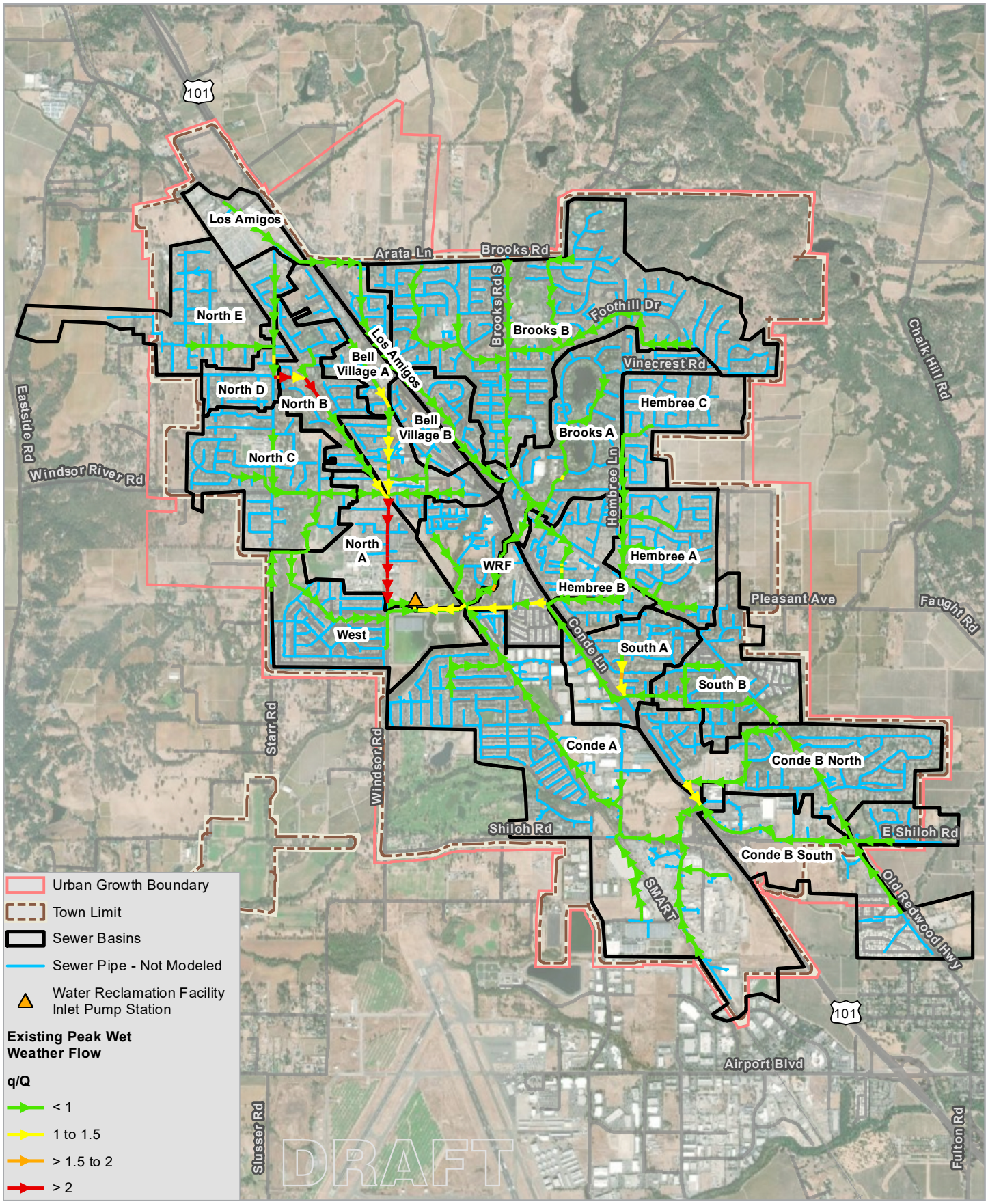
Project No. **11151247**
Revision No. **1**
Date **3/25/2019**

FIGURE 7-3

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 7-3 - Existing Peak Wet Weather Flow Capacity Deficiencies.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 7-4 Existing Peak Wet Weather Flow Capacity Deficiencies Severity



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Sewer Collection System
Master Plan

Project No. 11151247
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Date 8/18/2020

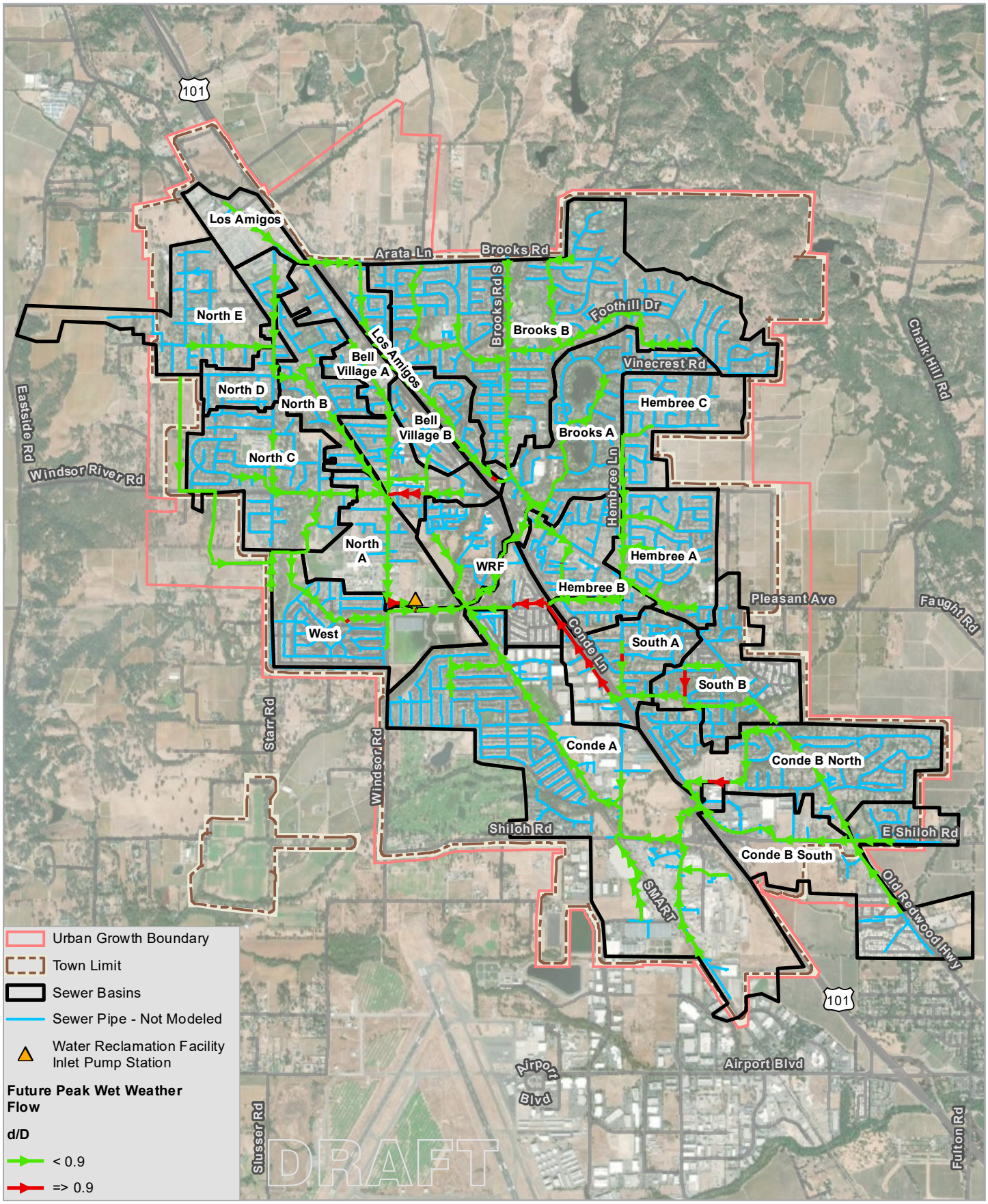
Existing Peak Wet Weather Flow Capacity Deficiencies Severity

FIGURE 7-4

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 7-5 Future Peak Wet Weather Flow Capacity Deficiencies



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System
Master Plan

Future Peak Wet Weather Flow Capacity Deficiencies

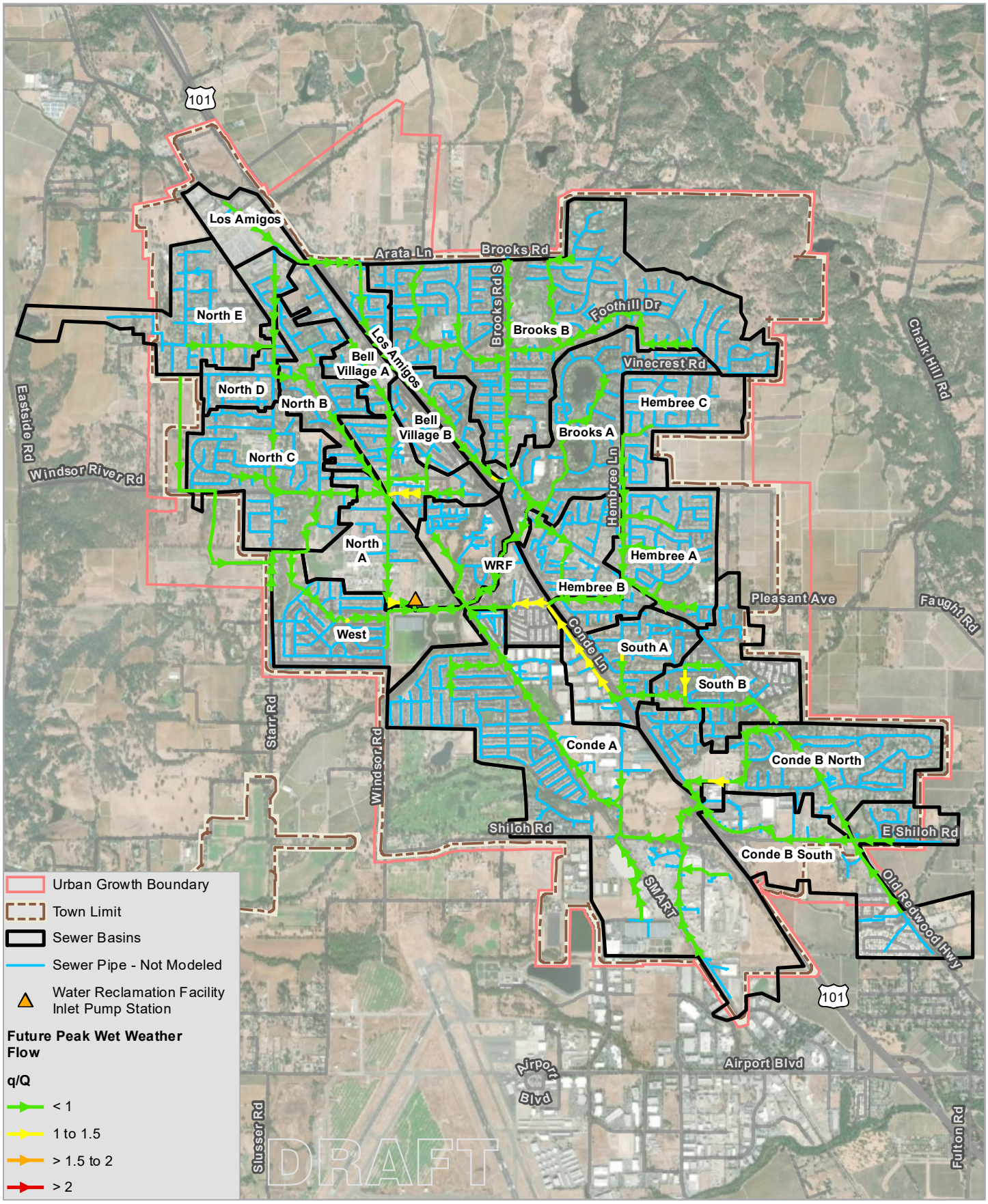
Project No. 11151247
Revision No. 0
Date 6/24/2020

FIGURE 7-5

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 7-5 - Future Peak Wet Weather Flow Capacity Deficiencies.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Figure 7-6 Future Peak Wet Weather Flow Capacity Deficiencies Severity



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Sewer Collection System
Master Plan

Project No. 11151247
Revision No. 1
Date 8/18/2020

Future Peak Wet Weather Flow Capacity Deficiencies Severity

FIGURE 7-6

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 7-6 - Future Peak Wet Weather Flow Capacity Deficiencies Severity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

8. Recommended Capital Improvement Projects

The recommended improvement projects primarily involve the upsizing of existing pipelines to increase hydraulic capacity and reduce the contribution of I/I within the collection system where cost effective. Most of these improvements address existing deficiencies while also accommodate future growth. Improvements focus on reducing the potential for SSOs while balancing associated environmental and cost impacts, with designs conforming to established design criteria established in Chapter 5. Figure 8-1 shows the extent of the recommended projects. Project prioritization and opinions of probable cost are presented in Section 9.

8.1 Improvements to Address Current Deficiencies

The hydraulic evaluation identified a number of current pipelines with insufficient hydraulic capacity to convey peak flows for the existing and/or future condition. Improvement projects will enable the Town to resolve current hydraulic deficiencies within the sewer collection system and support the future condition as well. Detailed individual project descriptions are included in Appendix H. A summary of the CEQA and permitting requirements of the projects is provided in Appendix I.

The following sewer improvement projects are recommended to address existing hydraulic deficiencies. The recommended projects are budgeted around capacity upgrade costs rather than I/I reduction. However, it would be worthwhile for the Town to investigate potential I/I reduction projects to evaluate whether or not the cost and potential benefit would be improved over the recommended capacity upgrade projects. While the scope of this master planning effort is not sufficiently focused on making these determinations, I/I reduction opportunities are discussed later in this section. The recommended projects to address existing hydraulic deficiencies, which are presented by identification number denoted SS-# where “SS” stands for “sanitary sewer”, are:

- SS-1 – Windsor Road North of Plant Road: includes upsizing approximately 0.18 miles of 10-inch gravity sewer and 0.27 miles of 15-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 10-inch and 15-inch gravity sewer in Windsor Road from Windsor River Road to Unnamed Road North of Plant Road found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in SSO. The proximity of this project to a large residential area, the high school, and municipal services, makes this deficiency a high risk. Traffic at the high school will have an impact on construction; therefore, suggest construction during the summer. Priority = High.
- SS-2 – Starr Road: includes upsizing approximately 0.34 miles of the existing 10-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 10-inch gravity sewer in Starr Road from Starr Circle to Starr View Drive, and East to the SMART railway, then Southeast parallel to railway found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in SSO. The proximity of this project to a residential area makes this deficiency a high risk. The construction area is narrow through the easement and tree removal may necessitate tree planting in a mitigation area. If the Town desires relocating the pipe outside of the railroad, this project presents a good opportunity to do so. Priority = High.

- SS-3 – Hembree Lane: includes upsizing approximately 0.18 miles of the existing 6-inch gravity sewer to address both existing and future capacity limitations. Hydraulic evaluation of the existing 6-inch gravity sewer in Hembree Lane from Shannon Way to Billington Lane found that the pipeline is undersized to convey existing and future PWWF. This capacity deficiency has the potential to result in SSO. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. Priority = Medium-High.
- SS-4 – Windsor Road North of Windsor River Road: includes upsizing approximately 0.13 miles of 10-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 10-inch gravity sewer in Windsor Road from Emily Rose Circle to Windsor River Road found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in a SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. Priority = Medium-High.
- SS-5 – Victory and Hembree Lanes: includes upsizing approximately 0.31 miles of the existing 10-inch gravity sewer to address both existing and future capacity limitations. Hydraulic evaluation of the existing 10-inch gravity sewer in Victory Lane from Amie Drive to Hembree Lane and Hembree Lane from Victory Lane to Walmart Access Road found that the pipeline is undersized to convey existing and future PWWF. This capacity deficiency has the potential to result in SSO. The proximity of this project to a commercial shopping area and creek(s), in addition to being a hot spot area (per Town), this adds to the risk. However, the low flow (0.96 mgd) and medium Q_{max}/Q_{cap} (1.42), combined with sewer depths mostly over 10 ft, are less likely to result in an SSO, which makes this deficiency a medium-high risk overall. This is area requires maintenance, according to the Town, which could be due in part to lack of slope. Potential for additional slope should be evaluated during pre-design for this project. Priority = Medium.
- SS-6 – Lake Drive to Bell Road: includes upsizing approximately 0.36 miles of the existing 14-inch gravity sewer to address both existing and future capacity limitations. Hydraulic evaluation of the existing 14-inch gravity sewer in Lake Drive from Conde Lane to Bell Road found that the pipeline is undersized to convey existing and future PWWF. This capacity deficiency has the potential, though unlikely, to result in SSO. An I/I reduction greater than 50 percent would be necessary to avoid the capacity increase project and is probably unrealistic; however, an I/I reduction of a lesser extent could reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. Priority = Medium
- SS-7 – Enzos Way: includes installation at a new slope of approximately 0.08 miles of the existing 24-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 24-inch gravity sewer in Enzos Way and Oakfield Lane found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction is not viable option to reduce the scope of the capacity upgrade project. Priority = Medium-Low.

- SS-8 – Bluebird Drive: includes upsizing approximately 0.05 miles of the existing 12-inch gravity sewer to address both existing and future capacity limitations. Hydraulic evaluation of the existing 12-inch gravity sewer in Bluebird Drive from South of Old Redwood Highway to North of Stonebarger Lane found that the pipeline is undersized to convey existing and future PWWF. This capacity deficiency has a low potential to result in SSO. I/I reduction is likely to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. Priority = Medium-Low.
- SS-9 – SMART Railway: includes upsizing approximately 0.11 miles of 15-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 15-inch gravity sewer in Wild Oak Drive from Wild Oak Drive to Windsor River Road found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has a low potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. This project is upstream of SS-1 and overlaps with the roundabout project which could cause additional traffic issues. It is recommended that construction take place during the summer. If the Town desires to relocate the pipe out of the road, this would be a good time to do so. Priority = Medium-Low.
- SS-10 – WRF: includes upsizing of approximately 0.21 miles of the existing 20-inch gravity sewer to address existing capacity limitations. Note, there is adequate capacity in the parallel line to the south. If the condition of the southern pipe is good, the project could simply create an overflow/tie-in to the south line at the most upstream point in the project. This alternate project would be significantly less expensive. This project is immediately upstream of the treatments plant, and its location makes this deficiency a low risk. The proximity to creek(s) is a high risk, but the high flow (3.95 mgd) and low Q max/Q cap (1.15), combined with sewer depths of over 11 ft, have a low chance of resulting in an SSO, which makes this deficiency a low risk overall. Priority = Low.
- SS-11 – Public Works Corporation Yard: includes upsizing approximately 0.01 miles of 20-inch gravity sewer, 0.02 miles of 21-inch gravity sewer, and 0.11 miles of 24-inch gravity sewer to address existing and future capacity limitations. Hydraulic evaluation of the existing 20-inch, 21-inch, and 24-inch gravity sewer in Unnamed Road North of Plant Road to Plant Road found that the pipeline is undersized to convey existing and future PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. The distance of this project to a residential area (minimal impact on the residential area) makes this deficiency a lower risk. The high flow (5.53 mgd) and low Q_{max}/Q_{cap} (1.19), combined with sewer depths of almost 7 ft to over 18 ft, have a lower chance of resulting in an SSO. This project is mostly a future need with low overall risk.. Priority = Low.

- SS-12 – Old Redwood Highway and Windsor Road: includes upsizing approximately 0.33 miles of 8-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 8-inch gravity sewer in Old Redwood Highway from Godfrey Drive to Windsor Road, and Windsor Road from Old Redwood Highway to Emily Rose found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction is likely to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. The proximity of this project to a large residential area raises risk. The low flow (0.71 mgd) and Q max/Q cap (1.20), combined with sewer depths of just over 8 ft to 10 ft, have a low chance of resulting in an SSO, which makes this deficiency a low risk overall. Priority = Low.
- SS-13 – Fawn Lilly Court: includes upsizing of approximately 0.02 miles of the existing 8-inch gravity sewer to address existing capacity limitations. Hydraulic evaluation of the existing 8-inch gravity sewer in Fawn Lily Court found that the pipeline is undersized to convey existing PWWF. This capacity deficiency has the potential to result in SSO. An I/I reduction greater than 50 percent is probably unrealistic; however, an I/I reduction of a lesser extent could reduce the scope of the capacity upgrade project. Priority = Low.

A summary of the recommended sewer collection system improvement projects is presented in Table 8-1. Note that the proposed pipe size includes further upsizing of pipes to address future need as well (see Section 8.2).

Table 8-1 Recommended Improvement Projects to Address Existing Sewer Deficiencies

Project ID	Project Descriptor	Proposed Pipe Size	Priority
SS-1	Windsor Road North of Plant Road	24-inch	High
SS-2	Starr Road	12- and 18-inch	High
SS-3	Hembree Lane	8-inch	Medium-High
SS-4	Windsor Road North of Windsor River Road	15-inch	Medium-High
SS-5	Victory and Hembree Lanes	12-inch	Medium
SS-6	Lake Drive to Bell Road	18-inch	Medium
SS-7	Enzos Way	24-inch (new slope)	Medium-Low
SS-8	Bluebird Drive	15-inch	Medium-Low
SS-9	SMART Railway	18-inch	Medium-Low
SS-10	WRF	24-inch or overflow pipe	Low
SS-11	Public Works Corporation Yard	24-inch (and new slope)	Low
SS-12	Old Redwood Highway and Windsor Road	10-inch	Low
SS-13	Fawn Lily Court	10-inch	Low

8.2 Improvements for Combined Existing and Future Deficiencies

Improvements to the sewer collection system to accommodate planned growth primarily focus on connecting future development to the collection system.

- Recommended existing condition projects SS-3, SS-5, SS-6, SS-8, and SS-11 need additional capacity to accommodate the future development projects in addition to the additional capacity required to meet existing need alone. These projects assume that the increased capacity will meet the both future and existing need in just one upsize project, rather than two, within the 20-year planning horizon. These projects also include extensions that address other future deficiencies to avoid two projects in the same area in a relatively short timeframe when they could be addressed as one project and avoid additional costs. The following is a description of the additional capacity upgrades which are also outlined in Appendix H. The additional costs for these future condition-related upgrades are listed in Section 9.SS-3 – Hembree Lane: includes upsizing approximately 0.18 miles of the existing 6-inch gravity sewer to address both existing and future capacity limitations. To solely address existing deficiencies, the project includes replacement of 0.15 miles of 6-inch with 8-inch gravity sewers and replacement of five 48-inch manholes. Sewer depth is 7.2 to 8.0 ft. To address future deficiencies, the project includes replacement of 0.03 miles of 6-inch with 8-inch gravity sewers and the replacement of one 48-inch manhole. Sewer depths range from 8.3 to 8.4 ft.
- SS-5 – Victory and Hembree Lanes: overall this includes upsizing approximately 0.31 miles of existing 10-inch gravity sewer to address both existing and future capacity limitations. To solely address existing deficiencies, the project includes replacement of 0.12 miles of 10-inch with 12-inch gravity sewers and replacement of three 48-inch manholes. Sewer depth is 15.0 to 16.9 ft. To solely address future deficiencies, the project includes replacement of 0.19 miles of 10-inch with 12-inch gravity sewers and replacement of three 48-inch manholes. Sewer depths range from 9.3 to 11.8 ft.
- SS-6 - Lake Drive: includes upsizing approximately 0.82 miles of existing 14-inch gravity sewer to address both existing and future capacity limitations. To address existing deficiencies, the project included replacement of 0.07 miles of 14-inch with 15-inch and 0.19 miles of 14-inch with 18-inch gravity sewers; and replacement of two 48-inch and two 60-inch manholes. Sewer depths range from 11.4 to 12.0 ft. To address future deficiencies, the project includes replacement of 0.09 miles of 14-inch with 18-inch gravity sewers and replacement of two 48-inch and five 60-inch manholes. This project includes combined existing and future upgrades: further upsizing of the 0.07 miles of 14-inch gravity sewer needed to address existing deficiencies to 18-inch (instead of 15-inch); and further upsizing of two 48-inch manholes needed to address existing capacity limitations to 60-inch manholes. Sewer depths range from 9.3 to 14.2 ft.
- SS-8 – Bluebird Drive: includes upsizing approximately 0.05 miles of existing 12-inch gravity sewer to address both existing and future capacity limitations. To address existing deficiencies, the project includes replacement of 0.04 miles of 12-inch with 15-inch gravity sewers and replacement of four 48-inch manholes. Sewer depth is 11.0 to 11.2 ft. To address future deficiencies, the project includes replacement of 0.01 miles of 12-inch with 15-inch gravity sewers and replacement of one 48-inch manhole. Sewer depths range from 11.5 ft.

- SS-11 – Public Works Corp Yard: includes upsizing approximately 0.01 miles of 20-inch gravity sewer, 0.02 miles of 21-inch gravity sewer, and 0.11 miles of 24-inch gravity sewer to address existing and future capacity limitations. To address existing deficiencies, the project includes replacement of 0.01 miles of 20-inch with 24-inch, replacement of 0.02 miles of 21-inch with 24-inch and replacement of three 60-inch manholes. Sewer depth is 15.8 to 18.3 ft. To address future deficiencies, the project includes replacement of 0.11 miles of 24-inch with 24-inch at a new slope and replacement of three 60-inch manholes. Sewer depths range from 6.7 to 15.7 ft.

8.3 Improvements for Future Driven Deficiencies

Projects SS-14, SS-15, SS-16, SS-17, and SS-18 are required to meet future need only. These projects are triggered by future development.

- SS-14 – Conde Lane: includes upsizing approximately 0.46 miles of existing 14-inch gravity sewer to address future capacity limitations. Hydraulic evaluation of the existing 14-inch gravity sewer in Conde Lane from Denbeste Court to Lake Drive found that the pipeline is undersized to convey future PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction has a high potential to eliminate the need of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. This project is fully driven by future development.
- SS-15 – Edgewood Place: includes installation of approximately 0.08 miles of existing 18-inch gravity sewer at a new slope to address future capacity limitations. Hydraulic evaluation of the existing 18-inch gravity sewer in Edgewood Place, South of Los Amigos Road to Brooks Road South found that the pipeline is undersized to convey future PWWF. This capacity deficiency has the potential to result in SSO. This project is fully driven by future development.
- SS-16 – Windsor River Road: includes upsizing approximately 0.14 miles to 10-inch gravity sewer to address future capacity limitations. Hydraulic evaluation of the existing 8-inch gravity sewer in Windsor River Road from Honsa Avenue to Windsor Road found that the pipeline is undersized to convey future PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction has a good chance to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. This project is fully driven by future development. Approximately 80 feet of the 8-inch sewer is currently being planned for upgrade during the Windsor River Road/Windsor Road traffic circle project.
- SS-17 – Winemaker Way: includes installation of approximately 0.04 miles of existing 15-inch gravity sewer at a new slope to address existing capacity limitations. Hydraulic evaluation of the existing 15-inch gravity sewer in Winemaker way near Decanter Circle finds that the pipeline is undersized or installed at too shallow of a slope to convey future PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction has a good potential to eliminate or reduce the scope of the capacity upgrade project. Predesign for the project should characterize the distribution of I/I within the upstream sewer basins, including the location and quantity of I/I sources. This project is fully driven by future development.

- SS-18 – Robbins Park: includes upsizing approximately 0.11 miles of existing 6-inch gravity sewer to address future capacity limitations. Hydraulic evaluation of the existing 6-inch gravity sewer that skirts the west edge of Robbins Park from Cornell Street to Billington Lane finds that the pipeline is undersized to convey future PWWF. This capacity deficiency has the potential to result in SSO. I/I reduction has a high potential to eliminate the need of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of I/I sources. This project is fully driven by future development.

A summary of the recommended improvement projects for planned growth is presented in Table 8-2. Chapter 9 provides project cost and prioritization information.

Table 8-2 Recommended Improvement Projects for Planned Growth

Project ID	Project Descriptor	Proposed Pipe Size	Key Development Driving Future Need
SS-14	Conde Lane	15- and 18-inch	• Creekwalk • 6500 Old Redwood Highway • Hembree Lane Subdivision
SS-15	Edgewood Place	18-inch (new slope)	• Sherlock Subdivision • 280 Arata Lane • 330 Arata Lane • North of Arata Annexation • North Annexation School
SS-16	Windsor River Road	10-inch	• Town Green Hotel • Richardson Street Mixed-Use • Chevron Remodel • Town Hall Expansion • Vintage Oaks on the Town Green
SS-17	Winemaker Way	15-inch (new slope)	• Lytton
SS-18	Robbins Park	8-inch	• 6500 Old Redwood Highway

8.4 I/I Reduction

All of the existing capacity deficiencies are related to I/I as demonstrated by the fact that all pipes have adequate capacity to handle PDWF but not PWWF. Improvements that address I/I typically include lining sewer mains and laterals and rehabilitating manholes to minimize leaking (infiltration) into the collection system. Improvements also address known illicit connections from the storm drain system such as, roof leaders, yard drains and basement pumps. These type of I/I reduction programs typically require flow monitoring in basins with high I/I flows, nighttime reconnaissance during wet weather, CCTV inspections and/or smoke testing to identify target neighborhoods for rehabilitation.

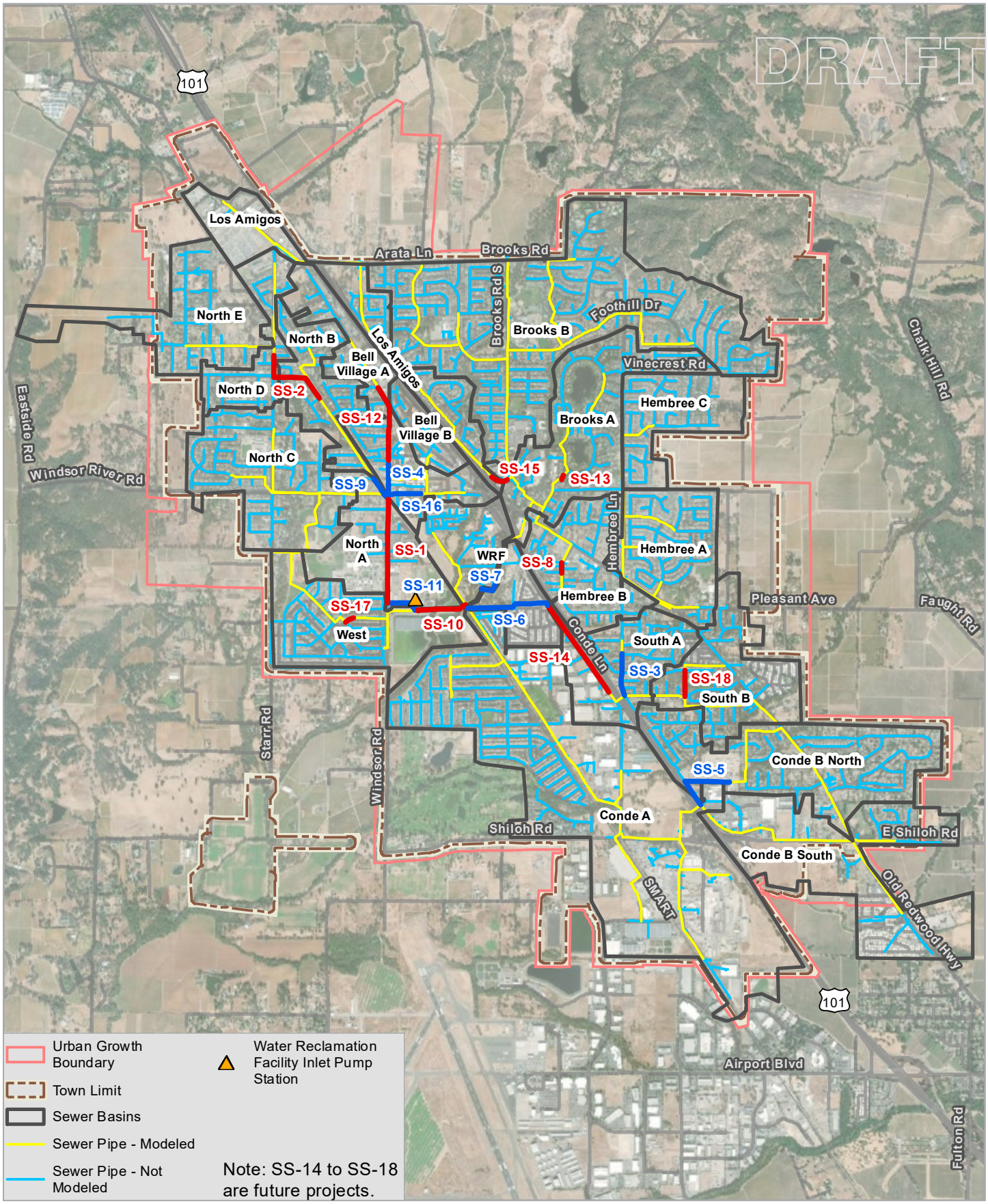
Results from I/I reduction projects typically vary from neighborhood to neighborhood, and they are dependent on several factors including extent of rehabilitation of a main and its appurtenances, and

the percentage of a basin rehabilitated. For example, lining a sewer main but not rehabilitating the manholes and laterals may have little benefit. Likewise, rehabilitating one block in a neighborhood may not be effective because water flows down the trench to the next block and enters the system at that location.

In general, the wastewater industry does not have clear standards of practice for addressing I/I. Reported results vary and in general one can conclude that at least 40 percent of a basin needs to be fully rehabilitated (mains, manholes, and laterals) to get meaningful results. As a percentage of PWWF reduction, results are typically in the 15 to 50 percent range as measured at the basin level. Moving downstream, the reduction in peak flow is reduced due to attenuation of flow in the collection system; therefore, the benefit is not as great for downstream infrastructure.

Based on the above industry understanding of the effectiveness of I/I reduction programs, GHD evaluated the impacts, effectiveness, and costs of I/I reduction projects in place of capacity projects. This evaluation is provided in Appendix J (I/I projects). GHD recommends that two of the five I/I projects (numbers I/I 2 and I/I 5) identified should be considered. The I/I projects GHD recommends evaluating further includes I/I reduction projects in the South A, South B, and Bell Village A basins. The potential to reduce or eliminate the capacity upgrade projects via an I/I reduction program warrants further investigation and is noted in the impacted project descriptions, namely, SS-11, SS-14, SS-16, and SS-18. The Impacted projects are all medium and low priority.

Figure 8-1 Recommended Capital Improvement Projects



Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

GHD

Town of Windsor
Sewer Collection System
Master Plan

Project No. **11151247**
Revision No. **1**
Date **8/18/2020**

Recommended Improvement Projects

FIGURE 8-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure 8-1 - Recomended Improvement Projects.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

9. Recommendations for Improvements Planning

The recommended prioritized improvement projects list is intended to provide a roadmap for the construction or replacement of sewer infrastructure to address current and future sewer flows within the Town. The 18 projects on this list are candidates for the Town's Capital Improvement Plan (CIP). These have been prioritized to meet more critical and time-dependent needs first, whether to correct existing system deficiencies or accommodate pending development projects, and then address longer term issues and future planned growth over an extended timeframe. Project assumptions, cost estimates, and project prioritizations are discussed below. The detailed project descriptions, CEQA requirements, and opinions of probable cost for each recommended project are provided in Appendices H, I, and K, respectively.

9.1 Opinions of Probable Cost

The opinions of probable cost for the recommended projects should be considered as order-of-magnitude estimates for planning purposes only. The total project cost consists of the construction cost, design and technical effort, construction management effort, and a contingency fund. Land acquisition and/or Town degradation fees are not included. Construction costs are based on a Class 5 (planning-level) estimate of probable cost as defined by the Association for the Advancement of Cost Engineering, International (AACE). AACE defines the "Class 5" estimate as follows:

> *Generally prepared on very limited information, where little more than proposed plan type, its location, and the capacity are known, and for strategic planning purposes such as but not limited to market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, long-range capital planning, etc. Some examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. Typically, very little time is expended in the development of this estimate. The typical expected accuracy ranges for this class estimate are -20% to -50% on the low side and +30% to +100% on the high side.*

Construction costs are based on the April 2020 Engineering News Record Construction Cost Index (ENR CCI) for San Francisco, CA (12,816.67).

9.1.1 Construction Cost

Construction costs associated with sewer projects typically include the time and materials for the following items:

- Mobilization and demobilization
- Temporary traffic control
- Potholing to identify existing utilities
- Shoring and trench safety
- Trench dewatering
- Handling, treatment, and disposal of contaminated soil and groundwater
- Construction or replacement of collection system and supporting infrastructures

Estimated unit costs for pipelines includes pipe material, trenching (at minimum cover), installation, backfill, fittings and appurtenances, connections, pavement restoration, testing, and traffic control.

Sewer pipelines are assumed to be SDR 35 or AWWA C900 polyvinyl chloride (PVC). For trench repairs, the following are assumed: all pipelines are located in paved areas; the repair width is based on 24-inch t-cut (both sides); the trench foundation is 12 inches thick; and there is 6 to 9 inches of backfill on either side of the pipe (depending on pipe diameter). The pavement repair zone assumes 6-inch thick hot mix asphalt (HMA) and 2-inch pavement overlay. Method of rehabilitation for sewer pipelines, including sewer laterals is cured-in-place pipe (CIPP). Method of rehabilitation for sewer manholes is epoxy coating or similar. In some instances, unit prices were revised to reflect recent bids for similar construction projects.

9.1.2 Design and Technical Cost

Design and technical costs include the following:

- Completing the pipeline and infrastructure designs
- Land surveys
- Geotechnical surveys
- Environmental review
- Permitting (excluding permits associated with land acquisition)

The design and technical costs are estimated to be approximately 25 percent of construction cost based on previous project experience.

9.1.3 Construction Management Effort

Construction management costs include the following:

- Site inspections
- Project management
- Engineering services during construction

The construction management costs are estimated to be approximately 12 percent of construction cost based on previous project experience.

9.1.4 Contingency

The actual project costs can vary greatly due to a number of possible external factors, including but not limited to climate, market conditions, government policy, and material pricing. An additional 25 percent of the construction cost is added to the overall cost as a contingency to ensure appropriate levels of financing for each project.

9.2 Prioritized Project Plan

Table 9-1 shows the priority (low, medium, or high) for the recommended projects according to the severity of existing and future deficiencies. In cases where the depth of the sewer is greater, and therefore risk of SSO is reduced, a project's priority may be reduced. Project numbering does not indicate priority of one project over another within the same priority level. The total cost for all the recommended sewer system capital improvements projects is $32,580,000, which includes $20,200,000 in capacity upgrades to address existing capacity deficiencies and $12,380,000 to address future capacity deficiencies. The opinion of probable cost for each project is rounded to the nearest $10,000.

CIP projects are typically funded from two sources, wastewater capacity fees and wastewater rates. Wastewater capacity fees are paid by new development to offset their impact on the system. This "Wastewater Capacity" revenue is then used to construct capacity improvements required to meet the needs of new growth, i.e. projects in the "Fix Future Project Cost" column in Table 9-1 below. Wastewater rates, the monthly service charges levied by the wastewater utility, pays for all operating expenses as well as debt covenants and replacement and rehabilitation of capital assets. This "Wastewater Operations" revenue covers operating expenses including the cost of treatment, power and chemicals, salaries and benefits for utility staff, and timely replacement and rehabilitation of wastewater infrastructure. This includes projects in the "Fix Existing Project Cost" column. Table 9-1 lists the recommended CIP projects and opinions of probable costs. Opinions of probable cost are prepared for 1) the project that fixes existing deficiencies only and 2) the additional cost to further fix the future deficiencies. The fix future project cost is the difference in the two.

Table 9-1 Sewer System Recommended Capital Improvement Projects

Project ID	Project	Priority	Fix Existing Project Cost	Fix Future Project Cost
SS-1	Windsor Road at Unnamed Road North of Plant Road	High	$4,530,000	$0
SS-2	Starr Road	High	$2,870,000	$0
SS-3	Hembree Lane	Medium-High	$950,000	$240,000
SS-4	Windsor Road at Emily Rose Circle	Medium-High	$1,090,000	$0
SS-5	Victory and Hembree Lanes	Medium	$900,000	$1,360,000
SS-6	Lake Drive to Bell Road	Medium	$2,170,000	$2,660,000
SS-7	Enzos Way	Medium-Low	$870,000	$0
SS-8	Bluebird Drive	Medium-Low	$480,000	$140,000
SS-9	SMART Railway	Low-Medium	$1,240,000	$0
SS-10	WRF	Low	2,320,000	$0
SS-11	Public Works Corporation Yard	Low	$440,000	$1,140,000
SS-12	Old Redwood Highway and Windsor Road	Low	$2,130,000	$0
SS-13	Fawn Lily Court	Low	$210,000	$0
SS-14	Conde Lane	Medium-Low	$0	$3,870,000
SS-15	Edgewood Place	Low	$0	$830,000
SS-16	Windsor River Road	Low	$0	$1,020,000
SS-17	Winemaker Way	Low	$0	$460,000
SS-18	Robbins Park	Low	$0	$660,000
		Total	**$20,200,000**	**$12,380,000**

Preliminary design for each project should include an evaluation of the feasibility for I/I rehabilitation in lieu of upsizing of existing infrastructure, where I/I reduction potential is discussed in Chapter 8.

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Appendices

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Appendix A – Phase I and II Flow Meter Locations

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Flow monitoring period was split into two parts. Initial monitoring was perfromed, result were analyzed and some of the flow monitors were moved.

Town Limits
Basins
Parcels
Rivers and Creeks
Trunk Line
Sanitary Sewer Gravity Main
Sanitary Sewer Force Main
Flow Meter Location, Entire Period
Flow Meter Location, Beginning Period Only
Flow Meter, End Period Only

0 1,000 2,000 ft
1 inch = 2,000 feet printed at 11x17

Sources: USDA: Aerial NAIP 2009 1 meter resolution; Humboldt County GIS: Parcels, Blueline Streams.

WINZLER & KELLY
www.w-and-k.com

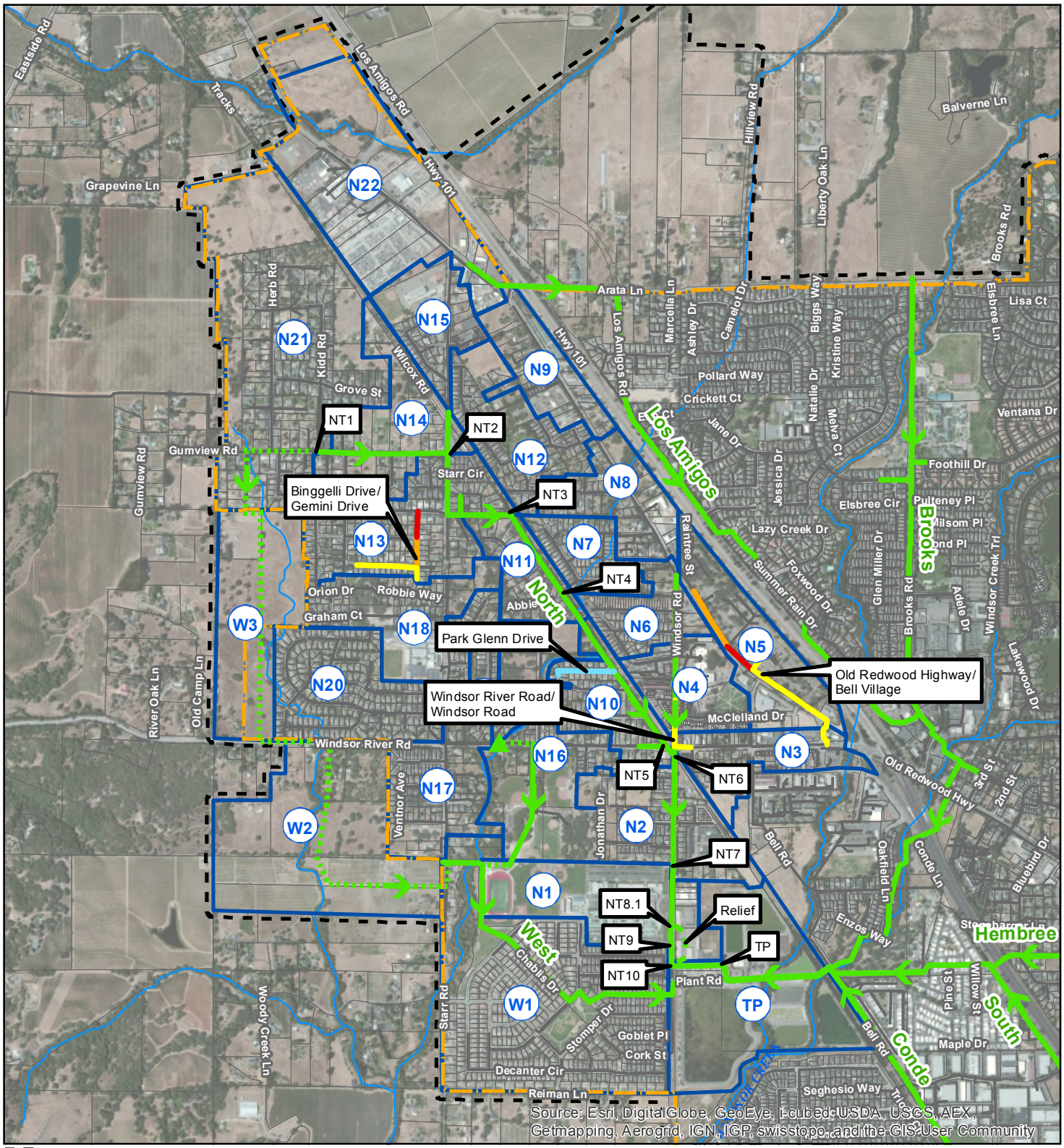
© Winzler & Kelly

Cartography	Date	Project #
AF	6/17/2011	0228310005

Figure 2
Windsor Sanitary Sewer Flow Meter Locations

WW Collection System Master Plan Phase I

Town of Windsor



Town Sphere of Influence
Town Limits
Parcels
2000 MTSP Basins
Rivers and Creeks

Sanitary Sewer Force Main
Sanitary Sewer Gravity Main
Trunk Sewer
(F) West Trunk

CCTV Inspection Location

Total Returns

4 +
2 - 3
0 - 1
CCTV not completed due to sewer line defect

Deer Creek Pump Station (Demolished in Summer 2013)

Paper Size 8.5" x 11" (ANSI A)
0 400 800 1,200 1,600
Feet
Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Master Plan Phase II

Job Number 8410484
Revision 2
Date 08 Jan 2014

CCTV Inspection Results

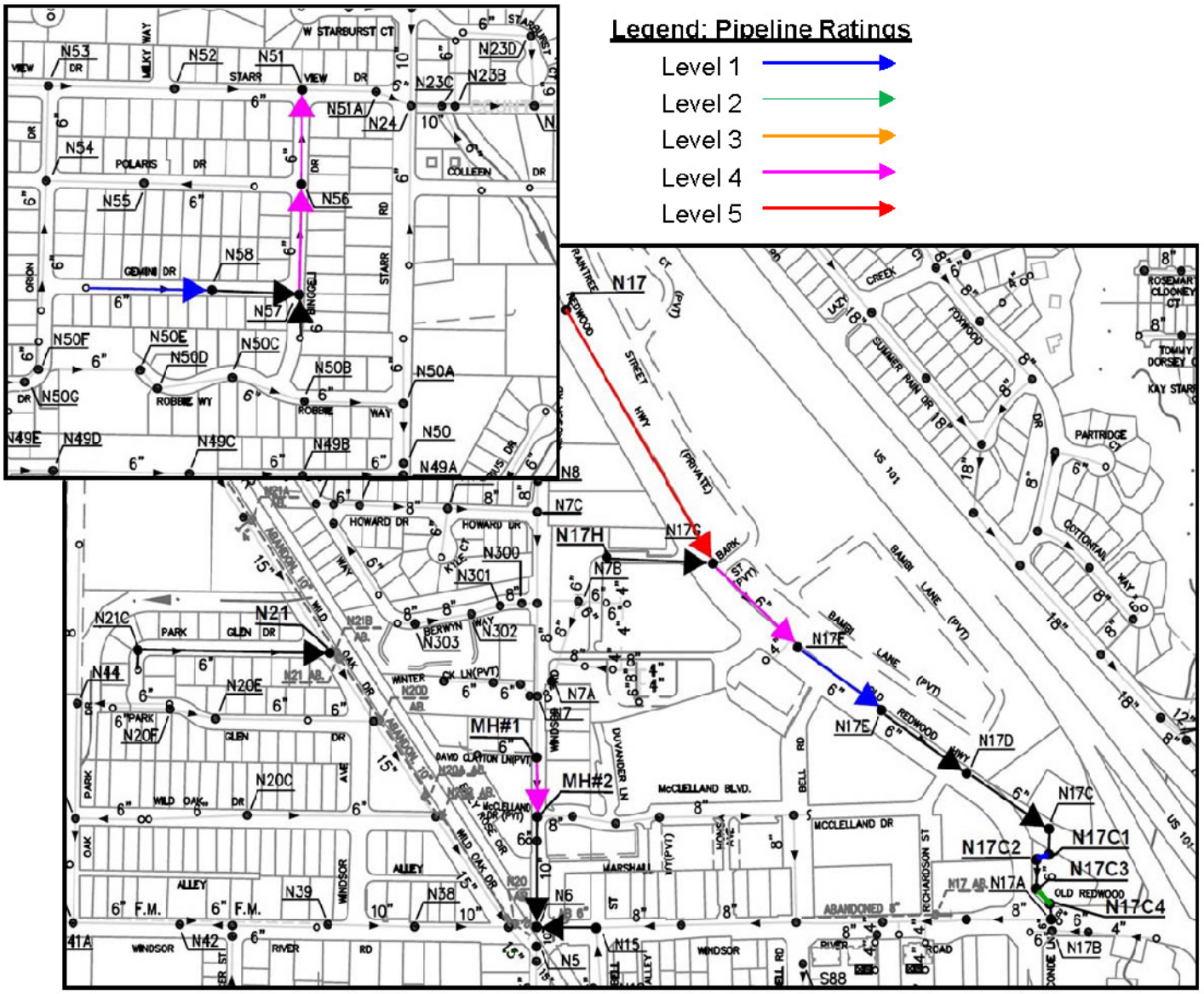
Figure 2

2235 Mercury Way Suite 150 Santa Rosa CA 95407 USA T 707 523 1010 F 707 527 8679 E santarosa@ghd.com W www.ghd.com

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Data source: Sonoma Count GIS, Parcels, Town Limits, Rivers and Creeks, and Sphere of Influence, 2013; GHD GIS, Sewer System, 2013. Created by:afisher2



Legend

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GHD

TOWN OF WINDSOR

Town of Windsor
Sewer Master Plan Phase II

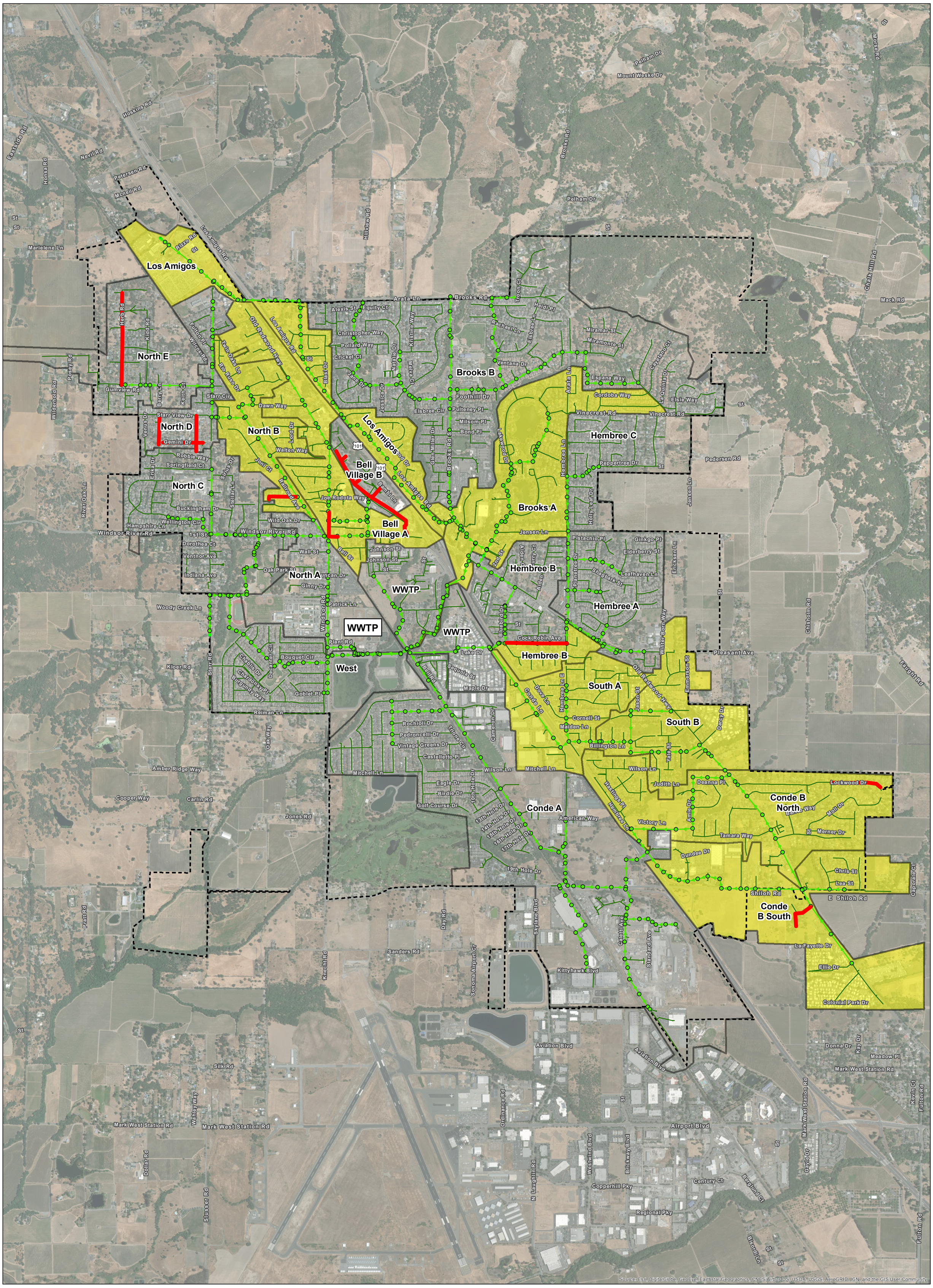
(V&A Figure 2-2)
CCTV Pipelines by Overall Level

Job Number 8410484
Revision 2
Date 08 Jan 2014

Figure 3

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Town Limits
Sewer Basins
Sewer Pipe - Not Modeled
Sewer Cleanout - Modeled
Sewer Manhole - Modeled
Sewer Pipe - Modeled
CCTV
Night Time Recon Basins

Paper Size 22" x 34" (ANSI D)

0 500 1,000 1,500 2,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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Town of Windsor
Sewer Collection System, Phase 3

Job Number 11151247
Revision 0
Date 18 Jan 2018

CCTV and Night Time Recon

Figure 1

\\ghdnet\ghd\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Misc\CCTV and Night Time Recon.mxd
2235 Mercury Way Suite 150 Santa Rosa CA 95407 USA **T** 707 523 1010 **F** 707 527 8679 **E** santarosa@ghd.com **W** www.ghd.com
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Appendix B – V&A Inflow/Infiltration Investigation 2011-2016

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GHD Town of Windsor
Inflow / Infiltration
Investigation 2011 - 2016



Prepared for:

GHD
2235 Mercury Way
Santa Rosa, CA 95407

Date: November 2016

Prepared by:

V&A

V&A Project No. 16-0080

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APPENDICES

Appendix A. Associated Reports

ABBREVIATIONS, TERMS AND DEFINITIONS USED IN THIS REPORT

Table i. Abbreviations

Abbreviation	Term
ADWF	average dry weather flow
CCTV	closed-circuit television
CDEC	California Data Exchange Center
CIP	capital improvement plan
CO	carbon monoxide
CWOP	Citizen Weather Observing Program
d/D	depth/diameter ratio
FM	flow monitor
gpd	gallons per day
gpm	gallons per minute
GWI	groundwater infiltration
H_2S	hydrogen sulfide
I/I	inflow and infiltration
IDW	inverse distance weighting
LEL	lower explosive limit
mgd	million gallons per day
NOAA	National Oceanic and Atmospheric Administration
Q	flow rate
RDI/I	rainfall-dependent infiltration and inflow
RG	rain gauge
SSO	sanitary sewer overflow
WEF	Water Environment Federation
WRCC	Western Regional Climate Center

Table ii. Terms and Definitions

Term	Definition
Average dry weather flow (ADWF)	Average flow rate or pattern from days without noticeable inflow or infiltration response. ADWF usage patterns for weekdays and weekends differ and must be computed separately. ADWF is expressed as a numeric average and includes the influence of normal groundwater infiltration (not related to a rain event).
Basin	Sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. Also refers to the ground surface area near and enclosed by pipelines. A basin may refer to the entire collection system upstream from a flow meter or exclude separately monitored basins upstream.
Depth/diameter (*d/D*) ratio	Depth of water in a pipe as a fraction of the pipe's diameter. A measure of fullness of the pipe used in capacity analysis.
Design storm	A theoretical storm event of a given duration and intensity that aligns with historical frequency records of rainfall events. For example, a 10-year, 24-hour design storm is a storm event wherein the volume of rain that falls in a 24-hour period would historically occur once every 10 years. Design storm events are used to predict I/I response and are useful for modeling how a collection system will react to a given set of storm event scenarios.
Infiltration and inflow	Infiltration and inflow (I/I) rates are calculated by subtracting the ADWF flow curve from the instantaneous flow measurements taken during and after a storm event. Flow in excess of the baseline consists of inflow, rainfall-responsive infiltration, and rainfall-dependent infiltration. **Total I/I** is the total sum in gallons of additional flow attributable to a storm event.
Infiltration, *groundwater*	Groundwater infiltration (**GWI**) is groundwater that enters the collection system through pipe defects. GWI depends on the depth of the groundwater table above the pipelines as well as the percentage of the system that is submerged. The variation of groundwater levels and subsequent groundwater infiltration rates is seasonal by nature. On a day-to-day basis, groundwater infiltration rates are relatively steady and will not fluctuate greatly.
Infiltration, *rainfall-dependent*	Rainfall-dependent infiltration (**RDI**) is similar to groundwater infiltration but occurs as a result of storm water. The storm water percolates into the soil, submerges more of the pipe system, and enters through pipe defects. RDI is the slowest component of storm-related infiltration and inflow, beginning gradually and often lasting 24 hours or longer. The response time depends on the soil permeability and saturation levels.
Inflow	**Inflow** is defined as water discharged into the sewer system, including private sewer laterals, from **direct** connections such as downspouts, yard and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins. Inflow creates a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows. Overflows are often attributable to high inflow rates.
Peaking factor	Ratio of peak measured flow to average dry weather flow. This ratio expresses the degree of fluctuation in flow rate over the monitoring period and is used in capacity analysis.
Surcharge	When the flow level is higher than the crown of the pipe, then the pipeline is said to be in a **surcharged** condition. The pipeline is surcharged when the *d/D* ratio is greater than 1.0.
Synthetic hydrograph	A set of algorithms has been developed to approximate the actual I/I hydrograph. The synthetic hydrograph is developed strictly using rainfall data and response parameters representing response time, recession coefficient and soil saturation.

ES EXECUTIVE SUMMARY

Scope and Purpose

Since 2010, V&A Consulting Engineers (V&A) was retained by GHD (formerly Winzler & Kelly) and has completed a number of inflow/infiltration (I/I) evaluation projects within the Town of Windsor (Town) collection system. The primary purpose of these projects was to evaluate specific areas within the Town's collection system in an effort to locate areas with high levels of inflow and/or infiltration. This information will assist GHD and the Town in prioritizing future CIP projects and updating the Town's master plan. The various techniques and the associated dates and durations these techniques were employed are listed below:

- Flow Monitoring (December 16, 2010 – March 16, 2011):
  - 12 flow meters – Select flow meters were moved several times to isolate basins of interest. 19 total basins evaluated
- I/I Night-time Reconnaissance (February 17-18, March 6 & March 24, 2011; March 14, 2016):
  - 2011 Project – 6 basins evaluated
  - 2016 Project – 4 basins evaluated
- Closed Circuit Television (CCTV) (April 8-9, 2013; March 14-15, 2016)
  - 2013 Project – 5,384 linear feet, 21 pipe reaches evaluated
  - 2016 Project – 5,736 linear feet, 19 pipe reaches evaluated

The locations of the various evaluation projects are shown in Figure ES-1-1.

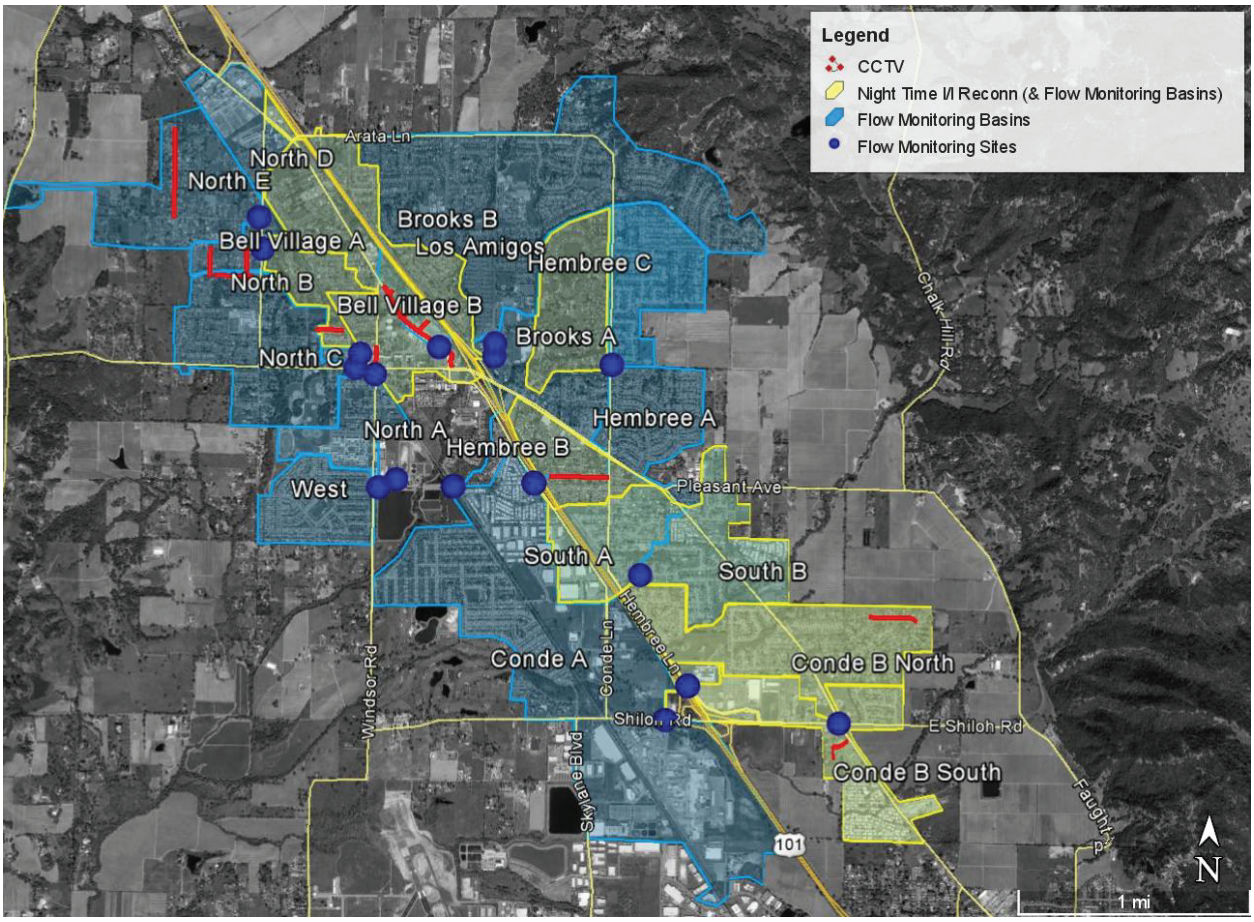


Figure ES-1-1. Map of 2011-2016 I/I Evaluation Projects performed by V&A in Windsor, CA

Flow Monitoring

Flow and rainfall monitoring was performed over a period of over 3 months from December 16, 2011 to March 16, 2011. Twelve flow monitors were used and rotated during the flow monitoring period to capture flow from 20 different open channel flow monitoring sites[1] and effectively isolate 19 different flow monitoring basins. Rain gauges were installed in three locations. There were three general purposes for the flow monitoring.

1. Establish the baseline sanitary sewer flows at the flow monitoring sites
2. Estimate available sewer capacity
3. Quantify I/I and develop synthetic I/I hydrographs for a design storm event.

The flow monitoring locations were selected and approved by GHD and the Town. The locations are listed in Table 2-1and can be seen in Figure 2-1.

[1] Twelve of the 20 sites were installed on December 15, 2010. Eight of these 12 sites were removed and installed in different locations on January 27, 2011. All 12 sites were removed on March 18, 2011.

Site Flow Monitoring and Capacity Results: Peak d/D Ratio and Peaking Factors

Peak measured flows and the consequent hydraulic grade line data (flow depths) are important to understand the capacity limitations of a collection system. There were several instances of backflow conditions due to capacity constraints and the inability of the local collection system to handle peak wet weather flows. The following capacity analyses terms are defined as follows:

- **d/D Ratio:** The d/D ratio is the peak measured depth of flow (d) divided by the pipe diameter (D). Standards for d/D ratio vary from agency to agency, but typically range between $d/D \leq 0.5$ and $d/D \leq 0.75$. The d/D ratio for each site was computed based on the maximum depth of flow for the flow monitoring study.
- **Peaking Factor:** Peaking factor is defined as the peak measured flow divided by the average dry weather flow (ADWF). Peaking factors are influenced by many factors including size and topography of tributary area and the amount and characteristics of I/I entering the collection system. Flow attenuation and flow restrictions will also affect the peaking factor.

Table ES-1 summarizes the peak recorded flows, levels, *d/D* ratios, and peaking factors per site during the flow monitoring period. Results of note have been shaded in RED. Capacity analysis data is presented on a site-by-site basis and represents the hydraulic conditions only at the site locations; hydraulic conditions in other areas of the collection system will differ.

Table ES-1. Capacity Analysis Summary

Metering Site	ADWF (mgd)	Peak Measured Flow (mgd)	Peaking Factor	Pipe Diameter, *D* (in)	Max Depth, *d* (in)	Max *d/D* Ratio	Surcharge above Pipe Crown (ft)
North A	0.431	2.18	5.05	16	10.22	0.64	-
North B	0.132	0.95	7.14	14.5	21.43	1.48	0.6
North C	0.044	0.65	14.66	9.75	5.57	0.57	-
North D	0.061	0.61	10.01	10	5.5	0.55	-
North E	0.017	0.15	8.59	10	3.11	0.31	-
Bell Village A	0.119	1.06	8.94	16	34.9	2.18	1.6
Bell Village B	0.008	0.14	16.31	6	5.22	0.87	-
Los Amigos	0.045	0.51	11.43	17.25	4.33	0.25	-
Brooks A	0.581	1.29	2.23	23	4.43	0.19	-
Brooks B	0.257	0.68	2.67	17.25	5.22	0.30	-
Hembree A	0.147	0.33	2.25	24	3.62	0.15	-
Hembree B	0.183	0.54	2.92	12	3.13	0.26	-
Hembree C	0.040	0.19	4.73	9.75	3.12	0.32	-
West	0.058	1.42	24.40	22.5	43.56	1.94	1.8
South A	0.180	0.67	3.72	14	10.09	0.72	-
South B	0.063	0.26	4.10	12	2.48	0.21	-
Conde A	0.337	0.98	2.90	31.5	5.41	0.17	-

Metering Site	ADWF (mgd)	Peak Measured Flow (mgd)	Peaking Factor	Pipe Diameter, *D* (in)	Max Depth, *d* (in)	*Max d/D* Ratio	Surcharge above Pipe Crown (ft)
Conde B	0.157	0.91	5.81	21	5.83	0.28	-
Conde B North	0.085	0.29	3.38	9.75	2.34	0.24	-
Conde B South	0.069	0.49	7.10	14.5	3.36	0.23	-

The following capacity analysis results are noted:

- **Site West:** Even though Site West had high values for both peaking factor and d/D ratio, this location is adjacent to the treatment facility. The high d/D ratios were due to treatment plant wet well operations (backing flows into the collection system). The high peaking factors were due to a "flushing" effect when backed-up flows were released back into the treatment plant. Deeper analysis of this site shows that it does not have capacity issues.
- **Peaking Factor:** Sites North A, North B, North C, North D, North E, Bell Village A, Bell Village B, Los Amigos, Hembree C, West, South A, South B, Conde B, Conde B North and Conde B South had peaking factors that exceeded typical design threshold limits for peak flow to average dry weather flow ratio. Excluding Site West (see bullet 1), Sites North C, North D and Bell Village B had the highest peaking factors recorded for this study.
- **d/D Ratio:** Sites North B, Bell Village A, Bell Village B and West had d/D ratios that exceeded common threshold values for d/D ratio. Excluding Site West (see bullet 1), North B and Bell Village had the highest d/D ratios and both sites surcharged above the pipe crown during this study.

Infiltration and Inflow Analysis

Table ES-2 summarizes the flow monitoring and I/I results for the flow monitoring basins that were monitored during this study. Results of note have been shaded in RED. Infiltration and inflow rankings are shown such that 1 represents the highest infiltration or inflow contribution.

Table ES-2. I/I Analysis Summary

Metering Basin	ADWF (mgd)	Inflow Ranking [A]	RDI Ranking [A]	Evidence of High GWI? [A]
North A	0.14	2	2	10
North B	0.071	5	8	10
North C	0.044	10	9	10
North D	0.044	3	3	10
North E	0.017	9	12	10
Bell Village A	0.11	1	1	2

Metering Basin	ADWF (mgd)	Inflow Ranking [A]	RDI Ranking [A]	Evidence of High GWI? [A]
Bell Village B	0.008	8	4	7
Los Amigos	0.045	6	7	5
Brooks A	0.28	12	14	1
Brooks B	0.26	18	15	10
Hembree A	0.11	19	19	9
Hembree B	0.18	14	11	3
Hembree C	0.040	17	17	10
West	0.058	16	16	10
South A	0.12	11	10	10
South B	0.063	7	13	10
Conde A	0.12	15	18	6
Conde B North	0.085	13	6	4
Conde B South	0.069	4	5	8

[A] Ranking of 1 represents most inflow/infiltration after normalization.

The following inflow/infiltration analysis results are noted:

- **Inflow:** Basins Bell Village A, North A and North D ranked highest for normalized inflow contribution.
- **Rainfall-Dependent Infiltration:** Basins North A, Bell Village A, and North D ranked highest for normalized RDI contribution.
- **Groundwater Infiltration:** Basins Brooks A, Bell Village A, and Hembree B showed evidence of GWI rates that were above the WEF typical low-to-average ratio, indicating excessive groundwater infiltration.

Figure ES-1-2 through Figure ES-1-4 illustrate temperature map summaries of the I/I results.

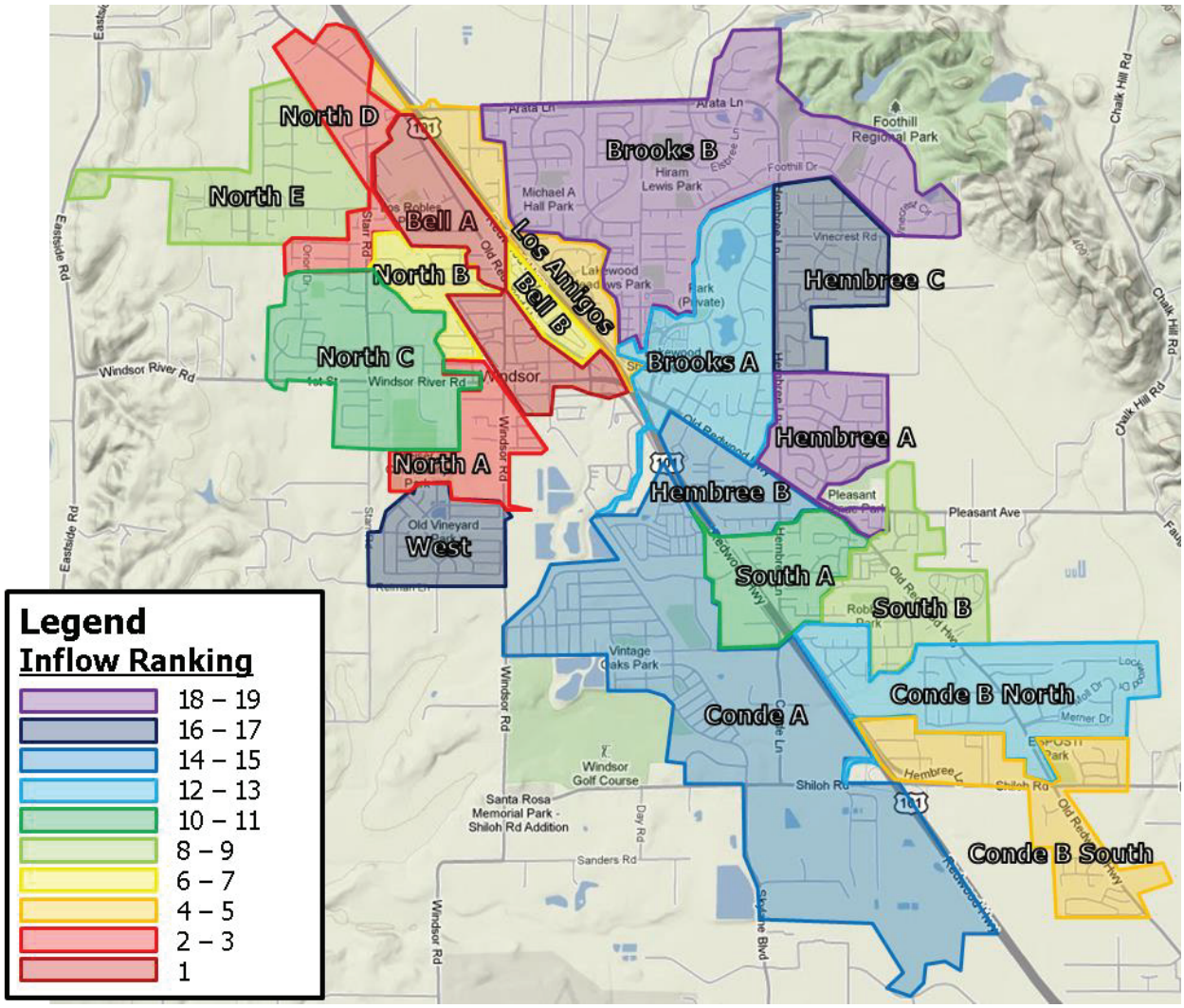


Figure ES-1-2. Inflow Temperature Map

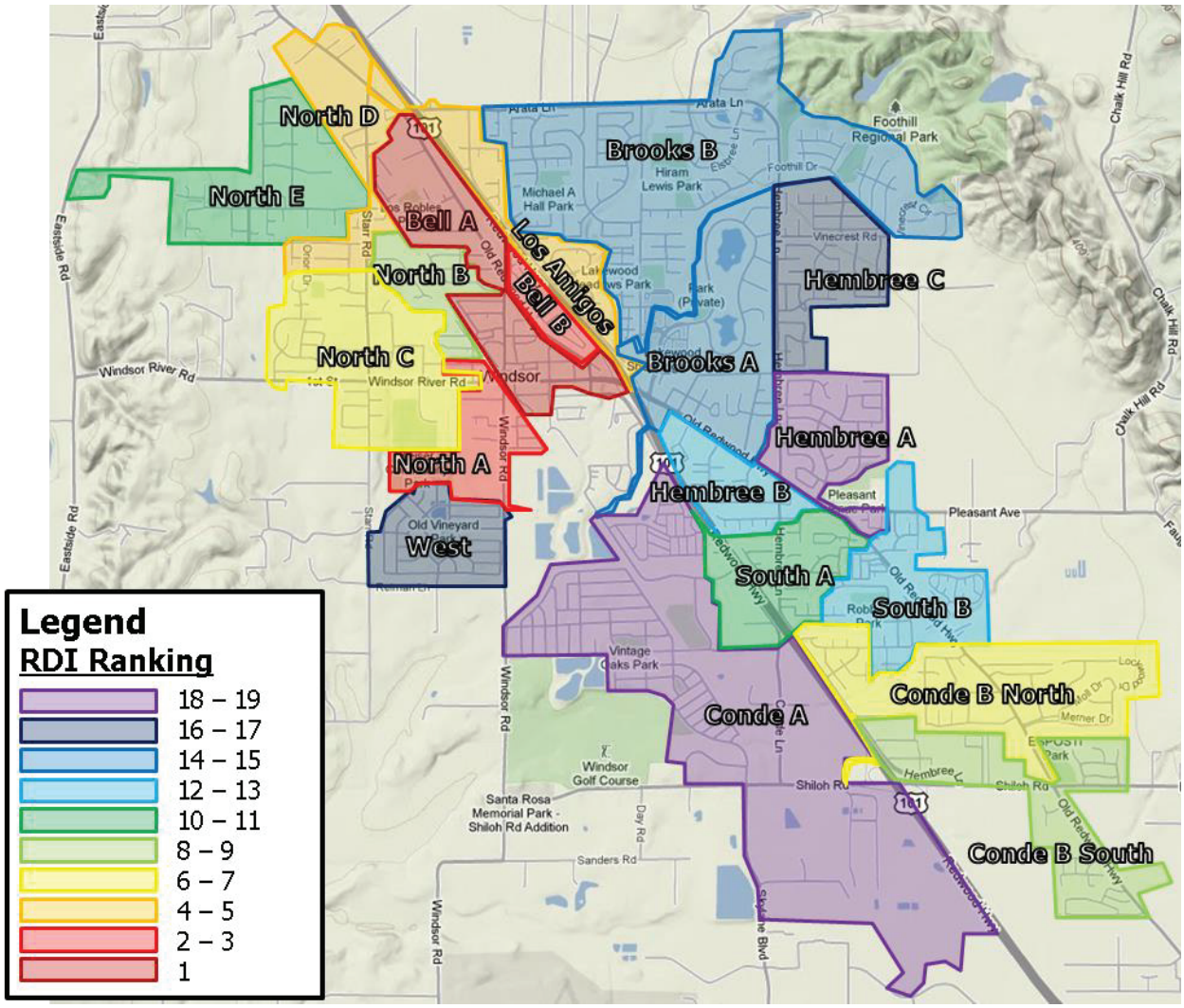


Figure ES-1-3. RDI Temperature Map

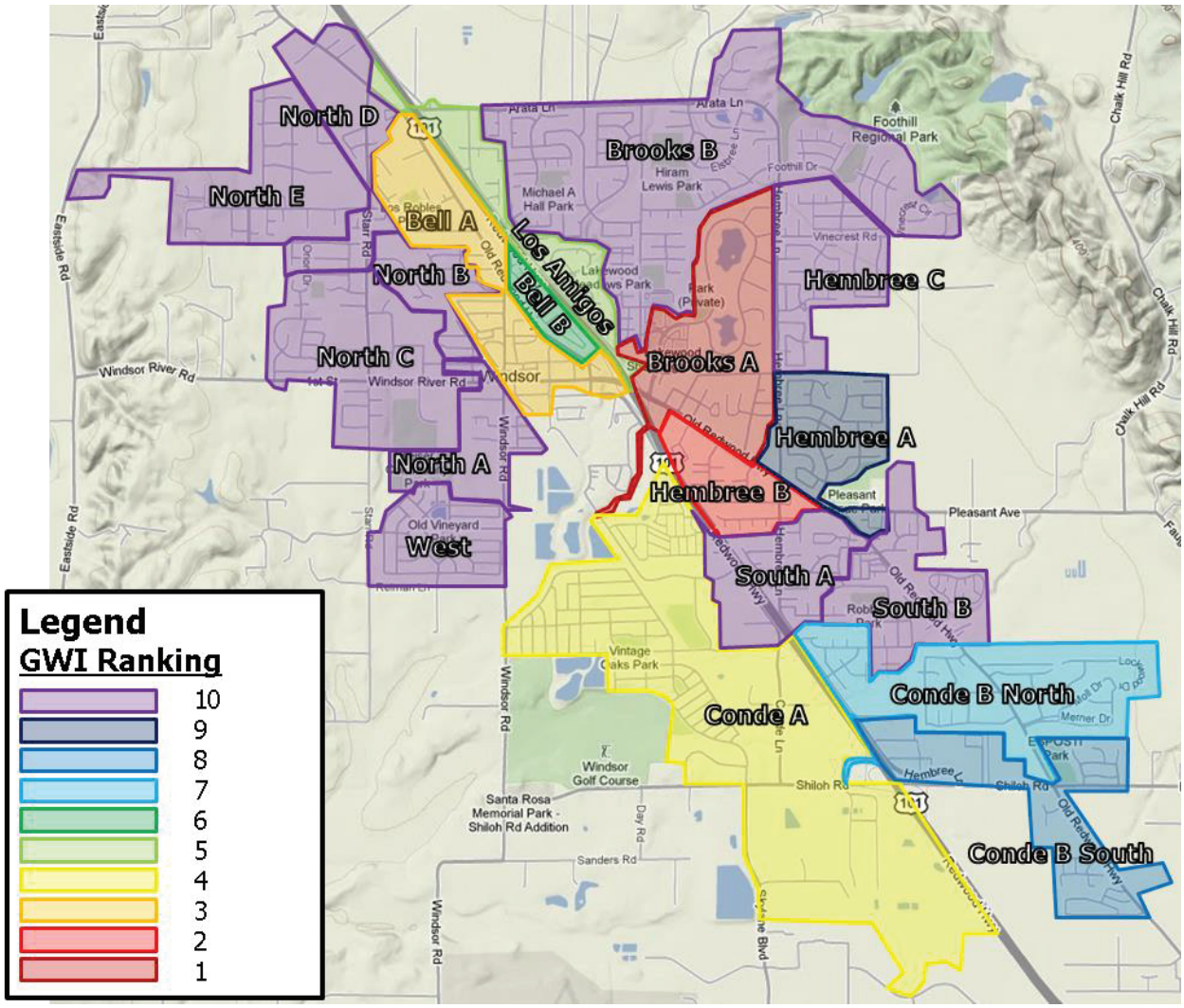


Figure ES-1-4. GWI Temperature Map

Night-Time I/I Reconnaissance

V&A performed I/I reconnaissance during two wet weather seasons. During the 2010/2011 wet weather season, V&A performed four nights of I/I reconnaissance. On February 17 and 18, 2011, V&A conducted nighttime I&I reconnaissance in the North B, Los Amigos and Hembree B Basins. The Bell Village Basin was examined on March 6, 2011 and a final night of I&I reconnaissance was performed in the South and Conde B Basins on March 24, 2011.

- V&A found eight segments of pipeline that had rates of I&I that fell into the highest category. These segments are located in the Bell Village, Conde B, North B and South Basins.
- V&A found a number of manholes with defects that serve as infiltration sources. No particular basin had the majority of pipe defects found.

During the 2015/2016 wet weather season, V&A performed one night of I/I reconnaissance on March 14.

- **Brooks A Basin:** Lakewood Area
  - Observations of infiltration were found at mainly manhole to pipe penetration joints, especially for the PVC pipes.
  - A source of infiltration was also found at a manhole joint, but this was not widespread.
  - The spot flow measurements indicated that the highest infiltration within the Lakewood basin appears to be mainly along:
    - The main line around the north lake
    - The laterals closest to the lake, i.e. the laterals extending towards the lake rather than radially out.
    - The eastern main line around the south lake
- **Conde B North Basin:**
  - Observations of infiltration were found at pipe penetrations and manhole joints in manholes on Amie Drive.
  - The highest infiltration rates were measured within the pipelines of Amie Drive, Victory Lane, Marsi Ct and Old Redwood Highway.
  - The area north of Victory Lane on Hembree Lane needs further investigation.
  - The spot flow measurements and observations confirmed the 2010/11 flow monitoring and abbreviated night-time I/I reconnaissance conclusions that the Conde B north basin has areas of infiltration.
- **Conde B South Basin:**
  - No signs of infiltration were observed in manholes apart from clear water flow.
  - The spot flow measurements confirmed that the pipeline on Lafayette Drive has a high infiltration rate of approximately 21,100 gpd/IDM and should be CCTVed or smoke tested.
  - The lines and laterals on Ellie Drive and Anne Drive also have high infiltration rates of approximately 15,600 gpd/IDM.

- In general, the infiltration within Conde B South basin is moderate to high and is fairly widespread and systemic.

CCTV Evaluation

V&A was retained by GHD to review closed-circuit television (CCTV) inspections of certain areas within the Town of Windsor (Town). V&A prepared two technical memorandums (see Appendix A) on the condition assessment findings of the CCTV videoed pipelines using the National Association of Sewer Service Companies' (NASSCO's) Pipeline Assessment and Certification Program (PACP) standardized ratings.

In 2013, the CCTV evaluation was performed by Roy's Sewer Service on April 8 and April 9. For this evaluation, V&A reviewed a total of 5,384 linear feet of sewer pipeline. In 2016, the CCTV evaluation was again performed by Roy's Sewer Service on March 14 and March 15. This year, V&A reviewed a total of 5,736 linear feet of sewer pipeline.

In 2013, a total of 20 returns[2] of I/I were observed. In 2016, a total of 34 returns of I/I were observed and separated into the following categories:

- **Manholes:** Infiltration entering the collection system from defects within the manhole structure
- **Pipe Mains:** Infiltration entering the collection system from defects within the Town pipe main
- **Lateral:** Infiltration entering the collection system from defects within the private lateral
- **Pipe/Lateral Connection:** Infiltration entering the collection system from connection between the private lateral and the Town pipe main

Table ES-3 shows I/I returns over both years.

[2] **Return** is a term used in smoke testing and other I/I detection methods to define an instance of clear water flow that is suspected to be inflow or infiltration.

Table ES-3. I/I Return Analysis Summary

Type of Return	# of Returns	% of Total	Light Returns	Medium Returns	Heavy Returns
2013 Project					
Manhole	2	10%	2	0	0
Pipe Main	6	30%	4	2	0
Lateral	12	60%	6	5	1
Total:	**20**	**100%**	**12**	**7**	**1**
2016 Project					
Manhole	3	9%	0	3	0
Pipe Main	13	38%	0	7	6
Lateral	18	53%	0	15	3
Total:	**34**	**100%**	**0**	**25**	**9**

1.0 INTRODUCTION

1.1 Scope and Purpose

Since 2010, V&A Consulting Engineers (V&A) was retained by GHD (formerly Winzler & Kelly) and has completed a number of inflow/infiltration (I/I) evaluation projects within the Town of Windsor (Town) collection system. The primary purpose of these projects was to evaluate specific areas with the Town's collection system in an effort to locate areas with high levels of inflow and/or infiltration. This information will assist GHD and the Town in prioritizing future CIP projects and updating the Town's master plan. The various techniques and the associated dates and durations these techniques were employed are listed below:

- Flow Monitoring (December 16, 2010 – March 16, 2011):
  - 12 flow meters – Select flow meters were moved several times to isolate basins of interest. 19 total basins evaluated
- I/I Night-time Reconnaissance (February 17-18, March 6 & March 24, 2011; March 14, 2016):
  - 2011 Project – 6 basins evaluated
  - 2016 Project – 4 basins evaluated
- Closed Circuit Television (CCTV) (April 8-9, 2013; March 14-15, 2016)
  - 2013 Project – 5,384 linear feet, 21 pipe reaches evaluated
  - 2016 Project – 5,736 linear feet, 19 pipe reaches evaluated

The locations of the various evaluation projects are shown in Figure ES-1-1Figure 1-1. Notably, the locations sometimes overlapped as it was a strategic process to narrow down specific areas with high levels of I/I.

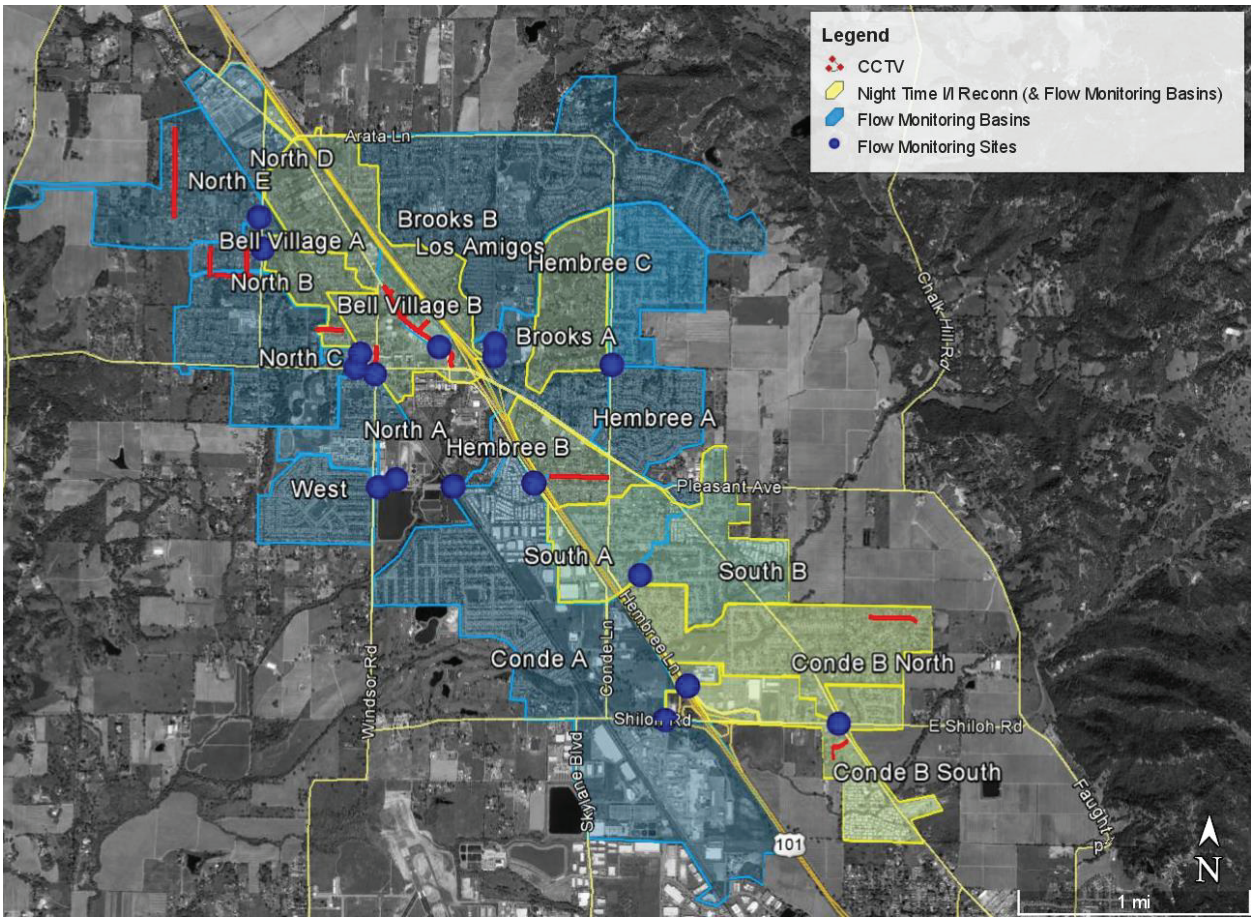


Figure 1-1. Map of 2011-2016 I/I Evaluation Projects performed by V&A in Windsor, CA

2.0 FLOW MONITORING

2.1 Flow Monitoring Locations

Flow Monitoring Sites: Flow monitoring sites are the actual locations where the flow monitors were placed. Flow monitoring site data may include the flows of one or many drainage basins. To isolate a flow monitoring basin, an addition or subtraction of flows may be required[3]. Capacity and flow rate information is presented on a site-by-site basis.

Flow Monitoring Basins: Flow monitoring basins are localized areas of a sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. The basin refers to the ground surface area near and enclosed by the pipelines. A basin may refer to the entire collection system upstream from a flow meter, or if flow meters are aligned in series (flowing into each other), a basin may exclude separately monitored basins upstream. I&I analysis in this report will be conducted on a basin-by-basin basis.

Rain Gauges: Data from three rain gauges were utilized for this project. The three rain gauges were located at Hiram Lewis Park, at Windsor Fire District Station #1 located on Hembree Rd. and Old Redwood Highway, and CIMIS Station 103 located on Starr Rd.

The flow monitoring sites and rain gauge sites are listed in Table 2-1 and illustrated in Figure 2-1. The flow monitoring basins are described in Table 2-2 and illustrated in Figure 2-2.

Table 2-1. List of Flow Monitoring and Rain Gauge Locations

Monitoring Site	Pipe Diameter (in)	Location
Bell Village A	16	MH N5: Windsor Road, south of Windsor River Road
Bell Village B	6	MH N17D: Old Redwood Hwy, southeast of Richardson Street
Brooks A	23	MH S183: Bell Road, northwest of Joshua Drive
Brooks B	17.25	MH S207: Brooks Road S, south of Los Amigos Road
Conde A	31.5	MH S183: Bell Road, northwest of Joshua Drive
Conde B	21	MH S338: Shiloh Road, east of Caletti Avenue

[3] Adding and subtracting flows increases error on an additive basis. For example, if Site A has error ±10% and Site B has error ±10%, then the resulting flow when subtracting Site A from Site B would be ±20%.

Monitoring Site	Pipe Diameter (in)	Location
Conde B North	9.75	MH S343: Hembree Lane, next to Shopping Center Parking Lot
Conde B South	14.5	MH S343: Hembree Lane, next to Shopping Center Parking Lot
Hembree A	24	Conde Lane, northwest of Circle Drive
Hembree B	12	MH S9: Conde Lane, northwest of Circle Drive
Hembree C	9.75	MH S421: Intersection of Hembree Lane and Jensen Lane
Los Amigos	17.25	Los Amigos Road, near Brooks Road S
North A	16	MH N1A: Plant Road, in front of the plant
North B	14.5	MH N200: Wild Oak Drive at 2nd Street
North C	9.75	MH N38: Windsor River Road, west of Windsor Road
North D	10	MH N230: About 100 feet from Starr Road and Starr View Drive
North E	10	MH N25: Intersection of Gumview Road and Starr Road
South	14	Conde Lane, northwest of Circle Drive
South A	14	Conde Lane, northwest of Circle Drive
South B	12	MH S44: Billington Lane, near Sparrow Court
West	22.5	About 130 feet from Windsor Road, between Plant Road and Winemaker Way
Rain Gauge	**Location**	
RG Northeast	Hiram Lewis Park, off of Brooks Road	
RG Central	Windsor Fire District, Hembree and Old Redwood Highway	
RG Southwest	CIMIS Station 103, Starr Road	

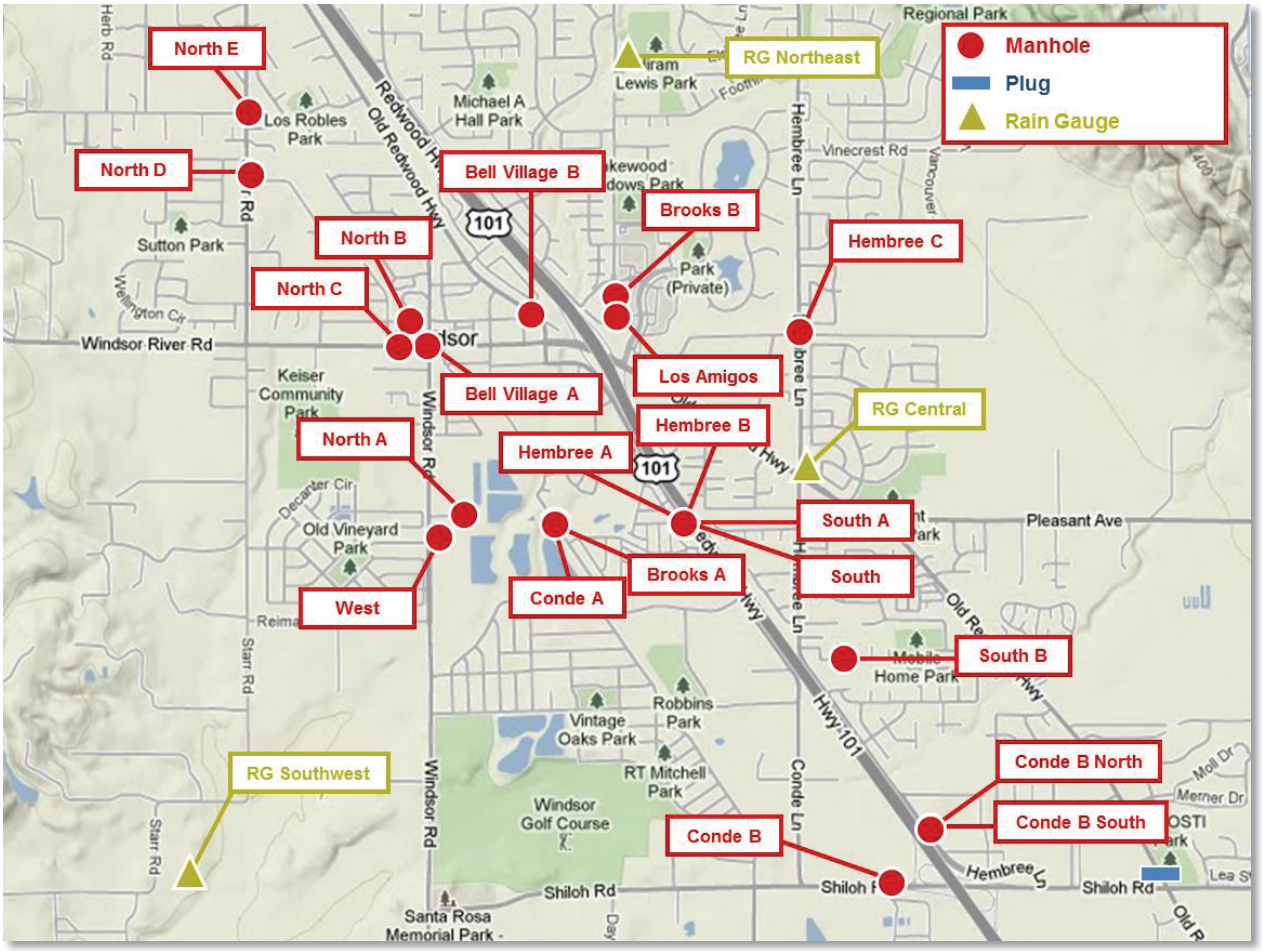


Figure 2-1. Flow Meter, Rain Gauge, Plug Location

Table 2-2. Flow Monitoring Basin Information

Monitoring Basin	Size (acres)	Pipe Length (IDM[4])	Basin Flow Calculation
North A	128.1	18.79	$Q_{NorthA} = Q_{NorthA} - Q_{NorthB} - Q_{NorthC} - Q_{BellA}$
North B	99.5	23.65	$Q_{NorthB} = Q_{NorthB} - Q_{NorthD}$
North C	205.8	36.09	$Q_{NorthC} = Q_{NorthC}$
North D	134.3	18.47	$Q_{NorthD} = Q_{NorthD} - Q_{NorthE}$
North E	170.3	20.48	$Q_{NorthE} = Q_{NorthE}$
Bell A	130.7	20.60	$Q_{BellA} = Q_{BellA} - Q_{BellB}$
Bell B	65.4	12.61	$Q_{BellB} = Q_{BellB}$
Los Amigos	100.8	32.87	$Q_{LosAmigos} = Q_{LosAmigos}$
Brooks A	41.7	22.46	$Q_{BrooksA} = Q_{BrooksA} - Q_{BrooksB} - Q_{LosAmigos}$
Brooks B	535.8	108.24	$Q_{BrooksB} = Q_{BrooksB}$
Hembree A	142.3	48.95	$Q_{HembreeA} = Q_{HembreeA} - Q_{HembreeC}$
Hembree B	299.6	57.03	$Q_{HembreeB} = Q_{HembreeB}$
Hembree C	110.4	20.66	$Q_{HembreeC} = Q_{HembreeC}$
West	177.2	47.84	$Q_{West} = Q_{West}$
South A	126.6	28.59	$Q_{SouthA} = Q_{SouthA} - Q_{SouthB}$
South B	151.8	24.30	$Q_{SouthB} = Q_{SouthB}$
Conde A	693.2	131.25	$Q_{CondeA} = Q_{CondeA} - Q_{CondeBNorth} - Q_{CondeBSouth}$
Conde B North	249.5	45.55	$Q_{CondeBNorth} = Q_{CondeBNorth}$
Conde B South	270.9	32.10	$Q_{CondeBSouth} = Q_{CondeBSouth}$

[4] IDM = inch-diameter-mile, miles of pipeline multiplied by the diameter of the pipeline in inches. This is the industry standard unit of measurement for stating length of pipe within a sanitary drainage basin.

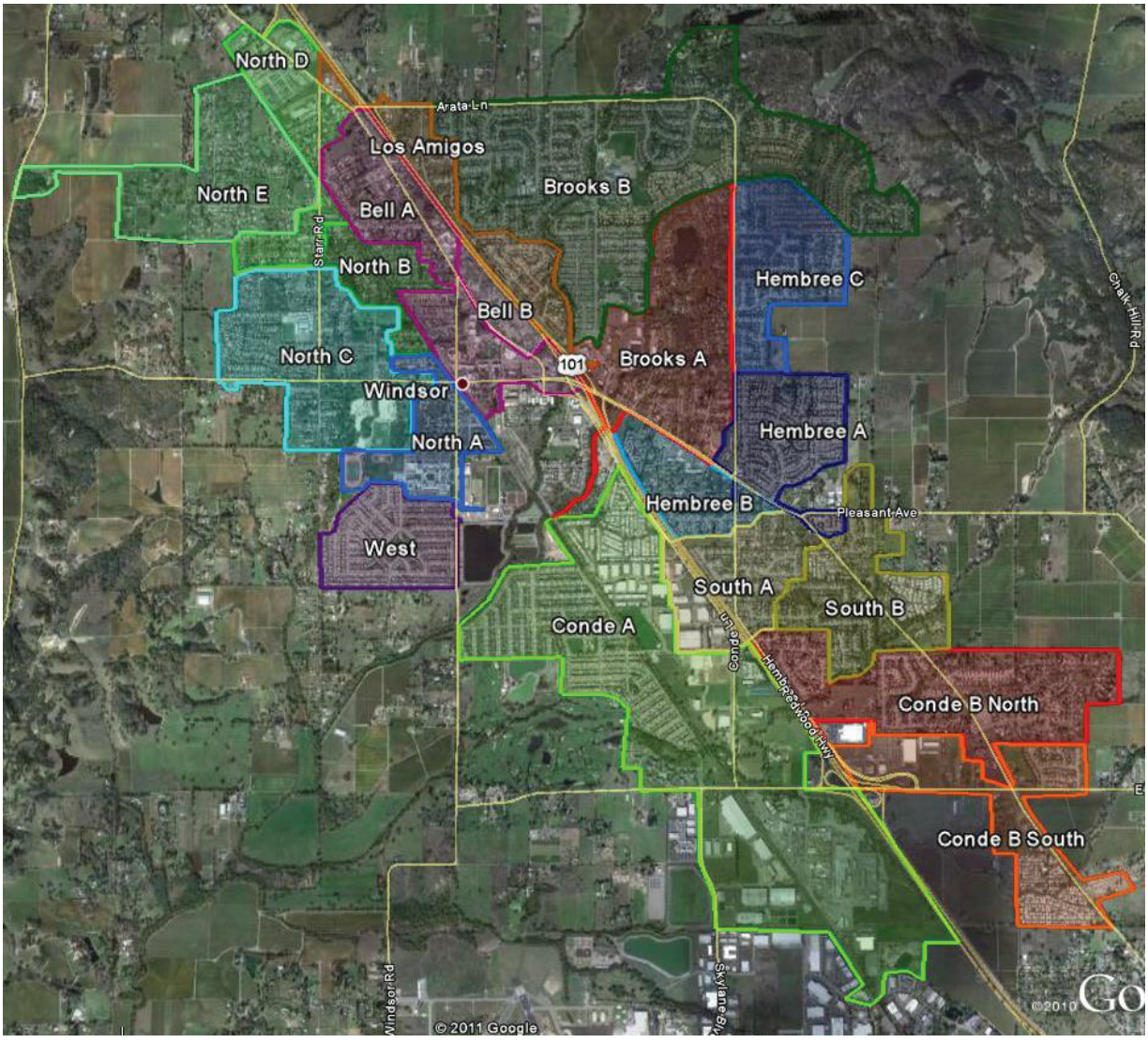


Figure 2-2. Flow Monitoring Basins

2.2 Flow Monitoring Results

Peak measured flows and the consequent hydraulic grade line data (flow depths) are important to understand the capacity limitations of a collection system. There were several instances of backflow conditions due to capacity constraints and the inability of the local collection system to handle peak wet weather flows. The following capacity analyses terms are defined as follows:

- **d/D Ratio:** The d/D ratio is the peak measured depth of flow (d) divided by the pipe diameter (D). Standards for d/D ratio vary from agency to agency, but typically range between d/D ≤ 0.5 and d/D ≤ 0.75. The d/D ratio for each site was computed based on the maximum depth of flow for the flow monitoring study.
- **Peaking Factor:** Peaking factor is defined as the peak measured flow divided by the average dry weather flow (ADWF). Peaking factors are influenced by many factors including size and topography of tributary area and the amount and characteristics of I/I entering the collection system. Flow attenuation and flow restrictions will also affect the peaking factor.
- **Meter Durations:** Due to the relocation of flow meters and different flow data capture periods, the peak flows and peak levels should not be directly compared to each other. See Section 5.1 2011, 2013, 2016 I/I Flow Measurements and Discussion for an overview of the rainfall events. The period of meter installation are color coded per the following scheme:

BLUE:	12/16/2010 – 3/18/2011
YELLOW:	12/16/2010 – 1/27/2011
GREEN:	1/27/2011 – 3/18/2011
ORANGE:	1/27/2011 – 2/24/2011
PINK:	2/24/2011 – 3/18/2011

Table 2-3 summarizes the peak recorded flows, levels, *d/D* ratios, and peaking factors per site during the flow monitoring period. Results of note have been shaded in RED. Capacity analysis data is presented on a site-by-site basis and represents the hydraulic conditions only at the site locations; hydraulic conditions in other areas of the collection system will differ.

Table 2-3. Capacity Analysis Summary

Metering Site	ADWF (mgd)	Peak Measured Flow (mgd)	Peaking Factor	Pipe Diameter, *D* (in)	Max Depth, *d* (in)	*Max d/D* Ratio	Surcharge above Pipe Crown (ft)
North A	0.431	2.18	5.05	16	10.22	0.64	-
North B	0.132	0.95	7.14	14.5	21.43	1.48	0.6
North C	0.044	0.65	14.66	9.75	5.57	0.57	-
North D	0.061	0.61	10.01	10	5.5	0.55	-
North E	0.017	0.15	8.59	10	3.11	0.31	-
Bell Village A	0.119	1.06	8.94	16	34.9	2.18	1.6

Metering Site	ADWF (mgd)	Peak Measured Flow (mgd)	Peaking Factor	Pipe Diameter, *D* (in)	Max Depth, *d* (in)	*Max d/D* Ratio	Surcharge above Pipe Crown (ft)
Bell Village B	0.008	0.14	16.31	6	5.22	0.87	-
Los Amigos	0.045	0.51	11.43	17.25	4.33	0.25	-
Brooks A	0.581	1.29	2.23	23	4.43	0.19	-
Brooks B	0.257	0.68	2.67	17.25	5.22	0.30	-
Hembree A	0.147	0.33	2.25	24	3.62	0.15	-
Hembree B	0.183	0.54	2.92	12	3.13	0.26	-
Hembree C	0.040	0.19	4.73	9.75	3.12	0.32	-
West	0.058	1.42	24.40	22.5	43.56	1.94	1.8
South A	0.180	0.67	3.72	14	10.09	0.72	-
South B	0.063	0.26	4.10	12	2.48	0.21	-
Conde A	0.337	0.98	2.90	31.5	5.41	0.17	-
Conde B	0.157	0.91	5.81	21	5.83	0.28	-
Conde B North	0.085	0.29	3.38	9.75	2.34	0.24	-
Conde B South	0.069	0.49	7.10	14.5	3.36	0.23	-

The following capacity analysis results are noted:

- **Site West:** Even though Site West had high values for both peaking factor and d/D ratio, this location is adjacent to the treatment facility. The high d/D ratios were due to treatment plant wet well operations (backing flows into the collection system). The high peaking factors were due to a "flushing" effect when backed-up flows were released back into the treatment plant. Deeper analysis of this site shows that it does not have capacity issues.
- **Peaking Factor:** Sites North A, North B, North C, North D, North E, Bell Village A, Bell Village B, Los Amigos, Hembree C, West, South A, South B, Conde B, Conde B North and Conde B South had peaking factors that exceeded typical design threshold limits for peak flow to average dry weather flow ratio. Excluding Site West (see bullet 1), Sites North C, North D and Bell Village B had the highest peaking factors recorded for this study.
- **d/D Ratio:** Sites North B, Bell Village A, Bell Village B and West had d/D ratios that exceeded common threshold values for d/D ratio. Excluding Site West (see bullet 1), North B and Bell Village A had the highest d/D ratios and both sites surcharged above the pipe crown during this study.

2.3 Infiltration and Inflow Analysis

Table 2-4 summarizes the flow monitoring and I/I results for the flow monitoring basins that were monitored during this study. Results of note have been shaded in RED. Infiltration and inflow rankings are shown such that 1 represents the highest infiltration or inflow contribution.

Table 2-4. I/I Analysis Summary

Metering Basin	ADWF (mgd)	Inflow Ranking [A]	RDI Ranking [A]	Evidence of High GWI? [A]
North A	0.14	2	2	10
North B	0.071	5	8	10
North C	0.044	10	9	10
North D	0.044	3	3	10
North E	0.017	9	12	10
Bell Village A	0.11	1	1	2
Bell Village B	0.008	8	4	7
Los Amigos	0.045	6	7	5
Brooks A	0.28	12	14	1
Brooks B	0.26	18	15	10
Hembree A	0.11	19	19	9
Hembree B	0.18	14	11	3
Hembree C	0.040	17	17	10
West	0.058	16	16	10
South A	0.12	11	10	10
South B	0.063	7	13	10
Conde A	0.12	15	18	6
Conde B North	0.085	13	6	4
Conde B South	0.069	4	5	8

[A] Ranking of 1 represents most inflow/infiltration after normalization.

The following inflow/infiltration analysis results are noted:

- **Inflow:** Basins Bell Village A, North A and North D ranked highest for normalized inflow contribution.
- **Rainfall-Dependent Infiltration:** Basins North A, Bell Village A, and North D ranked highest for normalized RDI contribution.
- **Groundwater Infiltration:** Basins Brooks A, Bell Village A, and Hembree B showed evidence of GWI rates that were above the WEF typical low-to-average ratio, indicating excessive groundwater infiltration.

Figure 2-3 through Figure 2-5 illustrate temperature map summaries of the I/I results.

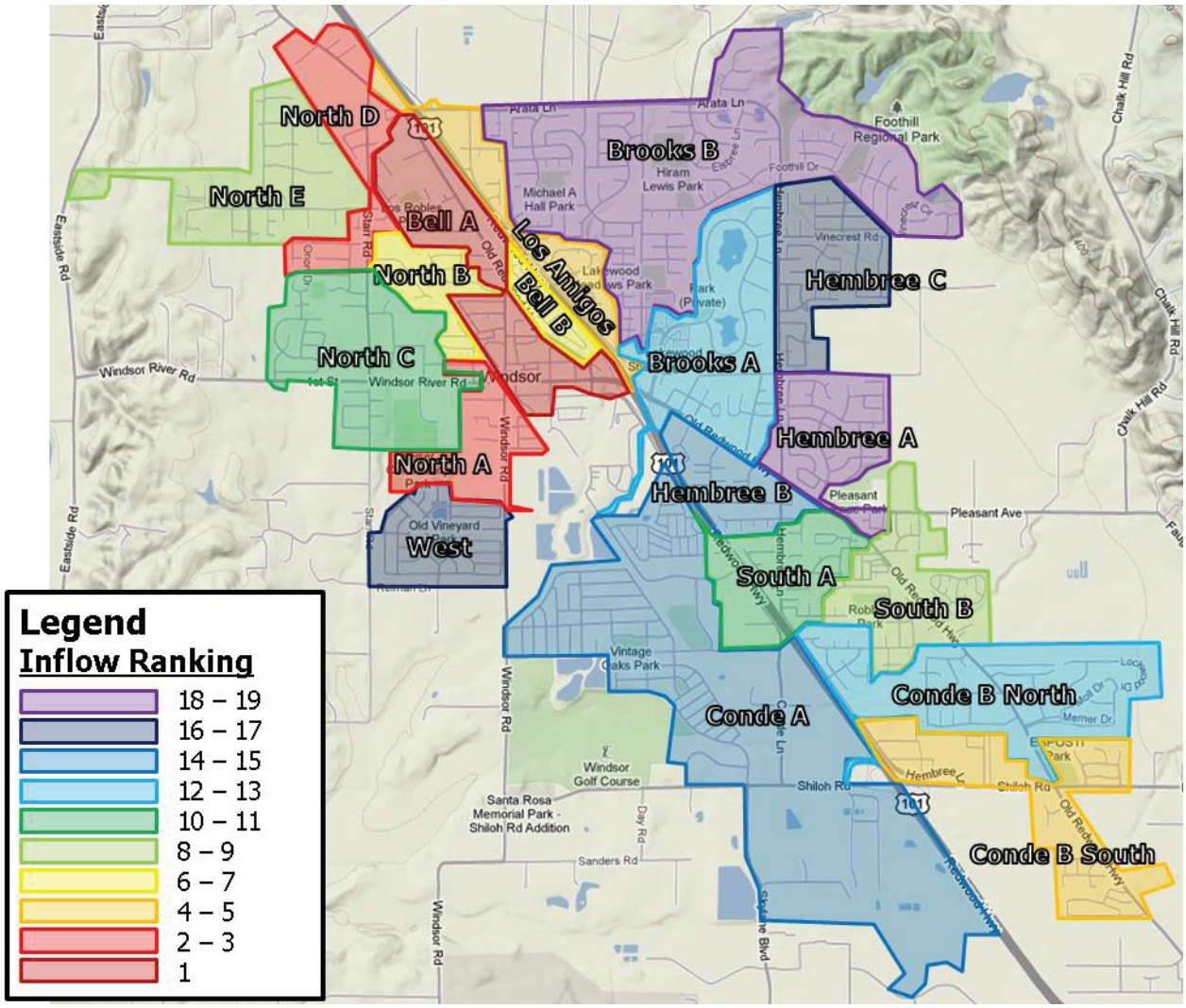


Figure 2-3. Inflow Temperature Map

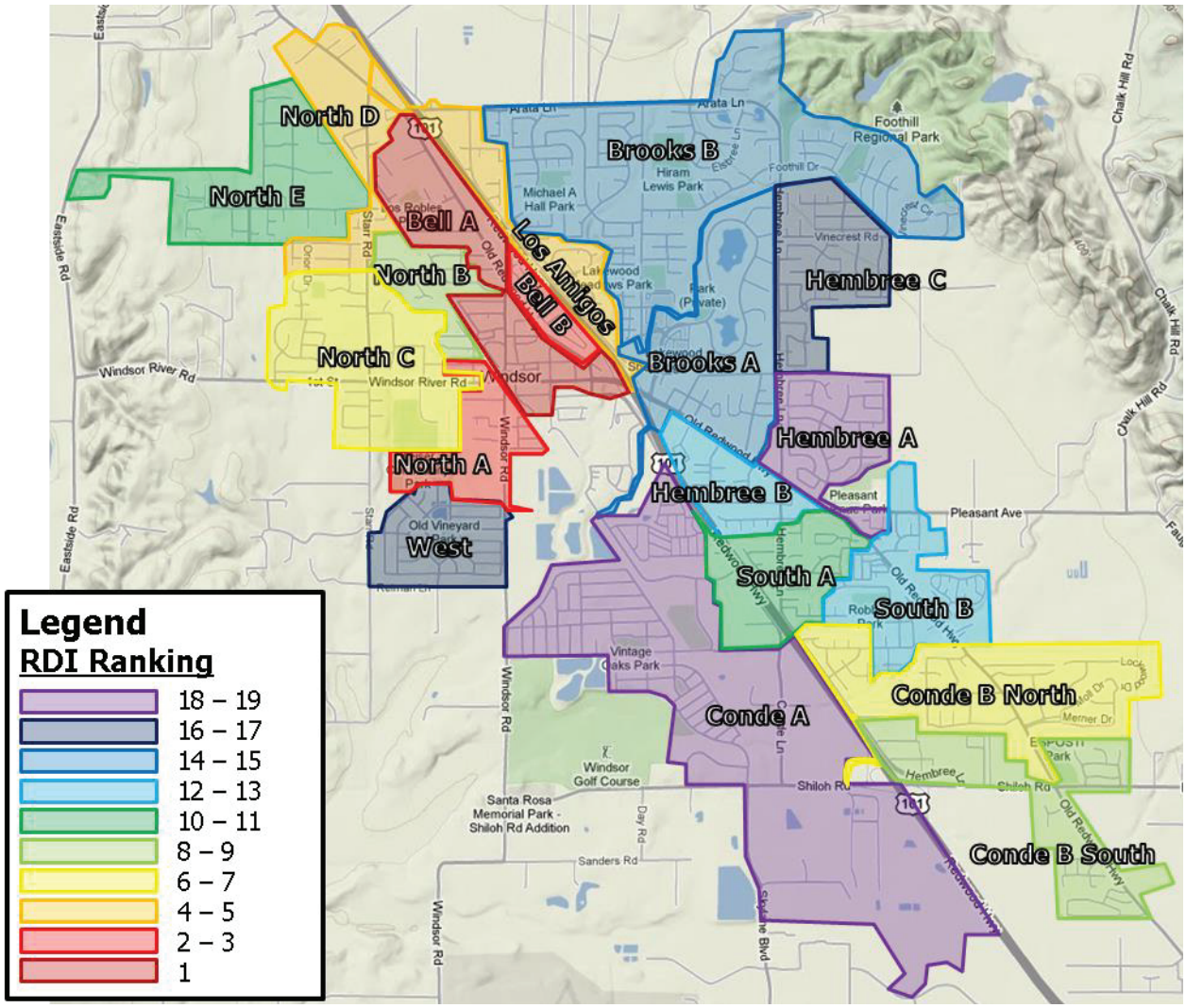


Figure 2-4. RDI Temperature Map

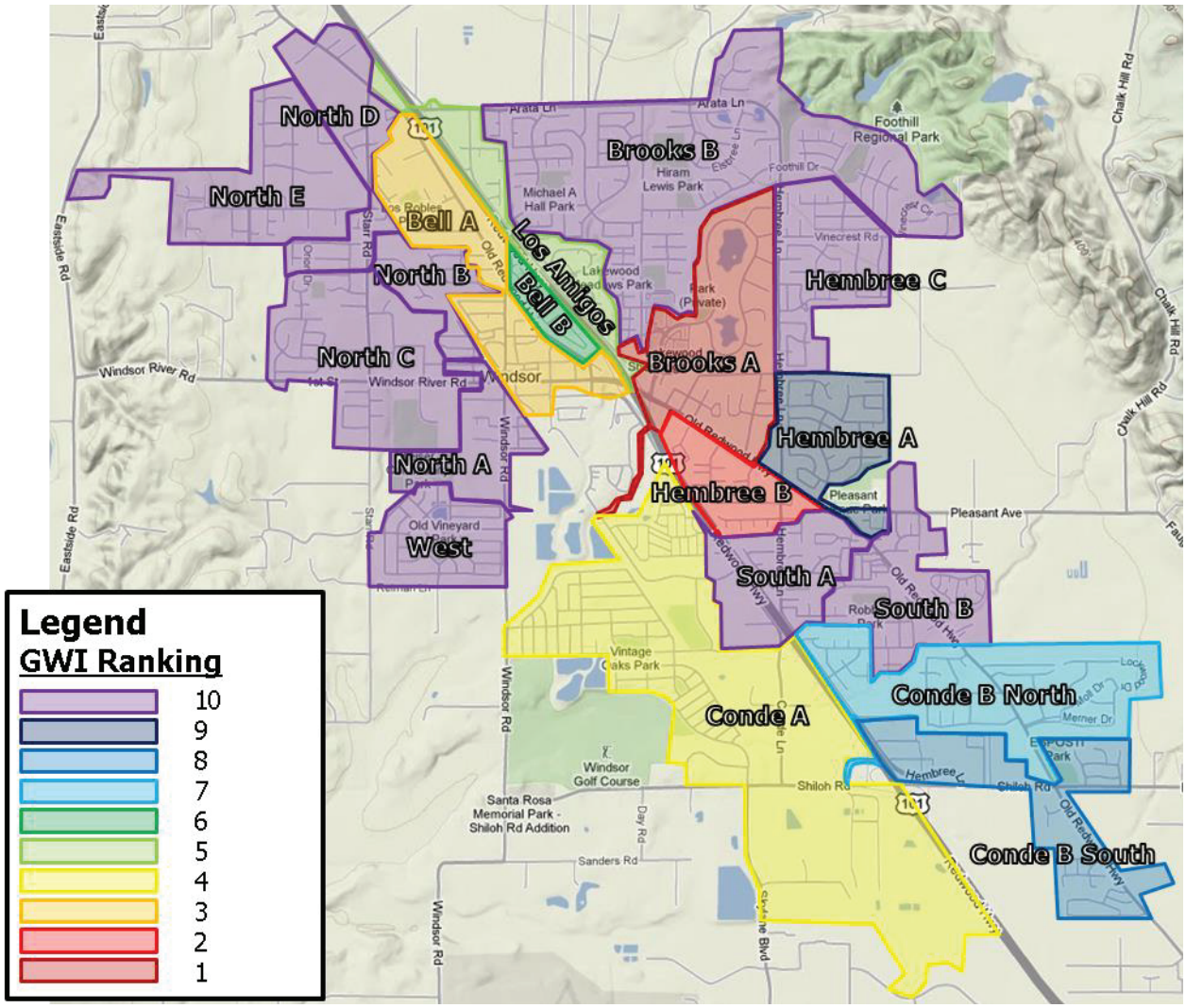


Figure 2-5. GWI Temperature Map

2.4 Synthetic I/I Hydrograph Analysis

Flow meters were relocated mid-study to better isolate and sub-divide the basins and sub-basins. However, relocation of flow meters results in different data and different storm events for the newly defined basins and sub-basins. An "apples-to-apples" comparison of basins to each other is made by applying synthetic I&I hydrograph methodology, summarized as follows:

- Synthetic hydrograph analysis methods were used for normalization of early-season and mid-season flows amongst the different basins and sub-basins.
- A 10-year, 24-hour design storm event was used for final estimation of basin and sub-basin response and basin and sub-basin normalization of flows.

This method effectively models and extrapolates the best estimated response to the design storm events. These results assume full ground saturation, and the peak I/I flows from the design storm coincide with peak dry weather flows to get a "worst-case" scenario of peak wet weather flows. Table 2-5 summarizes the final results for each design storm on a site-by-site basis. Figure 2-6 shows the synthetic hydrograph response for the design storm event at the Bell Village A flow monitoring site.

Table 2-5. Design Storm I/I Analysis Summary

Metering Basin	Peak Dry Weather Flow (mgd)	Peak I/I Rate (mgd)	Peak Flow (mgd)	Total I/I (gallons)	RDI Rate[5]: (mgd)
North A	0.46	1.16	1.61	671,000	0.16
North B	0.19	0.67	0.86	413,000	0.058
North C	0.11	0.63	0.74	649,000	0.084
North D	0.094	0.82	0.92	678,000	0.079
North E	0.049	0.36	0.41	343,000	0.042
Bell Village A	0.15	1.46	1.6	1,508,000	0.19
Bell Village B	0.013	0.23	0.25	273,000	0.043
Los Amigos	0.086	0.78	0.87	742,000	0.092
Brooks A	0.56	0.34	0.9	44,000	0.016
Brooks B	0.5	0.45	0.95	542,000	0.066
Hembree A	0.21	0.13	0.34	104,000	0.003
Hembree B	0.28	0.62	0.9	800,000	0.12
Hembree C	0.1	0.11	0.2	67,000	0.005

[5] For this analysis, the RDI rate was is the average rate of I&I during Day 4 of the design storm. This is over 24 hours after the conclusion of rainfall and all I&I can be considered rain dependent infiltration with no influence from inflow. The RDI rates shown in the above table is not a component of the peak I/I or peak flow rates.

West	0.12	0.29	0.41	209,000	0.022
South A	0.23	0.45	0.68	361,000	0.062
South B	0.14	0.57	0.7	455,000	0.047
Conde A	0.4	1.16	1.56	325,000	0.03
Conde B North	0.14	0.53	0.66	906,000	0.15
Conde B South	0.12	0.97	1.09	931,000	0.11
Treatment Plant[6]	*3.22*	*8.3*	*11.52*	*10,021,000*	*1.33*

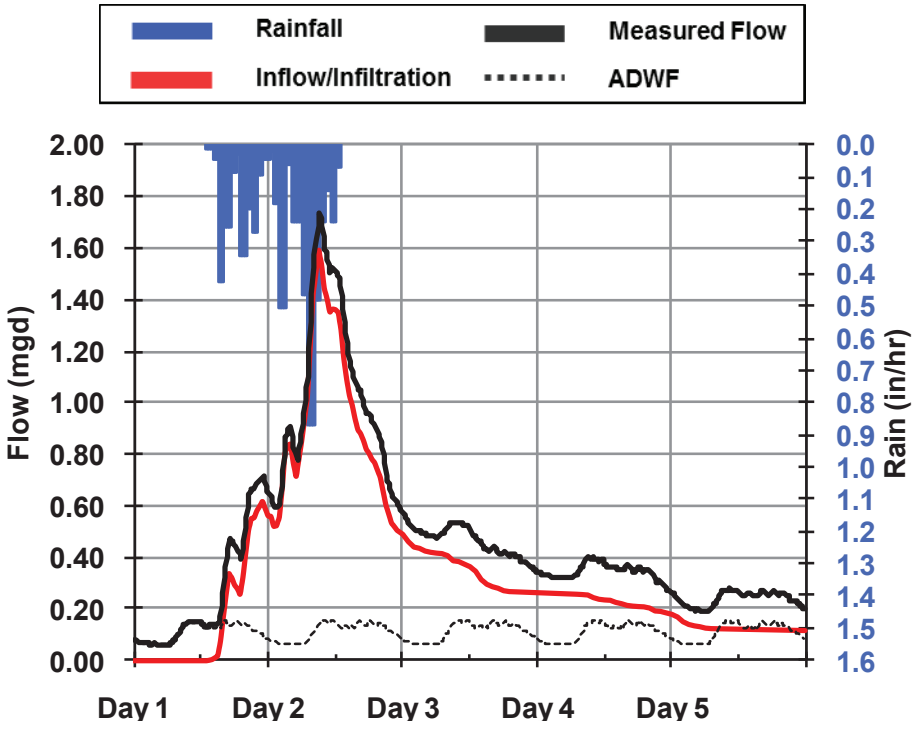


Figure 2-6. 10-Year, 24-Hour Design Storm Estimated I&I Response (Bell Village A)

[6] It is noted that the peak rates at the treatment plant are less than the sum of the peak rates of the individual basins. This is due to *attenuation*: the natural process of the reduction of the peak flow rate through redistribution of the same volume of flow over a longer period of time.

3.0 NIGHTTIME I/I RECONNAISSANCE

3.1 Preface

As shown in Section 2.0 Flow Monitoring, the 2010 - 2011 early season inflow and infiltration flow monitoring and analysis resulted in the following basins having normalized I&I rates higher than the system average:

- North A
- North B
- Bell Village
- Los Amigos
- South
- Conde B
- The Hembree B Basin was observed to have significantly high GWI Rates.

V&A performed I/I reconnaissance during two wet weather seasons. During the 2010/2011 wet weather season, V&A performed four nights of I/I reconnaissance. On February 17 and 18, 2011, V&A conducted nighttime I&I reconnaissance in the North B, Los Amigos and Hembree B Basins. The Bell Village Basin was examined on March 6, 2011 and a final night of I&I reconnaissance was performed in the South and Conde B Basins on March 24, 2011. During the 2015/2016 wet weather season, V&A performed one night of I/I reconnaissance on March 14 in the Brooks A (Lakewood Area) and Conde B North and South Basins.

3.2 2011 Project

3.2.1 Bell Village

Bell Village Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** There was some clear water flow found in most of the pipelines in the Bell Village Basin. As shown in the calculations in Figure 3-1, the two segments with the highest rates of I&I are the segments immediately upstream from Manhole N6. The other segments

that had large amounts of clear water flow were the inlets in Manhole N17G and the northeast lateral in Manhole N17D.

- **Manhole Infiltration:** There were a few manholes with cracks or seams in the manhole chimney that were weeping water. These manholes include N8A, N9C, and N15.
- **Pipeline Mains Infiltration:** Two of the manholes had defects that qualify as infiltration sources. The south lateral of N15 had a small squirter on the bottom portion of the penetration into the manhole. The northeast lateral of N17B had two defects at the pipe penetration to the manhole.

Figure 3-1 illustrates the spot measurements and the infiltration rates of the mini-basins.

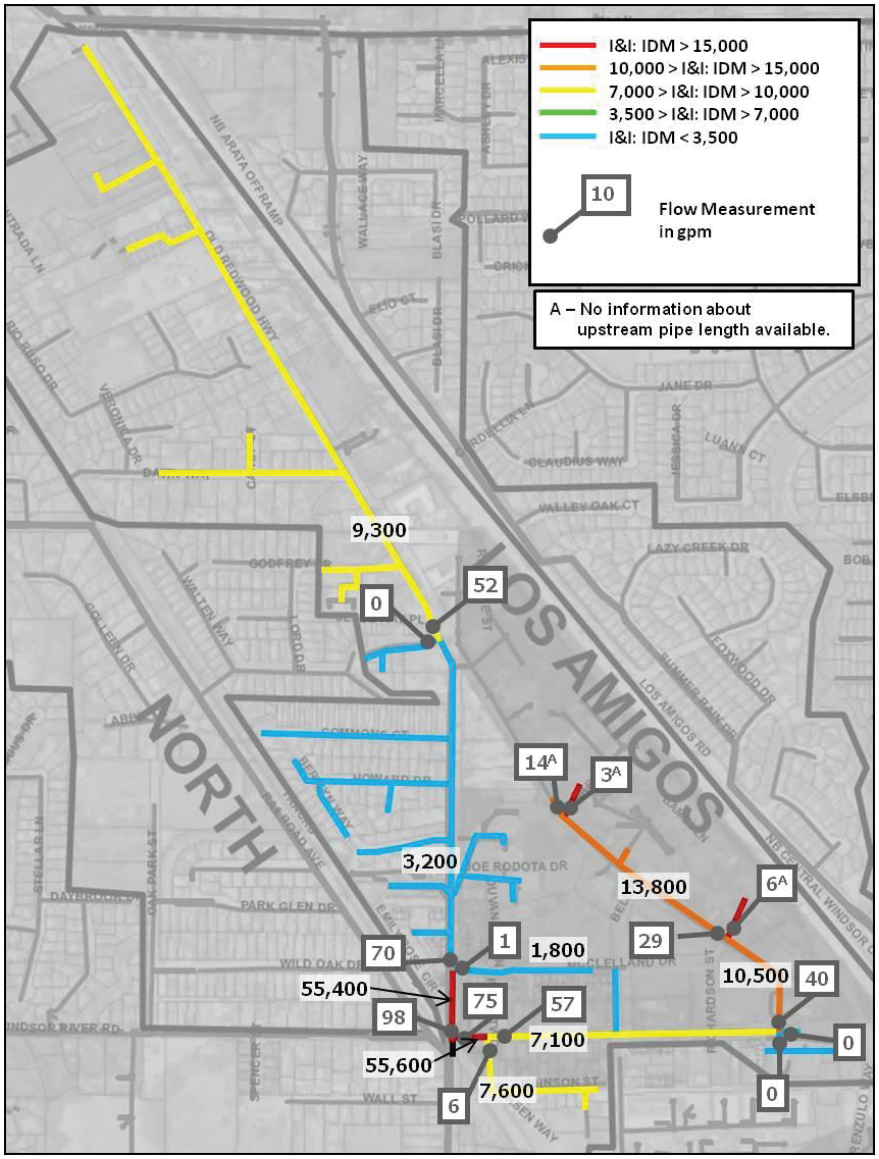


Figure 3-1. Bell Village I/I Reconnaissance Results

3.2.2 Conde B

Conde B Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** There was a fair amount of clear water flow throughout this basin. The majority of this clear water flow was coming from the north inlet at Manhole 343. According to the flow calculations from the I&I reconnaissance (Figure 3-2), the only section with significant contribution of infiltration is the west inlet of S53A.
- **Manhole Infiltration:** None reported.
- **Pipeline Mains Infiltration:** Manhole S343 had the major defect in this basin, located at the crown of the 21-inch effluent pipeline.

Note: As seen in Figure 3-2, some of the I&I data is inconclusive. This is due to the unpredictable nature of the flow split at Manhole S130. This split accumulates debris that releases at unpredictable times and alters flow characteristics through both effluent lines. It should be noted that while exact calculations for the rates of infiltration per IDM could not be made for these segments, estimates show that these rates are comparatively low for the segments in question.

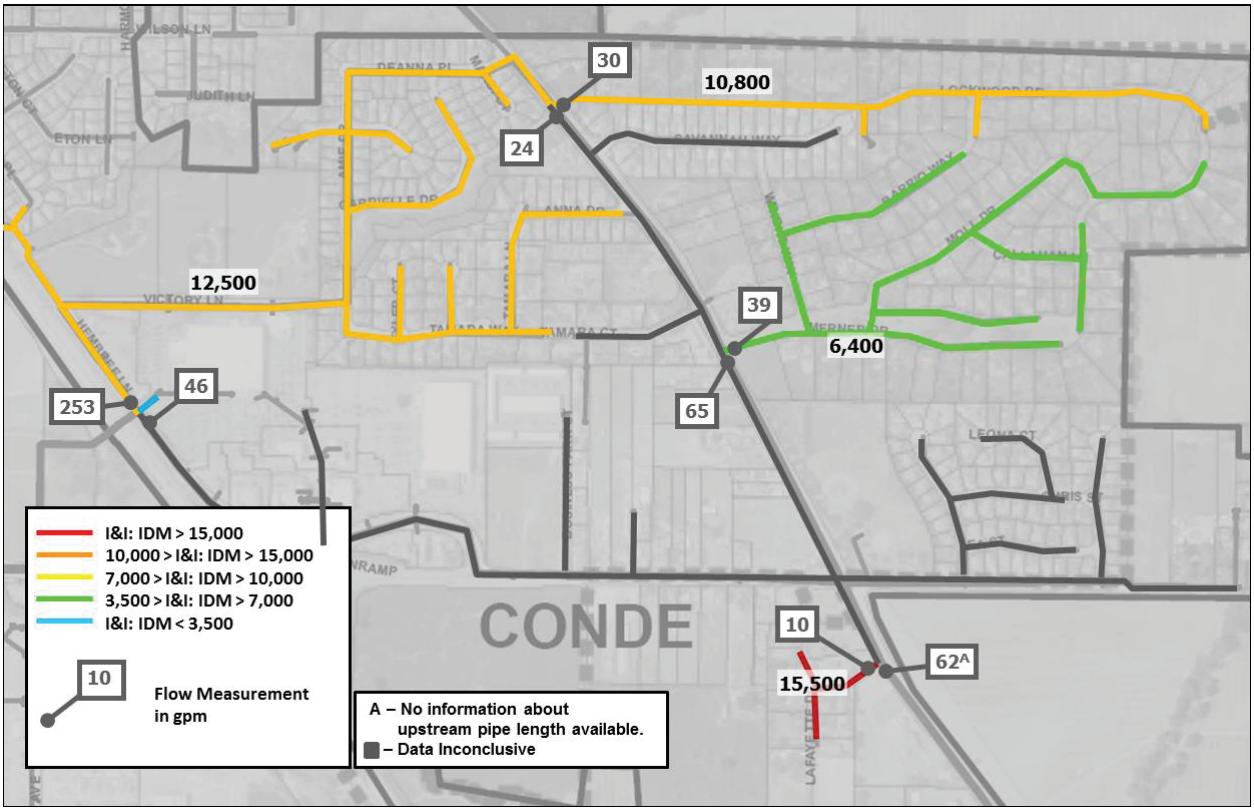


Figure 3-2. Conde B I/I Reconnaissance Results

3.2.3 Hembree B

Hembree B Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** Most of the segments in this basin had some clear water flow. The two segments with the most clear water flow are the east inlets to Manholes S11 and S12 (Figure 3-3). It should be noted that these two segments run parallel to a drainage ditch. These two segments are prime candidates for further investigation, perhaps through smoke testing.
- **Manhole Infiltration:** None reported.
- **Pipeline Mains Infiltration:** None reported.

Figure 3-3 illustrates the spot measurements and the infiltration rates of the mini-basins.

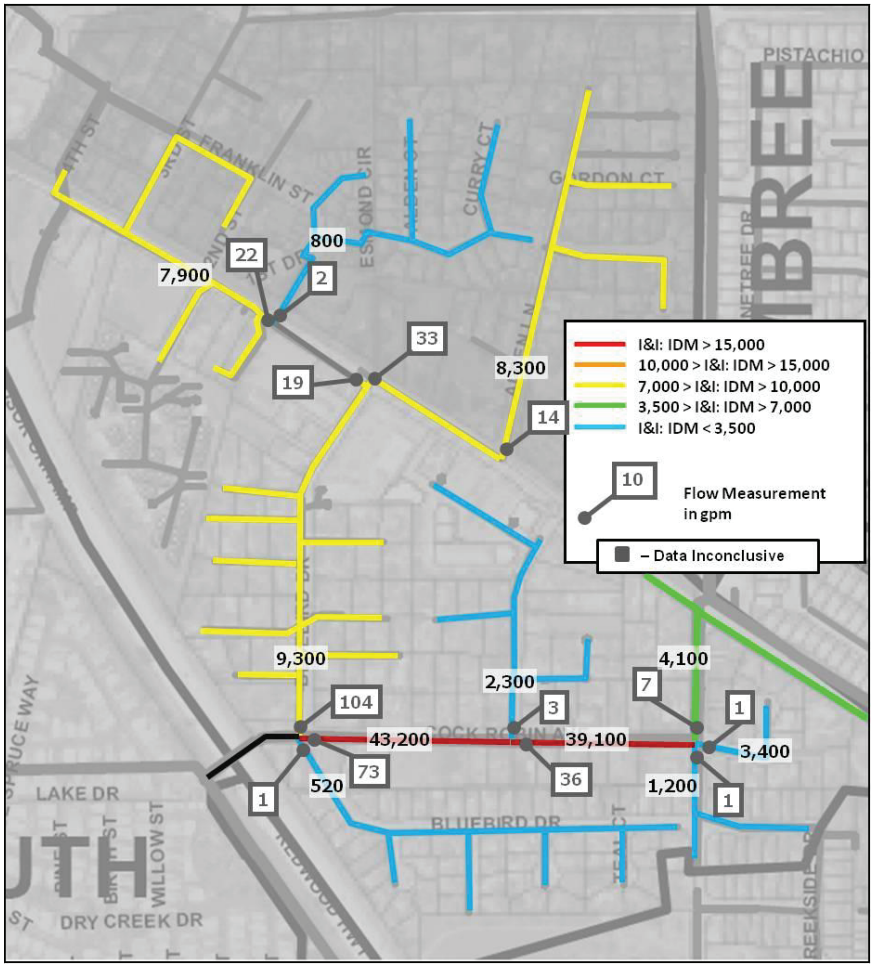


Figure 3-3. Hembree B I/I Reconnaissance Results

3.2.4 Los Amigos

Los Amigos Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** Many of the segments in this basin had some clear water flow, though the overall levels were lower here than in other basins (Figure 3-4). The segment with the worst rate of infiltration was the west inlet of Manhole G, which is located at Arata and Los Amigos. Given that this is the pipeline that feeds into the Los Amigos Basin, it is possible that much of the infiltration reported originates from outside this basin.
- **Manhole Infiltration:** None reported.
- **Pipeline Mains Infiltration:** None reported.

Figure 3-4 illustrates the spot measurements and the infiltration rates of the mini-basins.

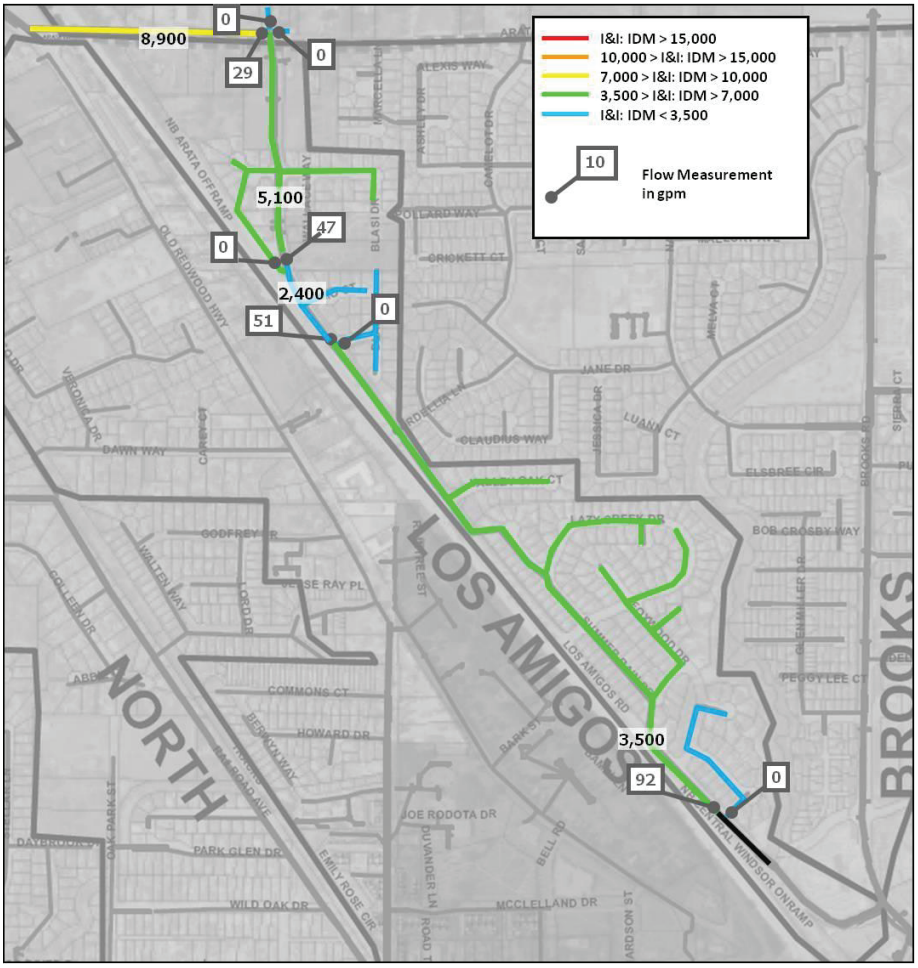


Figure 3-4. Los Amigos B I/I Reconnaissance Results

3.2.5 North B

North B Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** A number of segments had large amounts of clear water flow (Figure 3-5). One segment that may warrant attention is the east inlet of Manhole N25. This is a lateral that serves a small development of perhaps 8 to 10 homes; however, there is a significant amount of clear water flow. Other segments with high rates of infiltration include the south inlet of N51 and the west inlet of N21B.
- **Manhole Infiltration:** Several manholes, N23G, N22C, and the manhole located at the intersection of Veronica and Rio Russo, had infiltration sources in the form of weepers emanating from the manhole walls.
- **Pipeline Mains Infiltration:** None reported.

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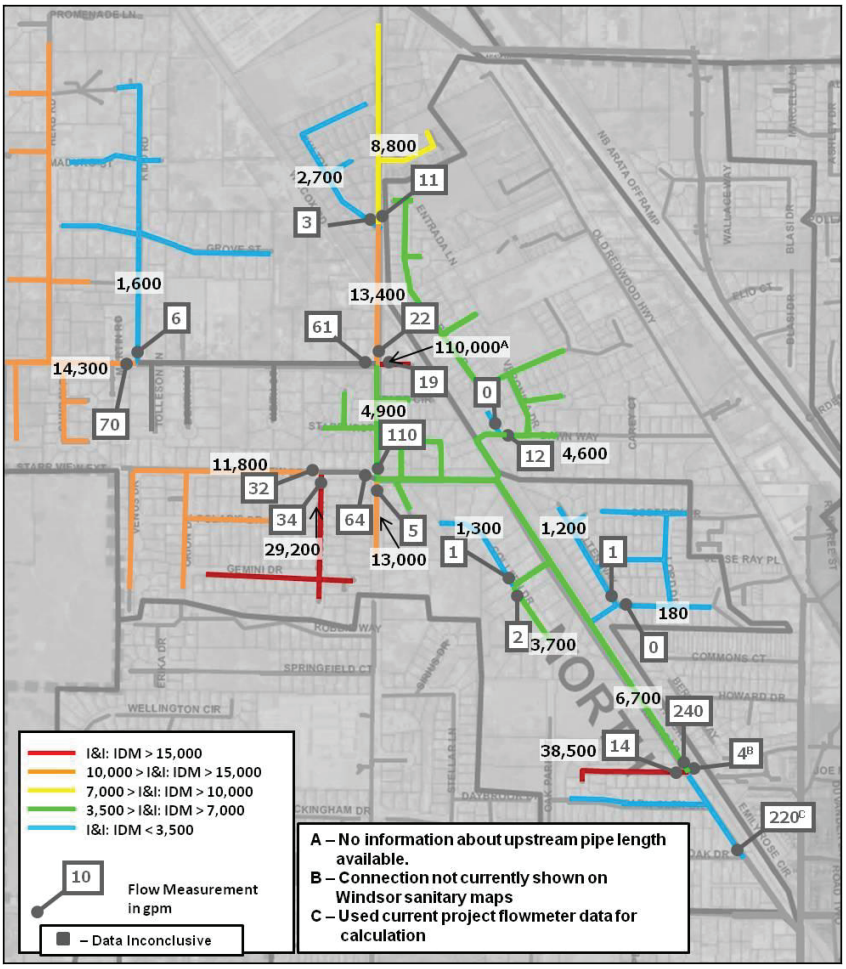


Figure 3-5. North B I/I Reconnaissance Results

3.2.6 South

South Basin I&I reconnaissance observations and results are summarized below:

- **Clear Water Flow:** While there was some clear water flow present throughout the basin, the overall levels were lower than in other basins. There were two segments that generated moderately high levels of infiltration (Figure 3-6). The first is the south inlet of Manhole S45 and the second was the east inlet of Manhole S54. It should be noted that the calculation for the east inlet of Manhole S54 is based on IDM information obtained from Town maps. Actual IDM may be greater depending on the reach of the lateral into the private development.
- **Manhole Infiltration:** Manhole S43 had an instance of weepers on the lower portion of the manhole chimney wall.
- **Pipeline Mains Infiltration:** Manhole S63 had the only squirter found during the reconnaissance in this basin. It is located on the penetration of the east inlet into the manhole and actually has 4 separate streams of water coming in with a fair amount of hydrostatic pressure.

Figure 3-6 illustrates the spot measurements and the infiltration rates of the mini-basins

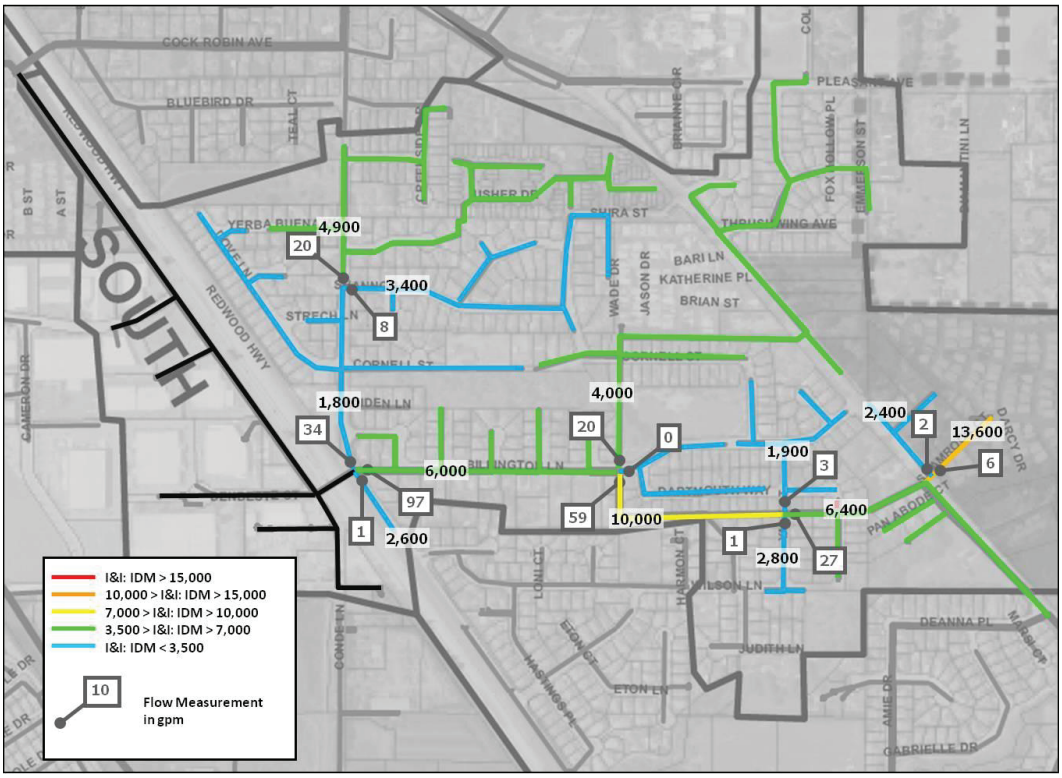


Figure 3-6. South I/I Reconnaissance Results

3.3 2016 Project

3.3.1 Brooks A Basin – Lakewood Area

Brooks A Basin I&I reconnaissance observations and results are summarized below:

- Manhole S96A at Fireweed Court and Lakewood Drive had infiltration from the top of the PVC pipe.
- Manhole S106, near 9188 Lakewood drive, at the "+" pipe configuration, there is a squirter at a manhole joint.
- Observations of infiltration were found at mainly manhole to pipe penetration joints, especially for the PVC pipes.
- A source of infiltration was also found at a manhole joint, but this was not widespread.
- The spot flow measurements indicated that the highest infiltration within the Lakewood basin appears to be mainly along:
  - The main line around the north lake
  - The laterals closest to the lake, i.e. the laterals extending towards the lake rather than radially out.
  - The eastern main line around the south lake

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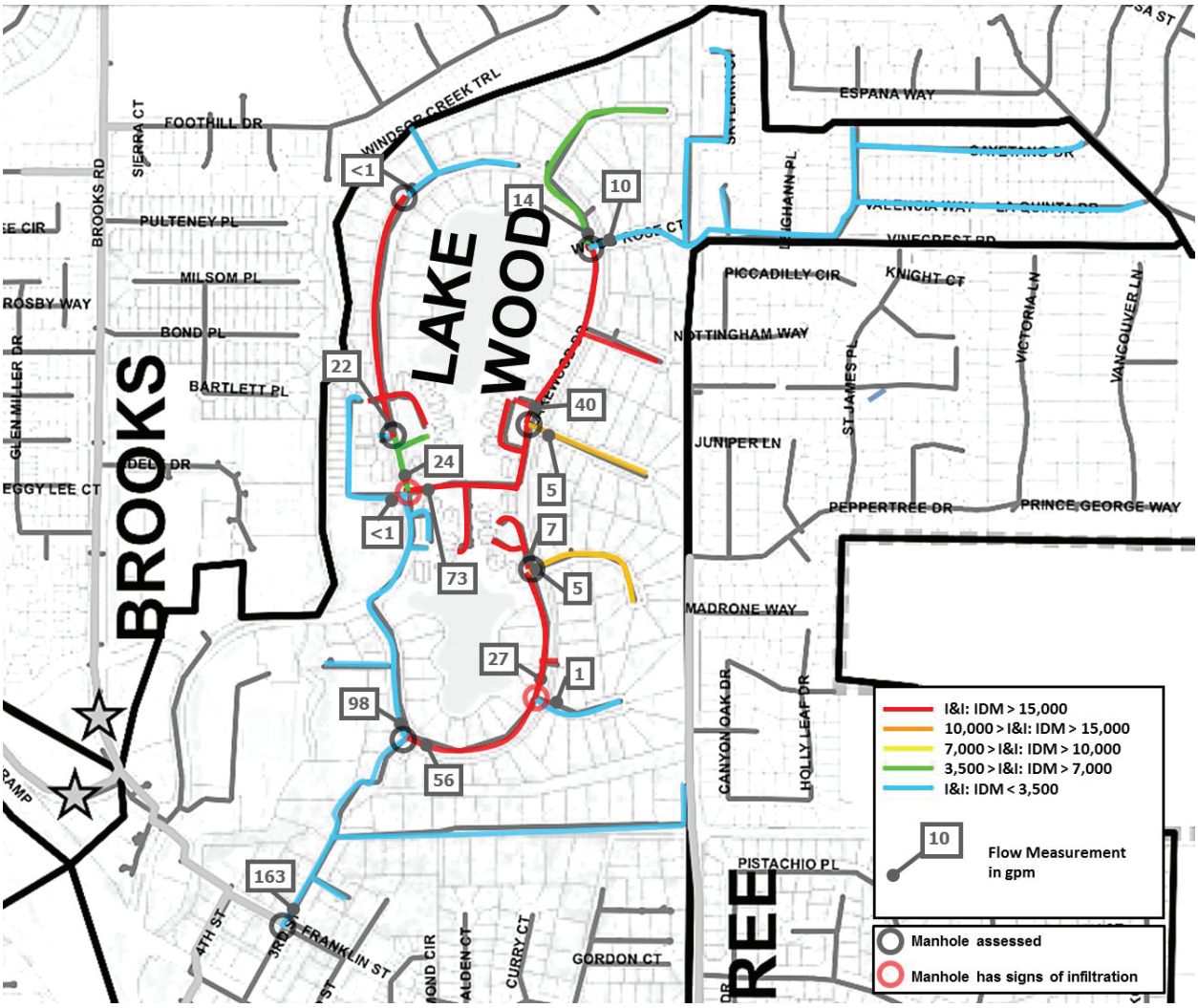


Figure 3-7. I/I Reconnaissance Summary, Lakewood area in Brooks A Basin

3.3.2 Conde B North and South Basins

No signs of infiltration were observed in manholes apart from clear water flow. Figure 3-8 and Figure 3-9 illustrate the spot flow measurements and the infiltration rates.

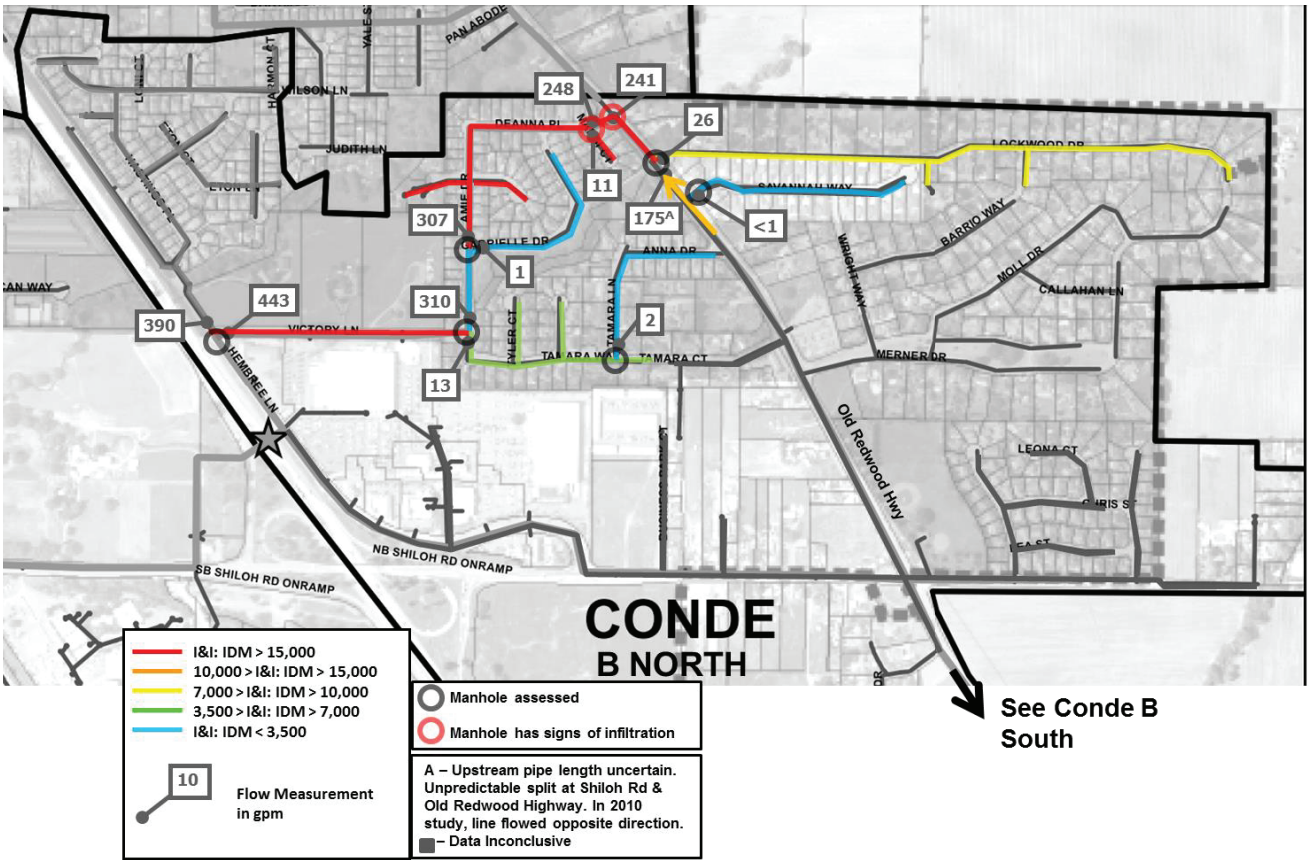


Figure 3-8. I/I Reconnaissance Summary, Conde B North Basin

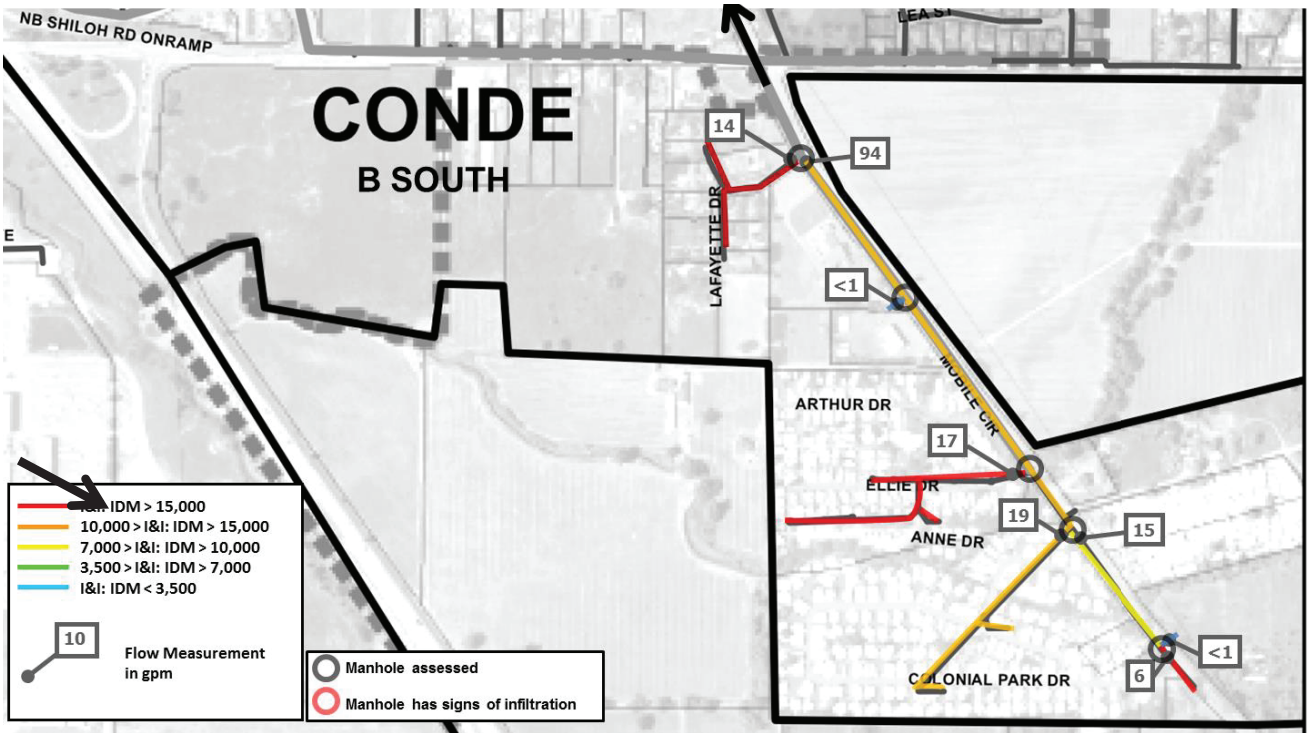


Figure 3-9. I/I Reconnaissance Summary, Conde B South Basin

4.0 CCTV Evaluation

4.1 Preface

V&A was retained by GHD to review closed-circuit television (CCTV) inspection of certain areas within the Town of Windsor (Town). V&A prepared two technical memorandums (see Appendix A) on the condition assessment findings of the CCTV videoed pipelines using the National Association of Sewer Service Companies' (NASSCO's) Pipeline Assessment and Certification Program (PACP) standardized ratings. I/I returns were observed and separated into the following categories:

- **Manholes:** Infiltration entering the collection system from defects within the manhole structure
- **Pipe Mains:** Infiltration entering the collection system from defects within the Town pipe main
- **Lateral:** Infiltration entering the collection system from defects within the private lateral
- **Pipe/Lateral Connection:** Infiltration entering the collection system from connection between the private lateral and the Town pipe main

The significance of the infiltration returns were also evaluated and classified as "light", "medium" or "heavy" per standards set forth by the National Association of Sewer Service Companies (NASSCO). Within NASSCO coding domain, infiltration "weepers" or "drippers" were classified as light, infiltration "runners" as medium and infiltration "gushers" as heavy. Additionally, other pertinent information was integrated into the classifications of the infiltration returns, including presence of roots, clear water flow generated from concealed sources and other information pertinent to I/I into a collection system.

In 2013, the CCTV evaluation was performed by Roy's Sewer Service on April 8 and April 9 in the North B, North D, Bell Village A and Bell Village B Basins.

In 2016, the CCTV evaluation was again performed by Roy's Sewer Service. On March 14 and March 15, CCTV was performed in the North D, North E and Hembree B Basins..

4.2 2013 Project

A total of 21 pipe reaches totaling 5,384 feet was CCTV documented and reviewed for this study. A

total of 20 returns[7] of I/I were observed.

Table 4-1 provides a summary of the returns by type and severity. Table 4-2 lists all of the CCTV I/I defects that were observed during this study. Figure 4-1 shows the total number of returns by pipe segment color-coded on a map.

Table 4-1. Summary of Returns Found

Type of Return	# of Returns	% of Total	Light Returns	Medium Returns	Heavy Returns
Manhole	2	10%	2	0	0
Pipe Main	6	30%	4	2	0
Lateral	12	60%	6	5	1
Total:	**20**	**100%**	**12**	**7**	**1**

Table 4-2. CCTV Evaluation I/I Defects

Address / Street	Pipe Length (ft)	Pipe Dia. (in)	Manhole Numbers	Type of I/I Return	Light Return	Medium Returns	Heavy Returns	Total Returns by Segment
Binggelli Dr.	311.1	6	N56 – N51	Manhole	1			5
				Pipe Joint	3	1		
Binggelli Dr.	327.6	6	N57 – N56	Lateral	1			2
				Pipe Joint		1		
Gemini Dr.	404.8	6	N58 – CO	Lateral	1			1
	275.1	6	N58 – N57	Lateral		1		1
Old Redwood Hwy	396.0	6	N17G – N17F	Lateral	2	1	1	4
	820.1	6	N17G – N17[a]	Lateral		3[b]		3
	352.3	6	N17F – N17E	Lateral	1			1
Park Glen Dr.	0.0	6	N21 – N21C	Manhole	1			1
Windsor Rd., David Clayton Lane	208.6	10	1 – 2	Pipe Joint	1			1
Windsor Rd., McClelland Dr	351.4	10	2 – 3	Lateral	1			1

[a] N17 is an old designation that may not be currently in use. The location of manhole is correct.

b One defect was open cleanout (daylight was visible from inside pipe). Disposition and inflow potential were not determined. Defect is temporarily graded medium and assigned as belonging to the "Lateral" category.

[7] **Return** is a term used in smoke testing and other I/I detection methods to define an instance of clear water flow that is suspected to be inflow or infiltration.

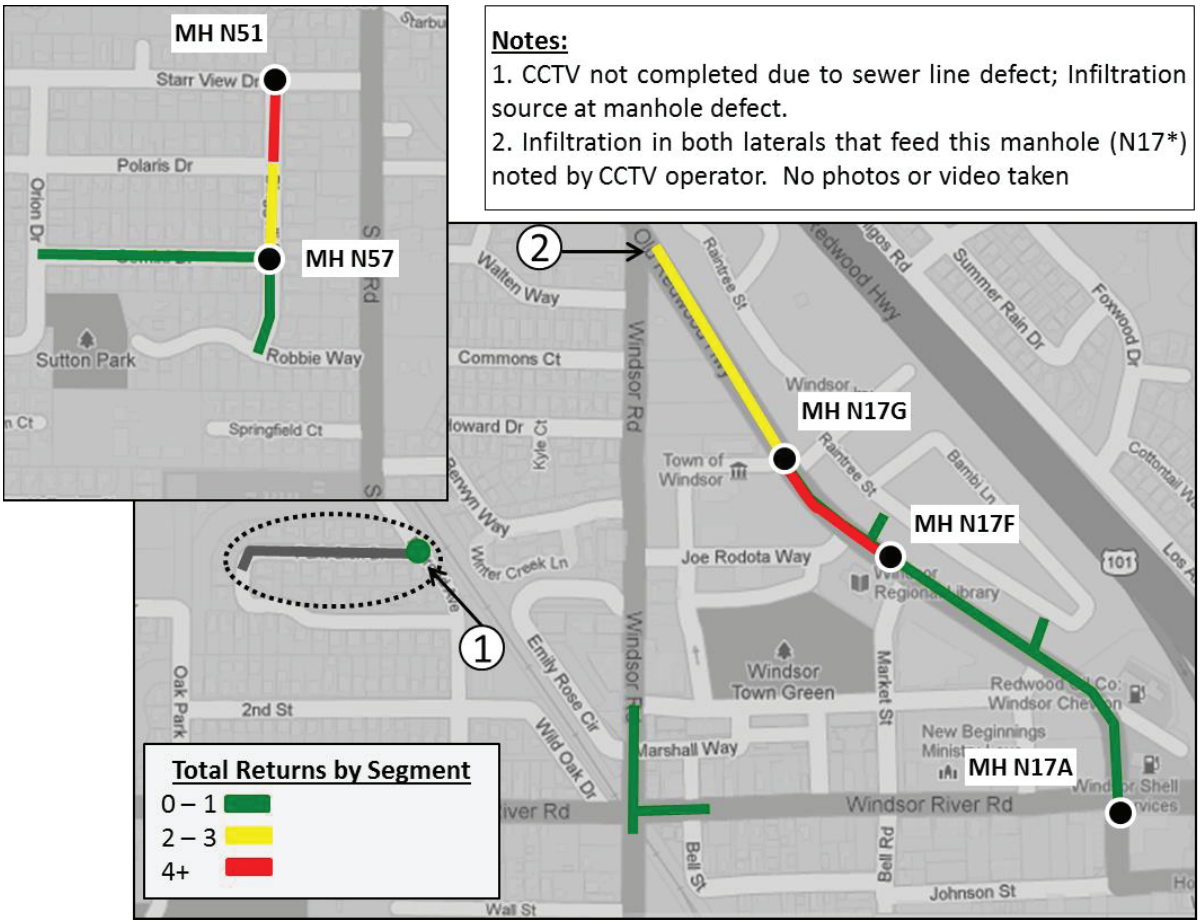


Figure 4-1. CCTV I/I Investigation Results

4.3 2016 Project

A total of 19 pipe reaches totaling 5,736 feet was CCTV documented and reviewed for this study. A total of 34 returns[8] of I/I were observed.

Table 4-3 provides a summary of the returns by type and severity. Table 4-4 lists all of the CCTV I/I defects that were observed during this study. Figure 4-2 through Figure 4-4 shows the total number of returns by pipe segment color-coded on a map.

[8] **Return** is a term used in smoke testing and other I/I detection methods to define an instance of clear water flow that is suspected to be inflow or infiltration.

Table 4-3. Summary of Returns Found

Type of Return	# of Returns	% of Total	Light Returns	Medium Returns	Heavy Returns
Manhole	3	9%	0	3	0
Pipe Main	13	38%	0	7	6
Lateral	18	53%	0	15	3
Total:	**34**	**100%**	**0**	**25**	**9**

Table 4-4. CCTV Inspection I/I Defects

Street Name	Survey Length (ft)	Pipe Dia. (in)	Upstream Manhole Number	Downstream Manhole Number	Type of I/I Return	Returns by Type	Light	Medium	Heavy	Total Returns by Segment
Orion Drive	389.7	6	SSCO	SSMH-N54	Pipe Joint	3		3		3
Orion Drive	312	6	SSMH-N54	SSMH-N53	Lateral	1			1	1
Herb Road	507.5	6	SSMH-N34A	SSMH-N34	Pipe Joint	2			2	3
					Lateral	1		1		
Herb Road	98	6	SSMH-N36	SSMH-N34A	Pipe Joint	1			1	1
Herb Road	604	6	SSMH-N37	SSMH-N36	Pipe Joint	1			1	4
					Lateral	3		3		
Herb Road	449	6	SSMH-N37A	SSMH-N37	Pipe Joint	2		2		3
					Lateral	1		1		
Herb Road	438	6	SSMH-N37C	SSMH-N37A	Pipe Joint	2		1	1	3
					Lateral	1		1		
Cockrobin Avenue	738	8	SSMH-S12	SSMH-S11	Lateral	4		3	1	4
Cockrobin Avenue	663	8	SSMH-S13	SSMH-S12	Pipe Joint	1			1	4
					Lateral	3		3		
Lafayette Drive	281	6	SSCO	SSMH-S135	Lateral	1		1		1
Lafayette Drive	226.5	6	SSMH-S133	SSMH-S132	Lateral	1		1		1
Lafayette Drive	147	6	SSMH-S134	SSMH-S133	Manhole	1		1		2
					Lateral	1			1	
Lockwood Drive	110	6	SSMH-S164	SSMH-S165	Manhole	2		2		3
					Pipe Joint	1		1		
Lockwood Drive	248	6	SSMH-S165	SSMH-S166	Lateral	1		1		1

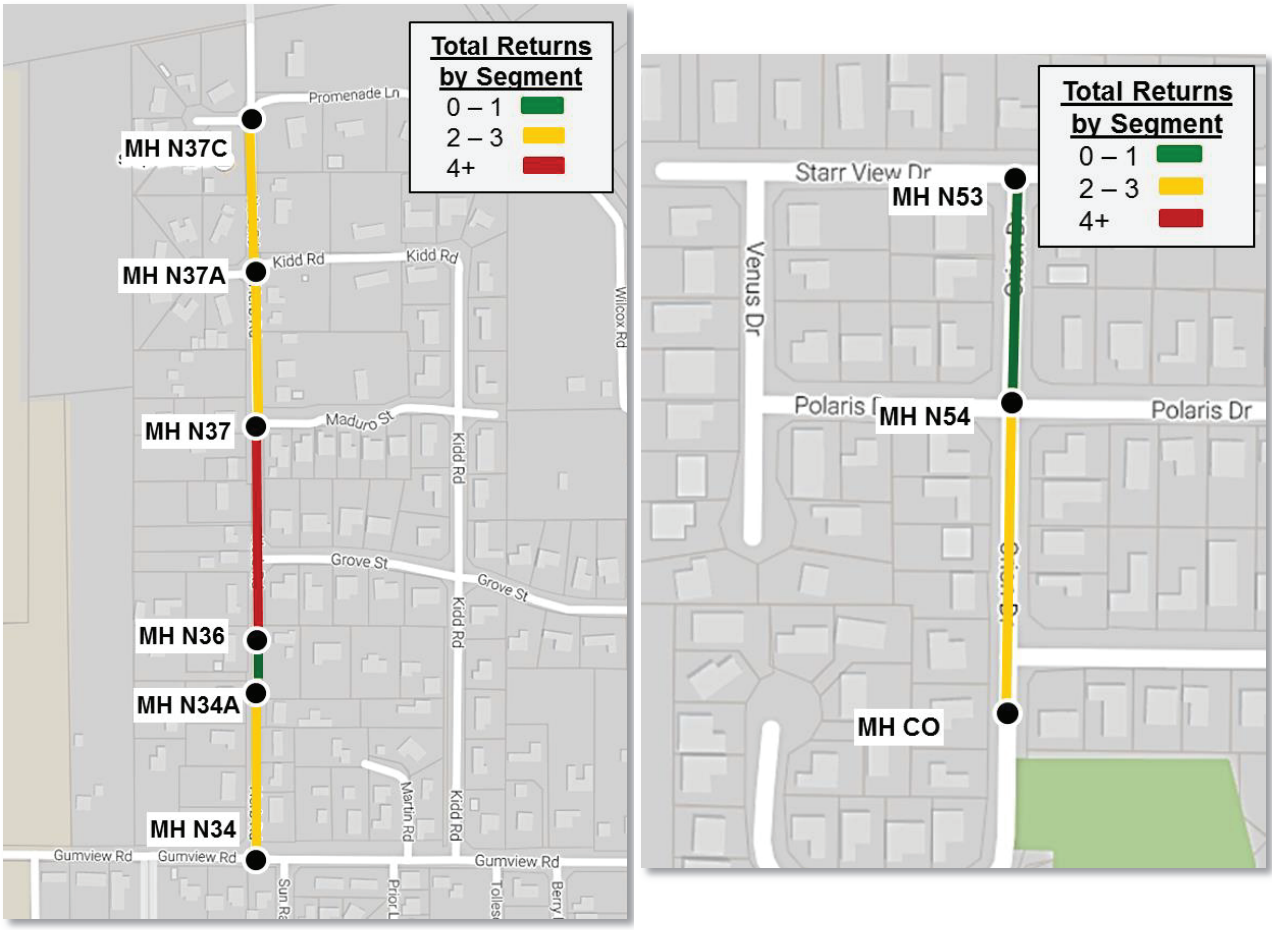


Figure 4-2. CCTV I/I Evaluation Results – Herb Dr. (left), Orion Dr. (right)

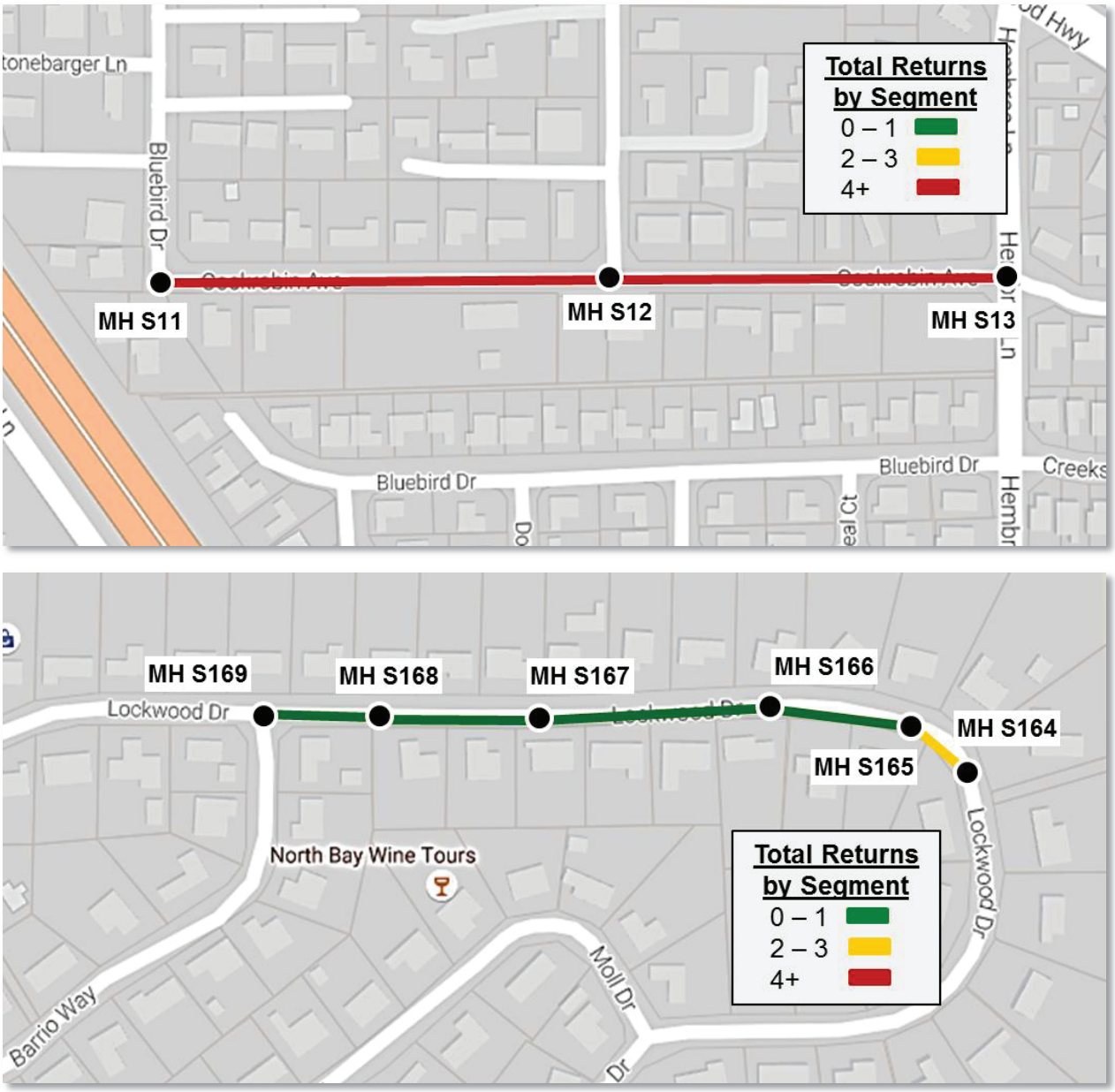


Figure 4-3. CCTV I/I Evaluation Results – Cockrobin Ave. (top), Lockwood Dr. (bottom)

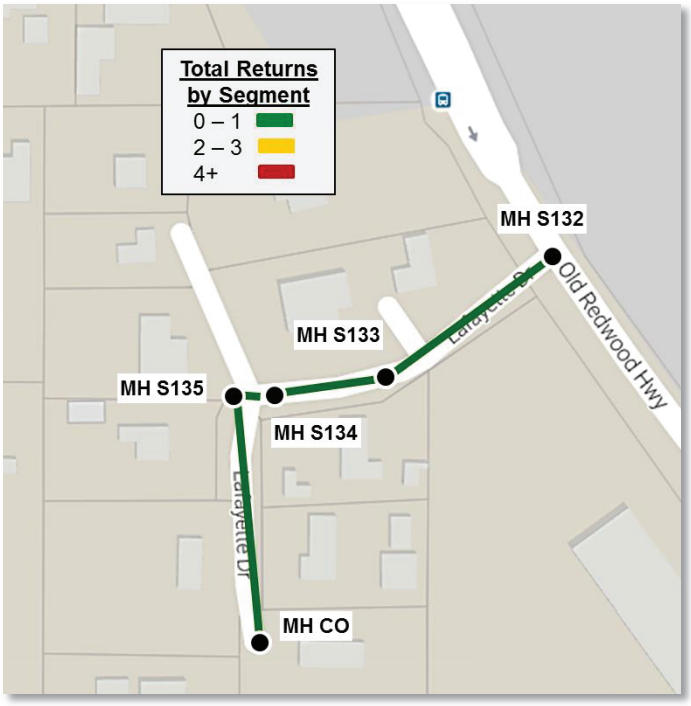


Figure 4-4. CCTV I/I Evaluation Results – Lafayette Dr.

4.4 Laterals

Of the 34 returns found during the CCTV review, 18 (53%) involved laterals (Photo 4-1, Photo 4-2). The disadvantage of this type of return is that the source or defect may not be readily apparent; a video inspection of the individual lateral would be required to determine the source of the I/I and the associated defect. These defects could include offset joints, root intrusion, cracks in the lateral or direct connections from area drains or roof leaders.

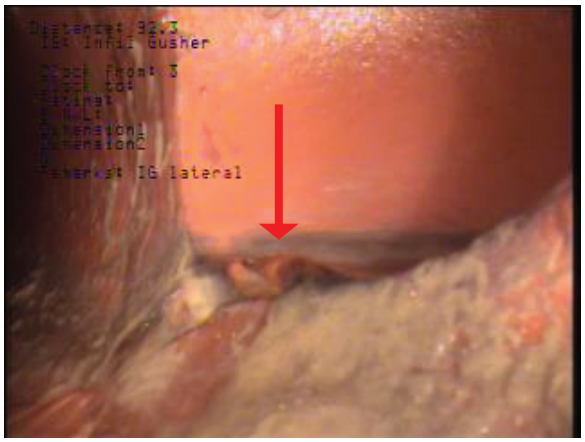


Photo 4-1. Runner in Lateral

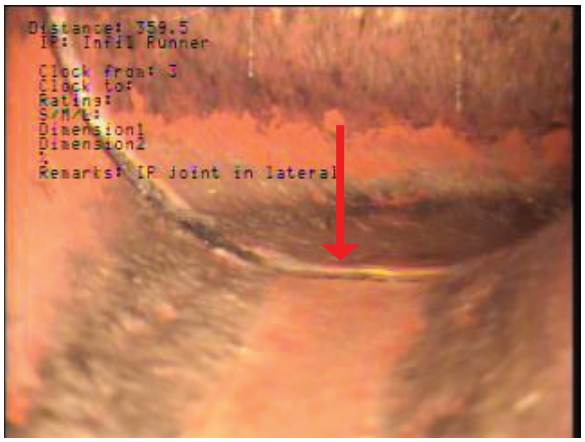


Photo 4-2. Runner in Lateral

4.5 Pipeline Joints

Returns found at pipeline joints were observed in 13 out of a total 34 returns. Seven of the returns were graded 'medium' with the remaining returns being graded 'heavy'. Photo 4-3 shows infiltration bubbling up from the invert of the pipeline through a defect at the pipeline joint. Photo 4-4 shows infiltration entering the pipeline in several locations around a pipeline joint.



Photo 4-3. Gusher in Pipeline Joint

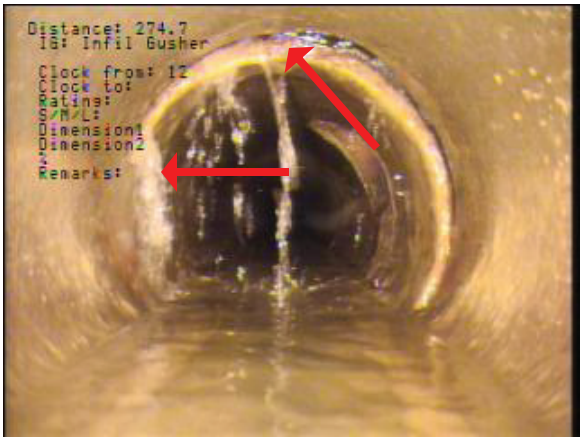


Photo 4-4. Multiple Drippers and Gushers in Pipeline Joint

4.6 Manholes

During the CCTV review, there were three locations with defects that occurred in manholes. It should be noted that CCTV is not ideally suited for detecting sources of I/I in manholes because manholes are often 10 feet deep or more and the CCTV camera is at the bottom in the manhole channel. Many sources of I/I in a manhole may not be visible from this position. All three of these returns were graded 'medium'. At least two of these returns occurred at the pipeline's penetration into the manhole (Photo 4-5). The third return may have also originated there but the camera angle did not allow for confirmation (Photo 4-6).

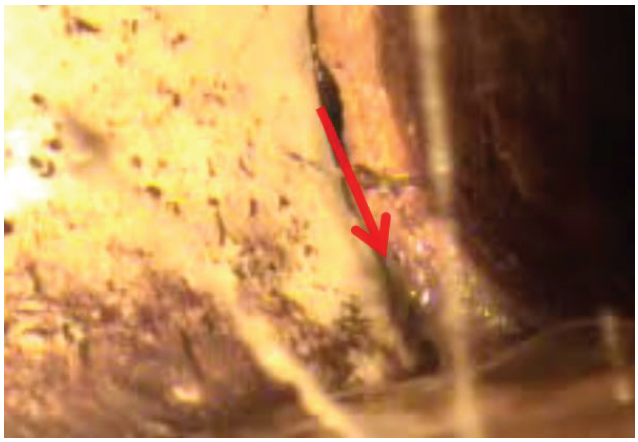


Photo 4-5. Runner in Pipeline Penetration into Manhole



Photo 4-6. Multiple Runners at Pipeline Penetration into Manhole

4.7 Conclusions

- **Laterals:** 53 percent of the infiltration sources were discovered within laterals, including 60% of the medium returns (15 of 25) and 33% of the heavy returns (3 of 9). This follows industry trends that have been determining that, for many sanitary sewer collection systems, over half of the infiltration and inflow can be attributed to private laterals. The Windsor data would seemingly be in alignment with this industry trend.
- **Pipe Mains:** 28 percent of the infiltration sources were observed to originate in pipeline joints. Sometimes, the pipeline joint is defective or offset but other times there is no obvious defect.
- **Manholes:** 9 percent of the infiltration sources were observed to originate in manholes. In at least 2 of the 3 observed sources, the pipeline's penetration into the manhole was the source location.

5.0 SUMMARY AND DISCUSSION

5.1 2011, 2013, 2016 I/I Flow Measurements and Discussion

When V&A performed the flow monitoring and I/I reconnaissance in February and March 2011, the rainfall season was much closer to a normal season with larger and more intense storm events. Figure 5-1 shows the rainfall activity and dates of I/I reconnaissance for 2011 and can be compared to Figure 5-2 to show the relative differences in rainfall seasons. It is noted that even the 2011 season was slightly less than average total rainfall for the dates shown below.

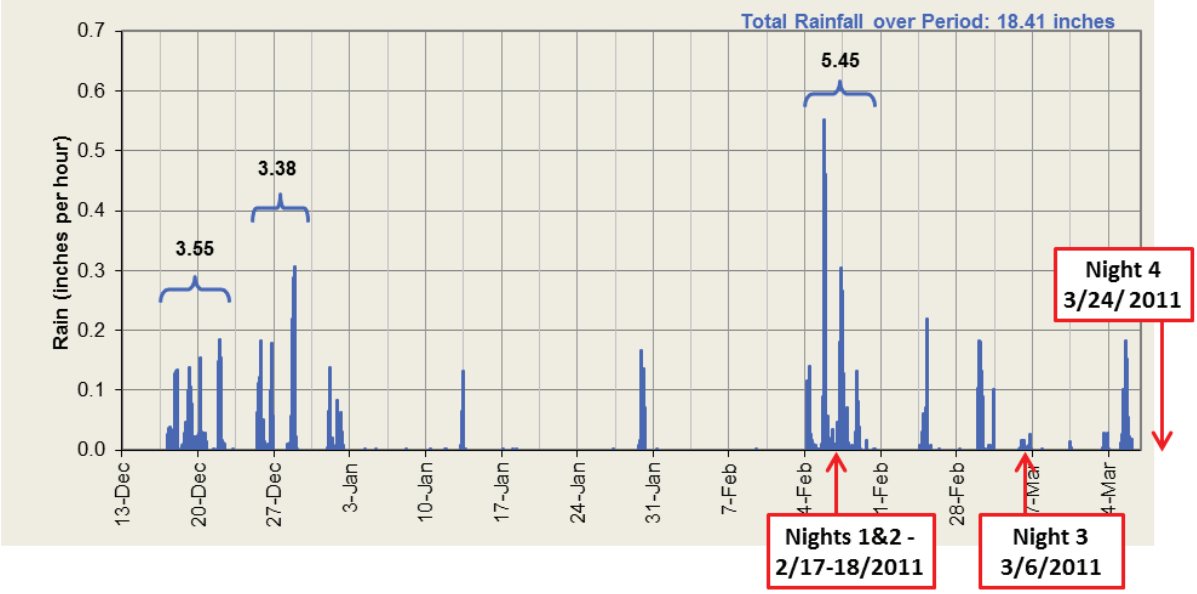


Figure 5-1. 2010 – 2011 Rainfall Season in Windsor, CA

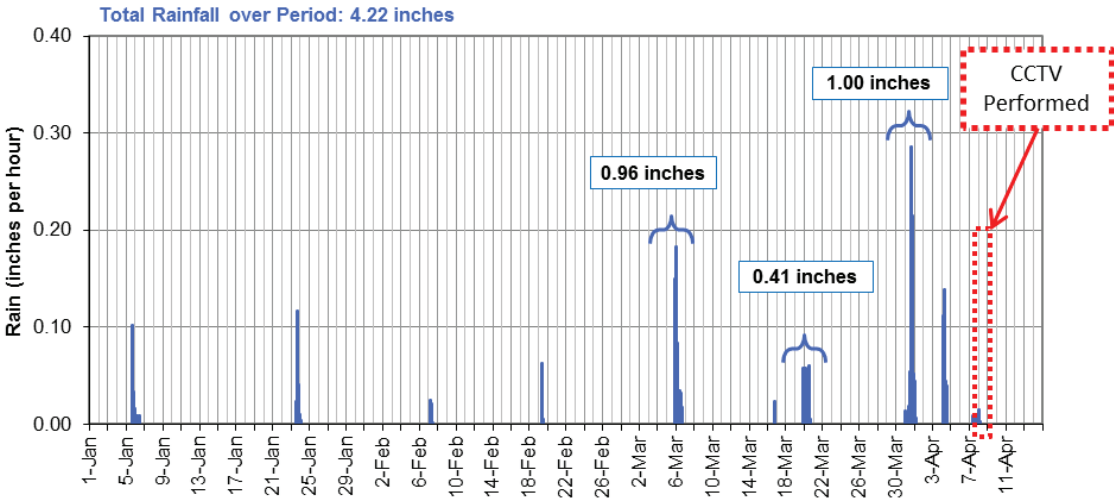


Figure 5-2. 2013 (January 1 – April 15) Rainfall in Windsor, CA,

The higher groundwater levels in 2011 activated many infiltration sources that were not activated in the 2013 rainfall season. Photo 5-1 through Photo 5-4 show some of the sources of infiltration that were found during the 2011 study, including some in the same areas that were evaluated via CCTV during the 2013 study.



Photo 5-1. Runner in Lateral of Manhole N17D



Photo 5-2. Runner, Clear Water MH N15 Lateral



Photo 5-3. Gushers in Manhole S63



Photo 5-4. Runners in Manhole S343

In the 2013 CCTV assessment, the infiltration returns that were found were fewer and less intense. It is noted that between the two studies different assessment techniques were used. The purpose of this 2013 study was not to locate and compare previous sources of infiltration; however, in 2011 there were several obvious and clear observations of infiltration within the manholes and pipelines of the North Basin. The decrease of these observations from 2011 to 2013 indicate that it is likely that many infiltration sources present in the pipelines that were assessed by CCTV in 2013 were not activated due to the unsaturated nature of the soil and low rainfall levels.

In 2016, the wet weather season was similar to the 2011 season with rainfall amounts that were closer to normal (Figure 5-3 and Figure 5-4). During the CCTV evaluation and the I/I reconnaissance, the infiltration returns located were more numerous.

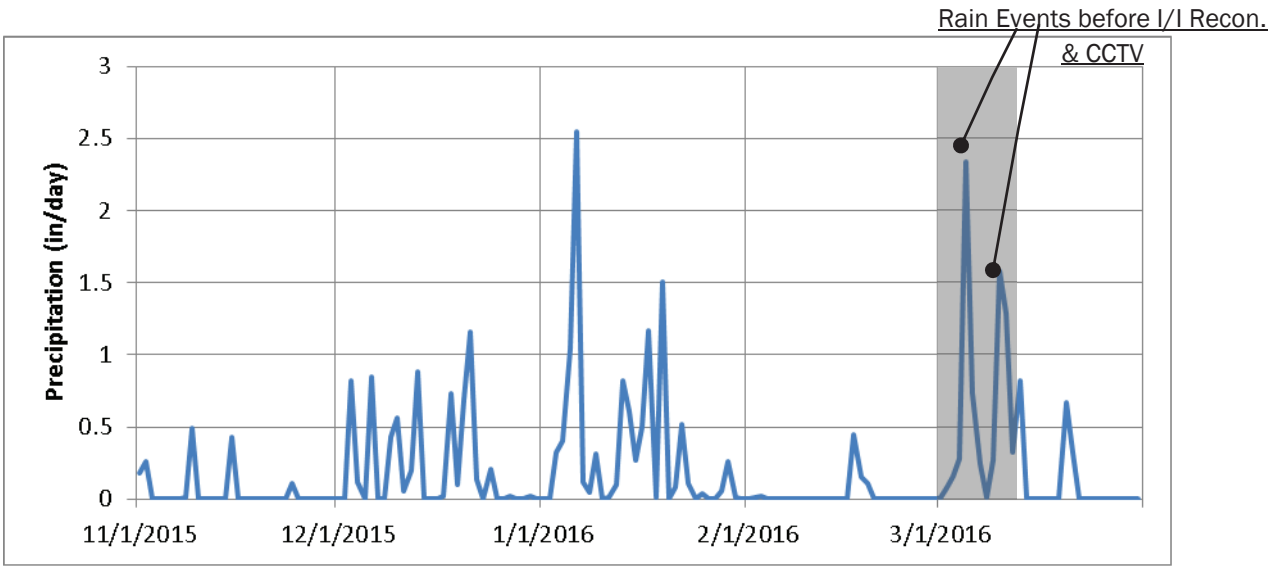


Figure 5-3. 2015 – 2016 Rainfall Season in Windsor, CA

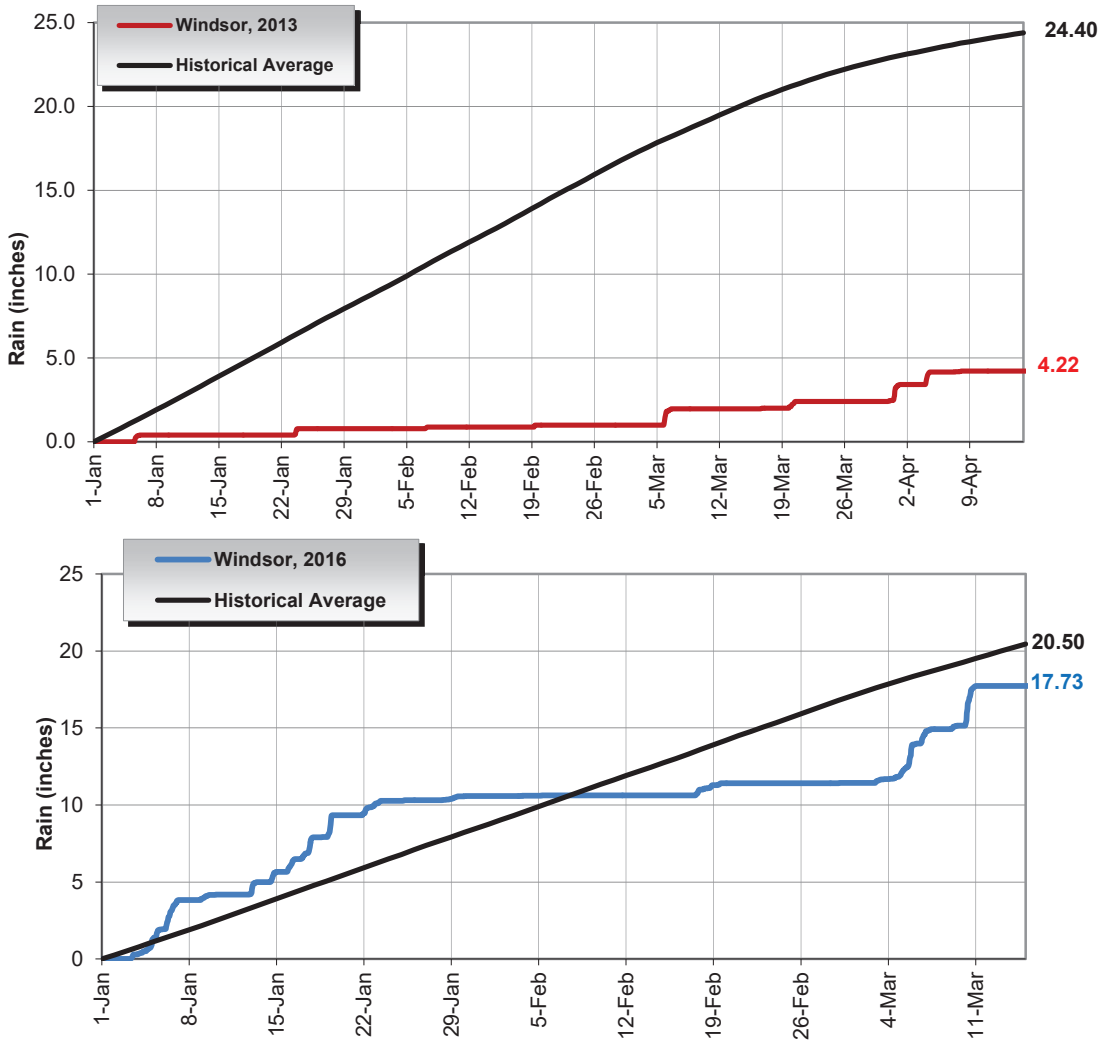


Figure 5-4. Cumulative Rainfall in Windsor, CA – 2013 (top), 2016 (bottom)

5.2 Conclusions

The overall purpose of these I/I investigation projects is to provide GHD and the Town with data and information that may be used to make informed decisions about future CIP and I/I mitigation efforts. In summarizing these efforts to date, V&A will discuss two groups of basins that will serve as examples of the process and conclusions.

5.2.1 Hembree B

During the 2010/2011 wet weather season, Hembree B was found to have high levels of groundwater infiltration (Figure 5-5) with moderate levels of rain-dependent infiltration. After the initial phase of flow monitoring and with the high levels of infiltration, Hembree B was chosen as a basin of focus during the nighttime I/I reconnaissance performed in 2011. A fair amount of clear water flow was observed in a majority of the basin. The segments on Bluebird Dr. and those upstream had moderate amounts of clear water flow. It was the two segments on Cockrobin Ave that had the highest infiltration observed.

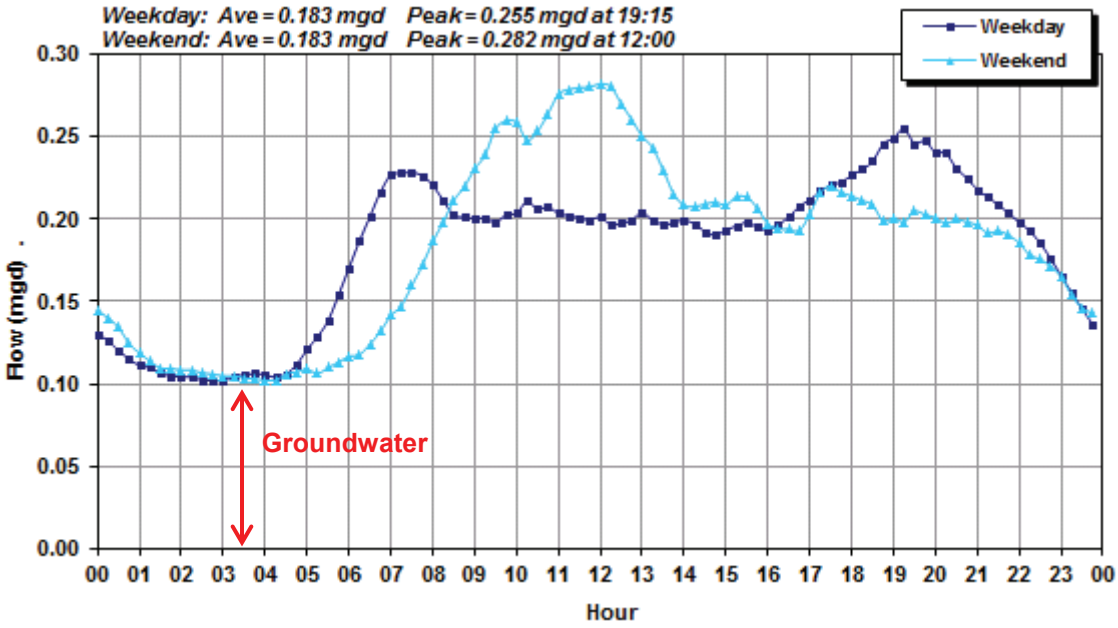


Figure 5-5. ADWF Curve – Hembree B

In 2016, these two segments were chosen as subjects for the CCTV evaluation. In these two segments, 8 total returns were observed, seven of which are recorded as clear water flow from laterals. Within these two segments, there are 25 properties, each with a lateral. The CCTV evaluation indicates that approximately 1/3 of the laterals on this street are defective. Another note is that a drainage ditch runs along the south side of the street.

5.2.2 North Basins

In the 2010/2011 flow monitoring, the North A and North B basins had substantial amounts of inflow (North A) and RDI (North B). After the initial phase of flow monitoring, these two basins were further subdivided into 5 sub-basins and recommended for further evaluation. In February, V&A performed I/I reconnaissance in the North B basin. Several segments with high rates of infiltration were observed (Figure 5-6).

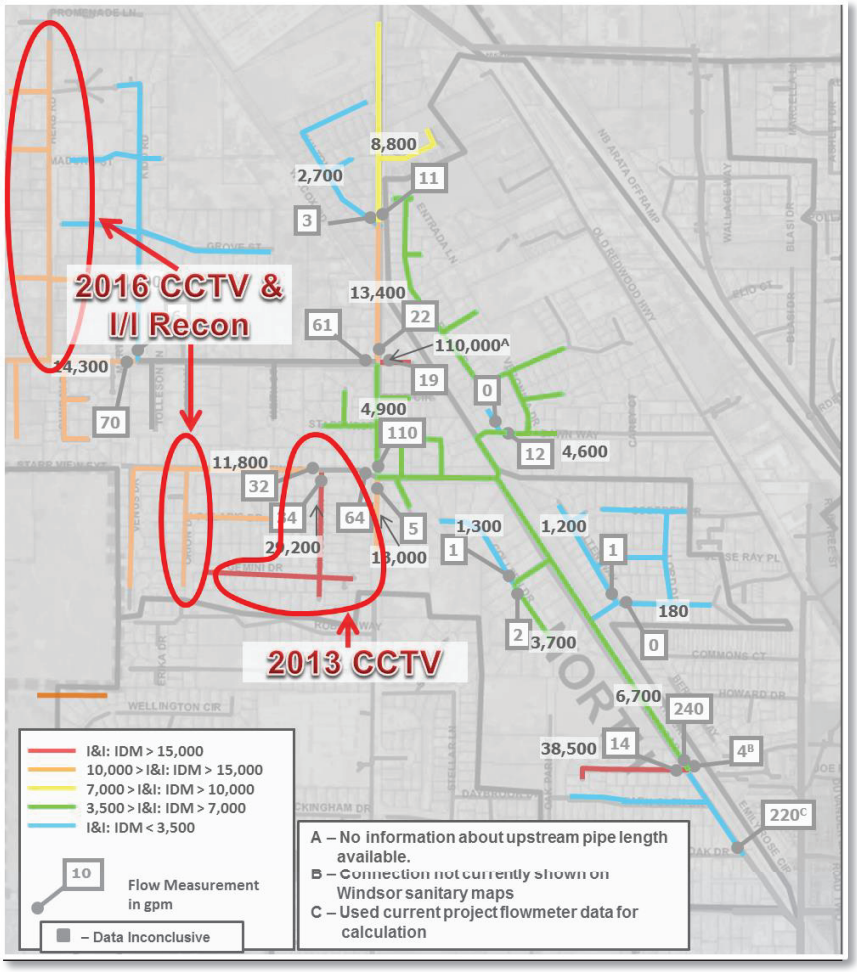


Figure 5-6. Areas Evaluated by 2011 I/I Recon (background), 2013 CCTV (circled) and 2016 CCTV (circled)

In 2013, two of the sub-basins, North A and North D were evaluated via CCTV. Another part of North D and North E were evaluated in 2016. During the CCTV evaluation in 2013, several segments with moderate to heavy levels of infiltration were found. 20 total returns were observed, 7 from Binggelli Drive. The I/I reconnaissance performed in 2016 found several segments on Herb Road and Orion Drive with high rates of infiltration. The 2016 CCTV evaluation observed 11 (out of 34 total) returns from these segments on Herb Road and Orion Drive; primarily the segment from the cleanout to

manhole N54, had four returns observed and recorded. These segments had a fairly even mixture of defects in pipeline joints and returns involving laterals.

5.3 Final Thoughts

As can be seen in the Hembree B and North basins, a systematic approach of I/I investigation using a variety of techniques can yield valuable information. This program consists of a wet-weather flow monitoring program, I/I analysis followed by nighttime I/I reconnaissance and CCTV evaluation in pertinent areas. In the case of the Hembree B basin, the two segments on Cockrobin showed that a large percentage of the laterals on this street may be defective and that the nearby drainage ditch may play a role. The North basin is a large basin that was systematically reduced to a few small areas that contribute a large portion of the I/I found in these basins.

A possible next step would be to perform pre-construction/rehabilitation flow monitoring in areas the Town has slated for an I/I mitigation project. Once the construction/rehabilitation is complete, another round of flow monitoring can be performed. By applying these two rounds of flow monitoring data to a design storm, the approximate amount of I/I removed can be estimated. With this estimate, a cost/benefit analysis could be performed.

APPENDIX A. ASSOCIATED REPORTS

Appendices not included. See full report for complete document.

Appendix C – Development Project Descriptions

Developments Incorporated into the Future Condition Model

The future condition model assumes that projects in the planning and approval stages as of May 2018 (the cutoff time for inclusion in the model) will be completed and that all other undeveloped land will be developed in accordance with the Town Zoning Map and General Plan Land Use Map by 2040. Developments are categorized as “approved application”, “submitted application”, or “other/non-submitted application” based on discussion with Town staff. The following projects are included in the future condition hydraulic model.

Submitted and Approved Projects as of May 2018

Vintage Oaks on the Town Green

Vintage Oaks Apartments is comprised of 387 units to be completed in two phases. Phase 1 is anticipated to be completed by 2020 and Phase 2 is to be completed by 2021. Flows were based on Residential High Density utility land use classification on a per-unit basis.

Overlook

Overlook consists of 12 single family detached houses located on large lots. Some units may contain smaller “granny” units; however, in setting flow rates the Town considered the total square footage of both units. In order to consistently apply assumptions, the additional units were not counted as individual units for wastewater flows.

6100 Old Redwood Highway

Windsor Live/Work is a development with 12 primary units and 12 attached secondary living units (1 each) that will be located on the southeast corner of Old Redwood Highway and Merner Dr. This project was treated as 24 living units in the future condition model.

Richardson Street Mixed-Use

Richardson Apartments has been approved and consists of 30 apartments (which may be converted to condos) and 4,200 square feet of retail space, possibly including a restaurant. Both the Residential High Density and Commercial utility land use classifications were used for generating sewer flows, on a per-unit and per-1,000-sf basis, respectively.

280 Arata Ln

280 Arata Lane consists of 6 single family detached houses with 1 existing house on site. This project is expected to go into construction in 2018.

330 Arata Ln

330 Arata Lane consists of 6 single family detached houses. This project is expected to go into construction in 2018.

6500 Old Redwood Highway

6500 Old Redwood Highway consists of 8 single family detached houses. This project is expected to go into construction in 2018.

Den Beste Warehouse

This project is a 34,880-sf warehouse located at 1145 Kittyhawk. Sewer flows were generated based on the Light Industrial utility land use classification and based on a per-1,000-sf basis.

The Oaks

The Oaks is comprised of 31 apartments. The project is in the entitlements phase and is expected to be approved in 2018.

Creekwalk

Creekwalk is comprised of 24 residential units currently in the planning review phase.

Draper Estates

Draper Estates is in process and approval is anticipated by summer 2018. It will be comprised of 5 single family detached homes on estate lots (5 acres or more). Zoning allows each lot to have a second detached unit on the property. For modeling of the future condition, GHD assumed 2 units on each lot by 2040 (i.e., 2 times flow).

Duncan Village

Duncan Village is comprised of 16 low income units (attached) being built by Habitat for Humanity. It is estimated that construction will begin in 2019.

Mill Creek Apartments

Mill Creek Apartments will be an apartment complex with 360 units and a clubhouse and pool. Sewer flows were based on Residential High Density utility land use classification on a per-unit basis. Wastewater flows from the club house and pool were considered negligible.

Windsor Veteran Village

Windsor Veteran Village will have 60 apartments and no pool. Construction could begin in 2020.

Chevron Remodel

Chevron is planning to expand the store and add a new retail space on its site between Old Redwood Highway and Highway 101 at Windsor River Road. . Additional sewer flows were estimated based on the Commercial utility land use classification on a per-acre basis because square footage was unknown.

LaFort

This will be a 19,732sf warehouse for wine equipment located at 7321 Conde Lane. Sewer flows were generated based on Light Industrial utility land use classification on a per-1,000-sf basis.

Heritage Park

Heritage Park will be a 31-unit affordable housing apartment complex. Construction is expected to begin in 2021.

Other Known Development Projects

Hembree Lane Subdivision

The planned Old Hembree Lane subdivision consists of 19-21 units, 8 of which are duplexes and the rest are single family detached homes. Sewer flows were generated based on the Residential Very Low Density utility land use classification on a per-unit basis assuming 21 units.

Sky

Sky will be an apartment complex with 20 apartments and some commercial space. Sewer flows were generated using the Residential High Density utility land use classification on a per-unit basis. The commercial space was assumed to contribute negligible flow.

Jensen Lane Annexation & Subdivision

Jensen Lane annexation and subdivision is an area in the east of Town north of Jensen Lane comprised of 275 single family detached homes that will be constructed over the next 5-10 years. This was the site of a potential school, however, no school will be built. Development of this area needs to go through Local Agency Formation Commission (LAFCO). Sewer flows were generated based on the Residential Very Low Density utility land use classification on a per-unit basis.

Wine Country RV Park

40 new connections are to be added at this RV park. For the future condition model, GHD assumed a vehicle is always connected at each spot.

Revel

REVEL will be a lightly assisted living facility with 159 units with a maximum of two people per unit. Each unit has a kitchen, however, there is also a group dining room on the site for the residents as well as a gym and hair salon. Sewer flows were generated from the Residential High Density utility land use classification on a per-unit basis.

Town Green Hotel

Town Green Hotel is a planned 134-room hotel with a limited menu bistro and pool. The site is currently vacant. The limited bistro will have 1,667 sf of gross area. Flows were generated on a per-room basis borrowing unit flows rates, which are assumed to be similar, from the City of Rohnert Park standards. For the bistro, flows were generated using the commercial utility land use classification on a per-1,000-sf basis.

North of Arata Annexation

The area north of Arata Lane and east of Highway 101 is being annexed over the next 1-2 years in two phases. The entire annexed area will include approximately 850 dwelling units, including apartments and single family homes and could include some commercial uses as well. For the future condition model, the Residential Low Density utility land use classification was used on a per-unit basis.

North Annexation School

A campus for approximately 500 students is proposed in the north annexation area. While it is too early to determine which grades the school will serve, it will not be a high school. The Town of Windsor standard (2000 MTSP) of 4 gallons per student per day was used to generate sewer flows.

Carnation/ATP

22.5 acres south of Shiloh Rd at Skylane Blvd are expected to be annexed in 2019. On this site, the following is expected to occur: carnation property expansion, ATP to expand warehouse, Waterworks relocation from Pruitt, wrestling center to be built which might include locker rooms and showers, and the

Santa Rosa Junior College expansion of their Public Safety Training Facility to this property. For modeling of the future condition, GHD assumed Light Industrial utility land use and applied unit flows on a per-acre basis.

Lytton

This future development is comprised of 147 planned homes and is located partially within and partially outside of the Town. Future wastewater flows from this development were included in the hydraulic model at the Town's direction based on the low density residential land use classification on a "per-unit" bases. Lytton owned properties W1 and W2 within the Urban Growth Boundary are included in the future scenario according to the 2040 General Plan land use designation "Estate Residential".

Civic Center Block A

Civic Center Block A refers to a region undergoing significant change. This is the site of the existing Huerta Gymnasium. The Town Council is moving forward with a Request for Qualifications (RFQ) for a mixed-use hotel on the property. The area will be redeveloped into a hotel with more than 100 rooms, a lobby, a restaurant and potentially conference space. Development of the property is projected to occur in approximately three to five years. Sewer flows were generated based on the Commercial utility land use classification on a per-acre basis.

Town Hall Expansion

Town Hall is being relocated to make room for the Sonoma County Library. The School District offices are moving to Windsor Creek Elementary and the Police Station is moving, however, the new location had not been determined at the time of this planning effort. On the site of the existing library, a new multi-purpose performing arts center may be built. Sewer flows were generated based on the Public Institutional utility land use classification on a per-acre basis.

Micro-Vu

Micro-Vu is categorized as light industrial/manufacturing. They are currently located on 2 acres and have indicated they plan to expand to 15-20 acres ono the Olaf property at Condi and Shiloh Road. . For sewer flow generation, the Light Industrial utility land use classification was used on a per-acre basis assuming 20 acres.

Vicini

Vicini is approximately 11 acres of developable land to the south of Shiloh Road and west of Highway 101 and the rest is wetlands. A hotel, assisted living, and 20,000 square feet of retail are being discussed. Multi-story buildings are expected and parking is planned to be included in structures (i.e. no parking lots). The Commercial utility land use classification was applied on a per-acre basis to generate sewer flows.

Winery south of Wilson Park soccer fields

A winery producing 250,000 cases a year is in discussion (no application yet) which could also include a tasting room and/or restaurant. The site for the project is south of Wilson Park soccer fields. Light Industrial utility land use classification was used on a "per acre" basis.

Mini-Storage

Mini storage at Shiloh Road and Caletti is expected to have no significant wastewater use; therefore, the Light Industrial utility land use designation was used for the future condition model sewer flow.

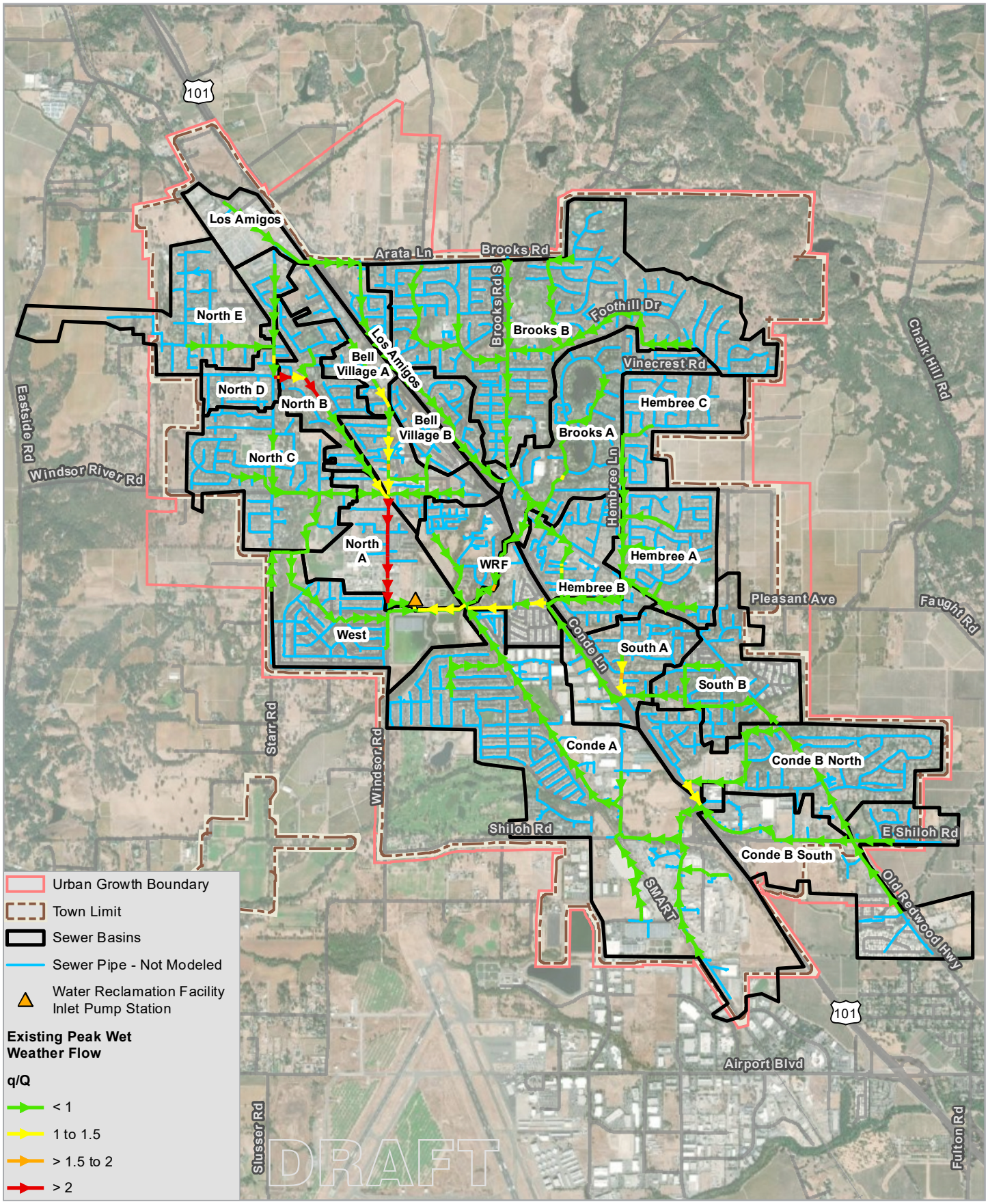
The Artisan

This will be a 64-unit assisted living facility located at 6675 Old Redwood Highway. Future wastewater flows from this development were included in the hydraulic model based on the high density residential land use classification on a per-unit bases.

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Appendix D – Existing Condition Model

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Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

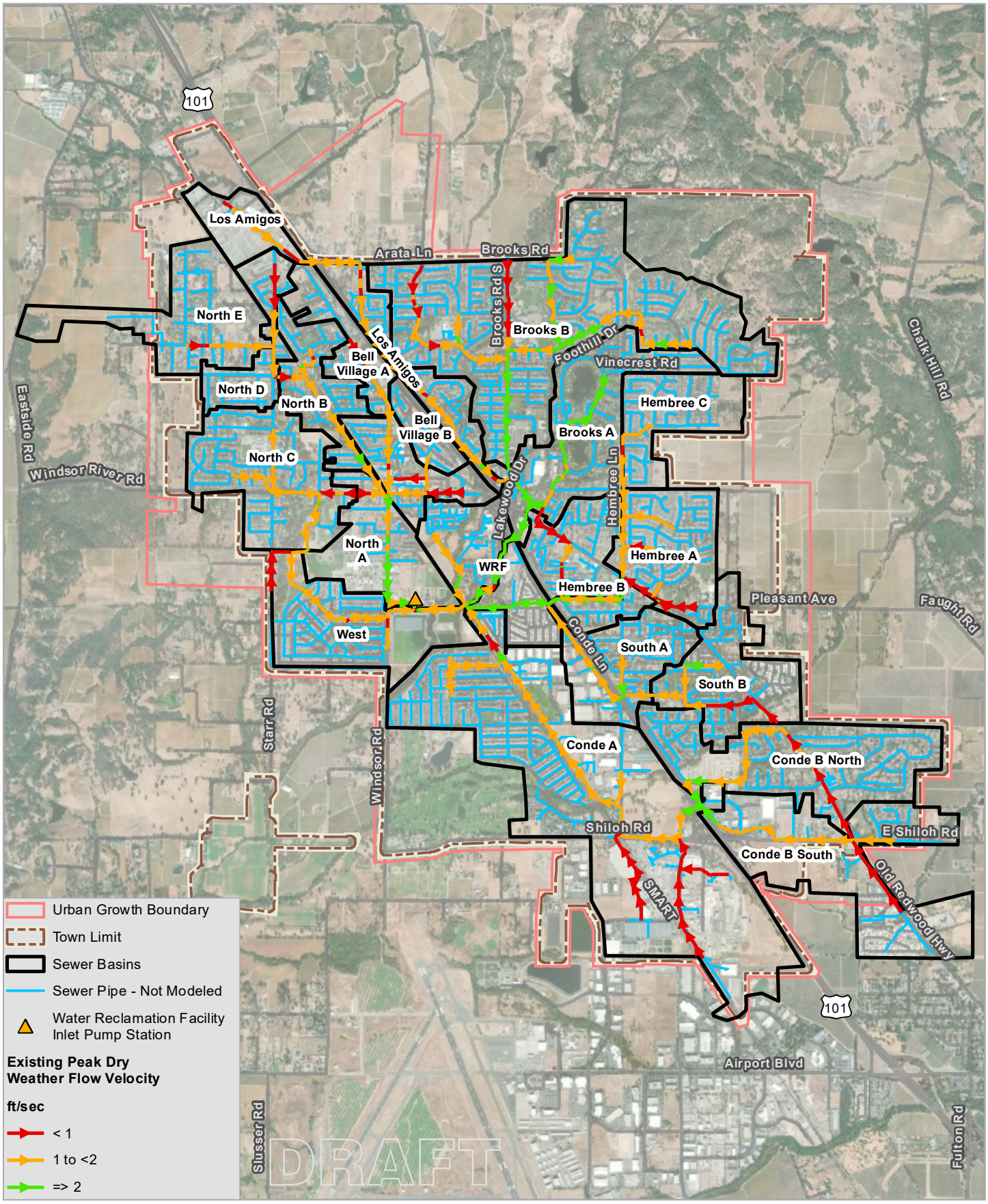
Project No. 11151247
Revision No. 1
Date 8/18/2020

Existing Peak Wet Weather Flow Capacity Deficiencies Severity

FIGURE C-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure C-1 - Existing Peak Wet Weather Flow Capacity Deficiencies Severity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Existing Peak Dry Weather Flow Velocity

Project No. 11151247
Revision No. 1
Date 8/20/2020

FIGURE 7-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure C-2 - Existing Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1000	118.4	6.2	5.8	Bell Village A
MH-1001	117.1	0.8	6.8	Bell Village A
MH-1032	120.8	4.1	9.6	Bell Village A
MH-1033	119.1	3.7	7.7	Bell Village A
MH-1034	122.1	4.6	11.7	Bell Village A
MH-1035	118.7	2.8	6.4	Bell Village A
MH-1036	120.5	2.5	7.0	Bell Village A
MH-1037	121.5	1.3	7.4	Bell Village A
MH-1038	122.2	1.8	11.1	Bell Village A
MH-1039	122.0	1.7	10.7	Bell Village A
MH-1046	121.3	5.6	8.1	Bell Village A
MH-1053	122.9	11.5	8.5	Bell Village A
MH-1055	123.2	0.2	8.2	Bell Village A
MH-1360	129.9	1.3	10.1	Bell Village A
MH-1361	129.4	1.8	10.0	Bell Village A
MH-1364	123.7	9.4	8.1	Bell Village A
MH-1366	126.9	0.2	9.2	Bell Village A
MH-1367	127.6	5.2	9.5	Bell Village A
MH-1385	129.7	7.6	8.5	Bell Village A
MH-1386	129.3	1.1	7.7	Bell Village A
MH-1854	118.3	-	8.5	Bell Village A
MH-1855	121.5	-	10.8	Bell Village A
MH-1856	122.0	-	10.8	Bell Village A
MH-1857	121.8	-	10.5	Bell Village A
MH-1858	120.8	-	8.9	Bell Village A
MH-1889	122.1	1.3	10.5	Bell Village A
MH-1903	118.7	1.3	9.6	Bell Village A
MH-88	133.0	14.0	9.7	Bell Village A
MH-993	118.9	5.3	11.7	Bell Village A
MH-994	118.8	0.9	13.0	Bell Village A
MH-995	118.2	3.2	10.1	Bell Village A
MH-996	118.9	0.7	9.2	Bell Village A
MH-999	116.0	4.2	4.6	Bell Village A
MH-1859	122.7	-	10.2	Bell Village B
MH-1860	123.9	-	11.2	Bell Village B
MH-1861	124.3	-	11.6	Bell Village B
MH-1902	124.5	16.0	11.5	Bell Village B
MH-1237	131.6	-	7.4	Brooks A
MH-1238	132.0	0.6	5.7	Brooks A
MH-1239	132.9	1.9	5.7	Brooks A
MH-1243	128.9	38.4	6.3	Brooks A
MH-1244	134.0	12.6	5.8	Brooks A
MH-1245	135.4	-	6.3	Brooks A

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1246	136.1	-	6.3	Brooks A
MH-1249	140.6	9.9	6.4	Brooks A
MH-1251	144.3	0.6	8.1	Brooks A
MH-1252	145.5	97.5	8.2	Brooks A
MH-1651	101.6	-	12.3	Brooks A
MH-1652	102.0	-	12.2	Brooks A
MH-1904	119.9	-	9.2	Brooks A
MH-724	120.3	7.0	9.4	Brooks A
MH-726	119.1	-	20.3	Brooks A
MH-730	117.8	0.6	18.2	Brooks A
MH-731	117.7	27.2	19.6	Brooks A
MH-732	115.9	-	19.8	Brooks A
MH-733	111.7	19.1	17.4	Brooks A
MH-734	108.6	-	15.0	Brooks A
MH-735	109.0	-	15.5	Brooks A
MH-736	110.2	-	17.3	Brooks A
MH-742	107.5	-	15.1	Brooks A
MH-743	103.8	-	11.4	Brooks A
MH-744	104.3	-	12.3	Brooks A
MH-745	105.0	-	13.5	Brooks A
MH-898	121.5	17.5	9.4	Brooks A
MH-899	121.3	8.6	9.6	Brooks A
MH-900	120.3	6.6	9.2	Brooks A
MH-901	120.4	3.6	12.3	Brooks A
MH-912	123.4	49.7	6.8	Brooks A
MH-913	123.8	-	6.7	Brooks A
MH-919	123.5	-	7.3	Brooks A
MH-920	124.6	0.7	6.7	Brooks A
MH-921	125.0	1.0	6.6	Brooks A
MH-922	125.7	-	6.2	Brooks A
MH-923	126.6	-	6.1	Brooks A
MH-924	127.6	0.8	6.4	Brooks A
MH-925	127.7	1.0	6.2	Brooks A
MH-927	128.4	1.1	6.4	Brooks A
MH-928	124.3	-	8.5	Brooks A
MH-929	122.9	-	8.5	Brooks A
MH-930	121.8	-	9.3	Brooks A
MH-944	118.9	5.3	18.1	Brooks A
MH-945	118.8	-	18.0	Brooks A
MH-947	120.3	-	18.9	Brooks A
MH-948	120.9	-	13.0	Brooks A
MH-949	120.6	84.2	11.8	Brooks A
MH-951	120.0	-	10.8	Brooks A

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-952	120.1	-	11.1	Brooks A
MH-954	120.1	-	9.8	Brooks A
MH-956	120.1	-	9.6	Brooks A
MH-957	120.8	-	9.8	Brooks A
MH-961	119.9	21.7	8.9	Brooks A
MH-1203	174.2	33.2	9.3	Brooks B
MH-1209	171.8	1.1	9.1	Brooks B
MH-1210	166.1	2.0	6.3	Brooks B
MH-1211	161.6	2.9	6.6	Brooks B
MH-1212	160.1	1.7	6.6	Brooks B
MH-1213	166.9	0.9	13.9	Brooks B
MH-1214	167.2	-	14.5	Brooks B
MH-1220	166.4	20.9	15.2	Brooks B
MH-1221	165.6	1.1	14.9	Brooks B
MH-1242	128.8	-	14.4	Brooks B
MH-1277	142.5	0.4	10.4	Brooks B
MH-1278	141.5	1.2	11.3	Brooks B
MH-1280	140.2	1.3	10.9	Brooks B
MH-1281	139.5	0.6	10.8	Brooks B
MH-1282	139.0	1.6	10.6	Brooks B
MH-1283	140.6	1.9	13.1	Brooks B
MH-1284	142.5	-	15.9	Brooks B
MH-1285	141.2	0.2	22.3	Brooks B
MH-1286	139.2	6.5	21.2	Brooks B
MH-1288	135.4	15.0	19.0	Brooks B
MH-1289	134.2	7.8	18.1	Brooks B
MH-1290	130.1	4.9	15.2	Brooks B
MH-1299	138.7	1.1	18.7	Brooks B
MH-1300	136.9	1.5	16.6	Brooks B
MH-1301	136.1	5.2	15.5	Brooks B
MH-1302	135.7	-	15.0	Brooks B
MH-1305	136.0	-	15.0	Brooks B
MH-1306	138.1	22.7	16.7	Brooks B
MH-1453	164.3	4.2	14.9	Brooks B
MH-1456	148.6	2.9	8.2	Brooks B
MH-1457	153.6	1.1	7.8	Brooks B
MH-1458	155.7	3.3	9.0	Brooks B
MH-1460	160.8	1.1	12.3	Brooks B
MH-1461	144.2	2.6	8.3	Brooks B
MH-1462	142.9	1.0	9.8	Brooks B
MH-1463	143.3	1.4	6.5	Brooks B
MH-1466	145.0	2.8	6.7	Brooks B
MH-1467	146.9	-	7.5	Brooks B

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1468	148.6	18.9	7.8	Brooks B
MH-1482	155.3	3.7	8.9	Brooks B
MH-1483	149.2	2.1	6.8	Brooks B
MH-1484	155.5	4.3	8.4	Brooks B
MH-1486	145.6	1.8	14.0	Brooks B
MH-1487	150.0	0.2	16.3	Brooks B
MH-1488	153.3	-	18.0	Brooks B
MH-1489	153.8	-	18.1	Brooks B
MH-1490	153.7	-	17.5	Brooks B
MH-1491	155.3	0.6	7.8	Brooks B
MH-1495	158.1	0.2	9.1	Brooks B
MH-1499	156.6	9.6	8.3	Brooks B
MH-1501	158.2	-	8.0	Brooks B
MH-1502	165.4	-	4.7	Brooks B
MH-1503	174.3	18.6	10.6	Brooks B
MH-1557	138.9	0.4	17.1	Brooks B
MH-1558	139.2	0.6	10.2	Brooks B
MH-1561	140.0	1.4	10.2	Brooks B
MH-1562	141.4	28.2	11.0	Brooks B
MH-1568	137.7	2.0	15.6	Brooks B
MH-1569	135.5	0.9	12.7	Brooks B
MH-1570	134.0	8.0	11.0	Brooks B
MH-1571	134.3	-	10.9	Brooks B
MH-1572	133.5	6.1	9.9	Brooks B
MH-1573	133.3	4.2	9.4	Brooks B
MH-1574	133.6	1.1	9.1	Brooks B
MH-1595	137.0	1.8	11.9	Brooks B
MH-1597	139.9	7.4	14.4	Brooks B
MH-1599	139.5	5.3	14.0	Brooks B
MH-1610	140.3	22.7	14.4	Brooks B
MH-1611	139.6	-	13.9	Brooks B
MH-1612	140.7	0.9	14.2	Brooks B
MH-1613	140.9	0.2	14.2	Brooks B
MH-1614	141.0	0.6	14.0	Brooks B
MH-1615	142.0	4.6	14.9	Brooks B
MH-1627	143.9	0.1	16.5	Brooks B
MH-963	120.8	-	9.3	Brooks B
MH-964	121.6	7.4	9.7	Brooks B
MH-966	122.3	6.1	9.9	Brooks B
MH-967	125.7	7.0	12.2	Brooks B
MH-968	126.1	13.9	12.6	Brooks B
MH-111	107.2	-	13.2	Conde A
MH-112	109.4	-	15.7	Conde A

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-113	107.9	-	14.7	Conde A
MH-114	106.9	-	14.5	Conde A
MH-115	105.8	-	13.5	Conde A
MH-116	104.7	-	12.7	Conde A
MH-117	107.8	-	10.1	Conde A
MH-119	108.6	-	8.3	Conde A
MH-120	109.0	28.2	8.3	Conde A
MH-122	104.6	6.7	12.9	Conde A
MH-123	103.2	-	11.6	Conde A
MH-124	103.1	0.5	11.8	Conde A
MH-125	101.7	-	10.6	Conde A
MH-1634	98.5	5.4	4.0	Conde A
MH-1635	99.3	10.0	3.9	Conde A
MH-1636	106.1	2.9	14.1	Conde A
MH-1637	103.8	2.6	10.9	Conde A
MH-1638	101.3	5.5	7.6	Conde A
MH-1642	103.2	-	14.5	Conde A
MH-1643	102.7	-	14.4	Conde A
MH-1799	111.6	3.5	7.6	Conde A
MH-1845	114.2	-	13.0	Conde A
MH-1846	114.1	-	11.6	Conde A
MH-1847	115.1	-	11.7	Conde A
MH-1848	115.4	0.2	11.9	Conde A
MH-1869	113.9	-	12.2	Conde A
MH-1872	108.8	0.5	11.5	Conde A
MH-1914	109.2	-	14.6	Conde A
MH-1915	115.2	-	15.3	Conde A
MH-202	104.8	131.0	13.9	Conde A
MH-214	108.1	-	17.8	Conde A
MH-215	108.4	-	18.3	Conde A
MH-216	108.5	-	18.7	Conde A
MH-217	113.5	-	24.0	Conde A
MH-252	109.0	-	18.4	Conde A
MH-272	117.2	-	17.8	Conde A
MH-273	111.7	-	13.6	Conde A
MH-274	111.9	-	14.8	Conde A
MH-275	113.1	-	16.4	Conde A
MH-296	111.8	0.2	15.4	Conde A
MH-297	111.5	-	14.4	Conde A
MH-298	109.0	7.6	14.0	Conde A
MH-299	109.7	-	14.4	Conde A
MH-300	110.3	-	14.4	Conde A
MH-301	114.0	-	16.5	Conde A

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-302	114.9	0.1	16.6	Conde A
MH-303	113.6	0.6	15.0	Conde A
MH-304	113.1	-	14.4	Conde A
MH-310	113.1	-	13.6	Conde A
MH-311	114.2	-	14.4	Conde A
MH-312	115.6	-	15.5	Conde A
MH-313	117.0	4.8	16.2	Conde A
MH-314	117.4	-	16.0	Conde A
MH-315	113.3	-	14.4	Conde A
MH-317	114.4	-	14.8	Conde A
MH-319	113.7	-	13.2	Conde A
MH-320	113.6	-	12.9	Conde A
MH-324	113.5	-	16.2	Conde A
MH-325	113.7	-	15.1	Conde A
MH-326	112.7	-	13.1	Conde A
MH-327	112.3	-	11.8	Conde A
MH-328	112.1	-	10.5	Conde A
MH-329	111.8	-	9.7	Conde A
MH-330	111.3	-	7.9	Conde A
MH-331	107.6	-	13.5	Conde A
MH-332	109.7	-	15.3	Conde A
MH-333	112.3	-	16.0	Conde A
MH-334	110.3	-	14.3	Conde A
MH-335	110.5	0.3	15.0	Conde A
MH-430	99.8	11.4	4.1	Conde A
MH-431	100.1	15.5	3.8	Conde A
MH-451	101.0	62.4	3.9	Conde A
MH-577	107.6	0.5	16.2	Conde A
MH-578	114.7	9.8	25.6	Conde A
MH-579	110.2	-	21.4	Conde A
MH-151	123.2	3.8	9.1	Conde B North
MH-152	122.4	0.8	9.4	Conde B North
MH-154	124.5	1.3	9.3	Conde B North
MH-265	115.2	19.6	13.2	Conde B North
MH-267	115.3	-	9.9	Conde B North
MH-268	116.5	27.4	8.6	Conde B North
MH-269	118.6	27.4	9.4	Conde B North
MH-270	120.6	11.9	10.4	Conde B North
MH-271	117.4	0.2	16.1	Conde B North
MH-291	121.4	0.3	10.5	Conde B North
MH-292	123.0	4.9	10.7	Conde B North
MH-349	135.0	2.0	14.1	Conde B North
MH-350	135.6	21.3	14.5	Conde B North

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-351	137.3	13.0	15.8	Conde B North
MH-378	132.9	1.0	12.3	Conde B North
MH-388	124.8	1.2	7.9	Conde B North
MH-389	128.0	1.7	9.9	Conde B North
MH-390	130.2	0.6	11.1	Conde B North
MH-391	130.5	8.6	10.7	Conde B North
MH-406	130.6	9.6	11.1	Conde B North
MH-407	130.1	-	10.7	Conde B North
MH-1808	145.3	6.9	13.2	Conde B South
MH-1809	142.6	18.8	13.6	Conde B South
MH-1810	138.0	0.2	15.7	Conde B South
MH-1811	138.0	-	14.7	Conde B South
MH-1818	122.4	-	10.9	Conde B South
MH-1819	122.8	-	10.9	Conde B South
MH-1820	123.9	5.5	10.1	Conde B South
MH-1821	124.7	2.3	10.0	Conde B South
MH-1822	126.3	0.8	10.4	Conde B South
MH-1824	131.0	7.0	12.1	Conde B South
MH-1825	138.1	-	15.7	Conde B South
MH-1826	138.2	0.6	15.1	Conde B South
MH-1830	136.8	-	13.0	Conde B South
MH-1831	134.8	4.8	10.5	Conde B South
MH-1874	117.5	-	11.6	Conde B South
MH-276	119.0	9.3	10.0	Conde B South
MH-277	119.1	0.8	10.8	Conde B South
MH-278	118.3	-	10.9	Conde B South
MH-279	118.0	10.6	11.3	Conde B South
MH-281	117.3	13.2	14.1	Conde B South
MH-336	120.1	2.5	10.5	Conde B South
MH-337	121.5	-	11.2	Conde B South
MH-516	136.5	7.4	13.8	Hembree A
MH-520	134.5	-	12.3	Hembree A
MH-521	134.3	-	12.4	Hembree A
MH-522	133.7	-	7.0	Hembree A
MH-523	131.9	-	10.4	Hembree A
MH-524	131.6	-	10.4	Hembree A
MH-525	131.2	-	10.0	Hembree A
MH-526	130.6	-	9.5	Hembree A
MH-528	132.4	7.9	7.1	Hembree A
MH-529	132.3	-	8.3	Hembree A
MH-530	132.6	-	10.1	Hembree A
MH-602	125.9	-	12.3	Hembree A
MH-603	123.0	-	12.0	Hembree A

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-604	119.6	-	10.8	Hembree A
MH-605	117.8	-	11.5	Hembree A
MH-606	116.1	-	12.0	Hembree A
MH-613	134.1	31.6	10.9	Hembree A
MH-635	135.2	15.4	11.0	Hembree A
MH-636	134.7	0.8	11.0	Hembree A
MH-637	134.0	3.3	11.0	Hembree A
MH-638	132.4	23.4	10.0	Hembree A
MH-647	132.9	14.9	10.3	Hembree A
MH-648	134.2	1.4	10.7	Hembree A
MH-649	135.1	3.4	11.1	Hembree A
MH-650	136.0	1.2	11.4	Hembree A
MH-651	136.0	1.2	10.1	Hembree A
MH-652	137.1	29.7	10.1	Hembree A
MH-663	129.4	-	8.6	Hembree A
MH-665	131.7	4.1	9.4	Hembree A
MH-666	130.3	-	8.9	Hembree A
MH-667	129.0	0.2	8.8	Hembree A
MH-668	131.7	-	9.7	Hembree A
MH-669	131.1	-	10.2	Hembree A
MH-670	126.4	-	10.5	Hembree A
MH-671	129.0	-	12.1	Hembree A
MH-889	135.0	-	11.8	Hembree A
MH-890	133.4	-	10.6	Hembree A
FAKECO-1	120.0	-	9.0	Hembree B
MH-594	126.0	28.7	9.1	Hembree B
MH-601	116.1	28.7	8.6	Hembree B
MH-607	116.2	-	9.3	Hembree B
MH-608	119.6	25.4	7.2	Hembree B
MH-612	117.0	1.6	9.2	Hembree B
MH-681	125.6	0.0	16.4	Hembree B
MH-682	124.0	25.3	14.4	Hembree B
MH-685	120.3	38.4	11.5	Hembree B
MH-686	119.4	1.6	10.6	Hembree B
MH-687	119.7	1.2	11.1	Hembree B
MH-689	119.0	1.5	10.5	Hembree B
MH-690	119.1	3.2	10.7	Hembree B
MH-692	118.1	5.6	9.8	Hembree B
MH-694	117.1	1.4	9.0	Hembree B
MH-710	122.3	26.8	12.4	Hembree B
MH-711	120.1	3.9	9.8	Hembree B
MH-1142	142.1	0.3	12.1	Hembree C
MH-1143	142.7	33.5	12.1	Hembree C

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-880	139.6	5.3	11.9	Hembree C
MH-881	140.3	0.1	11.8	Hembree C
MH-882	141.3	2.2	12.1	Hembree C
MH-883	141.5	2.8	12.0	Hembree C
MH-884	139.1	9.9	12.0	Hembree C
MH-885	136.8	2.5	10.7	Hembree C
MH-886	136.0	-	10.2	Hembree C
MH-887	133.1	12.8	8.1	Hembree C
MH-888	132.5	-	8.0	Hembree C
MH-1056	127.3	11.0	9.5	Los Amigos
MH-1334	127.5	2.7	9.3	Los Amigos
MH-1336	127.5	1.2	8.8	Los Amigos
MH-1344	127.2	1.5	8.0	Los Amigos
MH-1346	126.5	6.3	7.2	Los Amigos
MH-1347	126.6	1.6	7.2	Los Amigos
MH-1348	128.0	2.1	8.0	Los Amigos
MH-1349	130.8	4.8	10.2	Los Amigos
MH-1350	129.6	-	9.4	Los Amigos
MH-1353	132.4	-	11.5	Los Amigos
MH-1354	135.0	-	13.5	Los Amigos
MH-1355	134.9	-	12.9	Los Amigos
MH-1438	136.1	8.8	11.1	Los Amigos
MH-1439	137.3	-	12.0	Los Amigos
MH-1440	138.0	-	12.3	Los Amigos
MH-1441	138.8	-	12.7	Los Amigos
MH-1445	133.1	2.6	9.6	Los Amigos
MH-1446	132.8	3.0	9.2	Los Amigos
MH-1449	134.0	-	9.7	Los Amigos
MH-1451	133.7	2.4	10.6	Los Amigos
MH-1524	139.4	-	8.3	Los Amigos
MH-1525	139.1	0.5	8.5	Los Amigos
MH-1526	138.7	-	8.5	Los Amigos
MH-1527	138.6	2.4	8.8	Los Amigos
MH-1528	136.4	-	7.0	Los Amigos
MH-1529	137.9	-	9.2	Los Amigos
MH-1530	139.0	-	10.8	Los Amigos
MH-1531	139.1	0.3	11.5	Los Amigos
MH-1532	140.9	0.5	14.5	Los Amigos
MH-1580	134.2	3.3	11.7	Los Amigos
MH-958	121.3	-	10.1	Los Amigos
MH-976	122.0	4.8	5.7	Los Amigos
MH-981	121.8	-	10.6	Los Amigos
MH-982	120.1	-	8.4	Los Amigos

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-983	121.1	-	5.7	Los Amigos
MH-984	126.2	-	9.3	Los Amigos
MH-985	126.8	-	9.4	Los Amigos
MH-1021	118.9	1.5	13.6	North A
MH-1022	118.4	0.1	13.4	North A
MH-1023	119.5	44.9	13.6	North A
MH-1057	121.1	6.2	5.8	North A
MH-1666	101.8	-	6.3	North A
MH-1667	103.9	-	8.0	North A
MH-1907	108.5	-	9.1	North A
MH-790	114.4	139.3	10.0	North A
MH-794	115.4	30.7	10.8	North A
MH-797	113.7	1.3	9.4	North A
MH-798	112.8	23.9	8.5	North A
MH-801	113.9	-	9.7	North A
MH-802	114.4	12.8	10.2	North A
MH-804	114.7	14.2	10.6	North A
MH-807	109.0	-	6.9	North A
MH-808	104.0	44.7	6.2	North A
MH-831	107.6	-	18.7	North A
MH-1081	119.0	12.6	12.2	North B
MH-1082	117.8	8.8	10.1	North B
MH-1083	116.6	0.4	7.8	North B
MH-1087	119.4	-	9.8	North B
MH-1378	125.3	35.7	14.9	North B
MH-1390	128.7	2.8	12.0	North B
MH-1391	126.8	-	11.2	North B
MH-1392	129.2	0.8	11.9	North B
MH-1393	129.2	5.0	11.7	North B
MH-1394	125.8	18.0	14.3	North B
MH-1400	125.6	-	13.5	North B
MH-1401	126.3	6.7	11.0	North B
MH-1402	124.2	-	10.8	North B
MH-1403	123.2	-	9.7	North B
MH-1404	125.3	-	10.6	North B
MH-1416	120.3	1.1	4.8	North B
MH-1417	121.2	1.1	5.7	North B
MH-55	129.0	38.9	10.8	North B
CO-425	123.2	0.5	6.8	North C
MH-1067	122.6	0.9	5.5	North C
MH-1068	115.5	1.8	5.0	North C
MH-1070	114.1	0.3	9.9	North C
MH-1073	115.2	2.4	12.3	North C

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1074	115.2	0.7	19.9	North C
MH-1075	114.1	-	19.0	North C
MH-1076	113.1	-	18.4	North C
MH-1077	112.3	-	18.0	North C
MH-1078	111.6	0.6	14.9	North C
MH-1098	117.4	0.9	6.4	North C
MH-1099	117.4	0.1	6.6	North C
MH-1101	122.6	11.3	8.5	North C
MH-1106	123.6	7.5	20.5	North C
MH-1107	122.7	1.8	18.5	North C
MH-1108	121.0	1.4	15.6	North C
MH-1109	125.3	-	22.9	North C
MH-1110	117.7	0.1	8.5	North C
MH-1114	120.5	0.4	14.6	North C
MH-1120	120.0	19.4	13.9	North C
MH-1776	122.4	13.2	21.1	North C
MH-1777	112.0	0.4	12.3	North C
MH-1778	111.5	-	9.4	North C
MH-1779	121.6	0.2	14.2	North C
MH-1780	110.2	0.4	9.0	North C
MH-1781	110.8	0.2	12.5	North C
MH-1782	110.5	0.2	13.4	North C
MH-1863	110.2	11.8	12.9	North C
MH-820	109.3	-	16.7	North C
MH-821	108.7	-	16.0	North C
MH-822	110.9	-	17.3	North C
MH-823	111.3	-	17.4	North C
MH-824	110.9	-	19.0	North C
MH-825	110.6	-	18.9	North C
MH-826	109.3	-	17.8	North C
MH-828	108.5	-	18.6	North C
MH-830	108.0	-	18.7	North C
CO-650	138.6	-	1.9	North D
MH-1418	122.7	13.6	7.0	North D
MH-1419	122.4	1.6	5.9	North D
MH-1423	123.3	1.0	6.4	North D
MH-1520	136.5	0.4	7.0	North D
MH-1521	139.2	4.5	7.9	North D
MH-1533	139.3	0.2	6.2	North D
MH-1534	140.2	0.7	5.7	North D
MH-1536	142.2	34.0	5.9	North D
MH-1537	141.2	0.2	4.8	North D
MH-30	136.0	-	6.9	North D

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-31	133.4	2.7	6.2	North D
MH-34	132.9	0.5	6.4	North D
MH-35	133.5	4.3	7.9	North D
MH-39	131.3	0.3	7.7	North D
MH-40	130.9	-	7.6	North D
MH-41	124.9	0.7	5.2	North D
MH-42	124.0	0.5	6.6	North D
MH-11	132.1	4.6	9.7	North E
MH-12	132.2	1.7	10.8	North E
MH-13	130.7	10.1	9.6	North E
MH-23	130.1	0.8	9.1	North E
MH-24	131.0	1.3	10.6	North E
MH-43	131.7	0.8	12.5	North E
MH-44	131.6	2.3	12.6	North E
MH-9	130.9	12.3	7.9	North E
MH-185	119.2	1.2	7.7	South A
MH-187	118.1	3.4	7.4	South A
MH-188	117.2	2.4	7.2	South A
MH-234	116.4	1.9	9.0	South A
MH-239	117.7	1.2	8.8	South A
MH-240	118.1	-	7.1	South A
MH-241	118.3	1.4	6.7	South A
MH-244	119.2	16.4	7.1	South A
MH-247	117.9	0.1	11.0	South A
MH-248	117.4	0.7	11.5	South A
MH-249	117.2	0.3	11.4	South A
MH-564	118.0	67.6	13.2	South A
MH-566	117.6	1.1	12.2	South A
MH-580	120.7	4.9	7.7	South A
MH-581	122.4	22.0	8.6	South A
MH-582	122.9	21.2	8.4	South A
MH-589	123.3	15.2	8.3	South A
MH-155	129.8	0.7	12.5	South B
MH-157	131.1	6.8	14.3	South B
MH-167	123.7	8.4	7.4	South B
MH-171	122.4	7.9	8.9	South B
MH-172	124.3	-	10.2	South B
MH-173	120.9	2.7	7.9	South B
MH-176	126.2	13.2	10.4	South B
MH-177	127.8	3.1	11.7	South B
MH-178	130.0	-	13.8	South B
MH-180	127.4	0.3	11.8	South B
MH-181	126.8	7.1	11.5	South B

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-182	119.5	2.0	7.4	South B
MH-184	119.4	0.9	7.8	South B
MH-408	130.5	0.6	11.9	South B
MH-409	133.1	2.9	15.2	South B
MH-410	131.9	-	14.2	South B
MH-497	132.7	38.2	7.8	South B
MH-498	129.5	1.2	8.3	South B
MH-499	125.7	-	8.6	South B
CO-340	102.6	1.4	7.6	West
MH-1669	101.3	13.7	18.2	West
MH-1674	99.8	1.3	16.6	West
MH-1675	100.1	2.8	16.9	West
MH-1676	101.5	0.8	18.3	West
MH-1677	97.8	8.1	14.7	West
MH-1680	96.4	-	13.1	West
MH-1683	94.3	-	10.1	West
MH-1684	94.8	33.1	10.1	West
MH-1699	102.9	0.8	19.7	West
MH-1700	103.3	0.3	19.8	West
MH-1701	104.3	0.1	20.7	West
MH-1728	107.1	0.2	23.1	West
MH-1733	111.4	7.6	27.1	West
MH-1736	112.4	0.9	27.8	West
MH-1737	111.0	4.0	26.1	West
MH-1741	107.3	3.1	21.8	West
MH-1867	106.8	-	18.6	West
MH-1868	106.9	-	19.1	West
MH-1883	101.1	-	14.8	West
MH-1905	101.6	-	14.9	West
MH-1906	106.1	-	20.2	West
MH-832	106.8	3.9	21.1	West
MH-833	104.5	-	17.1	West
MH-834	103.8	-	16.3	West
MH-835	108.9	-	18.5	West
MH-836	117.1	-	26.1	West
MH-837	117.3	-	26.1	West
MH-838	112.7	0.6	20.5	West
MH-839	110.8	0.3	17.5	West
MH-840	104.6	0.3	10.2	West
MH-1644	105.8	-	18.2	WWTP
MH-1649	105.7	-	14.2	WWTP
MH-1653	106.4	-	15.1	WWTP
MH-1654	102.5	-	11.4	WWTP

Existing Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1655	99.6	-	12.2	WWTP
MH-1656	107.3	-	16.6	WWTP
MH-1657	107.3	-	19.9	WWTP
MH-1658	100.9	-	14.9	WWTP
MH-1659	101.3	-	18.2	WWTP
MH-1660	101.3	-	18.2	WWTP
MH-1661	100.7	-	15.3	WWTP
MH-1662	101.4	-	15.5	WWTP
MH-1664	101.1	-	15.2	WWTP
MH-1665	99.3	-	16.2	WWTP
MH-1668	100.0	-	16.8	WWTP
MH-1895	101.7	-	20.7	WWTP
MH-1896	100.7	-	14.3	WWTP
MH-1897	101.3	-	11.5	WWTP
MH-1908	107.1	-	10.0	WWTP
MH-1909	104.0	1.5	10.1	WWTP
MH-1910	100.9	-	7.5	WWTP
MH-1911	101.5	-	11.1	WWTP
MH-1912	101.3	-	13.9	WWTP
MH-1913	100.5	-	10.0	WWTP
MH-565	114.0	-	10.9	WWTP
MH-567	114.6	-	11.6	WWTP
MH-568	114.8	-	12.1	WWTP
MH-569	110.3	-	9.7	WWTP
MH-570	106.9	-	8.8	WWTP
MH-571	106.1	-	9.2	WWTP
MH-757	105.8	25.2	10.1	WWTP
MH-759	105.0	2.6	9.4	WWTP
MH-760	106.4	-	13.6	WWTP
MH-768	107.1	-	11.1	WWTP
MH-769	108.2	-	6.7	WWTP
MH-770	111.7	20.3	8.6	WWTP

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1000-999	8	292	112.51	111.33	59.4	0.8	6.2	59.4	65.6	0.29	0.19	Bell Village A	
1001-996	8	291	110.24	109.55	29.8	0.8	11.1	122.0	133.1	0.50	0.50	Bell Village A	
1032-1034	8	123	111.11	110.20	1.7	1.3	14.3	7.6	21.9	0.15	0.05	Bell Village A	
1033-1032	8	141	111.32	111.11	1.1	0.7	10.2	5.9	16.2	0.19	0.08	Bell Village A	
1034-994	10	349	110.20	108.82	205.6	1.8	81.7	651.5	733.2	1.00	1.18	Bell Village A	SS-4
1035-1033	8	155	112.18	111.32	1.2	1.0	6.6	4.8	11.4	0.12	0.03	Bell Village A	
1036-1035	8	300	113.51	112.18	2.3	0.8	3.8	3.6	7.4	0.10	0.02	Bell Village A	
1037-1036	8	144	114.08	113.51	1.4	0.5	1.3	1.4	2.7	0.06	0.01	Bell Village A	
1038-1034	10	205	110.89	110.20	8.4	1.5	62.7	438.3	501.0	0.72	0.87	Bell Village A	SS-4
1039-1038	10	142	111.03	110.89	9.0	1.0	60.9	429.9	490.9	1.00	1.63	Bell Village A	SS-4
1046-1889	8	260	112.98	111.39	24.9	1.9	57.9	393.7	451.6	1.00	1.06	Bell Village A	SS-12
1053-1046	8	296	114.20	112.98	30.3	1.6	52.3	368.7	421.0	1.00	1.20	Bell Village A	SS-12
1055-1053	8	101	114.88	114.20	1.6	1.8	40.7	338.5	379.2	0.71	0.85	Bell Village A	SS-12
1360-1361	8	110	119.66	119.34	7.4	1.1	24.0	234.9	259.0	0.73	0.89	Bell Village A	
1361-1367	8	382	119.34	118.03	73.5	1.2	25.9	308.5	334.4	1.00	1.05	Bell Village A	SS-12
1364-1055	8	132	115.48	114.88	16.9	1.5	40.6	336.9	377.5	1.00	1.03	Bell Village A	SS-12
1366-1364	8	434	117.62	115.48	9.0	1.5	31.2	320.0	351.2	0.76	0.92	Bell Village A	SS-12
1367-1366	8	124	118.03	117.62	2.6	1.3	31.0	311.1	342.1	1.00	1.09	Bell Village A	SS-12
1385-1360	8	476	121.11	119.66	110.2	1.1	22.7	227.5	250.2	0.70	0.83	Bell Village A	
1386-1385	8	125	121.45	121.11	8.4	1.0	15.1	117.2	132.4	0.48	0.47	Bell Village A	
1854-996	8	64	109.68	109.55	-	0.9	16.0	-	16.0	0.17	0.06	Bell Village A	
1855-1854	8	238	110.59	109.68	-	1.1	16.0	-	16.0	0.15	0.05	Bell Village A	
1856-1855	8	108	111.07	110.59	-	1.2	16.0	-	16.0	0.14	0.04	Bell Village A	
1857-1856	8	21	111.24	111.07	-	1.4	16.0	-	16.0	0.12	0.03	Bell Village A	
1889-1039	10	77	111.39	111.03	27.2	1.7	59.2	420.9	480.1	0.62	0.71	Bell Village A	
1903-995	8	272	108.95	108.03	15.8	1.3	29.1	145.7	174.8	0.53	0.55	Bell Village A	SS-16
88-1386	8	600	123.24	121.45	108.8	1.0	14.0	108.8	122.8	0.45	0.41	Bell Village A	
993-994	8	199	107.07	106.02	131.9	1.6	37.6	293.9	331.5	0.70	0.84	Bell Village A	SS-16
994-1022	15	107	105.62	104.61	1.4	2.6	120.2	946.8	1,067.0	0.43	0.38	Bell Village A	
995-993	8	278	108.03	107.07	16.2	1.3	32.3	161.9	194.2	0.56	0.61	Bell Village A	SS-16
996-1903	8	134	109.55	108.95	7.8	1.4	27.9	129.8	157.7	0.46	0.43	Bell Village A	
999-1001	8	290	111.33	110.24	32.7	1.0	10.4	92.1	102.4	0.38	0.31	Bell Village A	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1858-1857	8	166	111.82	111.24	-	1.1	16.0	-	16.0	0.15	0.05	Bell Village B	
1859-1858	8	160	112.33	111.82	-	1.0	16.0	-	16.0	0.16	0.05	Bell Village B	
1860-1859	8	77	112.58	112.33	-	1.0	16.0	-	16.0	0.15	0.05	Bell Village B	
1861-1860	8	25	112.66	112.58	-	1.0	16.0	-	16.0	0.15	0.05	Bell Village B	
1902-1861	8	64	112.86	112.66	-	1.0	16.0	-	16.0	0.16	0.05	Bell Village B	
1237-1243	6	207	123.86	122.26	1.1	2.6	123.1	53.0	176.0	0.67	0.79	Brooks A	
1238-1237	6	295	126.03	123.86	2.9	2.5	123.1	52.0	175.0	0.68	0.81	Brooks A	
1239-1238	6	151	126.87	126.03	2.2	2.3	122.4	49.1	171.5	0.75	0.91	Brooks A	
1243-927	8	102	122.26	121.75	18.4	2.3	161.5	71.4	232.9	0.56	0.61	Brooks A	
1244-1239	6	120	127.94	126.87	3.5	2.7	120.5	46.8	167.3	0.62	0.70	Brooks A	
1245-1244	6	93	128.92	127.94	1.0	2.8	108.0	43.3	151.2	0.55	0.58	Brooks A	
1246-1245	6	65	129.61	128.92	0.3	2.8	108.0	42.2	150.2	0.55	0.58	Brooks A	
1249-1246	6	352	134.01	129.61	3.9	3.0	108.0	41.9	149.9	0.52	0.53	Brooks A	
1251-1249	6	273	136.00	134.01	1.4	2.4	98.0	38.0	136.0	0.58	0.63	Brooks A	
1252-1251	6	107	137.09	136.00	36.6	2.7	97.5	36.6	134.1	0.52	0.53	Brooks A	
1651-1644	24	111	88.85	87.55	2.3	4.6	863.7	1,112.2	1,975.8	0.29	0.18	Brooks A	
1652-1651	24	145	89.31	88.85	3.0	2.9	863.7	1,109.9	1,973.5	0.40	0.34	Brooks A	
1-724	10	147	112.00	110.78	7.1	-	-	-	-	-	-	Brooks A	
1904-956	18	50	110.48	110.29	0.3	1.7	99.4	573.5	672.8	0.33	0.24	Brooks A	
724-901	10	8	110.78	110.72	0.1	1.0	7.0	0.1	7.1	0.07	0.01	Brooks A	
726-731	24	108	98.41	97.74	2.2	3.6	817.4	1,057.9	1,875.2	0.33	0.23	Brooks A	
730-726	24	123	99.17	98.41	2.5	3.7	817.4	1,055.6	1,873.0	0.33	0.23	Brooks A	
731-732	24	297	97.74	95.57	6.5	3.9	844.6	1,064.4	1,909.0	0.32	0.22	Brooks A	
732-733	24	391	95.57	94.00	6.7	3.2	844.6	1,071.1	1,915.6	0.37	0.30	Brooks A	
733-734	24	231	93.70	93.12	4.8	2.7	863.7	1,075.9	1,939.5	0.43	0.38	Brooks A	
734-735	24	90	93.12	92.87	1.8	2.8	863.7	1,077.7	1,941.4	0.42	0.36	Brooks A	
735-736	24	205	92.87	92.38	4.2	2.7	863.7	1,081.9	1,945.6	0.43	0.39	Brooks A	
736-742	24	252	92.38	91.77	5.2	2.7	863.7	1,087.1	1,950.8	0.43	0.39	Brooks A	
742-743	24	245	91.77	91.17	5.1	2.7	863.7	1,092.2	1,955.9	0.43	0.39	Brooks A	
743-744	24	151	91.17	91.15	3.1	1.0	863.7	1,095.3	1,959.0	1.00	1.53	Brooks A	SS-7
744-745	24	248	91.15	91.02	5.1	1.5	863.7	1,100.4	1,964.1	0.71	0.86	Brooks A	SS-7
745-1652	24	311	91.02	89.31	6.4	3.6	863.7	1,106.9	1,970.5	0.35	0.26	Brooks A	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
898-899	10	224	111.58	111.20	11.2	1.7	233.2	111.2	344.4	0.71	0.85	Brooks A	
899-900	10	222	111.20	110.80	5.9	1.8	241.9	117.1	359.0	0.71	0.85	Brooks A	
900-901	10	13	110.80	110.72	0.1	2.8	248.5	117.2	365.7	0.48	0.47	Brooks A	
901-944	10	290	107.72	106.60	3.3	2.4	259.0	120.6	379.6	0.57	0.62	Brooks A	
912-919	8	134	116.21	115.72	15.3	2.2	215.7	96.8	312.5	0.78	0.95	Brooks A	
913-912	8	152	116.66	116.21	0.8	1.9	166.0	81.4	247.5	0.70	0.84	Brooks A	
919-928	8	114	115.72	115.46	0.8	1.8	215.7	97.5	313.2	1.00	1.21	Brooks A	SS-13
920-913	8	231	117.64	116.66	3.5	2.2	166.0	80.7	246.7	0.61	0.70	Brooks A	
921-920	8	111	118.08	117.64	0.6	2.2	165.3	77.2	242.5	0.62	0.71	Brooks A	
922-921	8	151	119.21	118.08	0.8	2.7	164.4	76.6	241.0	0.51	0.51	Brooks A	
923-922	8	165	120.16	119.21	1.1	2.5	164.4	75.9	240.2	0.55	0.58	Brooks A	
924-923	8	143	120.86	120.16	1.6	2.3	164.4	74.8	239.1	0.57	0.63	Brooks A	
925-924	8	43	121.15	120.86	0.3	2.6	163.6	73.2	236.8	0.52	0.53	Brooks A	
927-925	8	98	121.75	121.15	1.5	2.5	162.5	72.9	235.5	0.53	0.55	Brooks A	
928-929	8	78	115.46	114.15	0.5	4.0	215.7	98.0	313.8	0.47	0.45	Brooks A	
929-930	8	155	114.15	112.07	1.1	3.6	215.7	99.1	314.8	0.50	0.50	Brooks A	
930-898	8	137	112.07	111.58	0.9	2.2	215.7	100.0	315.7	0.79	0.96	Brooks A	
944-730	24	310	100.30	99.17	6.4	3.0	816.7	1,053.1	1,869.8	0.38	0.30	Brooks A	
945-944	24	16	100.38	100.30	0.2	3.0	552.4	926.1	1,478.6	0.31	0.21	Brooks A	
947-945	24	246	101.02	100.38	5.2	2.4	552.4	925.9	1,478.4	0.36	0.28	Brooks A	
948-947	24	69	107.70	101.02	1.4	8.5	552.4	920.6	1,473.1	0.15	0.05	Brooks A	
949-948	24	128	108.44	107.70	19.4	3.2	552.4	919.2	1,471.6	0.30	0.19	Brooks A	
951-952	24	66	108.88	108.51	1.4	3.0	468.2	898.7	1,367.0	0.29	0.18	Brooks A	
952-949	24	53	108.51	108.44	1.1	1.8	468.2	899.8	1,368.1	0.42	0.36	Brooks A	
954-951	24	238	109.90	108.88	4.9	2.7	468.2	897.4	1,365.6	0.31	0.20	Brooks A	
956-954	18	75	110.29	109.90	1.2	1.9	99.4	574.6	674.0	0.30	0.20	Brooks A	
957-1904	18	98	110.76	110.48	0.5	1.6	99.4	573.2	672.6	0.35	0.26	Brooks A	SS-15
961-954	24	223	110.69	109.90	5.4	2.4	368.9	317.8	686.7	0.23	0.11	Brooks A	
1203-1209	8	308	164.77	162.57	26.5	1.7	33.2	26.4	59.6	0.24	0.13	Brooks B	
1209-1210	8	291	162.57	159.74	1.7	1.9	34.4	28.1	62.5	0.23	0.12	Brooks B	
1210-1211	8	247	159.74	154.87	1.7	2.5	36.4	29.8	66.2	0.20	0.09	Brooks B	
1211-1212	8	300	154.87	153.34	1.8	1.6	39.3	31.7	71.0	0.29	0.18	Brooks B	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1212-1213	8	181	153.34	152.79	0.7	1.3	41.0	32.4	73.4	0.34	0.24	Brooks B	
1213-1214	8	154	152.79	152.59	0.6	1.0	41.8	33.0	74.9	0.43	0.38	Brooks B	
1214-1220	10	359	152.59	150.97	1.8	1.5	41.8	34.8	76.6	0.23	0.12	Brooks B	
1220-1221	6	192	150.97	150.49	13.9	1.4	62.7	48.7	111.4	0.73	0.88	Brooks B	
1221-1453	10	333	150.49	149.18	3.5	1.6	63.8	52.1	115.9	0.29	0.19	Brooks B	
1242-968	18	328	114.14	113.13	1.3	2.2	312.8	287.3	600.2	0.33	0.23	Brooks B	
1277-1278	10	172	131.93	129.91	0.9	3.0	141.9	125.0	266.9	0.34	0.25	Brooks B	
1278-1280	10	267	129.91	129.02	2.3	1.9	143.1	127.3	270.4	0.48	0.47	Brooks B	
1280-1281	10	117	129.02	128.42	1.4	2.3	144.4	128.7	273.1	0.43	0.39	Brooks B	
1281-1282	10	151	128.42	128.09	1.1	1.7	145.0	129.8	274.8	0.56	0.60	Brooks B	
1282-1283	10	332	128.09	127.18	2.8	1.8	146.6	132.4	279.1	0.52	0.54	Brooks B	
1283-1284	10	154	127.18	126.42	1.6	2.2	148.6	134.0	282.6	0.45	0.41	Brooks B	
1284-1285	12	208	126.42	118.57	1.3	4.6	151.4	149.7	301.1	0.21	0.10	Brooks B	
1285-1286	18	228	118.57	117.68	2.1	2.3	278.7	251.9	530.6	0.29	0.18	Brooks B	
1286-1288	18	471	117.68	116.14	7.4	2.2	285.2	259.4	544.5	0.30	0.20	Brooks B	
1288-1289	18	113	116.14	115.82	9.4	2.1	300.1	268.8	568.9	0.32	0.23	Brooks B	
1289-1290	18	388	115.82	114.50	11.6	2.3	307.9	280.4	588.4	0.31	0.21	Brooks B	
1290-1242	18	124	114.50	114.14	5.6	2.2	312.8	286.0	598.8	0.33	0.24	Brooks B	
1299-1285	12	344	119.65	118.57	2.1	1.8	127.0	100.2	227.2	0.34	0.25	Brooks B	
1300-1299	12	343	119.99	119.65	2.1	1.2	125.9	98.1	224.0	0.47	0.45	Brooks B	
1301-1300	12	110	120.32	119.99	3.7	1.8	124.4	95.9	220.4	0.34	0.25	Brooks B	
1302-1301	12	69	120.50	120.32	0.5	1.6	119.3	92.2	211.5	0.35	0.26	Brooks B	
1305-1302	12	68	120.68	120.50	0.3	1.7	119.3	91.7	211.0	0.34	0.26	Brooks B	
1306-1305	12	161	121.09	120.68	14.0	1.6	119.3	91.3	210.6	0.35	0.26	Brooks B	
1453-1460	10	204	149.18	148.33	4.3	1.7	68.1	56.4	124.5	0.30	0.20	Brooks B	
1456-1461	10	310	140.34	135.67	2.7	2.8	76.5	66.1	142.6	0.23	0.12	Brooks B	
1457-1456	10	309	145.74	140.34	1.6	2.9	73.6	63.4	137.0	0.22	0.10	Brooks B	
1458-1457	10	112	146.50	145.74	4.1	2.1	72.5	61.9	134.4	0.27	0.16	Brooks B	
1460-1458	10	279	148.33	146.50	1.4	2.0	69.2	57.8	126.9	0.27	0.16	Brooks B	
1461-1462	10	280	135.67	132.89	2.4	2.4	79.1	68.5	147.6	0.26	0.15	Brooks B	
1462-1277	10	73	132.89	131.93	0.4	3.2	141.4	124.1	265.6	0.33	0.23	Brooks B	
1463-1462	8	261	136.73	132.89	1.1	2.6	61.4	55.3	116.7	0.28	0.18	Brooks B	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1466-1463	8	270	138.07	136.73	2.7	1.8	60.0	54.3	114.2	0.37	0.30	Brooks B	
1467-1466	8	131	139.24	138.07	0.5	2.2	57.2	51.6	108.8	0.31	0.21	Brooks B	
1468-1467	8	239	140.62	139.24	14.1	1.9	57.2	51.1	108.3	0.35	0.26	Brooks B	
1482-1483	8	352	146.34	142.25	4.2	2.1	36.2	35.7	71.9	0.24	0.12	Brooks B	
1483-1468	8	319	142.25	140.62	1.3	1.6	38.3	37.0	75.3	0.30	0.19	Brooks B	
1484-1482	8	154	146.95	146.34	2.9	1.4	32.5	31.6	64.1	0.29	0.19	Brooks B	
1486-1284	12	286	131.62	126.42	1.8	1.1	2.9	14.3	17.2	0.06	0.01	Brooks B	
1487-1486	12	466	133.72	131.62	3.0	0.5	1.0	12.5	13.6	0.08	0.01	Brooks B	
1488-1487	12	419	135.31	133.72	2.7	0.4	0.8	9.6	10.4	0.07	0.01	Brooks B	
1489-1488	12	48	135.73	135.31	0.3	0.6	0.8	6.8	7.6	0.05	0.01	Brooks B	
1490-1489	12	129	136.25	135.73	1.0	0.4	0.8	6.5	7.3	0.06	0.01	Brooks B	
1491-1490	12	420	147.46	145.15	2.8	0.5	0.8	5.5	6.3	0.05	0.01	Brooks B	
1495-1491	12	329	149.01	147.46	2.6	0.3	0.2	2.7	2.8	0.04	0.00	Brooks B	
1499-1484	8	231	148.21	146.95	8.4	1.5	28.2	28.8	56.9	0.25	0.14	Brooks B	
1501-1499	8	179	150.07	148.21	1.0	1.6	18.6	20.4	38.9	0.18	0.07	Brooks B	
1502-1501	8	336	160.62	150.07	1.4	2.4	18.6	19.4	38.0	0.14	0.04	Brooks B	
1503-1502	8	261	163.58	160.62	18.1	1.7	18.6	18.0	36.6	0.17	0.06	Brooks B	
1557-1306	12	179	121.56	121.09	1.1	1.6	96.6	77.4	174.0	0.31	0.21	Brooks B	
1558-1557	8	173	128.94	121.56	3.0	3.1	30.2	21.3	51.5	0.15	0.05	Brooks B	
1561-1558	8	344	129.61	128.94	1.4	1.0	29.6	18.3	47.9	0.30	0.20	Brooks B	
1562-1561	8	190	130.35	129.61	16.9	1.3	28.2	16.9	45.0	0.25	0.13	Brooks B	
1568-1557	12	100	121.91	121.56	0.6	1.6	66.0	54.9	120.9	0.24	0.13	Brooks B	
1569-1568	12	335	122.60	121.91	2.0	1.3	63.9	54.3	118.2	0.27	0.16	Brooks B	
1570-1569	12	259	122.85	122.60	4.8	1.0	63.0	52.2	115.2	0.33	0.23	Brooks B	
1571-1570	12	104	123.16	122.85	0.6	1.4	55.0	47.4	102.4	0.23	0.12	Brooks B	
1572-1571	12	123	123.36	123.16	5.8	1.1	55.0	46.8	101.8	0.27	0.16	Brooks B	
1573-1572	12	252	123.74	123.36	2.9	1.0	48.9	41.0	89.9	0.26	0.15	Brooks B	
1574-1573	12	203	124.25	123.74	1.2	1.2	44.7	38.1	82.8	0.22	0.10	Brooks B	
1595-1574	12	208	125.04	124.25	4.3	1.4	43.6	36.8	80.4	0.19	0.08	Brooks B	
1597-1595	12	243	125.25	125.04	6.4	0.8	41.8	32.5	74.3	0.27	0.16	Brooks B	
1599-1597	12	69	125.39	125.25	2.9	1.0	34.4	26.2	60.6	0.20	0.08	Brooks B	
1610-1611	12	97	125.75	125.53	15.4	1.0	29.1	22.4	51.5	0.18	0.07	Brooks B	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1611-1599	12	137	125.53	125.39	0.8	0.8	29.1	23.3	52.4	0.22	0.10	Brooks B	
1612-1610	12	302	126.36	125.75	1.8	0.6	6.4	7.1	13.5	0.09	0.02	Brooks B	
1613-1612	12	133	126.63	126.36	0.8	0.6	5.5	5.2	10.7	0.09	0.01	Brooks B	
1614-1613	12	125	126.92	126.63	0.8	0.6	5.4	4.3	9.7	0.08	0.01	Brooks B	
1615-1614	12	95	127.01	126.92	2.5	0.4	4.8	3.6	8.3	0.09	0.02	Brooks B	
1627-1615	12	92	127.40	127.01	1.1	-	0.1	1.1	1.2	0.03	0.00	Brooks B	
963-961	24	151	111.21	110.69	1.9	2.3	347.2	312.4	659.6	0.22	0.11	Brooks B	
964-963	24	121	111.61	111.21	1.7	2.3	347.2	310.5	657.7	0.23	0.11	Brooks B	
966-964	24	98	112.11	111.61	4.2	2.6	339.8	308.8	648.6	0.20	0.09	Brooks B	
967-966	18	403	113.02	112.11	4.0	2.0	333.8	304.6	638.4	0.36	0.28	Brooks B	
968-967	18	47	113.13	113.02	13.3	2.0	326.7	300.6	627.4	0.36	0.28	Brooks B	
111-112	21	163	93.77	93.39	4.1	1.9	257.1	1,228.2	1,485.4	0.46	0.43	Conde A	
112-113	21	224	93.39	92.87	5.3	1.9	257.1	1,233.6	1,490.7	0.46	0.43	Conde A	
113-114	21	153	92.87	92.51	5.5	1.9	257.1	1,239.0	1,496.2	0.46	0.43	Conde A	
114-115	24	173	92.11	91.81	5.2	1.7	257.1	1,244.2	1,501.3	0.41	0.35	Conde A	
115-116	24	418	91.81	91.56	11.3	1.2	285.8	1,283.6	1,569.4	0.57	0.62	Conde A	
116-122	24	398	91.56	91.28	10.7	1.2	285.8	1,294.3	1,580.1	0.55	0.59	Conde A	
117-1872	8	89	97.58	97.19	0.8	1.4	28.2	24.1	52.3	0.26	0.14	Conde A	
119-117	8	502	100.15	97.58	5.5	1.4	28.2	23.3	51.5	0.25	0.13	Conde A	
120-119	8	71	100.64	100.15	17.9	1.6	28.2	17.9	46.1	0.22	0.10	Conde A	
122-123	27	230	91.28	91.11	7.5	1.3	292.5	1,301.7	1,594.2	0.45	0.42	Conde A	
123-124	27	274	91.11	90.92	8.3	1.2	292.5	1,310.1	1,602.6	0.46	0.44	Conde A	
124-125	27	297	90.92	90.71	15.9	1.2	293.0	1,325.9	1,618.9	0.46	0.44	Conde A	
125-202	27	408	90.71	90.42	10.3	1.2	293.0	1,336.2	1,629.2	0.46	0.44	Conde A	
1634-1638	10	302	94.23	93.48	3.4	1.6	104.7	128.9	233.7	0.48	0.47	Conde A	
1635-1634	8	239	95.28	94.23	10.1	1.0	10.0	10.1	20.1	0.16	0.06	Conde A	
1636-577	8	172	91.67	91.17	1.6	1.8	115.7	137.2	252.9	0.72	0.87	Conde A	
1637-1636	10	301	92.61	91.67	3.4	1.8	112.8	135.7	248.5	0.47	0.45	Conde A	
1638-1637	10	300	93.38	92.61	3.4	1.6	110.2	132.3	242.5	0.49	0.49	Conde A	
1642-1643	33	435	87.96	87.82	16.2	1.1	550.1	1,794.6	2,344.7	0.53	0.56	Conde A	
1643-1644	33	416	87.82	87.35	39.3	1.7	550.1	1,834.0	2,384.1	0.37	0.30	Conde A	
1799-330	8	167	103.97	103.38	8.7	0.7	3.5	8.7	12.2	0.13	0.04	Conde A	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1845-320	10	204	101.18	100.66	2.3	0.2	0.2	28.2	28.4	0.16	0.06	Conde A	
1846-1869	10	400	102.53	101.66	4.5	0.2	0.2	22.4	22.6	0.15	0.05	Conde A	
1847-1846	10	347	103.40	102.53	3.9	0.2	0.2	17.9	18.1	0.13	0.04	Conde A	
1848-1847	10	72	103.47	103.40	14.1	0.2	0.2	14.1	14.2	0.14	0.04	Conde A	
1869-1845	10	262	101.66	101.18	3.5	0.2	0.2	26.0	26.1	0.17	0.06	Conde A	
1872-115	8	159	97.19	96.41	4.1	1.4	28.7	28.1	56.9	0.26	0.15	Conde A	
1914-332	21	130	94.24	94.07	2.5	1.5	253.4	1,190.8	1,444.1	0.54	0.57	Conde A	
1915-311	10	118	99.86	99.71	1.3	0.5	4.8	11.1	15.9	0.14	0.05	Conde A	
202-252	27	500	90.42	90.06	198.4	1.4	424.0	1,534.6	1,958.6	0.51	0.52	Conde A	
214-215	27	327	89.83	89.60	9.9	1.4	424.0	1,553.2	1,977.2	0.52	0.53	Conde A	
215-216	27	323	89.60	89.37	9.8	1.4	424.0	1,563.1	1,987.1	0.52	0.53	Conde A	
216-217	27	500	89.37	89.01	15.2	1.4	424.0	1,578.3	2,002.4	0.52	0.54	Conde A	
217-578	27	243	89.01	88.72	7.4	1.7	424.0	1,585.7	2,009.8	0.45	0.42	Conde A	
252-214	27	331	90.06	89.83	8.7	1.4	424.0	1,543.2	1,967.2	0.52	0.54	Conde A	
272-273	24	280	99.07	97.79	11.2	2.3	239.9	1,052.9	1,292.8	0.29	0.19	Conde A	
273-274	24	246	97.79	96.66	6.6	2.3	239.9	1,059.5	1,299.4	0.29	0.19	Conde A	
274-275	21	446	96.66	96.42	10.6	1.1	239.9	1,070.1	1,310.0	0.67	0.79	Conde A	
275-296	21	174	96.42	96.03	4.8	1.8	239.9	1,074.9	1,314.8	0.43	0.39	Conde A	
296-300	21	323	96.03	95.57	6.1	1.6	245.8	1,169.3	1,415.1	0.52	0.53	Conde A	
297-296	10	46	97.00	96.83	0.5	0.8	5.6	88.4	94.0	0.27	0.16	Conde A	
298-1914	21	210	94.67	94.24	5.4	1.8	253.4	1,188.3	1,441.7	0.47	0.45	Conde A	
299-298	21	333	94.91	94.67	6.3	1.2	245.8	1,183.0	1,428.7	0.65	0.75	Conde A	
300-299	21	309	95.57	94.91	7.3	1.8	245.8	1,176.7	1,422.5	0.46	0.43	Conde A	
301-297	10	286	97.40	97.00	3.2	0.6	5.6	87.8	93.5	0.34	0.25	Conde A	
302-301	10	202	98.21	97.40	15.7	0.8	5.6	84.6	90.3	0.26	0.14	Conde A	
303-302	10	153	98.49	98.21	5.2	0.6	5.6	68.9	74.5	0.29	0.18	Conde A	
304-303	10	84	98.63	98.49	0.9	0.6	5.0	63.6	68.6	0.28	0.17	Conde A	
310-304	10	312	99.36	98.63	3.5	0.6	4.8	16.7	21.5	0.14	0.04	Conde A	
311-310	10	192	99.71	99.36	2.2	0.6	4.8	13.2	18.0	0.14	0.04	Conde A	
312-1915	10	96	99.99	99.86	1.1	0.5	4.8	9.7	14.6	0.14	0.04	Conde A	
313-312	10	225	100.69	99.99	5.0	0.7	4.8	8.7	13.5	0.11	0.02	Conde A	
314-313	10	224	101.40	100.69	3.7	-	-	3.7	3.7	0.06	0.01	Conde A	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
315-304	8	114	98.88	98.63	2.2	0.2	0.2	46.0	46.1	0.29	0.18	Conde A	
317-315	10	400	99.61	98.88	4.9	0.2	0.2	43.8	44.0	0.22	0.10	Conde A	
319-317	10	389	100.54	99.61	10.6	0.2	0.2	39.0	39.2	0.19	0.08	Conde A	
320-319	10	9	100.66	100.64	0.1	0.2	0.2	28.4	28.5	0.16	0.06	Conde A	
324-333	8	254	97.26	96.18	2.3	0.7	3.5	25.0	28.5	0.19	0.08	Conde A	
325-324	8	277	98.62	97.26	2.5	0.8	3.5	22.8	26.3	0.18	0.07	Conde A	
326-325	8	277	99.57	98.62	2.5	0.7	3.5	20.3	23.8	0.18	0.07	Conde A	
327-326	8	270	100.54	99.57	2.4	0.7	3.5	17.8	21.3	0.17	0.07	Conde A	
328-327	8	301	101.55	100.54	2.7	0.7	3.5	15.4	18.9	0.17	0.06	Conde A	
329-328	8	300	102.02	101.55	2.7	0.5	3.5	12.7	16.2	0.19	0.08	Conde A	
330-329	8	145	103.38	102.02	1.3	1.0	3.5	10.0	13.5	0.11	0.03	Conde A	
331-111	21	28	93.83	93.77	0.7	1.8	257.1	1,224.2	1,481.3	0.47	0.44	Conde A	
332-331	21	107	94.07	93.83	2.5	1.8	253.4	1,193.3	1,446.7	0.46	0.43	Conde A	
333-334	8	201	96.18	96.00	1.8	0.4	3.5	26.8	30.3	0.29	0.18	Conde A	
334-335	8	57	96.00	95.54	0.5	0.9	3.5	27.4	30.8	0.17	0.06	Conde A	
335-331	8	174	95.54	94.53	2.8	0.8	3.7	30.2	33.9	0.19	0.08	Conde A	
430-1634	8	254	95.49	94.23	13.5	2.0	89.3	115.5	204.8	0.52	0.54	Conde A	
431-430	8	255	96.10	95.49	15.0	1.5	77.9	101.9	179.8	0.60	0.67	Conde A	
451-431	8	203	96.89	96.10	86.8	1.6	62.4	86.9	149.3	0.46	0.44	Conde A	
577-578	10	174	91.17	90.52	2.0	1.9	116.2	139.2	255.4	0.46	0.42	Conde A	
578-579	27	241	88.72	88.04	35.6	2.4	550.1	1,760.4	2,310.5	0.38	0.31	Conde A	
579-1642	33	460	88.04	87.96	17.9	0.9	550.1	1,778.4	2,328.5	0.63	0.73	Conde A	
151-152	10	187	113.90	112.83	8.8	1.9	72.5	314.1	386.6	0.51	0.52	Conde B North	
152-292	10	188	112.83	112.07	2.7	1.7	73.3	316.7	390.0	0.57	0.62	Conde B North	
154-151	10	295	115.01	113.90	4.2	1.6	68.6	305.3	373.9	0.57	0.62	Conde B North	
1810-351	12	938	122.21	121.36	15.9	0.5	8.4	112.8	121.2	0.34	0.25	Conde B North	
265-271	10	322	101.60	100.96	71.2	1.7	164.9	459.5	624.3	1.00	1.42	Conde B North	SS-5
267-265	10	20	105.28	101.70	0.3	8.0	145.3	388.2	533.5	0.24	0.13	Conde B North	SS-5
268-267	10	499	107.62	105.38	7.7	2.2	145.3	387.9	533.2	0.68	0.81	Conde B North	SS-5
269-268	10	501	108.94	107.62	7.9	1.7	117.9	380.3	498.2	0.81	0.98	Conde B North	SS-5
270-269	10	375	110.04	108.94	39.6	1.6	90.5	372.4	462.9	0.72	0.87	Conde B North	
271-272	10	317	100.96	99.87	5.4	2.0	165.0	464.9	629.9	1.00	1.09	Conde B North	SS-5

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
291-270	10	193	110.71	110.04	2.7	1.7	78.6	332.7	411.3	0.62	0.71	Conde B North	
292-291	10	289	112.07	110.71	13.3	1.8	78.2	330.0	408.3	0.56	0.60	Conde B North	
349-378	12	391	120.71	120.38	23.8	0.8	44.7	221.4	266.1	0.54	0.57	Conde B North	
350-349	12	215	120.94	120.71	68.0	0.9	42.7	197.7	240.4	0.48	0.46	Conde B North	
351-350	12	348	121.36	120.94	16.8	0.8	21.4	129.6	151.0	0.36	0.27	Conde B North	
378-391	12	548	120.38	119.59	9.3	1.0	45.7	230.7	276.4	0.47	0.45	Conde B North	
388-154	10	326	116.67	115.01	4.6	1.8	67.4	301.2	368.5	0.51	0.52	Conde B North	
389-388	10	325	117.93	116.67	6.5	1.6	66.2	296.6	362.8	0.55	0.59	Conde B North	
390-389	10	174	118.86	117.93	2.4	1.8	64.5	290.1	354.5	0.50	0.49	Conde B North	
391-406	12	326	119.59	119.33	20.1	0.9	54.3	250.8	305.1	0.60	0.67	Conde B North	
406-407	12	90	119.33	119.24	33.3	1.0	63.9	284.1	348.0	0.62	0.70	Conde B North	
407-390	12	207	119.24	118.96	3.5	1.1	63.9	287.6	351.5	0.55	0.59	Conde B North	
1808-1809	10	332	132.15	128.91	72.9	1.1	6.9	72.9	79.7	0.19	0.08	Conde B South	
1809-1811	10	563	128.91	123.16	80.6	1.7	25.6	153.5	179.1	0.29	0.18	Conde B South	
1810-1824	12	512	122.21	118.83	24.3	1.4	22.8	304.0	326.8	0.34	0.25	Conde B South	
1811-1810	12	59	123.16	122.21	7.0	2.0	25.6	160.5	186.1	0.20	0.09	Conde B South	
1818-337	15	218	111.37	110.24	13.0	1.5	38.4	417.5	455.9	0.32	0.22	Conde B South	
1819-1818	15	178	111.82	111.37	12.1	1.1	38.4	404.6	443.0	0.38	0.30	Conde B South	
1820-1819	12	253	113.69	111.82	36.1	1.7	38.4	392.5	430.9	0.38	0.31	Conde B South	
1821-1820	12	137	114.58	113.69	7.3	1.6	32.9	356.4	389.3	0.38	0.30	Conde B South	
1822-1821	12	190	115.77	114.58	18.3	1.5	30.6	349.1	379.6	0.38	0.30	Conde B South	
1824-1822	12	535	118.83	115.77	26.8	1.4	29.8	330.7	360.5	0.37	0.30	Conde B South	
1825-1810	12	16	122.42	122.21	0.8	1.2	5.4	216.0	221.4	0.23	0.12	Conde B South	
1826-1825	12	413	122.97	122.42	41.3	0.5	5.4	215.2	220.6	0.43	0.38	Conde B South	
1830-1826	12	773	123.70	122.97	36.7	0.4	4.8	173.9	178.7	0.42	0.36	Conde B South	
1831-1830	12	802	124.23	123.70	137.0	0.4	4.8	137.2	142.0	0.40	0.34	Conde B South	
1874-281	15	199	105.77	103.14	11.8	2.3	61.7	553.1	614.8	0.29	0.18	Conde B South	
276-277	15	232	108.84	108.17	14.8	1.3	50.3	466.8	517.1	0.40	0.33	Conde B South	
277-278	15	198	108.17	107.35	46.6	1.5	51.1	513.4	564.5	0.38	0.30	Conde B South	
278-279	15	215	107.25	106.63	14.6	1.3	51.1	528.0	579.1	0.42	0.37	Conde B South	
279-1874	15	174	106.63	105.77	13.3	1.7	61.7	541.3	603.0	0.37	0.29	Conde B South	
281-272	15	380	103.14	100.37	23.7	2.0	74.9	576.8	651.7	0.35	0.26	Conde B South	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
336-276	15	237	109.49	108.84	18.5	1.2	40.9	452.0	492.9	0.39	0.32	Conde B South	
337-336	15	271	110.24	109.49	16.1	1.2	38.4	433.5	471.9	0.38	0.31	Conde B South	
516-520	18	298	122.60	122.09	5.5	0.6	7.4	5.5	12.9	0.06	0.01	Hembree A	
520-521	18	247	122.09	121.83	1.4	0.5	7.4	6.9	14.3	0.07	0.01	Hembree A	
521-523	18	384	121.83	121.41	2.2	0.5	7.4	9.2	16.5	0.07	0.01	Hembree A	
522-528	8	64	126.70	125.18	0.2	-	-	0.2	0.2	0.01	0.00	Hembree A	
523-524	18	154	121.41	121.07	0.9	0.8	15.3	11.3	26.5	0.08	0.01	Hembree A	
524-525	18	38	121.07	120.98	0.2	1.2	46.9	24.7	71.5	0.12	0.03	Hembree A	
525-526	18	92	120.98	120.86	0.5	0.9	46.9	25.2	72.1	0.14	0.04	Hembree A	
526-663	18	351	120.86	120.60	2.0	0.8	46.9	27.3	74.1	0.16	0.06	Hembree A	
528-529	8	323	125.18	124.00	0.8	0.9	7.9	1.0	9.0	0.11	0.03	Hembree A	
529-523	8	56	124.00	121.81	0.1	2.0	7.9	1.2	9.1	0.07	0.01	Hembree A	
530-524	10	187	122.44	121.07	0.6	1.6	31.6	13.2	44.8	0.16	0.05	Hembree A	
602-603	24	369	113.42	110.83	2.9	2.6	215.3	155.9	371.2	0.14	0.04	Hembree A	
603-604	24	390	110.83	108.61	3.0	2.4	215.3	158.9	374.1	0.15	0.05	Hembree A	
604-605	24	358	108.61	106.11	2.8	2.6	215.3	161.6	376.9	0.14	0.04	Hembree A	
605-606	24	385	106.11	103.90	3.0	2.4	215.3	164.5	379.8	0.15	0.05	Hembree A	
606-565	24	239	103.90	102.85	1.9	2.2	215.3	166.4	381.6	0.16	0.06	Hembree A	
613-530	10	201	123.07	122.44	12.6	1.2	31.6	12.6	44.2	0.19	0.08	Hembree A	
635-636	10	89	124.06	123.61	5.6	1.2	15.4	5.6	21.0	0.12	0.03	Hembree A	
636-637	10	169	123.61	122.95	0.5	1.1	16.2	6.1	22.3	0.13	0.04	Hembree A	
637-638	10	317	122.95	122.28	1.5	0.9	19.4	7.5	27.0	0.17	0.06	Hembree A	
638-666	10	160	122.28	121.60	6.1	1.5	42.8	13.6	56.4	0.20	0.09	Hembree A	
647-665	10	161	122.41	122.00	4.6	1.3	51.8	18.4	70.2	0.25	0.14	Hembree A	
648-647	10	343	123.43	122.41	1.1	1.3	37.0	13.7	50.7	0.21	0.09	Hembree A	
649-648	10	108	123.91	123.43	1.5	1.4	35.6	12.7	48.2	0.18	0.07	Hembree A	
650-649	10	180	124.54	123.91	0.6	1.3	32.1	11.2	43.3	0.18	0.07	Hembree A	
651-650	8	229	125.80	124.54	0.6	1.5	30.9	10.6	41.5	0.22	0.10	Hembree A	
652-651	8	234	126.90	125.80	10.0	1.4	29.7	10.0	39.7	0.22	0.11	Hembree A	
663-667	18	344	120.60	120.12	2.1	1.0	46.9	29.4	76.3	0.14	0.04	Hembree A	
665-668	18	363	122.00	121.73	2.1	1.0	125.4	99.8	225.2	0.28	0.18	Hembree A	
666-669	18	351	121.10	120.56	2.3	1.5	168.2	117.8	286.0	0.27	0.15	Hembree A	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
667-671	24	38	120.12	116.88	0.3	6.2	215.3	149.5	364.7	0.08	0.01	Hembree A	
668-666	18	350	121.73	121.10	2.0	1.4	125.4	101.8	227.2	0.23	0.11	Hembree A	
669-667	18	338	120.56	120.12	2.0	1.4	168.2	119.8	288.0	0.28	0.17	Hembree A	
670-602	24	328	115.65	113.42	2.6	2.5	215.3	153.1	368.4	0.14	0.04	Hembree A	
671-670	24	145	116.68	115.65	1.1	2.6	215.3	150.6	365.8	0.14	0.04	Hembree A	
889-890	10	276	123.03	122.60	0.9	1.2	69.4	77.3	146.7	0.43	0.38	Hembree A	
890-665	18	337	122.60	122.00	2.0	1.2	69.4	79.3	148.7	0.18	0.07	Hembree A	
594-608	8	657	116.81	112.22	87.1	1.6	28.7	87.0	115.7	0.34	0.25	Hembree B	
601-607	12	144	107.18	106.73	2.4	2.0	193.4	488.5	681.9	0.66	0.77	Hembree B	
607-567	12	219	106.73	102.56	6.6	3.9	193.4	495.1	688.5	0.38	0.31	Hembree B	
608-601	8	729	112.22	107.48	89.2	1.9	54.1	176.0	230.1	0.51	0.52	Hembree B	
612-601	12	219	107.53	107.18	15.0	1.4	110.6	310.1	420.6	0.59	0.65	Hembree B	
681-685	12	463	109.05	108.39	20.2	1.1	56.1	85.5	141.5	0.33	0.23	Hembree B	
682-681	12	345	109.26	109.05	4.9	0.8	56.0	65.3	121.3	0.38	0.31	Hembree B	
685-686	12	21	108.39	108.38	137.6	0.8	94.5	223.1	317.6	0.79	0.97	Hembree B	SS-8
686-687	12	76	108.38	108.36	5.4	0.7	96.1	228.5	324.6	1.00	1.13	Hembree B	SS-8
687-689	12	31	108.36	108.11	7.6	2.3	97.2	236.1	333.4	0.33	0.23	Hembree B	SS-8
689-690	12	116	108.11	108.08	12.0	0.7	98.8	248.2	346.9	1.00	1.39	Hembree B	SS-8
690-692	12	191	108.08	107.96	16.0	1.0	101.9	264.2	366.1	0.74	0.90	Hembree B	
692-694	12	94	107.96	107.76	19.6	1.5	107.6	283.8	391.3	0.52	0.53	Hembree B	
694-612	12	101	107.76	107.53	11.2	1.5	109.0	295.0	404.0	0.52	0.53	Hembree B	
710-682	12	288	109.68	109.26	32.3	0.9	30.7	60.5	91.3	0.26	0.15	Hembree B	
711-710	12	339	110.24	109.68	11.9	0.5	3.9	28.2	32.1	0.15	0.05	Hembree B	
ECO-1-711	10	240	111.00	110.24	9.3	-	-	16.3	16.3	0.12	0.03	Hembree B	
1142-883	8	123	129.91	129.38	0.6	1.4	33.8	32.3	66.1	0.29	0.18	Hembree C	
1143-1142	6	121	130.55	129.91	31.7	1.6	33.5	31.7	65.1	0.41	0.36	Hembree C	
880-884	8	181	127.55	126.86	5.1	1.5	44.2	42.2	86.5	0.35	0.26	Hembree C	
881-880	8	170	128.36	127.55	0.9	1.6	38.9	37.1	76.0	0.30	0.20	Hembree C	
882-881	8	124	129.09	128.36	1.4	1.7	38.8	36.2	75.0	0.29	0.18	Hembree C	
883-882	8	61	129.38	129.09	2.5	1.5	36.6	34.8	71.4	0.30	0.19	Hembree C	
884-885	10	240	126.86	125.76	12.9	1.6	54.1	55.1	109.3	0.27	0.16	Hembree C	
885-886	10	228	125.76	125.58	3.7	0.9	56.6	58.8	115.4	0.45	0.42	Hembree C	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
886-887	10	336	125.58	124.80	2.2	1.3	56.6	60.9	117.6	0.34	0.25	Hembree C	
887-888	10	138	124.80	124.27	13.7	1.7	69.4	74.6	144.0	0.33	0.24	Hembree C	
888-889	10	296	124.27	123.03	1.9	1.7	69.4	76.4	145.9	0.32	0.23	Hembree C	
1056-985	18	213	117.55	117.22	45.5	1.2	94.6	542.2	636.8	0.40	0.34	Los Amigos	
1334-1056	18	281	117.97	117.55	13.8	1.2	83.6	496.7	580.3	0.39	0.32	Los Amigos	
1336-1334	18	279	118.52	117.97	13.6	1.3	80.9	483.0	563.8	0.35	0.27	Los Amigos	
1344-1336	18	292	118.96	118.52	14.2	1.2	79.7	469.3	549.0	0.37	0.30	Los Amigos	
1346-1344	18	71	119.13	118.96	20.3	1.4	78.2	455.0	533.2	0.33	0.23	Los Amigos	
1347-1346	18	130	119.22	119.13	6.4	0.8	71.9	434.8	506.6	0.45	0.42	Los Amigos	
1348-1347	18	245	119.85	119.22	12.0	1.3	70.3	428.4	498.6	0.31	0.21	Los Amigos	
1349-1350	18	233	120.35	120.00	25.0	1.1	68.2	408.2	476.4	0.35	0.26	Los Amigos	
1350-1348	18	167	120.00	119.85	8.2	0.9	68.2	416.4	484.6	0.40	0.34	Los Amigos	
1353-1349	18	97	120.74	120.35	4.8	1.5	63.4	383.2	446.6	0.26	0.15	Los Amigos	
1354-1353	18	325	121.28	120.74	15.9	1.1	63.4	378.4	441.8	0.33	0.23	Los Amigos	
1355-1354	18	323	121.77	121.28	15.8	1.1	63.4	362.5	425.9	0.33	0.23	Los Amigos	
1438-1449	18	277	124.80	124.06	49.6	1.2	52.1	299.7	351.8	0.26	0.14	Los Amigos	
1439-1438	18	183	125.08	124.80	10.9	1.0	43.4	250.1	293.4	0.27	0.16	Los Amigos	
1440-1439	18	229	125.64	125.08	15.2	1.1	43.4	239.2	282.6	0.23	0.12	Los Amigos	
1441-1440	18	185	125.95	125.64	11.0	1.0	43.4	224.0	267.4	0.25	0.14	Los Amigos	
1445-1451	18	251	123.34	122.85	6.1	1.1	57.7	320.5	378.2	0.29	0.18	Los Amigos	
1446-1445	18	43	123.45	123.34	7.0	1.3	55.1	314.4	369.5	0.26	0.15	Los Amigos	
1449-1446	18	234	124.06	123.45	7.7	1.2	52.1	307.4	359.5	0.26	0.15	Los Amigos	
1451-1580	18	294	122.85	122.26	10.5	1.2	60.1	331.0	391.1	0.29	0.18	Los Amigos	
1521-1524	12	30	131.19	130.86	7.3	2.0	39.6	29.9	69.6	0.14	0.04	Los Amigos	
1524-1525	12	234	130.86	130.36	-	1.1	39.6	29.9	69.6	0.21	0.09	Los Amigos	
1525-1526	12	221	130.36	130.04	20.7	1.0	40.1	50.7	90.8	0.26	0.15	Los Amigos	
1526-1527	12	227	130.04	129.69	21.3	1.0	40.1	72.0	112.1	0.29	0.18	Los Amigos	
1527-1528	12	143	129.69	129.23	13.4	1.3	42.5	85.4	127.9	0.25	0.14	Los Amigos	
1528-1529	12	430	129.23	128.49	40.3	1.1	42.5	125.7	168.2	0.34	0.25	Los Amigos	
1529-1530	12	269	128.49	128.00	25.2	1.1	42.5	150.9	193.5	0.36	0.28	Los Amigos	
1530-1531	12	269	128.00	127.47	25.2	1.1	42.5	176.2	218.7	0.38	0.31	Los Amigos	
1531-1532	12	266	127.47	126.52	24.9	1.4	42.8	201.1	243.9	0.34	0.25	Los Amigos	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1532-1441	18	165	126.32	125.95	11.9	1.1	43.4	213.0	256.4	0.23	0.11	Los Amigos	
1580-1355	18	322	122.26	121.77	15.7	1.1	63.4	346.8	410.2	0.32	0.22	Los Amigos	
958-957	18	153	110.89	110.76	-	1.0	99.4	572.7	672.1	0.49	0.49	Los Amigos	SS-15
976-983	18	287	116.09	115.26	-	1.6	99.4	572.8	672.1	0.35	0.26	Los Amigos	
981-958	18	145	110.94	110.89	-	0.7	99.4	572.7	672.1	0.65	0.76	Los Amigos	SS-15
982-981	18	258	111.50	110.94	-	1.4	99.4	572.7	672.1	0.38	0.31	Los Amigos	
983-982	8	117	115.26	111.50	-	3.1	41.7	240.4	282.2	0.37	0.29	Los Amigos	
983-982	12	111	115.26	111.50	-	3.3	57.6	332.3	389.9	0.25	0.13	Los Amigos	
984-976	18	394	116.65	116.09	19.2	1.2	94.6	572.8	667.3	0.42	0.37	Los Amigos	
985-984	18	231	117.22	116.65	11.3	1.4	94.6	553.5	648.1	0.36	0.28	Los Amigos	
1021-1022	15	144	104.86	104.61	17.1	1.7	245.1	1,340.1	1,585.2	1.00	1.29	North A	SS-9
1022-794	15	242	104.61	104.11	31.1	2.1	365.3	2,318.0	2,683.4	1.00	2.02	North A	SS-1
1023-1021	15	437	105.52	104.86	98.2	1.6	236.5	1,291.6	1,528.1	1.00	1.36	North A	SS-9
1057-1021	10	309	115.22	112.76	24.5	1.1	7.1	31.4	38.4	0.14	0.04	North A	
1666-1910	24	245	94.98	94.28	37.2	2.6	632.2	2,943.5	3,575.6	0.59	0.66	North A	SS-11
1667-1666	24	289	95.33	94.98	63.4	1.9	632.2	2,906.2	3,538.4	0.81	0.99	North A	SS-11
1907-808	10	279	98.81	97.32	22.1	3.3	587.5	2,820.8	3,408.2	1.00	4.73	North A	SS-1
790-797	15	57	103.46	103.43	114.7	1.2	535.3	2,536.5	3,071.9	1.00	5.22	North A	SS-1
794-790	15	531	104.11	103.46	103.8	1.7	396.0	2,421.9	2,817.9	1.00	2.77	North A	SS-1
797-798	15	210	103.43	102.86	25.0	2.5	536.6	2,561.5	3,098.2	1.00	2.03	North A	SS-1
798-801	15	203	102.86	102.71	71.7	1.6	560.5	2,633.2	3,193.7	1.00	4.06	North A	SS-1
801-802	15	85	102.71	102.57	35.7	2.1	560.5	2,668.9	3,229.4	1.00	2.76	North A	SS-1
802-804	15	97	102.57	102.42	49.4	2.1	573.3	2,718.3	3,291.5	1.00	2.86	North A	SS-1
804-807	10	402	102.42	101.88	79.5	2.4	587.5	2,797.8	3,385.2	1.00	9.35	North A	SS-1
807-1907	10	11	101.88	98.81	0.9	13.9	587.5	2,798.7	3,386.1	0.59	0.66	North A	SS-1
808-1667	10	278	97.32	95.33	22.0	3.7	632.2	2,842.7	3,474.9	1.00	4.16	North A	SS-1
831-1867	12	188	88.70	87.97	-	1.7	75.5	423.3	498.8	0.50	0.50	North A	
1081-1023	15	368	106.47	105.52	17.4	1.8	191.6	1,193.4	1,385.0	0.77	0.94	North B	
1082-1081	15	261	107.41	106.47	88.8	2.0	179.0	1,175.9	1,354.9	0.66	0.77	North B	
1083-1082	15	508	108.46	107.41	44.5	1.7	170.1	1,087.1	1,257.3	0.78	0.95	North B	
1087-1083	15	314	109.30	108.46	26.6	1.8	169.7	1,042.6	1,212.4	0.68	0.81	North B	
1378-1087	15	293	110.06	109.30	44.3	1.8	169.7	1,016.0	1,185.7	0.68	0.80	North B	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1390-1391	8	228	116.53	115.54	6.5	1.6	47.4	70.9	118.3	0.40	0.33	North B	
1391-1404	8	103	115.54	114.48	4.7	2.2	47.4	75.5	123.0	0.32	0.22	North B	
1392-1390	8	111	117.14	116.53	2.1	1.7	44.6	64.3	108.9	0.36	0.27	North B	
1393-1392	8	96	117.19	117.14	6.0	0.7	43.8	62.2	106.0	0.69	0.82	North B	
1394-1378	15	456	111.25	110.06	64.6	1.7	134.0	971.7	1,105.7	0.64	0.75	North B	
1400-1394	10	8	112.04	111.55	0.4	5.2	116.0	907.0	1,023.0	0.45	0.41	North B	
1401-1402	10	331	115.06	113.23	34.4	1.9	68.5	785.5	854.1	1.00	1.17	North B	SS-2
1402-1400	10	563	113.13	112.14	31.8	1.5	116.0	906.6	1,022.6	1.00	2.47	North B	SS-2
1403-1402	8	32	113.28	113.13	1.4	1.6	47.4	89.2	136.6	0.42	0.37	North B	
1404-1403	8	270	114.48	113.28	12.2	1.6	47.4	87.8	135.2	0.42	0.37	North B	
1416-1401	10	267	115.20	115.06	21.6	0.8	61.8	751.1	812.9	1.00	3.71	North B	SS-2
1417-1416	10	42	115.30	115.20	6.5	1.4	60.8	729.4	790.1	1.00	1.61	North B	SS-2
55-1393	8	202	118.11	117.19	56.2	1.5	38.9	56.2	95.0	0.35	0.26	North B	
1067-1057	10	299	117.12	115.22	6.9	0.5	0.9	7.0	7.9	0.07	0.01	North C	
1068-1070	6	185	110.48	107.03	6.9	1.1	2.3	10.8	13.0	0.13	0.04	North C	
1070-1073	6	361	104.23	102.89	5.0	0.7	2.6	15.8	18.4	0.23	0.12	North C	
1073-1074	12	9	102.89	102.31	20.3	2.0	5.0	36.1	41.1	0.07	0.01	North C	
1074-1075	12	182	95.11	94.87	5.1	1.1	75.5	407.9	483.3	0.69	0.83	North C	
1075-1076	12	42	94.87	94.52	1.2	2.2	75.5	409.0	484.5	0.40	0.33	North C	
1076-1077	12	59	94.52	94.07	1.6	2.1	75.5	410.7	486.1	0.41	0.35	North C	
1077-823	12	120	94.07	93.69	3.3	1.6	75.5	414.0	489.5	0.52	0.54	North C	
1078-1074	12	300	96.54	95.21	8.4	1.7	69.7	366.7	436.4	0.45	0.41	North C	
1098-1099	6	37	110.86	110.73	3.2	1.0	12.2	66.1	78.3	0.52	0.54	North C	
1099-1110	6	439	110.73	109.06	7.3	1.1	12.3	73.4	85.7	0.53	0.55	North C	
1101-1098	6	527	114.03	110.86	62.9	1.2	11.3	62.9	74.2	0.43	0.38	North C	
1106-1109	8	180	103.02	102.28	22.6	1.4	30.4	131.7	162.1	0.48	0.46	North C	
1107-1106	8	294	104.13	103.02	7.9	1.2	22.9	109.1	132.0	0.44	0.40	North C	
1108-1107	8	282	105.26	104.13	7.7	1.2	21.2	101.1	122.3	0.41	0.35	North C	
1109-1776	8	225	102.28	101.08	4.2	1.5	30.4	135.9	166.3	0.45	0.42	North C	
1110-1779	6	449	109.06	107.28	6.3	1.1	12.4	79.6	92.1	0.55	0.58	North C	
1114-1108	8	109	105.78	105.26	2.0	1.3	19.8	93.4	113.2	0.38	0.30	North C	
1120-1114	8	100	106.03	105.78	91.4	1.0	19.4	91.4	110.8	0.44	0.41	North C	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1776-1777	8	350	101.08	99.58	62.5	1.5	43.6	198.4	241.9	0.60	0.68	North C	
1777-1781	8	218	99.58	98.20	4.0	1.8	43.9	202.4	246.3	0.54	0.57	North C	
1778-1780	6	201	102.00	101.23	2.2	1.1	12.6	86.5	99.1	0.58	0.63	North C	
1779-1778	6	332	107.28	102.20	4.6	1.7	12.6	84.3	96.9	0.38	0.31	North C	
1780-1863	6	11	101.23	97.08	0.2	5.3	13.0	86.7	99.6	0.17	0.07	North C	
1781-1863	8	9	98.20	97.18	0.2	5.0	44.2	202.5	246.7	0.24	0.13	North C	
1782-1078	12	111	96.90	96.54	3.1	1.5	69.1	358.4	427.5	0.48	0.47	North C	
1863-1782	12	112	97.08	96.90	66.0	1.2	69.0	355.3	424.2	0.59	0.66	North C	
425-1068	6	277	116.47	110.48	3.9	0.7	0.5	3.9	4.4	0.08	0.01	North C	
820-824	12	186	92.37	91.71	-	1.6	75.5	423.3	498.8	0.51	0.52	North C	
821-820	12	24	92.45	92.37	0.7	1.6	75.5	423.3	498.8	0.52	0.53	North C	
822-821	12	260	93.37	92.45	7.2	1.6	75.5	422.7	498.1	0.51	0.52	North C	
823-822	12	51	93.69	93.37	1.4	2.0	75.5	415.4	490.9	0.43	0.39	North C	
824-825	12	72	91.71	91.46	-	1.6	75.5	423.3	498.8	0.52	0.53	North C	
825-826	12	74	91.46	91.29	-	1.4	75.5	423.3	498.8	0.58	0.64	North C	
826-828	12	292	91.29	89.66	-	1.9	75.5	423.3	498.8	0.45	0.42	North C	
828-830	12	142	89.66	89.11	-	1.7	75.5	423.3	498.8	0.50	0.50	North C	
830-831	12	61	89.11	88.70	-	2.0	75.5	423.3	498.8	0.43	0.38	North C	
1418-1417	10	93	115.36	115.30	266.1	0.8	59.7	722.9	782.5	1.00	3.12	North D	SS-2
1419-1418	10	325	116.33	115.36	21.3	1.3	46.0	456.8	502.8	0.77	0.93	North D	SS-2
1423-1419	10	176	116.65	116.33	11.5	1.1	44.4	435.5	479.9	1.00	1.14	North D	SS-2
1520-30	6	167	129.55	129.09	6.4	0.3	0.4	6.5	6.8	0.15	0.05	North D	
1533-1521	6	350	133.02	131.19	4.2	1.6	35.2	22.6	57.8	0.39	0.32	North D	
1534-1533	6	350	134.26	133.02	4.2	1.4	34.9	18.4	53.3	0.41	0.35	North D	
1536-1534	6	589	136.08	134.26	11.2	1.3	34.2	14.1	48.4	0.41	0.34	North D	
1537-1536	6	111	136.36	136.08	1.3	0.3	0.2	3.0	3.3	0.11	0.03	North D	
30-31	6	470	129.09	127.18	5.7	0.4	0.4	12.1	12.5	0.19	0.08	North D	
31-34	6	157	127.18	126.41	8.3	0.8	3.1	20.4	23.5	0.25	0.13	North D	
34-35	6	267	126.41	125.46	3.2	0.7	3.6	23.6	27.2	0.29	0.18	North D	
35-39	6	352	125.46	123.50	30.2	1.1	7.9	53.8	61.7	0.39	0.33	North D	
39-40	6	58	123.50	123.17	2.7	1.1	8.2	56.5	64.7	0.40	0.34	North D	
40-41	6	318	123.17	119.64	14.8	1.4	8.2	71.2	79.4	0.37	0.30	North D	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
41-42	6	110	119.64	117.20	5.1	1.8	8.9	76.3	85.2	0.32	0.23	North D	
42-1423	10	198	117.20	116.65	97.8	1.3	43.4	424.0	467.4	0.74	0.90	North D	
650-1537	6	141	136.72	136.36	1.7	-	-	1.7	1.7	0.08	0.01	North D	
9-11	10	83	122.91	122.27	168.0	1.3	12.3	168.0	180.2	0.31	0.21	North E	
11-12	10	339	122.27	121.35	35.6	1.0	16.8	203.5	220.4	0.46	0.43	North E	
12-13	10	125	121.35	121.03	22.1	1.0	18.6	225.7	244.2	0.50	0.50	North E	
13-23	10	88	121.03	120.85	24.3	1.0	28.7	250.0	278.7	0.57	0.62	North E	
23-24	10	218	120.85	120.29	-	1.1	29.5	250.0	279.5	0.54	0.56	North E	
24-43	10	483	120.29	119.05	-	1.1	30.9	250.0	280.9	0.54	0.56	North E	
43-44	10	62	119.05	118.76	-	1.4	31.7	250.0	281.7	0.45	0.41	North E	
44-42	10	634	118.76	117.30	-	1.1	34.0	250.0	284.0	0.56	0.60	North E	
185-187	12	211	111.27	110.49	5.1	1.8	97.2	394.3	491.5	0.50	0.50	South A	
187-188	12	252	110.49	109.81	10.1	1.6	100.6	404.4	505.1	0.56	0.61	South A	
188-239	12	227	109.81	108.74	-	2.0	103.0	404.4	507.4	0.48	0.46	South A	
234-247	14	264	107.07	106.55	31.7	1.7	187.1	610.3	797.4	0.64	0.74	South A	
239-234	12	233	108.74	107.07	10.4	2.7	185.2	578.6	763.9	0.54	0.56	South A	
240-239	6	258	110.80	109.14	3.1	2.2	81.1	163.8	244.8	1.00	1.21	South A	SS-3
241-240	6	126	111.32	110.80	6.2	1.8	81.1	160.6	241.7	1.00	1.50	South A	SS-3
244-241	6	150	111.78	111.32	38.4	1.6	79.6	154.5	234.1	1.00	1.66	South A	SS-3
247-248	14	640	106.55	105.71	22.5	1.4	187.2	633.0	820.2	0.77	0.94	South A	SS-14
248-249	14	39	105.71	105.45	1.1	2.6	187.9	634.1	822.0	0.44	0.41	South A	SS-14
249-566	14	346	105.45	104.99	15.0	1.5	188.2	649.1	837.4	0.78	0.95	South A	SS-14
564-565	14	978	104.42	102.85	30.6	1.7	256.9	699.3	956.2	0.81	0.99	South A	SS-14
566-564	14	437	104.99	104.42	19.3	1.5	189.3	668.5	857.9	0.80	0.98	South A	SS-14
580-244	6	254	112.79	111.78	9.3	1.7	63.3	116.0	179.3	1.00	1.13	South A	SS-3
581-580	6	178	113.60	112.79	39.7	1.8	58.3	106.8	165.1	0.79	0.97	South A	SS-3
582-581	6	181	114.26	113.60	41.5	1.4	36.3	67.0	103.4	0.60	0.68	South A	
589-582	6	120	114.86	114.26	25.5	1.2	15.2	25.5	40.7	0.32	0.23	South A	
155-157	12	185	117.33	116.65	17.9	0.7	4.2	45.1	49.3	0.15	0.05	South B	
157-178	12	327	116.65	116.13	49.2	0.7	11.0	94.3	105.3	0.27	0.16	South B	
167-171	6	593	116.08	113.50	20.0	1.6	47.8	85.4	133.1	0.68	0.80	South B	SS-18
171-173	12	149	113.30	112.78	7.2	1.7	90.4	349.4	439.8	0.48	0.46	South B	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
172-171	12	239	113.95	113.30	16.0	1.2	34.8	256.8	291.6	0.41	0.35	South B	
173-182	12	252	112.78	111.93	17.5	1.7	93.1	366.9	460.1	0.50	0.50	South B	
176-180	12	221	115.67	115.42	32.1	0.8	27.3	150.2	177.5	0.39	0.33	South B	
177-176	12	280	115.98	115.67	18.8	0.7	14.1	118.1	132.2	0.34	0.25	South B	
178-177	12	128	116.13	115.98	4.9	0.6	11.0	99.3	110.2	0.31	0.20	South B	
180-181	12	155	115.42	115.25	10.4	0.8	27.6	160.6	188.2	0.41	0.35	South B	
181-172	12	476	115.25	113.95	80.4	1.2	34.8	240.9	275.6	0.39	0.33	South B	
182-184	12	251	111.93	111.38	20.1	1.5	95.2	387.1	482.3	0.58	0.64	South B	
184-185	12	42	111.38	111.27	2.1	1.6	96.0	389.2	485.2	0.56	0.59	South B	
408-409	12	448	118.64	117.91	20.5	0.3	0.6	20.5	21.1	0.12	0.03	South B	
409-410	12	78	117.91	117.68	3.0	0.6	3.5	23.5	27.0	0.12	0.03	South B	
410-155	12	97	117.68	117.33	3.7	0.6	3.5	27.2	30.7	0.12	0.03	South B	
497-498	6	463	124.76	121.08	58.4	1.9	38.2	58.4	96.6	0.46	0.43	South B	
498-499	6	439	121.08	117.13	5.2	2.0	39.4	63.6	102.9	0.46	0.43	South B	
499-167	6	109	117.03	116.08	1.8	2.0	39.4	65.4	104.7	0.47	0.45	South B	
1669-1668	24	106	81.36	81.26	19.9	1.2	158.8	624.7	783.5	0.34	0.24	West	
1674-1669	18	127	81.65	81.36	2.7	1.6	145.1	604.8	749.9	0.40	0.33	West	
1675-1674	15	241	82.05	81.65	4.1	1.3	102.5	525.2	627.8	0.52	0.53	West	
1676-1675	15	300	82.41	82.05	4.5	1.2	99.7	521.1	620.9	0.57	0.62	West	
1677-1674	8	230	81.93	81.65	13.9	1.0	41.2	76.8	118.1	0.57	0.62	West	
1680-1677	8	224	83.25	81.93	1.4	1.6	33.1	63.0	96.1	0.33	0.23	West	
1683-1680	8	224	84.07	83.25	1.4	1.4	33.1	61.6	94.7	0.37	0.29	West	
1684-1683	8	78	84.57	84.27	60.1	1.4	33.1	60.1	93.3	0.36	0.28	West	
1699-1676	15	242	82.95	82.41	2.8	1.4	99.0	516.6	615.5	0.47	0.45	West	
1700-1699	15	99	83.20	82.95	1.8	1.5	98.2	513.8	612.0	0.45	0.42	West	SS-17
1701-1700	15	106	83.27	83.20	1.2	0.9	97.8	512.1	609.9	0.69	0.82	West	SS-17
1728-1701	15	159	83.70	83.27	1.8	1.5	97.8	510.9	608.6	0.44	0.40	West	
1733-1728	15	159	83.97	83.70	30.5	1.3	97.5	509.1	606.6	0.50	0.51	West	
1736-1733	15	253	84.40	83.97	2.9	1.3	90.0	478.6	568.6	0.49	0.47	West	
1737-1736	15	236	84.70	84.40	9.4	1.2	89.1	475.8	564.9	0.53	0.55	West	
1741-1737	15	261	85.20	84.70	7.8	1.3	85.2	466.4	551.6	0.46	0.43	West	
1867-1868	12	155	87.97	87.58	-	1.4	75.5	423.3	498.8	0.57	0.62	West	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1868-833	12	36	87.58	87.48	-	1.5	75.5	423.3	498.8	0.56	0.61	West	
1883-1906	15	176	86.06	85.73	2.0	1.3	78.1	445.5	523.5	0.45	0.41	West	
1905-1883	15	242	86.47	86.06	2.8	1.2	78.1	443.5	521.6	0.46	0.44	West	
1906-832	15	179	85.73	85.47	2.0	1.1	78.1	447.5	525.6	0.49	0.48	West	
340-840	8	95	94.95	94.38	0.6	0.6	1.4	0.6	2.0	0.05	0.00	West	
832-1741	15	248	85.47	85.20	11.3	1.1	82.0	458.7	540.7	0.53	0.56	West	
833-1905	15	460	87.18	86.47	5.2	1.2	78.1	440.8	518.8	0.47	0.45	West	
834-833	15	43	87.48	87.18	0.5	0.7	2.6	12.3	14.9	0.06	0.01	West	
835-834	12	184	90.36	88.68	1.7	0.8	2.6	11.8	14.4	0.07	0.01	West	
836-835	12	218	90.96	90.36	2.0	0.5	2.6	10.1	12.8	0.09	0.02	West	
837-836	12	14	91.20	90.96	0.1	1.0	2.6	8.2	10.8	0.05	0.01	West	
838-837	8	254	92.18	91.20	3.9	0.6	2.6	8.1	10.7	0.12	0.03	West	
839-838	8	269	93.27	92.18	1.6	0.6	2.0	4.1	6.1	0.09	0.02	West	
840-839	8	282	94.38	93.27	1.7	0.6	1.7	2.4	4.1	0.08	0.01	West	
1644-1655	42	173	86.75	86.61	-	2.0	1,413.8	2,946.1	4,359.9	0.40	0.34	WWTP	
1649-1653	20	112	91.04	90.58	-	3.0	665.7	1,360.7	2,026.4	0.50	0.50	WWTP	
1653-1654	20	180	90.58	90.43	-	1.7	715.3	1,360.7	2,076.0	1.00	1.14	WWTP	SS-10
1654-1656	20	497	90.43	90.01	-	1.7	715.3	1,360.7	2,076.0	1.00	1.14	WWTP	SS-10
1655-1657	42	474	86.61	86.24	-	1.9	1,413.8	2,946.1	4,359.9	0.41	0.34	WWTP	
1656-1913	20	241	90.01	89.80	-	1.8	715.3	1,360.7	2,076.0	1.00	1.12	WWTP	SS-10
1657-1912	42	378	86.24	85.94	-	1.9	1,413.8	2,946.1	4,359.9	0.40	0.34	WWTP	
1658-1895	42	18	85.52	85.32	-	5.5	2,129.0	4,306.9	6,435.9	0.25	0.14	WWTP	
1659-1895	30	39	80.23	80.61	-	0.4	791.0	3,568.1	4,359.1	1.00		WWTP	
1660-1659	24	30	80.32	80.23	-	1.7	158.8	624.7	783.5	0.25	0.14	WWTP	
1661-1659	20	24	85.19	80.23	-	11.8	632.2	2,943.5	3,575.6	0.24	0.13	WWTP	SS-11
1662-1661	21	98	85.36	85.19	-	2.2	632.2	2,943.5	3,575.6	1.00	1.19	WWTP	SS-11
1664-1662	24	24	85.64	85.36	-	4.2	632.2	2,943.5	3,575.6	0.39	0.33	WWTP	SS-11
1665-1660	24	268	80.91	80.32	-	1.6	158.8	624.7	783.5	0.27	0.16	WWTP	
1668-1665	24	233	81.26	80.91	-	1.4	158.8	624.7	783.5	0.30	0.20	WWTP	
1896-1658	42	32	85.87	85.52	-	5.5	2,129.0	4,306.9	6,435.9	0.25	0.14	WWTP	
1897-1896	20	15	89.64	87.87	-	10.1	715.3	1,360.7	2,076.0	0.21	0.10	WWTP	SS-10
1908-768	6	82	97.03	95.95	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	

Existing Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1909-760	8	129	93.77	92.56	-	2.1	49.6	-	49.6	0.21	0.09	WWTP	
1910-1664	24	59	93.18	85.64	-	9.8	632.2	2,943.5	3,575.6	0.21	0.10	WWTP	SS-11
1911-1897	20	52	89.68	89.64	-	1.8	715.3	1,360.7	2,076.0	1.00	1.14	WWTP	SS-10
1912-1896	42	87	86.94	85.87	-	5.1	1,413.8	2,946.1	4,359.9	0.20	0.09	WWTP	
1913-1911	20	144	89.80	89.68	-	1.7	715.3	1,360.7	2,076.0	1.00	1.15	WWTP	SS-10
565-567	14	11	102.85	102.56	-	5.5	472.2	865.6	1,337.9	0.41	0.35	WWTP	SS-6
567-568	14	48	102.56	102.18	-	3.9	665.7	1,360.7	2,026.4	0.77	0.94	WWTP	SS-6
568-569	14	356	102.18	100.12	-	3.5	665.7	1,360.7	2,026.4	1.00	1.10	WWTP	SS-6
569-570	14	347	100.12	97.66	-	3.8	665.7	1,360.7	2,026.4	0.81	0.99	WWTP	SS-6
570-571	14	102	97.66	96.70	-	4.2	665.7	1,360.7	2,026.4	0.72	0.86	WWTP	SS-6
571-1649	14	1,020	96.40	91.54	-	3.3	665.7	1,360.7	2,026.4	1.00	1.21	WWTP	SS-6
757-759	8	251	94.06	93.73	-	1.0	45.5	-	45.5	0.33	0.23	WWTP	
759-1909	8	188	95.53	93.77	-	2.1	48.1	-	48.1	0.20	0.09	WWTP	
760-1653	8	420	92.56	91.48	-	1.3	49.6	-	49.6	0.29	0.18	WWTP	
768-757	6	143	95.95	94.06	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	
769-1908	6	332	101.40	97.03	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	
770-769	6	416	103.03	101.40	-	1.2	20.3	-	20.3	0.24	0.13	WWTP	

DRAFT

Los Amigos
North E
Bell Village A
North B
North D
Bell Village B
North C
North A
WRF
West
Brooks B
Brooks A
Hembree C
Hembree B
Hembree A
South A
South B
Conde B North
Conde A
Conde B South

Urban Growth Boundary
Town Limit
Sewer Basins
Sewer Pipe & Diameter - Modeled
Sewer Pipe - Not Modeled
Sewer Manhole & ID - Modeled
Sewer Cleanout & ID - Modeled
Water Reclamation Facility Inlet Pump Station

Paper Size ANSI A

0 500 1,000 1,500 2,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Sewer Model
Existing Pipes and Manholes

Project No. **11151247**
Revision No. **1**
Date **8/19/2020**

FIGURE C-3

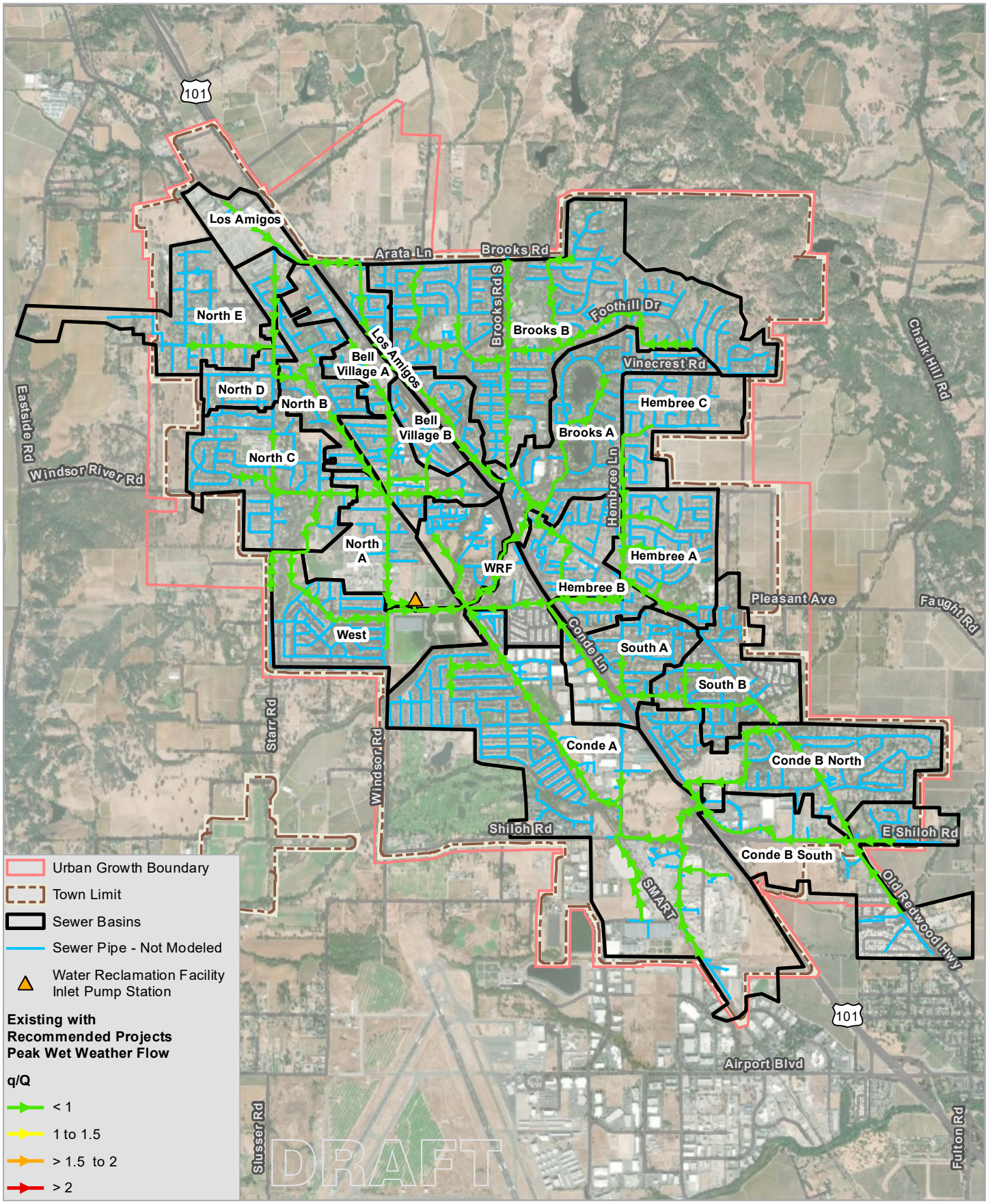
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Print date: 20 Aug 2020 - 11:09

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Appendix E – Existing Condition Model with CIP Fixes



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Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

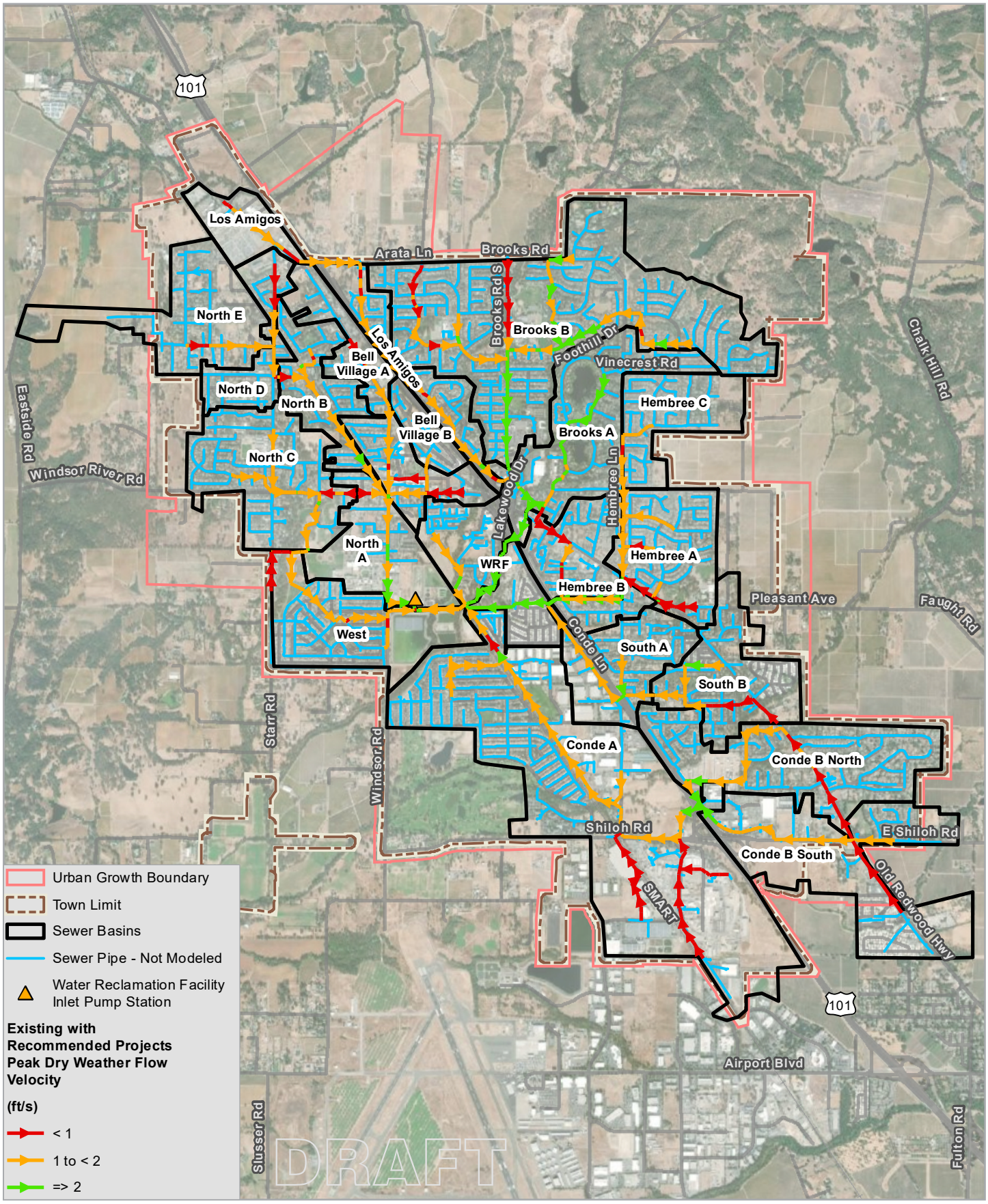
Existing with Recommended Projects Peak Wet Weather Flow Capacity Deficiencies Severity

Project No. 11151247
Revision No. 1
Date 8/19/2020

FIGURE D-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure D-1 - Existing with Recommended Projects Peak Wet Weather Flow Capacity Deficiencies Severity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2



Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Existing with Recommended Projects Peak Dry Weather Flow Velocity

Project No. 11151247
Revision No. 0
Date 8/19/2020

FIGURE D-2

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure D-2 - Existing with Recommended Projects Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1000	118.4	6.2	5.7	Bell Village A
MH-1001	117.1	0.8	6.6	Bell Village A
MH-1032	120.8	4.1	9.6	Bell Village A
MH-1033	119.1	3.7	7.7	Bell Village A
MH-1034	122.1	4.6	11.3	Bell Village A
MH-1035	118.7	2.8	6.4	Bell Village A
MH-1036	120.5	2.5	6.9	Bell Village A
MH-1037	121.5	1.3	7.4	Bell Village A
MH-1038	122.2	1.8	10.8	Bell Village A
MH-1039	122.0	1.7	10.3	Bell Village A
MH-1046	121.3	5.6	7.8	Bell Village A
MH-1053	122.9	11.5	8.2	Bell Village A
MH-1055	123.2	0.2	7.9	Bell Village A
MH-1360	129.9	1.3	9.7	Bell Village A
MH-1361	129.4	1.8	9.6	Bell Village A
MH-1364	123.7	9.4	7.8	Bell Village A
MH-1366	126.9	0.2	8.9	Bell Village A
MH-1367	127.6	5.2	9.1	Bell Village A
MH-1385	129.7	7.6	8.1	Bell Village A
MH-1386	129.3	1.1	7.5	Bell Village A
MH-1854	118.3	-	8.4	Bell Village A
MH-1855	121.5	-	10.8	Bell Village A
MH-1856	122.0	-	10.8	Bell Village A
MH-1857	121.8	-	10.5	Bell Village A
MH-1858	120.8	-	8.9	Bell Village A
MH-1889	122.1	1.3	10.2	Bell Village A
MH-1903	118.7	1.3	9.3	Bell Village A
MH-88	133.0	14.0	9.5	Bell Village A
MH-993	118.9	5.3	11.3	Bell Village A
MH-994	118.8	0.9	12.7	Bell Village A
MH-995	118.2	3.2	9.8	Bell Village A
MH-996	118.9	0.7	9.0	Bell Village A
MH-999	116.0	4.2	4.4	Bell Village A
MH-1859	122.7	-	10.2	Bell Village B
MH-1860	123.9	-	11.2	Bell Village B
MH-1861	124.3	-	11.6	Bell Village B
MH-1902	124.5	16.0	11.5	Bell Village B
MH-1237	131.6	-	7.4	Brooks A
MH-1238	132.0	0.6	5.7	Brooks A
MH-1239	132.9	1.9	5.6	Brooks A
MH-1243	128.9	38.4	6.2	Brooks A
MH-1244	134.0	12.6	5.8	Brooks A
MH-1245	135.4	-	6.2	Brooks A

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1246	136.1	-	6.2	Brooks A
MH-1249	140.6	9.9	6.3	Brooks A
MH-1251	144.3	0.6	8.0	Brooks A
MH-1252	145.5	97.5	8.1	Brooks A
MH-1651	101.6	-	12.1	Brooks A
MH-1652	102.0	-	11.9	Brooks A
MH-1904	119.9	-	8.9	Brooks A
MH-724	120.3	7.0	9.4	Brooks A
MH-726	119.1	-	20.0	Brooks A
MH-730	117.8	0.6	17.9	Brooks A
MH-731	117.7	27.2	19.4	Brooks A
MH-732	115.9	-	19.6	Brooks A
MH-733	111.7	19.1	17.1	Brooks A
MH-734	108.6	-	14.7	Brooks A
MH-735	109.0	-	15.2	Brooks A
MH-736	110.2	-	17.0	Brooks A
MH-742	107.5	-	14.9	Brooks A
MH-743	103.8	-	11.8	Brooks A
MH-744	104.3	-	12.7	Brooks A
MH-745	105.0	-	14.0	Brooks A
MH-898	121.5	17.5	9.3	Brooks A
MH-899	121.3	8.6	9.5	Brooks A
MH-900	120.3	6.6	9.1	Brooks A
MH-901	120.4	3.6	12.2	Brooks A
MH-912	123.4	49.7	6.7	Brooks A
MH-913	123.8	-	6.6	Brooks A
MH-919	123.5	-	7.3	Brooks A
MH-920	124.6	0.7	6.6	Brooks A
MH-921	125.0	1.0	6.5	Brooks A
MH-922	125.7	-	6.2	Brooks A
MH-923	126.6	-	6.0	Brooks A
MH-924	127.6	0.8	6.3	Brooks A
MH-925	127.7	1.0	6.2	Brooks A
MH-927	128.4	1.1	6.3	Brooks A
MH-928	124.3	-	8.5	Brooks A
MH-929	122.9	-	8.5	Brooks A
MH-930	121.8	-	9.2	Brooks A
MH-944	118.9	5.3	17.8	Brooks A
MH-945	118.8	-	17.7	Brooks A
MH-947	120.3	-	18.6	Brooks A
MH-948	120.9	-	12.9	Brooks A
MH-949	120.6	84.2	11.6	Brooks A
MH-951	120.0	-	10.5	Brooks A

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-952	120.1	-	10.8	Brooks A
MH-954	120.1	-	9.6	Brooks A
MH-956	120.1	-	9.3	Brooks A
MH-957	120.8	-	9.5	Brooks A
MH-961	119.9	21.7	8.7	Brooks A
MH-1203	174.2	33.2	9.2	Brooks B
MH-1209	171.8	1.1	9.0	Brooks B
MH-1210	166.1	2.0	6.3	Brooks B
MH-1211	161.6	2.9	6.5	Brooks B
MH-1212	160.1	1.7	6.6	Brooks B
MH-1213	166.9	0.9	13.8	Brooks B
MH-1214	167.2	-	14.4	Brooks B
MH-1220	166.4	20.9	15.0	Brooks B
MH-1221	165.6	1.1	14.9	Brooks B
MH-1242	128.8	-	14.2	Brooks B
MH-1277	142.5	0.4	10.3	Brooks B
MH-1278	141.5	1.2	11.2	Brooks B
MH-1280	140.2	1.3	10.8	Brooks B
MH-1281	139.5	0.6	10.6	Brooks B
MH-1282	139.0	1.6	10.5	Brooks B
MH-1283	140.6	1.9	13.0	Brooks B
MH-1284	142.5	-	15.9	Brooks B
MH-1285	141.2	0.2	22.2	Brooks B
MH-1286	139.2	6.5	21.0	Brooks B
MH-1288	135.4	15.0	18.8	Brooks B
MH-1289	134.2	7.8	17.9	Brooks B
MH-1290	130.1	4.9	15.1	Brooks B
MH-1299	138.7	1.1	18.7	Brooks B
MH-1300	136.9	1.5	16.4	Brooks B
MH-1301	136.1	5.2	15.5	Brooks B
MH-1302	135.7	-	14.9	Brooks B
MH-1305	136.0	-	14.9	Brooks B
MH-1306	138.1	22.7	16.6	Brooks B
MH-1453	164.3	4.2	14.9	Brooks B
MH-1456	148.6	2.9	8.1	Brooks B
MH-1457	153.6	1.1	7.7	Brooks B
MH-1458	155.7	3.3	9.0	Brooks B
MH-1460	160.8	1.1	12.3	Brooks B
MH-1461	144.2	2.6	8.3	Brooks B
MH-1462	142.9	1.0	9.7	Brooks B
MH-1463	143.3	1.4	6.4	Brooks B
MH-1466	145.0	2.8	6.7	Brooks B
MH-1467	146.9	-	7.5	Brooks B

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1468	148.6	18.9	7.8	Brooks B
MH-1482	155.3	3.7	8.8	Brooks B
MH-1483	149.2	2.1	6.7	Brooks B
MH-1484	155.5	4.3	8.3	Brooks B
MH-1486	145.6	1.8	13.9	Brooks B
MH-1487	150.0	0.2	16.2	Brooks B
MH-1488	153.3	-	17.9	Brooks B
MH-1489	153.8	-	18.0	Brooks B
MH-1490	153.7	-	17.4	Brooks B
MH-1491	155.3	0.6	7.7	Brooks B
MH-1495	158.1	0.2	9.1	Brooks B
MH-1499	156.6	9.6	8.2	Brooks B
MH-1501	158.2	-	8.0	Brooks B
MH-1502	165.4	-	4.7	Brooks B
MH-1503	174.3	18.6	10.6	Brooks B
MH-1557	138.9	0.4	17.0	Brooks B
MH-1558	139.2	0.6	10.2	Brooks B
MH-1561	140.0	1.4	10.2	Brooks B
MH-1562	141.4	28.2	10.9	Brooks B
MH-1568	137.7	2.0	15.6	Brooks B
MH-1569	135.5	0.9	12.6	Brooks B
MH-1570	134.0	8.0	10.9	Brooks B
MH-1571	134.3	-	10.9	Brooks B
MH-1572	133.5	6.1	9.8	Brooks B
MH-1573	133.3	4.2	9.3	Brooks B
MH-1574	133.6	1.1	9.1	Brooks B
MH-1595	137.0	1.8	11.8	Brooks B
MH-1597	139.9	7.4	14.3	Brooks B
MH-1599	139.5	5.3	13.9	Brooks B
MH-1610	140.3	22.7	14.3	Brooks B
MH-1611	139.6	-	13.9	Brooks B
MH-1612	140.7	0.9	14.2	Brooks B
MH-1613	140.9	0.2	14.2	Brooks B
MH-1614	141.0	0.6	14.0	Brooks B
MH-1615	142.0	4.6	14.9	Brooks B
MH-1627	143.9	0.1	16.5	Brooks B
MH-963	120.8	-	9.2	Brooks B
MH-964	121.6	7.4	9.5	Brooks B
MH-966	122.3	6.1	9.8	Brooks B
MH-967	125.7	7.0	12.1	Brooks B
MH-968	126.1	13.9	12.5	Brooks B
MH-111	107.2	-	12.7	Conde A
MH-112	109.4	-	15.2	Conde A

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-113	107.9	-	14.3	Conde A
MH-114	106.9	-	13.9	Conde A
MH-115	105.8	-	12.9	Conde A
MH-116	104.7	-	12.0	Conde A
MH-117	107.8	-	10.0	Conde A
MH-119	108.6	-	8.2	Conde A
MH-120	109.0	28.2	8.3	Conde A
MH-122	104.6	6.7	12.3	Conde A
MH-123	103.2	-	11.0	Conde A
MH-124	103.1	0.5	11.2	Conde A
MH-125	101.7	-	10.0	Conde A
MH-1634	98.5	5.4	3.9	Conde A
MH-1635	99.3	10.0	3.9	Conde A
MH-1636	106.1	2.9	13.9	Conde A
MH-1637	103.8	2.6	10.8	Conde A
MH-1638	101.3	5.5	7.5	Conde A
MH-1642	103.2	-	13.7	Conde A
MH-1643	102.7	-	13.9	Conde A
MH-1799	111.6	3.5	7.5	Conde A
MH-1845	114.2	-	12.9	Conde A
MH-1846	114.1	-	11.5	Conde A
MH-1847	115.1	-	11.6	Conde A
MH-1848	115.4	0.2	11.8	Conde A
MH-1869	113.9	-	12.1	Conde A
MH-1872	108.8	0.5	11.4	Conde A
MH-1914	109.2	-	14.1	Conde A
MH-1915	115.2	-	15.2	Conde A
MH-202	104.8	131.0	13.2	Conde A
MH-214	108.1	-	17.1	Conde A
MH-215	108.4	-	17.6	Conde A
MH-216	108.5	-	18.0	Conde A
MH-217	113.5	-	23.5	Conde A
MH-252	109.0	-	17.8	Conde A
MH-272	117.2	-	17.5	Conde A
MH-273	111.7	-	13.3	Conde A
MH-274	111.9	-	14.0	Conde A
MH-275	113.1	-	15.9	Conde A
MH-296	111.8	0.2	14.9	Conde A
MH-297	111.5	-	14.3	Conde A
MH-298	109.0	7.6	13.5	Conde A
MH-299	109.7	-	13.7	Conde A
MH-300	110.3	-	13.9	Conde A
MH-301	114.0	-	16.3	Conde A

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-302	114.9	0.1	16.5	Conde A
MH-303	113.6	0.6	14.9	Conde A
MH-304	113.1	-	14.3	Conde A
MH-310	113.1	-	13.6	Conde A
MH-311	114.2	-	14.4	Conde A
MH-312	115.6	-	15.5	Conde A
MH-313	117.0	4.8	16.2	Conde A
MH-314	117.4	-	16.0	Conde A
MH-315	113.3	-	14.2	Conde A
MH-317	114.4	-	14.6	Conde A
MH-319	113.7	-	13.0	Conde A
MH-320	113.6	-	12.8	Conde A
MH-324	113.5	-	16.1	Conde A
MH-325	113.7	-	15.0	Conde A
MH-326	112.7	-	13.0	Conde A
MH-327	112.3	-	11.7	Conde A
MH-328	112.1	-	10.4	Conde A
MH-329	111.8	-	9.7	Conde A
MH-330	111.3	-	7.8	Conde A
MH-331	107.6	-	13.0	Conde A
MH-332	109.7	-	14.8	Conde A
MH-333	112.3	-	15.9	Conde A
MH-334	110.3	-	14.2	Conde A
MH-335	110.5	0.3	14.9	Conde A
MH-430	99.8	11.4	4.0	Conde A
MH-431	100.1	15.5	3.6	Conde A
MH-451	101.0	62.4	3.8	Conde A
MH-577	107.6	0.5	16.0	Conde A
MH-578	114.7	9.8	24.9	Conde A
MH-579	110.2	-	20.5	Conde A
MH-151	123.2	3.8	8.9	Conde B North
MH-152	122.4	0.8	9.1	Conde B North
MH-154	124.5	1.3	9.0	Conde B North
MH-265	115.2	19.6	12.9	Conde B North
MH-267	115.3	-	9.8	Conde B North
MH-268	116.5	27.4	8.3	Conde B North
MH-269	118.6	27.4	9.0	Conde B North
MH-270	120.6	11.9	10.0	Conde B North
MH-271	117.4	0.2	15.8	Conde B North
MH-291	121.4	0.3	10.2	Conde B North
MH-292	123.0	4.9	10.4	Conde B North
MH-349	135.0	2.0	13.8	Conde B North
MH-350	135.6	21.3	14.2	Conde B North

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-351	137.3	13.0	15.5	Conde B North
MH-378	132.9	1.0	12.0	Conde B North
MH-388	124.8	1.2	7.7	Conde B North
MH-389	128.0	1.7	9.6	Conde B North
MH-390	130.2	0.6	10.9	Conde B North
MH-391	130.5	8.6	10.3	Conde B North
MH-406	130.6	9.6	10.7	Conde B North
MH-407	130.1	-	10.3	Conde B North
MH-1808	145.3	6.9	13.0	Conde B South
MH-1809	142.6	18.8	13.5	Conde B South
MH-1810	138.0	0.2	15.5	Conde B South
MH-1811	138.0	-	14.6	Conde B South
MH-1818	122.4	-	10.6	Conde B South
MH-1819	122.8	-	10.5	Conde B South
MH-1820	123.9	5.5	9.8	Conde B South
MH-1821	124.7	2.3	9.7	Conde B South
MH-1822	126.3	0.8	10.1	Conde B South
MH-1824	131.0	7.0	11.8	Conde B South
MH-1825	138.1	-	15.5	Conde B South
MH-1826	138.2	0.6	14.8	Conde B South
MH-1830	136.8	-	12.7	Conde B South
MH-1831	134.8	4.8	10.2	Conde B South
MH-1874	117.5	-	11.3	Conde B South
MH-276	119.0	9.3	9.7	Conde B South
MH-277	119.1	0.8	10.4	Conde B South
MH-278	118.3	-	10.6	Conde B South
MH-279	118.0	10.6	10.9	Conde B South
MH-281	117.3	13.2	13.8	Conde B South
MH-336	120.1	2.5	10.1	Conde B South
MH-337	121.5	-	10.8	Conde B South
MH-516	136.5	7.4	13.8	Hembree A
MH-520	134.5	-	12.3	Hembree A
MH-521	134.3	-	12.3	Hembree A
MH-522	133.7	-	7.0	Hembree A
MH-523	131.9	-	10.4	Hembree A
MH-524	131.6	-	10.3	Hembree A
MH-525	131.2	-	10.0	Hembree A
MH-526	130.6	-	9.5	Hembree A
MH-528	132.4	7.9	7.1	Hembree A
MH-529	132.3	-	8.3	Hembree A
MH-530	132.6	-	10.1	Hembree A
MH-602	125.9	-	12.2	Hembree A
MH-603	123.0	-	11.9	Hembree A

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-604	119.6	-	10.7	Hembree A
MH-605	117.8	-	11.4	Hembree A
MH-606	116.1	-	11.9	Hembree A
MH-613	134.1	31.6	10.8	Hembree A
MH-635	135.2	15.4	11.0	Hembree A
MH-636	134.7	0.8	11.0	Hembree A
MH-637	134.0	3.3	11.0	Hembree A
MH-638	132.4	23.4	9.9	Hembree A
MH-647	132.9	14.9	10.3	Hembree A
MH-648	134.2	1.4	10.6	Hembree A
MH-649	135.1	3.4	11.0	Hembree A
MH-650	136.0	1.2	11.3	Hembree A
MH-651	136.0	1.2	10.1	Hembree A
MH-652	137.1	29.7	10.1	Hembree A
MH-663	129.4	-	8.6	Hembree A
MH-665	131.7	4.1	9.3	Hembree A
MH-666	130.3	-	8.8	Hembree A
MH-667	129.0	0.2	8.7	Hembree A
MH-668	131.7	-	9.7	Hembree A
MH-669	131.1	-	10.1	Hembree A
MH-670	126.4	-	10.4	Hembree A
MH-671	129.0	-	12.0	Hembree A
MH-889	135.0	-	11.6	Hembree A
MH-890	133.4	-	10.5	Hembree A
FAKECO-1	120.0	-	8.9	Hembree B
MH-594	126.0	28.7	9.0	Hembree B
MH-601	116.1	28.7	8.2	Hembree B
MH-607	116.2	-	9.1	Hembree B
MH-608	119.6	25.4	7.1	Hembree B
MH-612	117.0	1.6	8.9	Hembree B
MH-681	125.6	0.0	16.3	Hembree B
MH-682	124.0	25.3	14.3	Hembree B
MH-685	120.3	38.4	11.1	Hembree B
MH-686	119.4	1.6	10.3	Hembree B
MH-687	119.7	1.2	10.7	Hembree B
MH-689	119.0	1.5	10.1	Hembree B
MH-690	119.1	3.2	10.3	Hembree B
MH-692	118.1	5.6	9.6	Hembree B
MH-694	117.1	1.4	8.8	Hembree B
MH-710	122.3	26.8	12.3	Hembree B
MH-711	120.1	3.9	9.7	Hembree B
MH-1142	142.1	0.3	12.0	Hembree C
MH-1143	142.7	33.5	12.0	Hembree C

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-880	139.6	5.3	11.9	Hembree C
MH-881	140.3	0.1	11.7	Hembree C
MH-882	141.3	2.2	12.0	Hembree C
MH-883	141.5	2.8	11.9	Hembree C
MH-884	139.1	9.9	12.0	Hembree C
MH-885	136.8	2.5	10.6	Hembree C
MH-886	136.0	-	10.1	Hembree C
MH-887	133.1	12.8	8.0	Hembree C
MH-888	132.5	-	7.9	Hembree C
MH-1056	127.3	11.0	9.1	Los Amigos
MH-1334	127.5	2.7	8.9	Los Amigos
MH-1336	127.5	1.2	8.5	Los Amigos
MH-1344	127.2	1.5	7.6	Los Amigos
MH-1346	126.5	6.3	6.9	Los Amigos
MH-1347	126.6	1.6	6.7	Los Amigos
MH-1348	128.0	2.1	7.7	Los Amigos
MH-1349	130.8	4.8	9.9	Los Amigos
MH-1350	129.6	-	9.0	Los Amigos
MH-1353	132.4	-	11.3	Los Amigos
MH-1354	135.0	-	13.2	Los Amigos
MH-1355	134.9	-	12.6	Los Amigos
MH-1438	136.1	8.8	10.9	Los Amigos
MH-1439	137.3	-	11.8	Los Amigos
MH-1440	138.0	-	12.0	Los Amigos
MH-1441	138.8	-	12.5	Los Amigos
MH-1445	133.1	2.6	9.4	Los Amigos
MH-1446	132.8	3.0	9.0	Los Amigos
MH-1449	134.0	-	9.5	Los Amigos
MH-1451	133.7	2.4	10.4	Los Amigos
MH-1524	139.4	-	8.3	Los Amigos
MH-1525	139.1	0.5	8.4	Los Amigos
MH-1526	138.7	-	8.4	Los Amigos
MH-1527	138.6	2.4	8.6	Los Amigos
MH-1528	136.4	-	6.9	Los Amigos
MH-1529	137.9	-	9.0	Los Amigos
MH-1530	139.0	-	10.6	Los Amigos
MH-1531	139.1	0.3	11.3	Los Amigos
MH-1532	140.9	0.5	14.3	Los Amigos
MH-1580	134.2	3.3	11.4	Los Amigos
MH-958	121.3	-	9.7	Los Amigos
MH-976	122.0	4.8	5.4	Los Amigos
MH-981	121.8	-	9.9	Los Amigos
MH-982	120.1	-	8.0	Los Amigos

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-983	121.1	-	5.6	Los Amigos
MH-984	126.2	-	8.9	Los Amigos
MH-985	126.8	-	9.1	Los Amigos
MH-1021	118.9	1.5	13.0	North A
MH-1022	118.4	0.1	12.6	North A
MH-1023	119.5	44.9	13.0	North A
MH-1057	121.1	6.2	5.8	North A
MH-1666	101.8	-	5.6	North A
MH-1667	103.9	-	7.0	North A
MH-1907	108.5	-	8.7	North A
MH-790	114.4	139.3	9.6	North A
MH-794	115.4	30.7	10.0	North A
MH-797	113.7	1.3	9.1	North A
MH-798	112.8	23.9	8.4	North A
MH-801	113.9	-	9.9	North A
MH-802	114.4	12.8	10.4	North A
MH-804	114.7	14.2	10.8	North A
MH-807	109.0	-	6.8	North A
MH-808	104.0	44.7	5.8	North A
MH-831	107.6	-	18.4	North A
MH-1081	119.0	12.6	11.5	North B
MH-1082	117.8	8.8	9.6	North B
MH-1083	116.6	0.4	7.1	North B
MH-1087	119.4	-	9.2	North B
MH-1378	125.3	35.7	14.4	North B
MH-1390	128.7	2.8	11.9	North B
MH-1391	126.8	-	11.1	North B
MH-1392	129.2	0.8	11.9	North B
MH-1393	129.2	5.0	11.5	North B
MH-1394	125.8	18.0	13.8	North B
MH-1400	125.6	-	13.2	North B
MH-1401	126.3	6.7	10.7	North B
MH-1402	124.2	-	10.3	North B
MH-1403	123.2	-	9.3	North B
MH-1404	125.3	-	10.5	North B
MH-1416	120.3	1.1	4.1	North B
MH-1417	121.2	1.1	5.0	North B
MH-55	129.0	38.9	10.7	North B
CO-425	123.2	0.5	6.7	North C
MH-1067	122.6	0.9	5.4	North C
MH-1068	115.5	1.8	4.9	North C
MH-1070	114.1	0.3	9.8	North C
MH-1073	115.2	2.4	12.2	North C

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1074	115.2	0.7	19.4	North C
MH-1075	114.1	-	18.8	North C
MH-1076	113.1	-	18.2	North C
MH-1077	112.3	-	17.7	North C
MH-1078	111.6	0.6	14.7	North C
MH-1098	117.4	0.9	6.2	North C
MH-1099	117.4	0.1	6.4	North C
MH-1101	122.6	11.3	8.4	North C
MH-1106	123.6	7.5	20.3	North C
MH-1107	122.7	1.8	18.3	North C
MH-1108	121.0	1.4	15.4	North C
MH-1109	125.3	-	22.7	North C
MH-1110	117.7	0.1	8.3	North C
MH-1114	120.5	0.4	14.4	North C
MH-1120	120.0	19.4	13.7	North C
MH-1776	122.4	13.2	20.9	North C
MH-1777	112.0	0.4	12.0	North C
MH-1778	111.5	-	9.2	North C
MH-1779	121.6	0.2	14.1	North C
MH-1780	110.2	0.4	8.9	North C
MH-1781	110.8	0.2	12.4	North C
MH-1782	110.5	0.2	13.1	North C
MH-1863	110.2	11.8	12.5	North C
MH-820	109.3	-	16.4	North C
MH-821	108.7	-	15.7	North C
MH-822	110.9	-	17.0	North C
MH-823	111.3	-	17.2	North C
MH-824	110.9	-	18.7	North C
MH-825	110.6	-	18.5	North C
MH-826	109.3	-	17.6	North C
MH-828	108.5	-	18.3	North C
MH-830	108.0	-	18.5	North C
CO-650	138.6	-	1.8	North D
MH-1418	122.7	13.6	6.4	North D
MH-1419	122.4	1.6	5.6	North D
MH-1423	123.3	1.0	6.0	North D
MH-1520	136.5	0.4	6.9	North D
MH-1521	139.2	4.5	7.9	North D
MH-1533	139.3	0.2	6.1	North D
MH-1534	140.2	0.7	5.7	North D
MH-1536	142.2	34.0	5.9	North D
MH-1537	141.2	0.2	4.7	North D
MH-30	136.0	-	6.8	North D

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-31	133.4	2.7	6.1	North D
MH-34	132.9	0.5	6.4	North D
MH-35	133.5	4.3	7.8	North D
MH-39	131.3	0.3	7.6	North D
MH-40	130.9	-	7.5	North D
MH-41	124.9	0.7	5.1	North D
MH-42	124.0	0.5	6.2	North D
MH-11	132.1	4.6	9.4	North E
MH-12	132.2	1.7	10.5	North E
MH-13	130.7	10.1	9.2	North E
MH-23	130.1	0.8	8.8	North E
MH-24	131.0	1.3	10.3	North E
MH-43	131.7	0.8	12.2	North E
MH-44	131.6	2.3	12.3	North E
MH-9	130.9	12.3	7.7	North E
MH-185	119.2	1.2	7.4	South A
MH-187	118.1	3.4	7.0	South A
MH-188	117.2	2.4	6.9	South A
MH-234	116.4	1.9	8.6	South A
MH-239	117.7	1.2	8.5	South A
MH-240	118.1	-	6.9	South A
MH-241	118.3	1.4	6.6	South A
MH-244	119.2	16.4	7.0	South A
MH-247	117.9	0.1	10.5	South A
MH-248	117.4	0.7	11.0	South A
MH-249	117.2	0.3	10.9	South A
MH-564	118.0	67.6	12.7	South A
MH-566	117.6	1.1	11.7	South A
MH-580	120.7	4.9	7.6	South A
MH-581	122.4	22.0	8.4	South A
MH-582	122.9	21.2	8.3	South A
MH-589	123.3	15.2	8.2	South A
MH-155	129.8	0.7	12.3	South B
MH-157	131.1	6.8	14.1	South B
MH-167	123.7	8.4	7.3	South B
MH-171	122.4	7.9	8.6	South B
MH-172	124.3	-	9.9	South B
MH-173	120.9	2.7	7.6	South B
MH-176	126.2	13.2	10.1	South B
MH-177	127.8	3.1	11.5	South B
MH-178	130.0	-	13.6	South B
MH-180	127.4	0.3	11.6	South B
MH-181	126.8	7.1	11.2	South B

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-182	119.5	2.0	7.0	South B
MH-184	119.4	0.9	7.4	South B
MH-408	130.5	0.6	11.8	South B
MH-409	133.1	2.9	15.1	South B
MH-410	131.9	-	14.1	South B
MH-497	132.7	38.2	7.7	South B
MH-498	129.5	1.2	8.2	South B
MH-499	125.7	-	8.5	South B
CO-340	102.6	1.4	7.6	West
MH-1669	101.3	13.7	18.1	West
MH-1674	99.8	1.3	16.5	West
MH-1675	100.1	2.8	16.7	West
MH-1676	101.5	0.8	18.0	West
MH-1677	97.8	8.1	14.5	West
MH-1680	96.4	-	13.0	West
MH-1683	94.3	-	10.0	West
MH-1684	94.8	33.1	10.0	West
MH-1699	102.9	0.8	19.3	West
MH-1700	103.3	0.3	19.5	West
MH-1701	104.3	0.1	20.2	West
MH-1728	107.1	0.2	22.8	West
MH-1733	111.4	7.6	26.8	West
MH-1736	112.4	0.9	27.4	West
MH-1737	111.0	4.0	25.6	West
MH-1741	107.3	3.1	21.5	West
MH-1867	106.8	-	18.2	West
MH-1868	106.9	-	18.8	West
MH-1883	101.1	-	14.4	West
MH-1905	101.6	-	14.5	West
MH-1906	106.1	-	19.8	West
MH-832	106.8	3.9	20.6	West
MH-833	104.5	-	16.7	West
MH-834	103.8	-	16.0	West
MH-835	108.9	-	18.4	West
MH-836	117.1	-	26.0	West
MH-837	117.3	-	26.0	West
MH-838	112.7	0.6	20.4	West
MH-839	110.8	0.3	17.4	West
MH-840	104.6	0.3	10.1	West
MH-1644	105.8	-	17.6	WWTP
MH-1649	105.7	-	13.9	WWTP
MH-1653	106.4	-	14.6	WWTP
MH-1654	102.5	-	10.9	WWTP

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1655	99.6	-	11.6	WWTP
MH-1656	107.3	-	16.1	WWTP
MH-1657	107.3	-	19.6	WWTP
MH-1658	100.9	-	14.5	WWTP
MH-1659	101.3	-	18.2	WWTP
MH-1660	101.3	-	18.2	WWTP
MH-1661	100.7	-	15.1	WWTP
MH-1662	101.4	-	14.6	WWTP
MH-1664	101.1	-	14.3	WWTP
MH-1665	99.3	-	16.2	WWTP
MH-1668	100.0	-	16.8	WWTP
MH-1895	101.7	-	20.4	WWTP
MH-1896	100.7	-	13.9	WWTP
MH-1897	101.3	-	11.4	WWTP
MH-1908	107.1	-	10.0	WWTP
MH-1909	104.0	1.5	10.1	WWTP
MH-1910	100.9	-	7.3	WWTP
MH-1911	101.5	-	10.5	WWTP
MH-1912	101.3	-	13.6	WWTP
MH-1913	100.5	-	9.5	WWTP
MH-565	114.0	-	10.5	WWTP
MH-567	114.6	-	11.1	WWTP
MH-568	114.8	-	11.7	WWTP
MH-569	110.3	-	9.3	WWTP
MH-570	106.9	-	8.4	WWTP
MH-571	106.1	-	8.8	WWTP
MH-757	105.8	25.2	10.1	WWTP
MH-759	105.0	2.6	9.4	WWTP
MH-760	106.4	-	13.6	WWTP
MH-768	107.1	-	11.1	WWTP
MH-769	108.2	-	6.7	WWTP
MH-770	111.7	20.3	8.6	WWTP

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1000-999	8	292	112.51	111.33	59.4	0.8	6.2	59.4	65.6	0.29	0.19	Bell Village A	
1001-996	8	291	110.24	109.55	29.8	0.8	11.1	122.0	133.1	0.50	0.50	Bell Village A	
1032-1034	8	123	111.11	110.20	1.7	1.3	14.3	7.6	21.9	0.15	0.05	Bell Village A	
1033-1032	8	141	111.32	111.11	1.1	0.7	10.2	5.9	16.2	0.19	0.08	Bell Village A	
1034-994	10	349	110.20	108.82	205.6	1.7	81.7	651.5	733.2	0.44	0.40	Bell Village A	SS-4
1035-1033	8	155	112.18	111.32	1.2	1.0	6.6	4.8	11.4	0.12	0.03	Bell Village A	
1036-1035	8	300	113.51	112.18	2.3	0.8	3.8	3.6	7.4	0.10	0.02	Bell Village A	
1037-1036	8	144	114.08	113.51	1.4	0.5	1.3	1.4	2.7	0.06	0.01	Bell Village A	
1038-1034	10	205	110.89	110.20	8.4	1.5	62.7	438.3	501.0	0.37	0.30	Bell Village A	SS-4
1039-1038	10	142	111.03	110.89	9.0	0.9	60.9	429.9	490.9	0.53	0.55	Bell Village A	SS-4
1046-1889	8	260	112.98	111.39	24.9	1.9	57.9	393.7	451.6	0.55	0.59	Bell Village A	SS-12
1053-1046	8	296	114.20	112.98	30.3	1.6	52.3	368.7	421.0	0.60	0.66	Bell Village A	SS-12
1055-1053	8	101	114.88	114.20	1.6	1.7	40.7	338.5	379.2	0.48	0.47	Bell Village A	SS-12
1360-1361	8	110	119.66	119.34	7.4	1.1	24.0	234.9	259.0	0.73	0.89	Bell Village A	
1361-1367	8	382	119.34	118.03	73.5	1.2	25.9	308.5	334.4	0.55	0.58	Bell Village A	SS-12
1364-1055	8	132	115.48	114.88	16.9	1.5	40.6	336.9	377.5	0.54	0.57	Bell Village A	SS-12
1366-1364	8	434	117.62	115.48	9.0	1.4	31.2	320.0	351.2	0.50	0.51	Bell Village A	SS-12
1367-1366	8	124	118.03	117.62	2.6	1.2	31.0	311.1	342.1	0.56	0.60	Bell Village A	SS-12
1385-1360	8	476	121.11	119.66	110.2	1.1	22.7	227.5	250.2	0.70	0.83	Bell Village A	
1386-1385	8	125	121.45	121.11	8.4	1.0	15.1	117.2	132.4	0.48	0.47	Bell Village A	
1854-996	8	64	109.68	109.55	-	0.9	16.0	-	16.0	0.17	0.06	Bell Village A	
1855-1854	8	238	110.59	109.68	-	1.1	16.0	-	16.0	0.15	0.05	Bell Village A	
1856-1855	8	108	111.07	110.59	-	1.2	16.0	-	16.0	0.14	0.04	Bell Village A	
1857-1856	8	21	111.24	111.07	-	1.4	16.0	-	16.0	0.12	0.03	Bell Village A	
1889-1039	10	77	111.39	111.03	27.2	1.7	59.2	420.9	480.1	0.62	0.71	Bell Village A	
1903-995	8	272	108.95	108.03	15.8	1.3	29.1	145.7	174.8	0.53	0.55	Bell Village A	SS-16
88-1386	8	600	123.24	121.45	108.8	1.0	14.0	108.8	122.8	0.45	0.41	Bell Village A	
993-994	8	199	107.07	106.02	131.9	1.6	37.6	293.9	331.5	0.70	0.84	Bell Village A	SS-16
994-1022	15	107	105.62	104.61	1.4	2.6	120.2	946.8	1,067.0	0.43	0.38	Bell Village A	
995-993	8	278	108.03	107.07	16.2	1.3	32.3	161.9	194.2	0.56	0.61	Bell Village A	SS-16
996-1903	8	134	109.55	108.95	7.8	1.4	27.9	129.8	157.7	0.46	0.43	Bell Village A	
999-1001	8	290	111.33	110.24	32.7	1.0	10.4	92.1	102.4	0.38	0.31	Bell Village A	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1858-1857	8	166	111.82	111.24	-	1.1	16.0	-	16.0	0.15	0.05	Bell Village B	
1859-1858	8	160	112.33	111.82	-	1.0	16.0	-	16.0	0.16	0.05	Bell Village B	
1860-1859	8	77	112.58	112.33	-	1.0	16.0	-	16.0	0.15	0.05	Bell Village B	
1861-1860	8	25	112.66	112.58	-	1.0	16.0	-	16.0	0.15	0.05	Bell Village B	
1902-1861	8	64	112.86	112.66	-	1.0	16.0	-	16.0	0.16	0.05	Bell Village B	
1237-1243	6	207	123.86	122.26	1.1	2.6	123.1	53.0	176.0	0.67	0.79	Brooks A	
1238-1237	6	295	126.03	123.86	2.9	2.5	123.1	52.0	175.0	0.68	0.81	Brooks A	
1239-1238	6	151	126.87	126.03	2.2	2.3	122.4	49.1	171.5	0.75	0.91	Brooks A	
1243-927	8	102	122.26	121.75	18.4	2.3	161.5	71.4	232.9	0.56	0.61	Brooks A	
1244-1239	6	120	127.94	126.87	3.5	2.7	120.5	46.8	167.3	0.62	0.70	Brooks A	
1245-1244	6	93	128.92	127.94	1.0	2.8	108.0	43.3	151.2	0.55	0.58	Brooks A	
1246-1245	6	65	129.61	128.92	0.3	2.8	108.0	42.2	150.2	0.55	0.58	Brooks A	
1249-1246	6	352	134.01	129.61	3.9	3.0	108.0	41.9	149.9	0.52	0.53	Brooks A	
1251-1249	6	273	136.00	134.01	1.4	2.4	98.0	38.0	136.0	0.58	0.63	Brooks A	
1252-1251	6	107	137.09	136.00	36.6	2.7	97.5	36.6	134.1	0.52	0.53	Brooks A	
1651-1644	24	111	88.85	87.55	2.3	4.6	863.7	1,112.2	1,975.8	0.29	0.18	Brooks A	
1652-1651	24	145	89.31	88.85	3.0	2.9	863.7	1,109.9	1,973.5	0.40	0.34	Brooks A	
1-724	10	147	112.00	110.78	7.1	-	-	-	-	-	-	Brooks A	
1904-956	18	50	110.48	110.29	0.3	1.7	99.4	573.5	672.8	0.33	0.24	Brooks A	
724-901	10	8	110.78	110.72	0.1	1.0	7.0	0.1	7.1	0.07	0.01	Brooks A	
726-731	24	108	98.41	97.74	2.2	3.6	817.4	1,057.9	1,875.2	0.33	0.23	Brooks A	
730-726	24	123	99.17	98.41	2.5	3.7	817.4	1,055.6	1,873.0	0.33	0.23	Brooks A	
731-732	24	297	97.74	95.57	6.5	3.9	844.6	1,064.4	1,909.0	0.32	0.22	Brooks A	
732-733	24	391	95.57	94.00	6.7	3.2	844.6	1,071.1	1,915.6	0.37	0.30	Brooks A	
733-734	24	231	93.70	93.12	4.8	2.7	863.7	1,075.9	1,939.5	0.43	0.38	Brooks A	
734-735	24	90	93.12	92.87	1.8	2.8	863.7	1,077.7	1,941.4	0.42	0.36	Brooks A	
735-736	24	205	92.87	92.38	4.2	2.7	863.7	1,081.9	1,945.6	0.43	0.39	Brooks A	
736-742	24	252	92.38	91.77	5.2	2.7	863.7	1,087.1	1,950.8	0.43	0.39	Brooks A	
742-743	24	245	91.77	91.17	5.1	2.7	863.7	1,092.2	1,955.9	0.43	0.39	Brooks A	
743-744	24	151	91.17	91.15	3.1	2.8	863.7	1,095.3	1,959.0	0.42	0.37	Brooks A	SS-7
744-745	24	248	91.15	91.02	5.1	2.7	863.7	1,100.4	1,964.1	0.43	0.38	Brooks A	SS-7
745-1652	24	311	91.02	89.31	6.4	2.7	863.7	1,106.9	1,970.5	0.43	0.38	Brooks A	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
898-899	10	224	111.58	111.20	11.2	1.7	233.2	111.2	344.4	0.71	0.85	Brooks A	
899-900	10	222	111.20	110.80	5.9	1.8	241.9	117.1	359.0	0.71	0.85	Brooks A	
900-901	10	13	110.80	110.72	0.1	2.8	248.5	117.2	365.7	0.48	0.47	Brooks A	
901-944	10	290	107.72	106.60	3.3	2.4	259.0	120.6	379.6	0.57	0.62	Brooks A	
912-919	8	134	116.21	115.72	15.3	2.2	215.7	96.8	312.5	0.78	0.95	Brooks A	
913-912	8	152	116.66	116.21	0.8	1.9	166.0	81.4	247.5	0.70	0.84	Brooks A	
919-928	8	114	115.72	115.46	0.8	1.9	215.7	97.5	313.2	0.60	0.67	Brooks A	SS-13
920-913	8	231	117.64	116.66	3.5	2.2	166.0	80.7	246.7	0.61	0.70	Brooks A	
921-920	8	111	118.08	117.64	0.6	2.2	165.3	77.2	242.5	0.62	0.71	Brooks A	
922-921	8	151	119.21	118.08	0.8	2.7	164.4	76.6	241.0	0.51	0.51	Brooks A	
923-922	8	165	120.16	119.21	1.1	2.5	164.4	75.9	240.2	0.55	0.58	Brooks A	
924-923	8	143	120.86	120.16	1.6	2.3	164.4	74.8	239.1	0.57	0.63	Brooks A	
925-924	8	43	121.15	120.86	0.3	2.6	163.6	73.2	236.8	0.52	0.53	Brooks A	
927-925	8	98	121.75	121.15	1.5	2.5	162.5	72.9	235.5	0.53	0.55	Brooks A	
928-929	8	78	115.46	114.15	0.5	4.0	215.7	98.0	313.8	0.47	0.45	Brooks A	
929-930	8	155	114.15	112.07	1.1	3.6	215.7	99.1	314.8	0.50	0.50	Brooks A	
930-898	8	137	112.07	111.58	0.9	2.2	215.7	100.0	315.7	0.79	0.96	Brooks A	
944-730	24	310	100.30	99.17	6.4	3.0	816.7	1,053.1	1,869.8	0.38	0.30	Brooks A	
945-944	24	16	100.38	100.30	0.2	3.0	552.4	926.1	1,478.6	0.31	0.21	Brooks A	
947-945	24	246	101.02	100.38	5.2	2.4	552.4	925.9	1,478.4	0.36	0.28	Brooks A	
948-947	24	69	107.70	101.02	1.4	8.5	552.4	920.6	1,473.1	0.15	0.05	Brooks A	
949-948	24	128	108.44	107.70	19.4	3.2	552.4	919.2	1,471.6	0.30	0.19	Brooks A	
951-952	24	66	108.88	108.51	1.4	3.0	468.2	898.7	1,367.0	0.29	0.18	Brooks A	
952-949	24	53	108.51	108.44	1.1	1.8	468.2	899.8	1,368.1	0.42	0.36	Brooks A	
954-951	24	238	109.90	108.88	4.9	2.7	468.2	897.4	1,365.6	0.31	0.20	Brooks A	
956-954	18	75	110.29	109.90	1.2	1.9	99.4	574.6	674.0	0.30	0.20	Brooks A	
957-1904	18	98	110.76	110.48	0.5	1.6	99.4	573.2	672.6	0.35	0.26	Brooks A	SS-15
961-954	24	223	110.69	109.90	5.4	2.4	368.9	317.8	686.7	0.23	0.11	Brooks A	
1203-1209	8	308	164.77	162.57	26.5	1.7	33.2	26.4	59.6	0.24	0.13	Brooks B	
1209-1210	8	291	162.57	159.74	1.7	1.9	34.4	28.1	62.5	0.23	0.12	Brooks B	
1210-1211	8	247	159.74	154.87	1.7	2.5	36.4	29.8	66.2	0.20	0.09	Brooks B	
1211-1212	8	300	154.87	153.34	1.8	1.6	39.3	31.7	71.0	0.29	0.18	Brooks B	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1212-1213	8	181	153.34	152.79	0.7	1.3	41.0	32.4	73.4	0.34	0.24	Brooks B	
1213-1214	8	154	152.79	152.59	0.6	1.0	41.8	33.0	74.9	0.43	0.38	Brooks B	
1214-1220	10	359	152.59	150.97	1.8	1.5	41.8	34.8	76.6	0.23	0.12	Brooks B	
1220-1221	6	192	150.97	150.49	13.9	1.4	62.7	48.7	111.4	0.73	0.88	Brooks B	
1221-1453	10	333	150.49	149.18	3.5	1.6	63.8	52.1	115.9	0.29	0.19	Brooks B	
1242-968	18	328	114.14	113.13	1.3	2.2	312.8	287.3	600.2	0.33	0.23	Brooks B	
1277-1278	10	172	131.93	129.91	0.9	3.0	141.9	125.0	266.9	0.34	0.25	Brooks B	
1278-1280	10	267	129.91	129.02	2.3	1.9	143.1	127.3	270.4	0.48	0.47	Brooks B	
1280-1281	10	117	129.02	128.42	1.4	2.3	144.4	128.7	273.1	0.43	0.39	Brooks B	
1281-1282	10	151	128.42	128.09	1.1	1.7	145.0	129.8	274.8	0.56	0.60	Brooks B	
1282-1283	10	332	128.09	127.18	2.8	1.8	146.6	132.4	279.1	0.52	0.54	Brooks B	
1283-1284	10	154	127.18	126.42	1.6	2.2	148.6	134.0	282.6	0.45	0.41	Brooks B	
1284-1285	12	208	126.42	118.57	1.3	4.6	151.4	149.7	301.1	0.21	0.10	Brooks B	
1285-1286	18	228	118.57	117.68	2.1	2.3	278.7	251.9	530.6	0.29	0.18	Brooks B	
1286-1288	18	471	117.68	116.14	7.4	2.2	285.2	259.4	544.5	0.30	0.20	Brooks B	
1288-1289	18	113	116.14	115.82	9.4	2.1	300.1	268.8	568.9	0.32	0.23	Brooks B	
1289-1290	18	388	115.82	114.50	11.6	2.3	307.9	280.4	588.4	0.31	0.21	Brooks B	
1290-1242	18	124	114.50	114.14	5.6	2.2	312.8	286.0	598.8	0.33	0.24	Brooks B	
1299-1285	12	344	119.65	118.57	2.1	1.8	127.0	100.2	227.2	0.34	0.25	Brooks B	
1300-1299	12	343	119.99	119.65	2.1	1.2	125.9	98.1	224.0	0.47	0.45	Brooks B	
1301-1300	12	110	120.32	119.99	3.7	1.8	124.4	95.9	220.4	0.34	0.25	Brooks B	
1302-1301	12	69	120.50	120.32	0.5	1.6	119.3	92.2	211.5	0.35	0.26	Brooks B	
1305-1302	12	68	120.68	120.50	0.3	1.7	119.3	91.7	211.0	0.34	0.26	Brooks B	
1306-1305	12	161	121.09	120.68	14.0	1.6	119.3	91.3	210.6	0.35	0.26	Brooks B	
1453-1460	10	204	149.18	148.33	4.3	1.7	68.1	56.4	124.5	0.30	0.20	Brooks B	
1456-1461	10	310	140.34	135.67	2.7	2.8	76.5	66.1	142.6	0.23	0.12	Brooks B	
1457-1456	10	309	145.74	140.34	1.6	2.9	73.6	63.4	137.0	0.22	0.10	Brooks B	
1458-1457	10	112	146.50	145.74	4.1	2.1	72.5	61.9	134.4	0.27	0.16	Brooks B	
1460-1458	10	279	148.33	146.50	1.4	2.0	69.2	57.8	126.9	0.27	0.16	Brooks B	
1461-1462	10	280	135.67	132.89	2.4	2.4	79.1	68.5	147.6	0.26	0.15	Brooks B	
1462-1277	10	73	132.89	131.93	0.4	3.2	141.4	124.1	265.6	0.33	0.23	Brooks B	
1463-1462	8	261	136.73	132.89	1.1	2.6	61.4	55.3	116.7	0.28	0.18	Brooks B	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1466-1463	8	270	138.07	136.73	2.7	1.8	60.0	54.3	114.2	0.37	0.30	Brooks B	
1467-1466	8	131	139.24	138.07	0.5	2.2	57.2	51.6	108.8	0.31	0.21	Brooks B	
1468-1467	8	239	140.62	139.24	14.1	1.9	57.2	51.1	108.3	0.35	0.26	Brooks B	
1482-1483	8	352	146.34	142.25	4.2	2.1	36.2	35.7	71.9	0.24	0.12	Brooks B	
1483-1468	8	319	142.25	140.62	1.3	1.6	38.3	37.0	75.3	0.30	0.19	Brooks B	
1484-1482	8	154	146.95	146.34	2.9	1.4	32.5	31.6	64.1	0.29	0.19	Brooks B	
1486-1284	12	286	131.62	126.42	1.8	1.1	2.9	14.3	17.2	0.06	0.01	Brooks B	
1487-1486	12	466	133.72	131.62	3.0	0.5	1.0	12.5	13.6	0.08	0.01	Brooks B	
1488-1487	12	419	135.31	133.72	2.7	0.4	0.8	9.6	10.4	0.07	0.01	Brooks B	
1489-1488	12	48	135.73	135.31	0.3	0.6	0.8	6.8	7.6	0.05	0.01	Brooks B	
1490-1489	12	129	136.25	135.73	1.0	0.4	0.8	6.5	7.3	0.06	0.01	Brooks B	
1491-1490	12	420	147.46	145.15	2.8	0.5	0.8	5.5	6.3	0.05	0.01	Brooks B	
1495-1491	12	329	149.01	147.46	2.6	0.3	0.2	2.7	2.8	0.04	0.00	Brooks B	
1499-1484	8	231	148.21	146.95	8.4	1.5	28.2	28.8	56.9	0.25	0.14	Brooks B	
1501-1499	8	179	150.07	148.21	1.0	1.6	18.6	20.4	38.9	0.18	0.07	Brooks B	
1502-1501	8	336	160.62	150.07	1.4	2.4	18.6	19.4	38.0	0.14	0.04	Brooks B	
1503-1502	8	261	163.58	160.62	18.1	1.7	18.6	18.0	36.6	0.17	0.06	Brooks B	
1557-1306	12	179	121.56	121.09	1.1	1.6	96.6	77.4	174.0	0.31	0.21	Brooks B	
1558-1557	8	173	128.94	121.56	3.0	3.1	30.2	21.3	51.5	0.15	0.05	Brooks B	
1561-1558	8	344	129.61	128.94	1.4	1.0	29.6	18.3	47.9	0.30	0.20	Brooks B	
1562-1561	8	190	130.35	129.61	16.9	1.3	28.2	16.9	45.0	0.25	0.13	Brooks B	
1568-1557	12	100	121.91	121.56	0.6	1.6	66.0	54.9	120.9	0.24	0.13	Brooks B	
1569-1568	12	335	122.60	121.91	2.0	1.3	63.9	54.3	118.2	0.27	0.16	Brooks B	
1570-1569	12	259	122.85	122.60	4.8	1.0	63.0	52.2	115.2	0.33	0.23	Brooks B	
1571-1570	12	104	123.16	122.85	0.6	1.4	55.0	47.4	102.4	0.23	0.12	Brooks B	
1572-1571	12	123	123.36	123.16	5.8	1.1	55.0	46.8	101.8	0.27	0.16	Brooks B	
1573-1572	12	252	123.74	123.36	2.9	1.0	48.9	41.0	89.9	0.26	0.15	Brooks B	
1574-1573	12	203	124.25	123.74	1.2	1.2	44.7	38.1	82.8	0.22	0.10	Brooks B	
1595-1574	12	208	125.04	124.25	4.3	1.4	43.6	36.8	80.4	0.19	0.08	Brooks B	
1597-1595	12	243	125.25	125.04	6.4	0.8	41.8	32.5	74.3	0.27	0.16	Brooks B	
1599-1597	12	69	125.39	125.25	2.9	1.0	34.4	26.2	60.6	0.20	0.08	Brooks B	
1610-1611	12	97	125.75	125.53	15.4	1.0	29.1	22.4	51.5	0.18	0.07	Brooks B	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1611-1599	12	137	125.53	125.39	0.8	0.8	29.1	23.3	52.4	0.22	0.10	Brooks B	
1612-1610	12	302	126.36	125.75	1.8	0.6	6.4	7.1	13.5	0.09	0.02	Brooks B	
1613-1612	12	133	126.63	126.36	0.8	0.6	5.5	5.2	10.7	0.09	0.01	Brooks B	
1614-1613	12	125	126.92	126.63	0.8	0.6	5.4	4.3	9.7	0.08	0.01	Brooks B	
1615-1614	12	95	127.01	126.92	2.5	0.4	4.8	3.6	8.3	0.09	0.02	Brooks B	
1627-1615	12	92	127.40	127.01	1.1	-	0.1	1.1	1.2	0.03	0.00	Brooks B	
963-961	24	151	111.21	110.69	1.9	2.3	347.2	312.4	659.6	0.22	0.11	Brooks B	
964-963	24	121	111.61	111.21	1.7	2.3	347.2	310.5	657.7	0.23	0.11	Brooks B	
966-964	24	98	112.11	111.61	4.2	2.6	339.8	308.8	648.6	0.20	0.09	Brooks B	
967-966	18	403	113.02	112.11	4.0	2.0	333.8	304.6	638.4	0.36	0.28	Brooks B	
968-967	18	47	113.13	113.02	13.3	2.0	326.7	300.6	627.4	0.36	0.28	Brooks B	
111-112	21	163	93.77	93.39	4.1	1.9	257.1	1,228.2	1,485.4	0.46	0.43	Conde A	
112-113	21	224	93.39	92.87	5.3	1.9	257.1	1,233.6	1,490.7	0.46	0.43	Conde A	
113-114	21	153	92.87	92.51	5.5	1.9	257.1	1,239.0	1,496.2	0.46	0.43	Conde A	
114-115	24	173	92.11	91.81	5.2	1.7	257.1	1,244.2	1,501.3	0.41	0.35	Conde A	
115-116	24	418	91.81	91.56	11.3	1.2	285.8	1,283.6	1,569.4	0.57	0.62	Conde A	
116-122	24	398	91.56	91.28	10.7	1.2	285.8	1,294.3	1,580.1	0.55	0.59	Conde A	
117-1872	8	89	97.58	97.19	0.8	1.4	28.2	24.1	52.3	0.26	0.14	Conde A	
119-117	8	502	100.15	97.58	5.5	1.4	28.2	23.3	51.5	0.25	0.13	Conde A	
120-119	8	71	100.64	100.15	17.9	1.6	28.2	17.9	46.1	0.22	0.10	Conde A	
122-123	27	230	91.28	91.11	7.5	1.3	292.5	1,301.7	1,594.2	0.45	0.42	Conde A	
123-124	27	274	91.11	90.92	8.3	1.2	292.5	1,310.1	1,602.6	0.46	0.44	Conde A	
124-125	27	297	90.92	90.71	15.9	1.2	293.0	1,325.9	1,618.9	0.46	0.44	Conde A	
125-202	27	408	90.71	90.42	10.3	1.2	293.0	1,336.2	1,629.2	0.46	0.44	Conde A	
1634-1638	10	302	94.23	93.48	3.4	1.6	104.7	128.9	233.7	0.48	0.47	Conde A	
1635-1634	8	239	95.28	94.23	10.1	1.0	10.0	10.1	20.1	0.16	0.06	Conde A	
1636-577	8	172	91.67	91.17	1.6	1.8	115.7	137.2	252.9	0.72	0.87	Conde A	
1637-1636	10	301	92.61	91.67	3.4	1.8	112.8	135.7	248.5	0.47	0.45	Conde A	
1638-1637	10	300	93.38	92.61	3.4	1.6	110.2	132.3	242.5	0.49	0.49	Conde A	
1642-1643	33	435	87.96	87.82	16.2	1.1	550.1	1,794.6	2,344.7	0.53	0.56	Conde A	
1643-1644	33	416	87.82	87.35	39.3	1.7	550.1	1,834.0	2,384.1	0.37	0.30	Conde A	
1799-330	8	167	103.97	103.38	8.7	0.7	3.5	8.7	12.2	0.13	0.04	Conde A	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1845-320	10	204	101.18	100.66	2.3	0.2	0.2	28.2	28.4	0.16	0.06	Conde A	
1846-1869	10	400	102.53	101.66	4.5	0.2	0.2	22.4	22.6	0.15	0.05	Conde A	
1847-1846	10	347	103.40	102.53	3.9	0.2	0.2	17.9	18.1	0.13	0.04	Conde A	
1848-1847	10	72	103.47	103.40	14.1	0.2	0.2	14.1	14.2	0.14	0.04	Conde A	
1869-1845	10	262	101.66	101.18	3.5	0.2	0.2	26.0	26.1	0.17	0.06	Conde A	
1872-115	8	159	97.19	96.41	4.1	1.4	28.7	28.1	56.9	0.26	0.15	Conde A	
1914-332	21	130	94.24	94.07	2.5	1.5	253.4	1,190.8	1,444.1	0.54	0.57	Conde A	
1915-311	10	118	99.86	99.71	1.3	0.5	4.8	11.1	15.9	0.14	0.05	Conde A	
202-252	27	500	90.42	90.06	198.4	1.4	424.0	1,534.6	1,958.6	0.51	0.52	Conde A	
214-215	27	327	89.83	89.60	9.9	1.4	424.0	1,553.2	1,977.2	0.52	0.53	Conde A	
215-216	27	323	89.60	89.37	9.8	1.4	424.0	1,563.1	1,987.1	0.52	0.53	Conde A	
216-217	27	500	89.37	89.01	15.2	1.4	424.0	1,578.3	2,002.4	0.52	0.54	Conde A	
217-578	27	243	89.01	88.72	7.4	1.7	424.0	1,585.7	2,009.8	0.45	0.42	Conde A	
252-214	27	331	90.06	89.83	8.7	1.4	424.0	1,543.2	1,967.2	0.52	0.54	Conde A	
272-273	24	280	99.07	97.79	11.2	2.3	239.9	1,052.9	1,292.8	0.29	0.19	Conde A	
273-274	24	246	97.79	96.66	6.6	2.3	239.9	1,059.5	1,299.4	0.29	0.19	Conde A	
274-275	21	446	96.66	96.42	10.6	1.1	239.9	1,070.1	1,310.0	0.67	0.79	Conde A	
275-296	21	174	96.42	96.03	4.8	1.8	239.9	1,074.9	1,314.8	0.43	0.39	Conde A	
296-300	21	323	96.03	95.57	6.1	1.6	245.8	1,169.3	1,415.1	0.52	0.53	Conde A	
297-296	10	46	97.00	96.83	0.5	0.8	5.6	88.4	94.0	0.27	0.16	Conde A	
298-1914	21	210	94.67	94.24	5.4	1.8	253.4	1,188.3	1,441.7	0.47	0.45	Conde A	
299-298	21	333	94.91	94.67	6.3	1.2	245.8	1,183.0	1,428.7	0.65	0.75	Conde A	
300-299	21	309	95.57	94.91	7.3	1.8	245.8	1,176.7	1,422.5	0.46	0.43	Conde A	
301-297	10	286	97.40	97.00	3.2	0.6	5.6	87.8	93.5	0.34	0.25	Conde A	
302-301	10	202	98.21	97.40	15.7	0.8	5.6	84.6	90.3	0.26	0.14	Conde A	
303-302	10	153	98.49	98.21	5.2	0.6	5.6	68.9	74.5	0.29	0.18	Conde A	
304-303	10	84	98.63	98.49	0.9	0.6	5.0	63.6	68.6	0.28	0.17	Conde A	
310-304	10	312	99.36	98.63	3.5	0.6	4.8	16.7	21.5	0.14	0.04	Conde A	
311-310	10	192	99.71	99.36	2.2	0.6	4.8	13.2	18.0	0.14	0.04	Conde A	
312-1915	10	96	99.99	99.86	1.1	0.5	4.8	9.7	14.6	0.14	0.04	Conde A	
313-312	10	225	100.69	99.99	5.0	0.7	4.8	8.7	13.5	0.11	0.02	Conde A	
314-313	10	224	101.40	100.69	3.7	-	-	3.7	3.7	0.06	0.01	Conde A	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
315-304	8	114	98.88	98.63	2.2	0.2	0.2	46.0	46.1	0.29	0.18	Conde A	
317-315	10	400	99.61	98.88	4.9	0.2	0.2	43.8	44.0	0.22	0.10	Conde A	
319-317	10	389	100.54	99.61	10.6	0.2	0.2	39.0	39.2	0.19	0.08	Conde A	
320-319	10	9	100.66	100.64	0.1	0.2	0.2	28.4	28.5	0.16	0.06	Conde A	
324-333	8	254	97.26	96.18	2.3	0.7	3.5	25.0	28.5	0.19	0.08	Conde A	
325-324	8	277	98.62	97.26	2.5	0.8	3.5	22.8	26.3	0.18	0.07	Conde A	
326-325	8	277	99.57	98.62	2.5	0.7	3.5	20.3	23.8	0.18	0.07	Conde A	
327-326	8	270	100.54	99.57	2.4	0.7	3.5	17.8	21.3	0.17	0.07	Conde A	
328-327	8	301	101.55	100.54	2.7	0.7	3.5	15.4	18.9	0.17	0.06	Conde A	
329-328	8	300	102.02	101.55	2.7	0.5	3.5	12.7	16.2	0.19	0.08	Conde A	
330-329	8	145	103.38	102.02	1.3	1.0	3.5	10.0	13.5	0.11	0.03	Conde A	
331-111	21	28	93.83	93.77	0.7	1.8	257.1	1,224.2	1,481.3	0.47	0.44	Conde A	
332-331	21	107	94.07	93.83	2.5	1.8	253.4	1,193.3	1,446.7	0.46	0.43	Conde A	
333-334	8	201	96.18	96.00	1.8	0.4	3.5	26.8	30.3	0.29	0.18	Conde A	
334-335	8	57	96.00	95.54	0.5	0.9	3.5	27.4	30.8	0.17	0.06	Conde A	
335-331	8	174	95.54	94.53	2.8	0.8	3.7	30.2	33.9	0.19	0.08	Conde A	
430-1634	8	254	95.49	94.23	13.5	2.0	89.3	115.5	204.8	0.52	0.54	Conde A	
431-430	8	255	96.10	95.49	15.0	1.5	77.9	101.9	179.8	0.60	0.67	Conde A	
451-431	8	203	96.89	96.10	86.8	1.6	62.4	86.9	149.3	0.46	0.44	Conde A	
577-578	10	174	91.17	90.52	2.0	1.9	116.2	139.2	255.4	0.46	0.42	Conde A	
578-579	27	241	88.72	88.04	35.6	2.4	550.1	1,760.4	2,310.5	0.38	0.31	Conde A	
579-1642	33	460	88.04	87.96	17.9	0.9	550.1	1,778.4	2,328.5	0.63	0.73	Conde A	
151-152	10	187	113.90	112.83	8.8	1.9	72.5	314.1	386.6	0.51	0.52	Conde B North	
152-292	10	188	112.83	112.07	2.7	1.7	73.3	316.7	390.0	0.57	0.62	Conde B North	
154-151	10	295	115.01	113.90	4.2	1.6	68.6	305.3	373.9	0.57	0.62	Conde B North	
1810-351	12	938	122.21	121.36	15.9	0.5	8.4	112.8	121.2	0.34	0.25	Conde B North	
265-271	10	322	101.60	100.96	71.2	1.6	164.9	459.5	624.3	0.72	0.87	Conde B North	SS-5
267-265	10	20	105.28	101.70	0.3	8.0	145.3	388.2	533.5	0.24	0.13	Conde B North	SS-5
268-267	10	499	107.62	105.38	7.7	2.2	145.3	387.9	533.2	0.68	0.81	Conde B North	SS-5
269-268	10	501	108.94	107.62	7.9	1.7	117.9	380.3	498.2	0.81	0.98	Conde B North	SS-5
270-269	10	375	110.04	108.94	39.6	1.6	90.5	372.4	462.9	0.72	0.87	Conde B North	
271-272	10	317	100.96	99.87	5.4	2.0	165.0	464.9	629.9	0.60	0.67	Conde B North	SS-5

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
291-270	10	193	110.71	110.04	2.7	1.7	78.6	332.7	411.3	0.62	0.71	Conde B North	
292-291	10	289	112.07	110.71	13.3	1.8	78.2	330.0	408.3	0.56	0.60	Conde B North	
349-378	12	391	120.71	120.38	23.8	0.8	44.7	221.4	266.1	0.54	0.57	Conde B North	
350-349	12	215	120.94	120.71	68.0	0.9	42.7	197.7	240.4	0.48	0.46	Conde B North	
351-350	12	348	121.36	120.94	16.8	0.8	21.4	129.6	151.0	0.36	0.27	Conde B North	
378-391	12	548	120.38	119.59	9.3	1.0	45.7	230.7	276.4	0.47	0.45	Conde B North	
388-154	10	326	116.67	115.01	4.6	1.8	67.4	301.2	368.5	0.51	0.52	Conde B North	
389-388	10	325	117.93	116.67	6.5	1.6	66.2	296.6	362.8	0.55	0.59	Conde B North	
390-389	10	174	118.86	117.93	2.4	1.8	64.5	290.1	354.5	0.50	0.49	Conde B North	
391-406	12	326	119.59	119.33	20.1	0.9	54.3	250.8	305.1	0.60	0.67	Conde B North	
406-407	12	90	119.33	119.24	33.3	1.0	63.9	284.1	348.0	0.62	0.70	Conde B North	
407-390	12	207	119.24	118.96	3.5	1.1	63.9	287.6	351.5	0.55	0.59	Conde B North	
1808-1809	10	332	132.15	128.91	72.9	1.1	6.9	72.9	79.7	0.19	0.08	Conde B South	
1809-1811	10	563	128.91	123.16	80.6	1.7	25.6	153.5	179.1	0.29	0.18	Conde B South	
1810-1824	12	512	122.21	118.83	24.3	1.4	22.8	304.0	326.8	0.34	0.25	Conde B South	
1811-1810	12	59	123.16	122.21	7.0	2.0	25.6	160.5	186.1	0.20	0.09	Conde B South	
1818-337	15	218	111.37	110.24	13.0	1.5	38.4	417.5	455.9	0.32	0.22	Conde B South	
1819-1818	15	178	111.82	111.37	12.1	1.1	38.4	404.6	443.0	0.38	0.30	Conde B South	
1820-1819	12	253	113.69	111.82	36.1	1.7	38.4	392.5	430.9	0.38	0.31	Conde B South	
1821-1820	12	137	114.58	113.69	7.3	1.6	32.9	356.4	389.3	0.38	0.30	Conde B South	
1822-1821	12	190	115.77	114.58	18.3	1.5	30.6	349.1	379.6	0.38	0.30	Conde B South	
1824-1822	12	535	118.83	115.77	26.8	1.4	29.8	330.7	360.5	0.37	0.30	Conde B South	
1825-1810	12	16	122.42	122.21	0.8	1.2	5.4	216.0	221.4	0.23	0.12	Conde B South	
1826-1825	12	413	122.97	122.42	41.3	0.5	5.4	215.2	220.6	0.43	0.38	Conde B South	
1830-1826	12	773	123.70	122.97	36.7	0.4	4.8	173.9	178.7	0.42	0.36	Conde B South	
1831-1830	12	802	124.23	123.70	137.0	0.4	4.8	137.2	142.0	0.40	0.34	Conde B South	
1874-281	15	199	105.77	103.14	11.8	2.3	61.7	553.1	614.8	0.29	0.18	Conde B South	
276-277	15	232	108.84	108.17	14.8	1.3	50.3	466.8	517.1	0.40	0.33	Conde B South	
277-278	15	198	108.17	107.35	46.6	1.5	51.1	513.4	564.5	0.38	0.30	Conde B South	
278-279	15	215	107.25	106.63	14.6	1.3	51.1	528.0	579.1	0.42	0.37	Conde B South	
279-1874	15	174	106.63	105.77	13.3	1.7	61.7	541.3	603.0	0.37	0.29	Conde B South	
281-272	15	380	103.14	100.37	23.7	2.0	74.9	576.8	651.7	0.35	0.26	Conde B South	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
336-276	15	237	109.49	108.84	18.5	1.2	40.9	452.0	492.9	0.39	0.32	Conde B South	
337-336	15	271	110.24	109.49	16.1	1.2	38.4	433.5	471.9	0.38	0.31	Conde B South	
516-520	18	298	122.60	122.09	5.5	0.6	7.4	5.5	12.9	0.06	0.01	Hembree A	
520-521	18	247	122.09	121.83	1.4	0.5	7.4	6.9	14.3	0.07	0.01	Hembree A	
521-523	18	384	121.83	121.41	2.2	0.5	7.4	9.2	16.5	0.07	0.01	Hembree A	
522-528	8	64	126.70	125.18	0.2	-	-	0.2	0.2	0.01	0.00	Hembree A	
523-524	18	154	121.41	121.07	0.9	0.8	15.3	11.3	26.5	0.08	0.01	Hembree A	
524-525	18	38	121.07	120.98	0.2	1.2	46.9	24.7	71.5	0.12	0.03	Hembree A	
525-526	18	92	120.98	120.86	0.5	0.9	46.9	25.2	72.1	0.14	0.04	Hembree A	
526-663	18	351	120.86	120.60	2.0	0.8	46.9	27.3	74.1	0.16	0.06	Hembree A	
528-529	8	323	125.18	124.00	0.8	0.9	7.9	1.0	9.0	0.11	0.03	Hembree A	
529-523	8	56	124.00	121.81	0.1	2.0	7.9	1.2	9.1	0.07	0.01	Hembree A	
530-524	10	187	122.44	121.07	0.6	1.6	31.6	13.2	44.8	0.16	0.05	Hembree A	
602-603	24	369	113.42	110.83	2.9	2.6	215.3	155.9	371.2	0.14	0.04	Hembree A	
603-604	24	390	110.83	108.61	3.0	2.4	215.3	158.9	374.1	0.15	0.05	Hembree A	
604-605	24	358	108.61	106.11	2.8	2.6	215.3	161.6	376.9	0.14	0.04	Hembree A	
605-606	24	385	106.11	103.90	3.0	2.4	215.3	164.5	379.8	0.15	0.05	Hembree A	
606-565	24	239	103.90	102.85	1.9	2.2	215.3	166.4	381.6	0.16	0.06	Hembree A	
613-530	10	201	123.07	122.44	12.6	1.2	31.6	12.6	44.2	0.19	0.08	Hembree A	
635-636	10	89	124.06	123.61	5.6	1.2	15.4	5.6	21.0	0.12	0.03	Hembree A	
636-637	10	169	123.61	122.95	0.5	1.1	16.2	6.1	22.3	0.13	0.04	Hembree A	
637-638	10	317	122.95	122.28	1.5	0.9	19.4	7.5	27.0	0.17	0.06	Hembree A	
638-666	10	160	122.28	121.60	6.1	1.5	42.8	13.6	56.4	0.20	0.09	Hembree A	
647-665	10	161	122.41	122.00	4.6	1.3	51.8	18.4	70.2	0.25	0.14	Hembree A	
648-647	10	343	123.43	122.41	1.1	1.3	37.0	13.7	50.7	0.21	0.09	Hembree A	
649-648	10	108	123.91	123.43	1.5	1.4	35.6	12.7	48.2	0.18	0.07	Hembree A	
650-649	10	180	124.54	123.91	0.6	1.3	32.1	11.2	43.3	0.18	0.07	Hembree A	
651-650	8	229	125.80	124.54	0.6	1.5	30.9	10.6	41.5	0.22	0.10	Hembree A	
652-651	8	234	126.90	125.80	10.0	1.4	29.7	10.0	39.7	0.22	0.11	Hembree A	
663-667	18	344	120.60	120.12	2.1	1.0	46.9	29.4	76.3	0.14	0.04	Hembree A	
665-668	18	363	122.00	121.73	2.1	1.0	125.4	99.8	225.2	0.28	0.18	Hembree A	
666-669	18	351	121.10	120.56	2.3	1.5	168.2	117.8	286.0	0.27	0.15	Hembree A	

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667-671	24	38	120.12	116.88	0.3	6.2	215.3	149.5	364.7	0.08	0.01	Hembree A	
668-666	18	350	121.73	121.10	2.0	1.4	125.4	101.8	227.2	0.23	0.11	Hembree A	
669-667	18	338	120.56	120.12	2.0	1.4	168.2	119.8	288.0	0.28	0.17	Hembree A	
670-602	24	328	115.65	113.42	2.6	2.5	215.3	153.1	368.4	0.14	0.04	Hembree A	
671-670	24	145	116.68	115.65	1.1	2.6	215.3	150.6	365.8	0.14	0.04	Hembree A	
889-890	10	276	123.03	122.60	0.9	1.2	69.4	77.3	146.7	0.43	0.38	Hembree A	
890-665	18	337	122.60	122.00	2.0	1.2	69.4	79.3	148.7	0.18	0.07	Hembree A	
1-711	10	240	111.00	110.24	9.3	-	-	16.3	16.3	0.12	0.03	Hembree B	
594-608	8	657	116.81	112.22	87.1	1.6	28.7	87.0	115.7	0.34	0.25	Hembree B	
601-607	12	144	107.18	106.73	2.4	2.0	193.4	488.5	681.9	0.66	0.77	Hembree B	
607-567	12	219	106.73	102.56	6.6	3.9	193.4	495.1	688.5	0.38	0.31	Hembree B	
608-601	8	729	112.22	107.48	89.2	1.9	54.1	176.0	230.1	0.51	0.52	Hembree B	
612-601	12	219	107.53	107.18	15.0	1.4	110.6	310.1	420.6	0.59	0.65	Hembree B	
681-685	12	463	109.05	108.39	20.2	1.1	56.1	85.5	141.5	0.33	0.23	Hembree B	
682-681	12	345	109.26	109.05	4.9	0.8	56.0	65.3	121.3	0.38	0.31	Hembree B	
685-686	12	21	108.39	108.38	137.6	0.8	94.5	223.1	317.6	0.79	0.97	Hembree B	SS-8
686-687	12	76	108.38	108.36	5.4	0.7	96.1	228.5	324.6	0.57	0.62	Hembree B	SS-8
687-689	12	31	108.36	108.11	7.6	2.2	97.2	236.1	333.4	0.24	0.13	Hembree B	SS-8
689-690	12	116	108.11	108.08	12.0	0.7	98.8	248.2	346.9	0.66	0.77	Hembree B	SS-8
690-692	12	191	108.08	107.96	16.0	1.0	101.9	264.2	366.1	0.74	0.90	Hembree B	
692-694	12	94	107.96	107.76	19.6	1.5	107.6	283.8	391.3	0.52	0.53	Hembree B	
694-612	12	101	107.76	107.53	11.2	1.5	109.0	295.0	404.0	0.52	0.53	Hembree B	
710-682	12	288	109.68	109.26	32.3	0.9	30.7	60.5	91.3	0.26	0.15	Hembree B	
711-710	12	339	110.24	109.68	11.9	0.5	3.9	28.2	32.1	0.15	0.05	Hembree B	
1142-883	8	123	129.91	129.38	0.6	1.4	33.8	32.3	66.1	0.29	0.18	Hembree C	
1143-1142	6	121	130.55	129.91	31.7	1.6	33.5	31.7	65.1	0.41	0.36	Hembree C	
880-884	8	181	127.55	126.86	5.1	1.5	44.2	42.2	86.5	0.35	0.26	Hembree C	
881-880	8	170	128.36	127.55	0.9	1.6	38.9	37.1	76.0	0.30	0.20	Hembree C	
882-881	8	124	129.09	128.36	1.4	1.7	38.8	36.2	75.0	0.29	0.18	Hembree C	
883-882	8	61	129.38	129.09	2.5	1.5	36.6	34.8	71.4	0.30	0.19	Hembree C	
884-885	10	240	126.86	125.76	12.9	1.6	54.1	55.1	109.3	0.27	0.16	Hembree C	
885-886	10	228	125.76	125.58	3.7	0.9	56.6	58.8	115.4	0.45	0.42	Hembree C	

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886-887	10	336	125.58	124.80	2.2	1.3	56.6	60.9	117.6	0.34	0.25	Hembree C	
887-888	10	138	124.80	124.27	13.7	1.7	69.4	74.6	144.0	0.33	0.24	Hembree C	
888-889	10	296	124.27	123.03	1.9	1.7	69.4	76.4	145.9	0.32	0.23	Hembree C	
1056-985	18	213	117.55	117.22	45.5	1.2	94.6	542.2	636.8	0.40	0.34	Los Amigos	
1334-1056	18	281	117.97	117.55	13.8	1.2	83.6	496.7	580.3	0.39	0.32	Los Amigos	
1336-1334	18	279	118.52	117.97	13.6	1.3	80.9	483.0	563.8	0.35	0.27	Los Amigos	
1344-1336	18	292	118.96	118.52	14.2	1.2	79.7	469.3	549.0	0.37	0.30	Los Amigos	
1346-1344	18	71	119.13	118.96	20.3	1.4	78.2	455.0	533.2	0.33	0.23	Los Amigos	
1347-1346	18	130	119.22	119.13	6.4	0.8	71.9	434.8	506.6	0.45	0.42	Los Amigos	
1348-1347	18	245	119.85	119.22	12.0	1.3	70.3	428.4	498.6	0.31	0.21	Los Amigos	
1349-1350	18	233	120.35	120.00	25.0	1.1	68.2	408.2	476.4	0.35	0.26	Los Amigos	
1350-1348	18	167	120.00	119.85	8.2	0.9	68.2	416.4	484.6	0.40	0.34	Los Amigos	
1353-1349	18	97	120.74	120.35	4.8	1.5	63.4	383.2	446.6	0.26	0.15	Los Amigos	
1354-1353	18	325	121.28	120.74	15.9	1.1	63.4	378.4	441.8	0.33	0.23	Los Amigos	
1355-1354	18	323	121.77	121.28	15.8	1.1	63.4	362.5	425.9	0.33	0.23	Los Amigos	
1438-1449	18	277	124.80	124.06	49.6	1.2	52.1	299.7	351.8	0.26	0.14	Los Amigos	
1439-1438	18	183	125.08	124.80	10.9	1.0	43.4	250.1	293.4	0.27	0.16	Los Amigos	
1440-1439	18	229	125.64	125.08	15.2	1.1	43.4	239.2	282.6	0.23	0.12	Los Amigos	
1441-1440	18	185	125.95	125.64	11.0	1.0	43.4	224.0	267.4	0.25	0.14	Los Amigos	
1445-1451	18	251	123.34	122.85	6.1	1.1	57.7	320.5	378.2	0.29	0.18	Los Amigos	
1446-1445	18	43	123.45	123.34	7.0	1.3	55.1	314.4	369.5	0.26	0.15	Los Amigos	
1449-1446	18	234	124.06	123.45	7.7	1.2	52.1	307.4	359.5	0.26	0.15	Los Amigos	
1451-1580	18	294	122.85	122.26	10.5	1.2	60.1	331.0	391.1	0.29	0.18	Los Amigos	
1521-1524	12	30	131.19	130.86	7.3	2.0	39.6	29.9	69.6	0.14	0.04	Los Amigos	
1524-1525	12	234	130.86	130.36	-	1.1	39.6	29.9	69.6	0.21	0.09	Los Amigos	
1525-1526	12	221	130.36	130.04	20.7	1.0	40.1	50.7	90.8	0.26	0.15	Los Amigos	
1526-1527	12	227	130.04	129.69	21.3	1.0	40.1	72.0	112.1	0.29	0.18	Los Amigos	
1527-1528	12	143	129.69	129.23	13.4	1.3	42.5	85.4	127.9	0.25	0.14	Los Amigos	
1528-1529	12	430	129.23	128.49	40.3	1.1	42.5	125.7	168.2	0.34	0.25	Los Amigos	
1529-1530	12	269	128.49	128.00	25.2	1.1	42.5	150.9	193.5	0.36	0.28	Los Amigos	
1530-1531	12	269	128.00	127.47	25.2	1.1	42.5	176.2	218.7	0.38	0.31	Los Amigos	
1531-1532	12	266	127.47	126.52	24.9	1.4	42.8	201.1	243.9	0.34	0.25	Los Amigos	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1532-1441	18	165	126.32	125.95	11.9	1.1	43.4	213.0	256.4	0.23	0.11	Los Amigos	
1580-1355	18	322	122.26	121.77	15.7	1.1	63.4	346.8	410.2	0.32	0.22	Los Amigos	
958-957	18	153	110.89	110.76	-	1.0	99.4	572.7	672.1	0.49	0.49	Los Amigos	SS-15
976-983	18	287	116.09	115.26	-	1.6	99.4	572.8	672.1	0.35	0.26	Los Amigos	
981-958	18	145	110.94	110.89	-	0.7	99.4	572.7	672.1	0.65	0.76	Los Amigos	SS-15
982-981	18	258	111.50	110.94	-	1.4	99.4	572.7	672.1	0.38	0.31	Los Amigos	
983-982	8	117	115.26	111.50	-	3.1	41.7	240.4	282.2	0.37	0.29	Los Amigos	
983-982	12	111	115.26	111.50	-	3.3	57.6	332.3	389.9	0.25	0.13	Los Amigos	
984-976	18	394	116.65	116.09	19.2	1.2	94.6	572.8	667.3	0.42	0.37	Los Amigos	
985-984	18	231	117.22	116.65	11.3	1.4	94.6	553.5	648.1	0.36	0.28	Los Amigos	
1021-1022	15	144	104.86	104.61	17.1	1.7	245.1	1,340.1	1,585.2	0.67	0.80	North A	SS-9
1022-794	15	242	104.61	104.11	31.1	2.0	365.3	2,318.0	2,683.4	0.69	0.83	North A	SS-1
1023-1021	15	437	105.52	104.86	98.2	1.6	236.5	1,291.6	1,528.1	0.70	0.84	North A	SS-9
1057-1021	10	309	115.22	112.76	24.5	1.1	7.1	31.4	38.4	0.14	0.04	North A	
1666-1910	24	245	94.98	94.28	37.2	2.6	632.2	2,943.5	3,575.6	0.59	0.66	North A	SS-11
1667-1666	24	289	95.33	94.98	63.4	1.9	632.2	2,906.2	3,538.4	0.81	0.99	North A	SS-11
1907-808	10	279	98.81	97.32	22.1	3.1	587.5	2,820.8	3,408.2	0.48	0.46	North A	SS-1
790-797	15	57	103.46	103.43	114.7	2.0	535.3	2,536.5	3,071.9	0.65	0.76	North A	SS-1
794-790	15	531	104.11	103.46	103.8	1.7	396.0	2,421.9	2,817.9	0.67	0.79	North A	SS-1
797-798	15	210	103.43	102.86	25.0	2.0	536.6	2,561.5	3,098.2	0.65	0.76	North A	SS-1
798-801	15	203	102.86	102.71	71.7	2.0	560.5	2,633.2	3,193.7	0.67	0.79	North A	SS-1
801-802	15	85	102.71	102.57	35.7	2.0	560.5	2,668.9	3,229.4	0.67	0.79	North A	SS-1
802-804	15	97	102.57	102.42	49.4	2.0	573.3	2,718.3	3,291.5	0.69	0.82	North A	SS-1
804-807	10	402	102.42	101.88	79.5	1.9	587.5	2,797.8	3,385.2	0.75	0.91	North A	SS-1
807-1907	10	11	101.88	98.81	0.9	12.4	587.5	2,798.7	3,386.1	0.17	0.06	North A	SS-1
808-1667	10	278	97.32	95.33	22.0	3.6	632.2	2,842.7	3,474.9	0.44	0.40	North A	SS-1
831-1867	12	188	88.70	87.97	-	1.7	75.5	423.3	498.8	0.50	0.50	North A	
1081-1023	15	368	106.47	105.52	17.4	1.8	191.6	1,193.4	1,385.0	0.77	0.94	North B	
1082-1081	15	261	107.41	106.47	88.8	2.0	179.0	1,175.9	1,354.9	0.66	0.77	North B	
1083-1082	15	508	108.46	107.41	44.5	1.7	170.1	1,087.1	1,257.3	0.78	0.95	North B	
1087-1083	15	314	109.30	108.46	26.6	1.8	169.7	1,042.6	1,212.4	0.68	0.81	North B	
1378-1087	15	293	110.06	109.30	44.3	1.8	169.7	1,016.0	1,185.7	0.68	0.80	North B	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1390-1391	8	228	116.53	115.54	6.5	1.6	47.4	70.9	118.3	0.40	0.33	North B	
1391-1404	8	103	115.54	114.48	4.7	2.2	47.4	75.5	123.0	0.32	0.22	North B	
1392-1390	8	111	117.14	116.53	2.1	1.7	44.6	64.3	108.9	0.36	0.27	North B	
1393-1392	8	96	117.19	117.14	6.0	0.7	43.8	62.2	106.0	0.69	0.82	North B	
1394-1378	15	456	111.25	110.06	64.6	1.7	134.0	971.7	1,105.7	0.64	0.75	North B	
1400-1394	10	8	112.04	111.55	0.4	5.2	116.0	907.0	1,023.0	0.45	0.41	North B	
1401-1402	10	331	115.06	113.23	34.4	1.7	68.5	785.5	854.1	0.34	0.24	North B	SS-2
1402-1400	10	563	113.13	112.14	31.8	1.4	116.0	906.6	1,022.6	0.51	0.52	North B	SS-2
1403-1402	8	32	113.28	113.13	1.4	1.6	47.4	89.2	136.6	0.42	0.37	North B	
1404-1403	8	270	114.48	113.28	12.2	1.6	47.4	87.8	135.2	0.42	0.37	North B	
1416-1401	10	267	115.20	115.06	21.6	0.7	61.8	751.1	812.9	0.66	0.77	North B	SS-2
1417-1416	10	42	115.30	115.20	6.5	1.3	60.8	729.4	790.1	0.40	0.34	North B	SS-2
55-1393	8	202	118.11	117.19	56.2	1.5	38.9	56.2	95.0	0.35	0.26	North B	
1067-1057	10	299	117.12	115.22	6.9	0.5	0.9	7.0	7.9	0.07	0.01	North C	
1068-1070	6	185	110.48	107.03	6.9	1.1	2.3	10.8	13.0	0.13	0.04	North C	
1070-1073	6	361	104.23	102.89	5.0	0.7	2.6	15.8	18.4	0.23	0.12	North C	
1073-1074	12	9	102.89	102.31	20.3	2.0	5.0	36.1	41.1	0.07	0.01	North C	
1074-1075	12	182	95.11	94.87	5.1	1.1	75.5	407.9	483.3	0.69	0.83	North C	
1075-1076	12	42	94.87	94.52	1.2	2.2	75.5	409.0	484.5	0.40	0.33	North C	
1076-1077	12	59	94.52	94.07	1.6	2.1	75.5	410.7	486.1	0.41	0.35	North C	
1077-823	12	120	94.07	93.69	3.3	1.6	75.5	414.0	489.5	0.52	0.54	North C	
1078-1074	12	300	96.54	95.21	8.4	1.7	69.7	366.7	436.4	0.45	0.41	North C	
1098-1099	6	37	110.86	110.73	3.2	1.0	12.2	66.1	78.3	0.52	0.54	North C	
1099-1110	6	439	110.73	109.06	7.3	1.1	12.3	73.4	85.7	0.53	0.55	North C	
1101-1098	6	527	114.03	110.86	62.9	1.2	11.3	62.9	74.2	0.43	0.38	North C	
1106-1109	8	180	103.02	102.28	22.6	1.4	30.4	131.7	162.1	0.48	0.46	North C	
1107-1106	8	294	104.13	103.02	7.9	1.2	22.9	109.1	132.0	0.44	0.40	North C	
1108-1107	8	282	105.26	104.13	7.7	1.2	21.2	101.1	122.3	0.41	0.35	North C	
1109-1776	8	225	102.28	101.08	4.2	1.5	30.4	135.9	166.3	0.45	0.42	North C	
1110-1779	6	449	109.06	107.28	6.3	1.1	12.4	79.6	92.1	0.55	0.58	North C	
1114-1108	8	109	105.78	105.26	2.0	1.3	19.8	93.4	113.2	0.38	0.30	North C	
1120-1114	8	100	106.03	105.78	91.4	1.0	19.4	91.4	110.8	0.44	0.41	North C	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1776-1777	8	350	101.08	99.58	62.5	1.5	43.6	198.4	241.9	0.60	0.68	North C	
1777-1781	8	218	99.58	98.20	4.0	1.8	43.9	202.4	246.3	0.54	0.57	North C	
1778-1780	6	201	102.00	101.23	2.2	1.1	12.6	86.5	99.1	0.58	0.63	North C	
1779-1778	6	332	107.28	102.20	4.6	1.7	12.6	84.3	96.9	0.38	0.31	North C	
1780-1863	6	11	101.23	97.08	0.2	5.3	13.0	86.7	99.6	0.17	0.07	North C	
1781-1863	8	9	98.20	97.18	0.2	5.0	44.2	202.5	246.7	0.24	0.13	North C	
1782-1078	12	111	96.90	96.54	3.1	1.5	69.1	358.4	427.5	0.48	0.47	North C	
1863-1782	12	112	97.08	96.90	66.0	1.2	69.0	355.3	424.2	0.59	0.66	North C	
425-1068	6	277	116.47	110.48	3.9	0.7	0.5	3.9	4.4	0.08	0.01	North C	
820-824	12	186	92.37	91.71	-	1.6	75.5	423.3	498.8	0.51	0.52	North C	
821-820	12	24	92.45	92.37	0.7	1.6	75.5	423.3	498.8	0.52	0.53	North C	
822-821	12	260	93.37	92.45	7.2	1.6	75.5	422.7	498.1	0.51	0.52	North C	
823-822	12	51	93.69	93.37	1.4	2.0	75.5	415.4	490.9	0.43	0.39	North C	
824-825	12	72	91.71	91.46	-	1.6	75.5	423.3	498.8	0.52	0.53	North C	
825-826	12	74	91.46	91.29	-	1.4	75.5	423.3	498.8	0.58	0.64	North C	
826-828	12	292	91.29	89.66	-	1.9	75.5	423.3	498.8	0.45	0.42	North C	
828-830	12	142	89.66	89.11	-	1.7	75.5	423.3	498.8	0.50	0.50	North C	
830-831	12	61	89.11	88.70	-	2.0	75.5	423.3	498.8	0.43	0.38	North C	
1418-1417	10	93	115.36	115.30	266.1	0.8	59.7	722.9	782.5	0.59	0.65	North D	SS-2
1419-1418	10	325	116.33	115.36	21.3	1.3	46.0	456.8	502.8	0.54	0.57	North D	SS-2
1423-1419	10	176	116.65	116.33	11.5	1.1	44.4	435.5	479.9	0.62	0.70	North D	SS-2
1520-30	6	167	129.55	129.09	6.4	0.3	0.4	6.5	6.8	0.15	0.05	North D	
1533-1521	6	350	133.02	131.19	4.2	1.6	35.2	22.6	57.8	0.39	0.32	North D	
1534-1533	6	350	134.26	133.02	4.2	1.4	34.9	18.4	53.3	0.41	0.35	North D	
1536-1534	6	589	136.08	134.26	11.2	1.3	34.2	14.1	48.4	0.41	0.34	North D	
1537-1536	6	111	136.36	136.08	1.3	0.3	0.2	3.0	3.3	0.11	0.03	North D	
30-31	6	470	129.09	127.18	5.7	0.4	0.4	12.1	12.5	0.19	0.08	North D	
31-34	6	157	127.18	126.41	8.3	0.8	3.1	20.4	23.5	0.25	0.13	North D	
34-35	6	267	126.41	125.46	3.2	0.7	3.6	23.6	27.2	0.29	0.18	North D	
35-39	6	352	125.46	123.50	30.2	1.1	7.9	53.8	61.7	0.39	0.33	North D	
39-40	6	58	123.50	123.17	2.7	1.1	8.2	56.5	64.7	0.40	0.34	North D	
40-41	6	318	123.17	119.64	14.8	1.4	8.2	71.2	79.4	0.37	0.30	North D	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
41-42	6	110	119.64	117.20	5.1	1.8	8.9	76.3	85.2	0.32	0.23	North D	
42-1423	10	198	117.20	116.65	97.8	1.3	43.4	424.0	467.4	0.74	0.90	North D	
650-1537	6	141	136.72	136.36	1.7	-	-	1.7	1.7	0.08	0.01	North D	
9-11	10	83	122.91	122.27	168.0	1.3	12.3	168.0	180.2	0.31	0.21	North E	
11-12	10	339	122.27	121.35	35.6	1.0	16.8	203.5	220.4	0.46	0.43	North E	
12-13	10	125	121.35	121.03	22.1	1.0	18.6	225.7	244.2	0.50	0.50	North E	
13-23	10	88	121.03	120.85	24.3	1.0	28.7	250.0	278.7	0.57	0.62	North E	
23-24	10	218	120.85	120.29	-	1.1	29.5	250.0	279.5	0.54	0.56	North E	
24-43	10	483	120.29	119.05	-	1.1	30.9	250.0	280.9	0.54	0.56	North E	
43-44	10	62	119.05	118.76	-	1.4	31.7	250.0	281.7	0.45	0.41	North E	
44-42	10	634	118.76	117.30	-	1.1	34.0	250.0	284.0	0.56	0.60	North E	
185-187	12	211	111.27	110.49	5.1	1.8	97.2	394.3	491.5	0.50	0.50	South A	
187-188	12	252	110.49	109.81	10.1	1.6	100.6	404.4	505.1	0.56	0.61	South A	
188-239	12	227	109.81	108.74	-	2.0	103.0	404.4	507.4	0.48	0.46	South A	
234-247	14	264	107.07	106.55	31.7	1.7	187.1	610.3	797.4	0.64	0.74	South A	
239-234	12	233	108.74	107.07	10.4	2.7	185.2	578.6	763.9	0.54	0.56	South A	
240-239	6	258	110.80	109.14	3.1	2.1	81.1	163.8	244.8	0.54	0.56	South A	SS-3
241-240	6	126	111.32	110.80	6.2	1.8	81.1	160.6	241.7	0.61	0.70	South A	SS-3
244-241	6	150	111.78	111.32	38.4	1.6	79.6	154.5	234.1	0.66	0.77	South A	SS-3
247-248	14	640	106.55	105.71	22.5	1.4	187.2	633.0	820.2	0.77	0.94	South A	SS-14
248-249	14	39	105.71	105.45	1.1	2.6	187.9	634.1	822.0	0.44	0.41	South A	SS-14
249-566	14	346	105.45	104.99	15.0	1.5	188.2	649.1	837.4	0.78	0.95	South A	SS-14
564-565	14	978	104.42	102.85	30.6	1.7	256.9	699.3	956.2	0.81	0.99	South A	SS-14
566-564	14	437	104.99	104.42	19.3	1.5	189.3	668.5	857.9	0.80	0.98	South A	SS-14
580-244	6	254	112.79	111.78	9.3	1.7	63.3	116.0	179.3	0.51	0.52	South A	SS-3
581-580	6	178	113.60	112.79	39.7	1.8	58.3	106.8	165.1	0.79	0.97	South A	SS-3
582-581	6	181	114.26	113.60	41.5	1.4	36.3	67.0	103.4	0.60	0.68	South A	
589-582	6	120	114.86	114.26	25.5	1.2	15.2	25.5	40.7	0.32	0.23	South A	
155-157	12	185	117.33	116.65	17.9	0.7	4.2	45.1	49.3	0.15	0.05	South B	
157-178	12	327	116.65	116.13	49.2	0.7	11.0	94.3	105.3	0.27	0.16	South B	
167-171	6	593	116.08	113.50	20.0	1.6	47.8	85.4	133.1	0.68	0.80	South B	SS-18
171-173	12	149	113.30	112.78	7.2	1.7	90.4	349.4	439.8	0.48	0.46	South B	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
172-171	12	239	113.95	113.30	16.0	1.2	34.8	256.8	291.6	0.41	0.35	South B	
173-182	12	252	112.78	111.93	17.5	1.7	93.1	366.9	460.1	0.50	0.50	South B	
176-180	12	221	115.67	115.42	32.1	0.8	27.3	150.2	177.5	0.39	0.33	South B	
177-176	12	280	115.98	115.67	18.8	0.7	14.1	118.1	132.2	0.34	0.25	South B	
178-177	12	128	116.13	115.98	4.9	0.6	11.0	99.3	110.2	0.31	0.20	South B	
180-181	12	155	115.42	115.25	10.4	0.8	27.6	160.6	188.2	0.41	0.35	South B	
181-172	12	476	115.25	113.95	80.4	1.2	34.8	240.9	275.6	0.39	0.33	South B	
182-184	12	251	111.93	111.38	20.1	1.5	95.2	387.1	482.3	0.58	0.64	South B	
184-185	12	42	111.38	111.27	2.1	1.6	96.0	389.2	485.2	0.56	0.59	South B	
408-409	12	448	118.64	117.91	20.5	0.3	0.6	20.5	21.1	0.12	0.03	South B	
409-410	12	78	117.91	117.68	3.0	0.6	3.5	23.5	27.0	0.12	0.03	South B	
410-155	12	97	117.68	117.33	3.7	0.6	3.5	27.2	30.7	0.12	0.03	South B	
497-498	6	463	124.76	121.08	58.4	1.9	38.2	58.4	96.6	0.46	0.43	South B	
498-499	6	439	121.08	117.13	5.2	2.0	39.4	63.6	102.9	0.46	0.43	South B	
499-167	6	109	117.03	116.08	1.8	2.0	39.4	65.4	104.7	0.47	0.45	South B	
1669-1668	24	106	81.36	81.26	19.9	1.2	158.8	624.7	783.5	0.34	0.24	West	
1674-1669	18	127	81.65	81.36	2.7	1.6	145.1	604.8	749.9	0.40	0.33	West	
1675-1674	15	241	82.05	81.65	4.1	1.3	102.5	525.2	627.8	0.52	0.53	West	
1676-1675	15	300	82.41	82.05	4.5	1.2	99.7	521.1	620.9	0.57	0.62	West	
1677-1674	8	230	81.93	81.65	13.9	1.0	41.2	76.8	118.1	0.57	0.62	West	
1680-1677	8	224	83.25	81.93	1.4	1.6	33.1	63.0	96.1	0.33	0.23	West	
1683-1680	8	224	84.07	83.25	1.4	1.4	33.1	61.6	94.7	0.37	0.29	West	
1684-1683	8	78	84.57	84.27	60.1	1.4	33.1	60.1	93.3	0.36	0.28	West	
1699-1676	15	242	82.95	82.41	2.8	1.4	99.0	516.6	615.5	0.47	0.45	West	
1700-1699	15	99	83.20	82.95	1.8	1.5	98.2	513.8	612.0	0.45	0.42	West	SS-17
1701-1700	15	106	83.27	83.20	1.2	0.9	97.8	512.1	609.9	0.69	0.82	West	SS-17
1728-1701	15	159	83.70	83.27	1.8	1.5	97.8	510.9	608.6	0.44	0.40	West	
1733-1728	15	159	83.97	83.70	30.5	1.3	97.5	509.1	606.6	0.50	0.51	West	
1736-1733	15	253	84.40	83.97	2.9	1.3	90.0	478.6	568.6	0.49	0.47	West	
1737-1736	15	236	84.70	84.40	9.4	1.2	89.1	475.8	564.9	0.53	0.55	West	
1741-1737	15	261	85.20	84.70	7.8	1.3	85.2	466.4	551.6	0.46	0.43	West	
1867-1868	12	155	87.97	87.58	-	1.4	75.5	423.3	498.8	0.57	0.62	West	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1868-833	12	36	87.58	87.48	-	1.5	75.5	423.3	498.8	0.56	0.61	West	
1883-1906	15	176	86.06	85.73	2.0	1.3	78.1	445.5	523.5	0.45	0.41	West	
1905-1883	15	242	86.47	86.06	2.8	1.2	78.1	443.5	521.6	0.46	0.44	West	
1906-832	15	179	85.73	85.47	2.0	1.1	78.1	447.5	525.6	0.49	0.48	West	
340-840	8	95	94.95	94.38	0.6	0.6	1.4	0.6	2.0	0.05	0.00	West	
832-1741	15	248	85.47	85.20	11.3	1.1	82.0	458.7	540.7	0.53	0.56	West	
833-1905	15	460	87.18	86.47	5.2	1.2	78.1	440.8	518.8	0.47	0.45	West	
834-833	15	43	87.48	87.18	0.5	0.7	2.6	12.3	14.9	0.06	0.01	West	
835-834	12	184	90.36	88.68	1.7	0.8	2.6	11.8	14.4	0.07	0.01	West	
836-835	12	218	90.96	90.36	2.0	0.5	2.6	10.1	12.8	0.09	0.02	West	
837-836	12	14	91.20	90.96	0.1	1.0	2.6	8.2	10.8	0.05	0.01	West	
838-837	8	254	92.18	91.20	3.9	0.6	2.6	8.1	10.7	0.12	0.03	West	
839-838	8	269	93.27	92.18	1.6	0.6	2.0	4.1	6.1	0.09	0.02	West	
840-839	8	282	94.38	93.27	1.7	0.6	1.7	2.4	4.1	0.08	0.01	West	
1644-1655	42	173	86.75	86.61	-	2.0	1,413.8	2,946.1	4,359.9	0.40	0.34	WWTP	
1649-1653	20	112	91.04	90.58	-	3.0	665.7	1,360.7	2,026.4	0.50	0.50	WWTP	
1653-1654	20	180	90.58	90.43	-	1.7	715.3	1,360.7	2,076.0	0.62	0.70	WWTP	SS-10
1654-1656	20	497	90.43	90.01	-	1.7	715.3	1,360.7	2,076.0	0.62	0.70	WWTP	SS-10
1655-1657	42	474	86.61	86.24	-	1.9	1,413.8	2,946.1	4,359.9	0.41	0.34	WWTP	
1656-1913	20	241	90.01	89.80	-	1.7	715.3	1,360.7	2,076.0	0.61	0.69	WWTP	SS-10
1657-1912	42	378	86.24	85.94	-	1.9	1,413.8	2,946.1	4,359.9	0.40	0.34	WWTP	
1658-1895	42	18	85.52	85.32	-	5.5	2,129.0	4,306.9	6,435.9	0.25	0.14	WWTP	
1659-1895	30	39	80.23	80.61	-	0.4	791.0	3,568.1	4,359.1	1.00	-	WWTP	
1660-1659	24	30	80.32	80.23	-	1.7	158.8	624.7	783.5	0.25	0.14	WWTP	
1661-1659	20	24	85.19	80.23	-	11.6	632.2	2,943.5	3,575.6	0.19	0.08	WWTP	SS-11
1662-1661	21	98	85.36	85.19	-	2.2	632.2	2,943.5	3,575.6	0.70	0.84	WWTP	SS-11
1664-1662	24	24	85.64	85.36	-	4.2	632.2	2,943.5	3,575.6	0.39	0.33	WWTP	SS-11
1665-1660	24	268	80.91	80.32	-	1.6	158.8	624.7	783.5	0.27	0.16	WWTP	
1668-1665	24	233	81.26	80.91	-	1.4	158.8	624.7	783.5	0.30	0.20	WWTP	
1896-1658	42	32	85.87	85.52	-	5.5	2,129.0	4,306.9	6,435.9	0.25	0.14	WWTP	
1897-1896	20	15	89.64	87.87	-	9.8	715.3	1,360.7	2,076.0	0.17	0.06	WWTP	SS-10
1908-768	6	82	97.03	95.95	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	

Existing Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1909-760	8	129	93.77	92.56	-	2.1	49.6	-	49.6	0.21	0.09	WWTP	
1910-1664	24	59	93.18	85.64	-	9.8	632.2	2,943.5	3,575.6	0.21	0.10	WWTP	SS-11
1911-1897	20	52	89.68	89.64	-	1.7	715.3	1,360.7	2,076.0	0.62	0.70	WWTP	SS-10
1912-1896	42	87	86.94	85.87	-	5.1	1,413.8	2,946.1	4,359.9	0.20	0.09	WWTP	
1913-1911	20	144	89.80	89.68	-	1.7	715.3	1,360.7	2,076.0	0.62	0.71	WWTP	SS-10
565-567	14	11	102.85	102.56	-	5.5	472.2	865.6	1,337.9	0.41	0.35	WWTP	SS-6
567-568	14	48	102.56	102.18	-	3.9	665.7	1,360.7	2,026.4	0.77	0.94	WWTP	SS-6
568-569	14	356	102.18	100.12	-	3.5	665.7	1,360.7	2,026.4	0.75	0.92	WWTP	SS-6
569-570	14	347	100.12	97.66	-	3.8	665.7	1,360.7	2,026.4	0.81	0.99	WWTP	SS-6
570-571	14	102	97.66	96.70	-	4.2	665.7	1,360.7	2,026.4	0.72	0.86	WWTP	SS-6
571-1649	14	1,020	96.40	91.54	-	3.2	665.7	1,360.7	2,026.4	0.57	0.62	WWTP	SS-6
757-759	8	251	94.06	93.73	-	1.0	45.5	-	45.5	0.33	0.23	WWTP	
759-1909	8	188	95.53	93.77	-	2.1	48.1	-	48.1	0.20	0.09	WWTP	
760-1653	8	420	92.56	91.48	-	1.3	49.6	-	49.6	0.29	0.18	WWTP	
768-757	6	143	95.95	94.06	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	
769-1908	6	332	101.40	97.03	-	1.9	20.3	-	20.3	0.18	0.07	WWTP	
770-769	6	416	103.03	101.40	-	1.2	20.3	-	20.3	0.24	0.13	WWTP	

DRAFT

Los Amigos
North E
Bell Village A
North B
North D
Bell Village B
North C
North A
WRF
West
Brooks B
Brooks A
Hembree C
Hembree B
Hembree A
South A
South B
Conde B North
Conde A
Conde B South

- Urban Growth Boundary
- Town Limit
- Sewer Basins
- Sewer Pipe & Diameter - Modeled
- Sewer Pipe - Not Modeled
- Sewer Manhole & ID - Modeled
- Sewer Cleanout & ID - Modeled
- Water Reclamation Facility Inlet Pump Station

Paper Size ANSI A

0 500 1,000 1,500 2,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

GHD

Town of Windsor
Sewer Collection System
Master Plan

Sewer Model
Existing with Recommended Projects
Pipes and Manholes

Project No. **11151247**
Revision No. **1**
Date **8/19/2020**

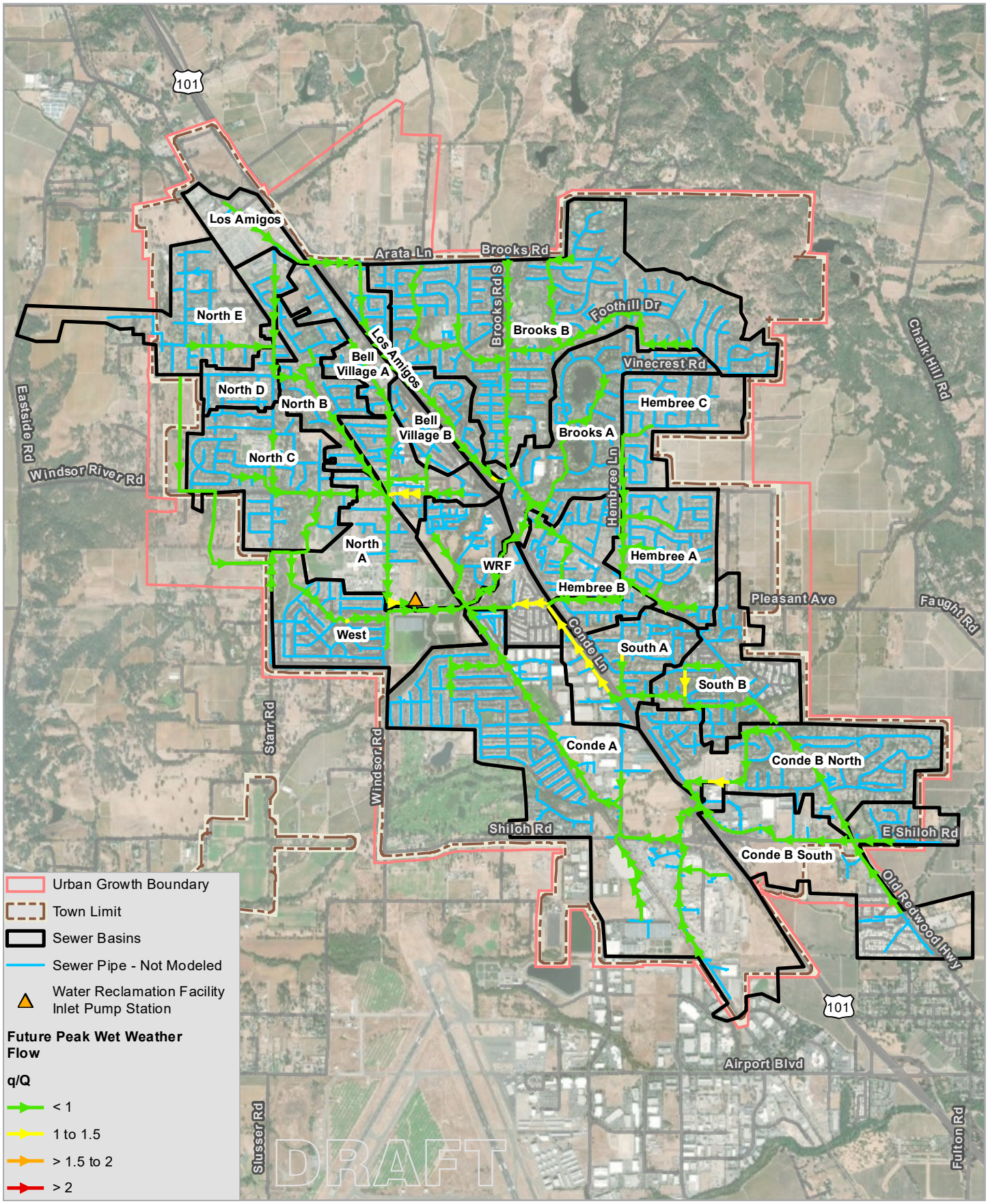
FIGURE D-3

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure D-3 - Sewer Model Existing with Recommended Projects Pipes and Manholes.mxd
Print date: 20 Aug 2020 - 12:07

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Appendix F – Future Condition Model

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Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

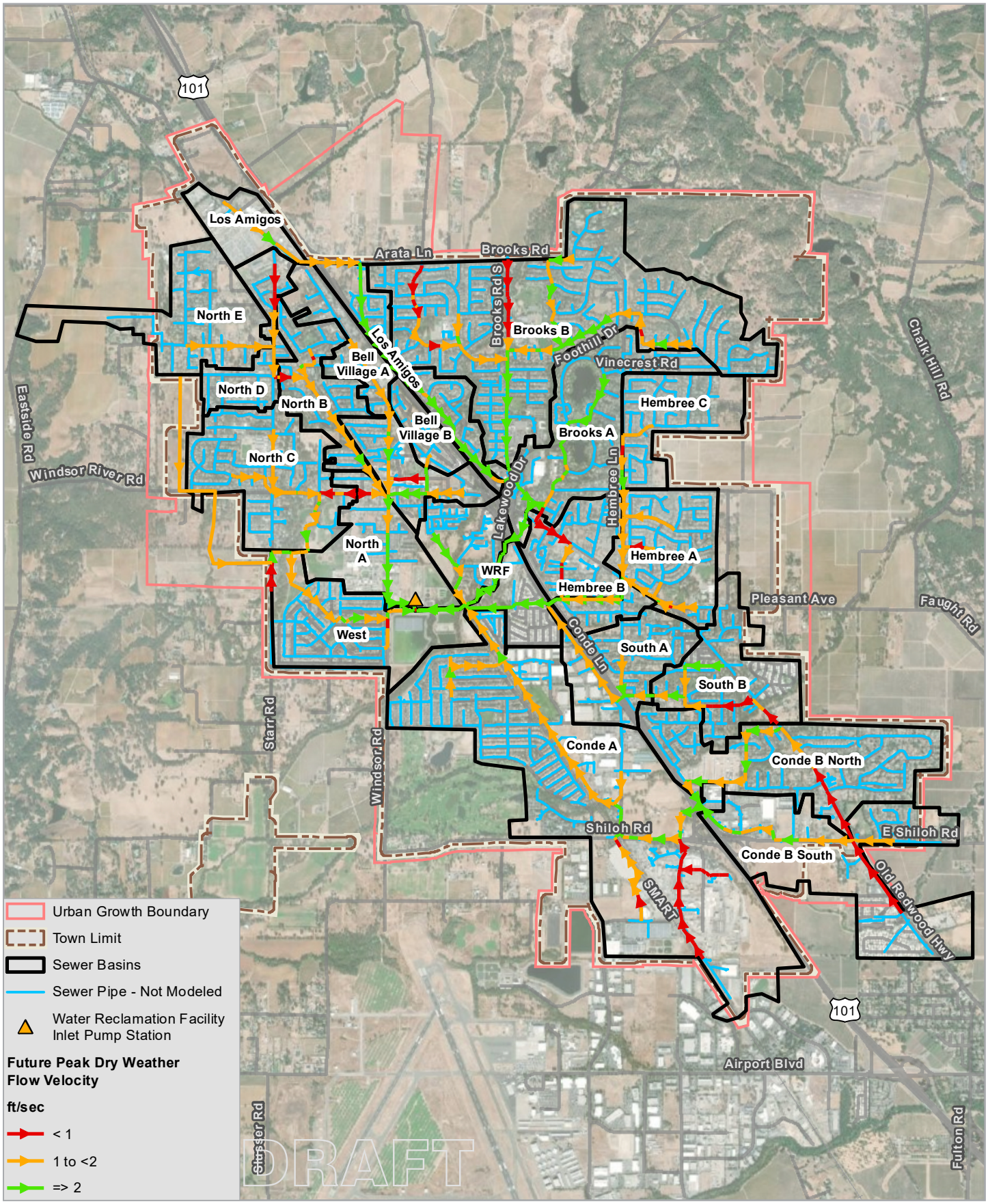
Future Peak Wet Weather Flow
Capacity Deficiencies Severity

Project No. 11151247
Revision No. 1
Date 8/18/2020

FIGURE E-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure E-1 - Future Peak Wet Weather Flow Capacity Deficiencies Severity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2



Paper Size ANSI A

0 1,000 2,000 3,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

GHD

Town of Windsor
Sewer Collection System
Master Plan

Future Peak Dry Weather Flow Velocity

Project No. 11151247
Revision No. 1
Date 8/18/2020

FIGURE E-2

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure E-2 - Future Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1000	118.4	20.6	5.7	Bell Village A
MH-1001	117.1	0.8	5.5	Bell Village A
MH-1032	120.8	4.1	9.6	Bell Village A
MH-1033	119.1	3.7	7.7	Bell Village A
MH-1034	122.1	4.6	11.3	Bell Village A
MH-1035	118.7	2.8	6.4	Bell Village A
MH-1036	120.5	2.5	6.9	Bell Village A
MH-1037	121.5	1.3	7.4	Bell Village A
MH-1038	122.2	1.8	10.8	Bell Village A
MH-1039	122.0	1.7	10.3	Bell Village A
MH-1046	121.3	18.5	7.8	Bell Village A
MH-1053	122.9	11.5	8.2	Bell Village A
MH-1055	123.2	6.4	7.9	Bell Village A
MH-1360	129.9	1.3	9.7	Bell Village A
MH-1361	129.4	1.8	9.6	Bell Village A
MH-1364	123.7	9.4	7.7	Bell Village A
MH-1366	126.9	0.2	8.9	Bell Village A
MH-1367	127.6	5.2	9.1	Bell Village A
MH-1385	129.7	10.3	8.1	Bell Village A
MH-1386	129.3	1.1	7.5	Bell Village A
MH-1854	118.3	-	6.7	Bell Village A
MH-1855	121.5	24.2	9.7	Bell Village A
MH-1856	122.0	-	10.1	Bell Village A
MH-1857	121.8	-	9.9	Bell Village A
MH-1858	120.8	-	8.7	Bell Village A
MH-1889	122.1	1.3	10.2	Bell Village A
MH-1903	118.7	1.3	7.7	Bell Village A
MH-88	133.0	31.2	9.5	Bell Village A
MH-993	118.9	5.4	10.4	Bell Village A
MH-994	118.8	0.9	12.6	Bell Village A
MH-995	118.2	3.8	8.4	Bell Village A
MH-996	118.9	0.7	7.4	Bell Village A
MH-999	116.0	4.2	4.2	Bell Village A
MH-1859	122.7	2.1	10.0	Bell Village B
MH-1860	123.9	-	11.0	Bell Village B
MH-1861	124.3	-	11.3	Bell Village B
MH-1902	124.5	155.3	11.3	Bell Village B
MH-1237	131.6	-	7.4	Brooks A
MH-1238	132.0	0.6	5.7	Brooks A
MH-1239	132.9	1.9	5.6	Brooks A
MH-1243	128.9	38.4	6.2	Brooks A
MH-1244	134.0	12.6	5.8	Brooks A
MH-1245	135.4	-	6.2	Brooks A

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1246	136.1	-	6.2	Brooks A
MH-1249	140.6	9.9	6.3	Brooks A
MH-1251	144.3	0.6	8.0	Brooks A
MH-1252	145.5	97.5	8.1	Brooks A
MH-1651	101.6	-	12.0	Brooks A
MH-1652	102.0	-	11.7	Brooks A
MH-1904	119.9	-	8.7	Brooks A
MH-724	120.3	9.0	9.4	Brooks A
MH-726	119.1	-	19.9	Brooks A
MH-730	117.8	0.8	17.8	Brooks A
MH-731	117.7	27.2	19.3	Brooks A
MH-732	115.9	8.5	19.4	Brooks A
MH-733	111.7	34.2	17.0	Brooks A
MH-734	108.6	-	14.5	Brooks A
MH-735	109.0	-	15.1	Brooks A
MH-736	110.2	-	16.8	Brooks A
MH-742	107.5	-	14.7	Brooks A
MH-743	103.8	-	11.6	Brooks A
MH-744	104.3	-	12.6	Brooks A
MH-745	105.0	-	13.9	Brooks A
MH-898	121.5	18.3	9.3	Brooks A
MH-899	121.3	9.2	9.5	Brooks A
MH-900	120.3	6.6	9.1	Brooks A
MH-901	120.4	3.6	12.2	Brooks A
MH-912	123.4	49.7	6.7	Brooks A
MH-913	123.8	-	6.6	Brooks A
MH-919	123.5	-	7.3	Brooks A
MH-920	124.6	0.7	6.6	Brooks A
MH-921	125.0	1.0	6.5	Brooks A
MH-922	125.7	-	6.2	Brooks A
MH-923	126.6	-	6.0	Brooks A
MH-924	127.6	0.8	6.3	Brooks A
MH-925	127.7	1.0	6.2	Brooks A
MH-927	128.4	1.1	6.3	Brooks A
MH-928	124.3	-	8.5	Brooks A
MH-929	122.9	-	8.5	Brooks A
MH-930	121.8	1.7	9.2	Brooks A
MH-944	118.9	5.3	17.7	Brooks A
MH-945	118.8	1.6	17.6	Brooks A
MH-947	120.3	-	18.4	Brooks A
MH-948	120.9	-	12.9	Brooks A
MH-949	120.6	84.2	11.5	Brooks A
MH-951	120.0	-	10.4	Brooks A

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-952	120.1	-	10.6	Brooks A
MH-954	120.1	-	9.5	Brooks A
MH-956	120.1	-	9.2	Brooks A
MH-957	120.8	-	9.2	Brooks A
MH-961	119.9	21.7	8.7	Brooks A
MH-1203	174.2	33.2	9.2	Brooks B
MH-1209	171.8	1.1	9.0	Brooks B
MH-1210	166.1	2.0	6.3	Brooks B
MH-1211	161.6	2.9	6.5	Brooks B
MH-1212	160.1	1.7	6.6	Brooks B
MH-1213	166.9	0.9	13.8	Brooks B
MH-1214	167.2	-	14.4	Brooks B
MH-1220	166.4	20.9	15.0	Brooks B
MH-1221	165.6	1.1	14.9	Brooks B
MH-1242	128.8	-	14.2	Brooks B
MH-1277	142.5	0.4	10.3	Brooks B
MH-1278	141.5	1.2	11.2	Brooks B
MH-1280	140.2	1.3	10.8	Brooks B
MH-1281	139.5	0.6	10.6	Brooks B
MH-1282	139.0	1.6	10.5	Brooks B
MH-1283	140.6	1.9	13.0	Brooks B
MH-1284	142.5	-	15.9	Brooks B
MH-1285	141.2	0.2	22.2	Brooks B
MH-1286	139.2	6.5	21.0	Brooks B
MH-1288	135.4	15.0	18.8	Brooks B
MH-1289	134.2	7.8	17.9	Brooks B
MH-1290	130.1	4.9	15.1	Brooks B
MH-1299	138.7	1.1	18.7	Brooks B
MH-1300	136.9	1.5	16.4	Brooks B
MH-1301	136.1	5.2	15.5	Brooks B
MH-1302	135.7	-	14.9	Brooks B
MH-1305	136.0	-	14.9	Brooks B
MH-1306	138.1	22.7	16.6	Brooks B
MH-1453	164.3	4.8	14.8	Brooks B
MH-1456	148.6	2.9	8.1	Brooks B
MH-1457	153.6	1.1	7.7	Brooks B
MH-1458	155.7	3.3	9.0	Brooks B
MH-1460	160.8	1.1	12.3	Brooks B
MH-1461	144.2	2.6	8.3	Brooks B
MH-1462	142.9	1.0	9.7	Brooks B
MH-1463	143.3	1.4	6.4	Brooks B
MH-1466	145.0	2.8	6.6	Brooks B
MH-1467	146.9	-	7.5	Brooks B

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1468	148.6	18.9	7.8	Brooks B
MH-1482	155.3	3.7	8.8	Brooks B
MH-1483	149.2	2.1	6.7	Brooks B
MH-1484	155.5	4.3	8.3	Brooks B
MH-1486	145.6	1.8	13.9	Brooks B
MH-1487	150.0	0.2	16.2	Brooks B
MH-1488	153.3	-	17.9	Brooks B
MH-1489	153.8	-	18.0	Brooks B
MH-1490	153.7	-	17.4	Brooks B
MH-1491	155.3	1.2	7.7	Brooks B
MH-1495	158.1	0.2	9.1	Brooks B
MH-1499	156.6	9.6	8.2	Brooks B
MH-1501	158.2	-	8.0	Brooks B
MH-1502	165.4	-	4.7	Brooks B
MH-1503	174.3	22.1	10.6	Brooks B
MH-1557	138.9	0.4	17.0	Brooks B
MH-1558	139.2	0.6	10.2	Brooks B
MH-1561	140.0	1.4	10.2	Brooks B
MH-1562	141.4	28.2	10.9	Brooks B
MH-1568	137.7	2.0	15.6	Brooks B
MH-1569	135.5	0.9	12.6	Brooks B
MH-1570	134.0	8.0	10.9	Brooks B
MH-1571	134.3	-	10.9	Brooks B
MH-1572	133.5	6.1	9.8	Brooks B
MH-1573	133.3	4.2	9.3	Brooks B
MH-1574	133.6	1.1	9.1	Brooks B
MH-1595	137.0	1.8	11.8	Brooks B
MH-1597	139.9	7.4	14.3	Brooks B
MH-1599	139.5	5.3	13.9	Brooks B
MH-1610	140.3	22.7	14.3	Brooks B
MH-1611	139.6	-	13.9	Brooks B
MH-1612	140.7	0.9	14.2	Brooks B
MH-1613	140.9	0.2	14.2	Brooks B
MH-1614	141.0	0.6	14.0	Brooks B
MH-1615	142.0	4.6	14.9	Brooks B
MH-1627	143.9	0.1	16.5	Brooks B
MH-963	120.8	-	9.1	Brooks B
MH-964	121.6	7.4	9.5	Brooks B
MH-966	122.3	6.1	9.8	Brooks B
MH-967	125.7	7.0	12.1	Brooks B
MH-968	126.1	13.9	12.5	Brooks B
MH-111	107.2	-	12.6	Conde A
MH-112	109.4	-	15.1	Conde A

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-113	107.9	-	14.2	Conde A
MH-114	106.9	-	13.7	Conde A
MH-115	105.8	2.3	12.7	Conde A
MH-116	104.7	-	11.9	Conde A
MH-117	107.8	-	10.0	Conde A
MH-119	108.6	-	8.2	Conde A
MH-120	109.0	33.2	8.2	Conde A
MH-122	104.6	6.7	12.2	Conde A
MH-123	103.2	-	10.9	Conde A
MH-124	103.1	0.5	11.1	Conde A
MH-125	101.7	-	9.8	Conde A
MH-1634	98.5	5.4	3.9	Conde A
MH-1635	99.3	10.9	3.9	Conde A
MH-1636	106.1	2.9	13.9	Conde A
MH-1637	103.8	2.6	10.8	Conde A
MH-1638	101.3	5.5	7.5	Conde A
MH-1642	103.2	-	13.6	Conde A
MH-1643	102.7	-	13.8	Conde A
MH-1799	111.6	21.3	7.5	Conde A
MH-1845	114.2	-	12.9	Conde A
MH-1846	114.1	-	11.5	Conde A
MH-1847	115.1	-	11.6	Conde A
MH-1848	115.4	1.2	11.8	Conde A
MH-1869	113.9	-	12.1	Conde A
MH-1872	108.8	2.6	11.4	Conde A
MH-1914	109.2	-	14.0	Conde A
MH-1915	115.2	-	15.2	Conde A
MH-202	104.8	138.2	13.1	Conde A
MH-214	108.1	-	17.0	Conde A
MH-215	108.4	-	17.5	Conde A
MH-216	108.5	-	17.9	Conde A
MH-217	113.5	-	23.4	Conde A
MH-252	109.0	2.1	17.7	Conde A
MH-272	117.2	-	17.5	Conde A
MH-273	111.7	-	13.3	Conde A
MH-274	111.9	11.8	13.9	Conde A
MH-275	113.1	-	15.9	Conde A
MH-296	111.8	0.2	14.8	Conde A
MH-297	111.5	-	14.3	Conde A
MH-298	109.0	7.6	13.4	Conde A
MH-299	109.7	22.2	13.5	Conde A
MH-300	110.3	-	13.8	Conde A
MH-301	114.0	-	16.3	Conde A

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-302	114.9	0.1	16.5	Conde A
MH-303	113.6	0.6	14.9	Conde A
MH-304	113.1	-	14.3	Conde A
MH-310	113.1	4.5	13.6	Conde A
MH-311	114.2	-	14.4	Conde A
MH-312	115.6	-	15.5	Conde A
MH-313	117.0	4.8	16.2	Conde A
MH-314	117.4	-	16.0	Conde A
MH-315	113.3	-	14.2	Conde A
MH-317	114.4	-	14.6	Conde A
MH-319	113.7	-	13.0	Conde A
MH-320	113.6	-	12.8	Conde A
MH-324	113.5	-	16.0	Conde A
MH-325	113.7	-	14.9	Conde A
MH-326	112.7	-	12.9	Conde A
MH-327	112.3	-	11.6	Conde A
MH-328	112.1	2.6	10.3	Conde A
MH-329	111.8	-	9.6	Conde A
MH-330	111.3	-	7.8	Conde A
MH-331	107.6	-	12.9	Conde A
MH-332	109.7	-	14.7	Conde A
MH-333	112.3	-	15.8	Conde A
MH-334	110.3	-	14.2	Conde A
MH-335	110.5	58.9	14.7	Conde A
MH-430	99.8	11.4	3.9	Conde A
MH-431	100.1	15.5	3.6	Conde A
MH-451	101.0	73.4	3.8	Conde A
MH-577	107.6	0.5	16.0	Conde A
MH-578	114.7	9.8	24.7	Conde A
MH-579	110.2	-	20.3	Conde A
MH-151	123.2	3.8	8.9	Conde B North
MH-152	122.4	0.8	9.1	Conde B North
MH-154	124.5	1.3	9.0	Conde B North
MH-265	115.2	19.6	12.8	Conde B North
MH-267	115.3	-	9.8	Conde B North
MH-268	116.5	27.4	8.3	Conde B North
MH-269	118.6	27.4	8.7	Conde B North
MH-270	120.6	11.9	10.0	Conde B North
MH-271	117.4	0.2	15.8	Conde B North
MH-291	121.4	1.1	10.2	Conde B North
MH-292	123.0	4.9	10.4	Conde B North
MH-349	135.0	18.2	13.7	Conde B North
MH-350	135.6	21.3	14.2	Conde B North

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-351	137.3	25.2	15.5	Conde B North
MH-378	132.9	1.0	12.0	Conde B North
MH-388	124.8	1.2	7.6	Conde B North
MH-389	128.0	1.7	9.6	Conde B North
MH-390	130.2	0.6	10.9	Conde B North
MH-391	130.5	8.6	10.3	Conde B North
MH-406	130.6	9.6	10.6	Conde B North
MH-407	130.1	-	10.3	Conde B North
MH-1808	145.3	6.9	13.0	Conde B South
MH-1809	142.6	18.8	13.5	Conde B South
MH-1810	138.0	0.2	15.4	Conde B South
MH-1811	138.0	-	14.6	Conde B South
MH-1818	122.4	36.3	10.5	Conde B South
MH-1819	122.8	-	10.5	Conde B South
MH-1820	123.9	74.5	9.8	Conde B South
MH-1821	124.7	2.3	9.7	Conde B South
MH-1822	126.3	18.8	10.1	Conde B South
MH-1824	131.0	14.0	11.8	Conde B South
MH-1825	138.1	-	15.5	Conde B South
MH-1826	138.2	27.4	14.7	Conde B South
MH-1830	136.8	-	12.7	Conde B South
MH-1831	134.8	4.8	10.2	Conde B South
MH-1874	117.5	-	11.3	Conde B South
MH-276	119.0	9.3	9.6	Conde B South
MH-277	119.1	0.8	10.4	Conde B South
MH-278	118.3	-	10.5	Conde B South
MH-279	118.0	10.6	10.9	Conde B South
MH-281	117.3	13.2	13.7	Conde B South
MH-336	120.1	2.5	10.0	Conde B South
MH-337	121.5	-	10.7	Conde B South
MH-516	136.5	118.0	13.6	Hembree A
MH-520	134.5	-	12.1	Hembree A
MH-521	134.3	-	12.2	Hembree A
MH-522	133.7	-	7.0	Hembree A
MH-523	131.9	-	10.2	Hembree A
MH-524	131.6	-	10.2	Hembree A
MH-525	131.2	-	9.8	Hembree A
MH-526	130.6	-	9.3	Hembree A
MH-528	132.4	64.1	7.0	Hembree A
MH-529	132.3	-	8.2	Hembree A
MH-530	132.6	-	10.1	Hembree A
MH-602	125.9	-	12.1	Hembree A
MH-603	123.0	-	11.8	Hembree A

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-604	119.6	-	10.6	Hembree A
MH-605	117.8	-	11.3	Hembree A
MH-606	116.1	-	9.9	Hembree A
MH-613	134.1	31.6	10.8	Hembree A
MH-635	135.2	15.8	11.0	Hembree A
MH-636	134.7	0.8	11.0	Hembree A
MH-637	134.0	3.3	11.0	Hembree A
MH-638	132.4	23.4	9.9	Hembree A
MH-647	132.9	14.9	10.3	Hembree A
MH-648	134.2	1.4	10.6	Hembree A
MH-649	135.1	3.4	11.0	Hembree A
MH-650	136.0	1.2	11.3	Hembree A
MH-651	136.0	1.2	10.1	Hembree A
MH-652	137.1	29.7	10.1	Hembree A
MH-663	129.4	-	8.4	Hembree A
MH-665	131.7	4.1	9.1	Hembree A
MH-666	130.3	-	8.7	Hembree A
MH-667	129.0	0.2	8.7	Hembree A
MH-668	131.7	-	9.5	Hembree A
MH-669	131.1	-	9.9	Hembree A
MH-670	126.4	-	10.3	Hembree A
MH-671	129.0	-	11.9	Hembree A
MH-889	135.0	-	11.3	Hembree A
MH-890	133.4	-	10.4	Hembree A
FAKECO-1	120.0	-	8.9	Hembree B
MH-594	126.0	28.7	9.0	Hembree B
MH-601	116.1	28.7	8.2	Hembree B
MH-607	116.2	-	9.1	Hembree B
MH-608	119.6	25.4	7.1	Hembree B
MH-612	117.0	1.6	8.9	Hembree B
MH-681	125.6	2.2	16.3	Hembree B
MH-682	124.0	25.3	14.3	Hembree B
MH-685	120.3	39.9	10.9	Hembree B
MH-686	119.4	1.6	10.3	Hembree B
MH-687	119.7	1.2	10.7	Hembree B
MH-689	119.0	1.5	10.1	Hembree B
MH-690	119.1	3.2	10.2	Hembree B
MH-692	118.1	5.6	9.6	Hembree B
MH-694	117.1	1.4	8.8	Hembree B
MH-710	122.3	38.0	12.3	Hembree B
MH-711	120.1	3.9	9.7	Hembree B
MH-1142	142.1	0.3	12.0	Hembree C
MH-1143	142.7	53.9	11.9	Hembree C

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-880	139.6	5.3	11.8	Hembree C
MH-881	140.3	0.1	11.7	Hembree C
MH-882	141.3	2.2	12.0	Hembree C
MH-883	141.5	2.8	11.9	Hembree C
MH-884	139.1	9.9	11.9	Hembree C
MH-885	136.8	2.5	10.6	Hembree C
MH-886	136.0	-	10.1	Hembree C
MH-887	133.1	229.6	7.8	Hembree C
MH-888	132.5	-	7.7	Hembree C
MH-1056	127.3	11.0	8.8	Los Amigos
MH-1334	127.5	2.7	8.6	Los Amigos
MH-1336	127.5	1.2	8.2	Los Amigos
MH-1344	127.2	1.5	7.3	Los Amigos
MH-1346	126.5	6.3	6.7	Los Amigos
MH-1347	126.6	1.6	6.2	Los Amigos
MH-1348	128.0	2.1	7.5	Los Amigos
MH-1349	130.8	4.8	9.6	Los Amigos
MH-1350	129.6	-	8.6	Los Amigos
MH-1353	132.4	-	11.1	Los Amigos
MH-1354	135.0	-	12.9	Los Amigos
MH-1355	134.9	-	12.3	Los Amigos
MH-1438	136.1	15.3	10.6	Los Amigos
MH-1439	137.3	-	11.5	Los Amigos
MH-1440	138.0	-	11.8	Los Amigos
MH-1441	138.8	9.9	12.2	Los Amigos
MH-1445	133.1	2.6	9.1	Los Amigos
MH-1446	132.8	3.0	8.7	Los Amigos
MH-1449	134.0	0.4	9.2	Los Amigos
MH-1451	133.7	2.4	10.1	Los Amigos
MH-1524	139.4	-	8.2	Los Amigos
MH-1525	139.1	0.5	8.3	Los Amigos
MH-1526	138.7	-	8.3	Los Amigos
MH-1527	138.6	2.4	8.6	Los Amigos
MH-1528	136.4	-	6.8	Los Amigos
MH-1529	137.9	-	9.0	Los Amigos
MH-1530	139.0	-	10.6	Los Amigos
MH-1531	139.1	0.3	11.2	Los Amigos
MH-1532	140.9	533.3	14.0	Los Amigos
MH-1580	134.2	3.3	11.1	Los Amigos
MH-958	121.3	-	9.2	Los Amigos
MH-976	122.0	4.8	5.1	Los Amigos
MH-981	121.8	-	9.3	Los Amigos
MH-982	120.1	-	7.4	Los Amigos

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-983	121.1	-	5.5	Los Amigos
MH-984	126.2	-	8.6	Los Amigos
MH-985	126.8	-	8.8	Los Amigos
MH-1021	118.9	1.5	12.8	North A
MH-1022	118.4	1.1	12.5	North A
MH-1023	119.5	44.9	12.9	North A
MH-1057	121.1	6.2	5.8	North A
MH-1666	101.8	-	5.6	North A
MH-1667	103.9	-	6.5	North A
MH-1907	108.5	-	8.7	North A
MH-790	114.4	145.7	9.5	North A
MH-794	115.4	30.7	9.9	North A
MH-797	113.7	1.3	9.0	North A
MH-798	112.8	27.9	8.3	North A
MH-801	113.9	-	9.8	North A
MH-802	114.4	12.8	10.4	North A
MH-804	114.7	16.2	10.7	North A
MH-807	109.0	-	6.7	North A
MH-808	104.0	44.7	5.8	North A
MH-831	107.6	-	18.4	North A
MH-1081	119.0	12.6	11.5	North B
MH-1082	117.8	8.8	9.6	North B
MH-1083	116.6	0.4	7.1	North B
MH-1087	119.4	-	9.2	North B
MH-1378	125.3	35.7	14.3	North B
MH-1390	128.7	2.8	11.9	North B
MH-1391	126.8	-	11.1	North B
MH-1392	129.2	0.8	11.9	North B
MH-1393	129.2	5.0	11.5	North B
MH-1394	125.8	18.0	13.8	North B
MH-1400	125.6	-	13.2	North B
MH-1401	126.3	6.7	10.7	North B
MH-1402	124.2	-	10.3	North B
MH-1403	123.2	-	9.2	North B
MH-1404	125.3	-	10.5	North B
MH-1416	120.3	1.1	4.1	North B
MH-1417	121.2	1.1	5.0	North B
MH-55	129.0	39.5	10.7	North B
CO-425	123.2	0.5	6.7	North C
MH-1067	122.6	0.9	5.4	North C
MH-1068	115.5	1.8	4.9	North C
MH-1070	114.1	0.3	9.8	North C
MH-1073	115.2	45.5	12.2	North C

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1074	115.2	0.7	19.3	North C
MH-1075	114.1	-	18.8	North C
MH-1076	113.1	-	18.2	North C
MH-1077	112.3	-	17.6	North C
MH-1078	111.6	0.6	14.7	North C
MH-1098	117.4	1.2	6.2	North C
MH-1099	117.4	0.1	6.4	North C
MH-1101	122.6	16.1	8.4	North C
MH-1106	123.6	7.5	20.3	North C
MH-1107	122.7	1.8	18.3	North C
MH-1108	121.0	1.4	15.4	North C
MH-1109	125.3	-	22.7	North C
MH-1110	117.7	0.1	8.3	North C
MH-1114	120.5	0.4	14.4	North C
MH-1120	120.0	19.4	13.7	North C
MH-1776	122.4	13.2	20.9	North C
MH-1777	112.0	0.4	12.0	North C
MH-1778	111.5	0.3	9.2	North C
MH-1779	121.6	0.2	14.1	North C
MH-1780	110.2	0.4	8.9	North C
MH-1781	110.8	0.2	12.4	North C
MH-1782	110.5	0.2	13.1	North C
MH-1863	110.2	11.8	12.5	North C
MH-820	109.3	-	16.4	North C
MH-821	108.7	-	15.7	North C
MH-822	110.9	-	17.0	North C
MH-823	111.3	-	17.1	North C
MH-824	110.9	-	18.7	North C
MH-825	110.6	-	18.5	North C
MH-826	109.3	-	17.5	North C
MH-828	108.5	-	18.3	North C
MH-830	108.0	-	18.4	North C
CO-650	138.6	58.4	1.6	North D
MH-1418	122.7	13.6	6.4	North D
MH-1419	122.4	1.6	5.5	North D
MH-1423	123.3	1.0	6.0	North D
MH-1520	136.5	0.4	6.9	North D
MH-1521	139.2	11.7	7.8	North D
MH-1533	139.3	0.2	6.0	North D
MH-1534	140.2	0.7	5.6	North D
MH-1536	142.2	40.4	5.8	North D
MH-1537	141.2	0.2	4.6	North D
MH-30	136.0	-	6.8	North D

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-31	133.4	2.7	6.1	North D
MH-34	132.9	0.5	6.4	North D
MH-35	133.5	4.3	7.8	North D
MH-39	131.3	0.3	7.6	North D
MH-40	130.9	-	7.5	North D
MH-41	124.9	0.7	5.1	North D
MH-42	124.0	0.5	6.1	North D
MH-11	132.1	4.6	9.4	North E
MH-12	132.2	1.7	10.5	North E
MH-13	130.7	10.1	9.2	North E
MH-23	130.1	2.0	8.7	North E
MH-24	131.0	5.8	10.2	North E
MH-43	131.7	0.8	12.2	North E
MH-44	131.6	2.3	12.3	North E
MH-9	130.9	39.5	7.7	North E
MH-185	119.2	1.2	6.8	South A
MH-187	118.1	3.4	6.0	South A
MH-188	117.2	2.4	5.5	South A
MH-234	116.4	1.9	5.6	South A
MH-239	117.7	1.2	6.3	South A
MH-240	118.1	-	6.0	South A
MH-241	118.3	1.4	5.9	South A
MH-244	119.2	25.4	6.4	South A
MH-247	117.9	0.1	7.6	South A
MH-248	117.4	0.7	8.0	South A
MH-249	117.2	2.4	7.9	South A
MH-564	118.0	68.7	9.9	South A
MH-566	117.6	1.1	8.7	South A
MH-580	120.7	4.9	7.5	South A
MH-581	122.4	22.4	8.2	South A
MH-582	122.9	21.2	8.3	South A
MH-589	123.3	31.4	8.2	South A
MH-155	129.8	0.7	12.3	South B
MH-157	131.1	6.8	14.1	South B
MH-167	123.7	8.4	6.5	South B
MH-171	122.4	7.9	8.6	South B
MH-172	124.3	-	9.9	South B
MH-173	120.9	2.7	7.5	South B
MH-176	126.2	13.2	10.1	South B
MH-177	127.8	3.1	11.5	South B
MH-178	130.0	-	13.6	South B
MH-180	127.4	0.3	11.6	South B
MH-181	126.8	19.2	11.2	South B

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-182	119.5	2.0	7.0	South B
MH-184	119.4	0.9	7.0	South B
MH-408	130.5	15.3	11.7	South B
MH-409	133.1	7.5	15.0	South B
MH-410	131.9	-	14.0	South B
MH-497	132.7	90.0	7.6	South B
MH-498	129.5	1.2	8.1	South B
MH-499	125.7	-	8.4	South B
CO-340	102.6	1.4	7.6	West
MH-1669	101.3	13.7	18.1	West
MH-1674	99.8	1.3	16.5	West
MH-1675	100.1	2.8	16.5	West
MH-1676	101.5	0.8	17.6	West
MH-1677	97.8	8.1	14.4	West
MH-1680	96.4	-	13.0	West
MH-1683	94.3	-	10.0	West
MH-1684	94.8	33.1	10.0	West
MH-1699	102.9	0.8	18.7	West
MH-1700	103.3	0.3	19.0	West
MH-1701	104.3	0.1	19.8	West
MH-1728	107.1	0.2	22.3	West
MH-1733	111.4	7.6	26.6	West
MH-1736	112.4	0.9	27.2	West
MH-1737	111.0	4.0	25.4	West
MH-1741	107.3	3.1	21.3	West
MH-1867	106.8	2.1	18.2	West
MH-1868	106.9	-	18.7	West
MH-1883	101.1	-	14.3	West
MH-1905	101.6	-	14.3	West
MH-1906	106.1	-	19.6	West
MH-832	106.8	3.9	20.4	West
MH-833	104.5	-	16.5	West
MH-834	103.8	-	15.8	West
MH-835	108.9	-	18.2	West
MH-836	117.1	-	25.7	West
MH-837	117.3	-	25.9	West
MH-838	112.7	0.6	20.0	West
MH-839	110.8	0.3	17.4	West
MH-840	104.6	0.3	10.1	West
MH-922	125.7	-	6.2	West
MH-923	126.6	-	6.0	West
MH-1644	105.8	-	17.4	WWTP
MH-1649	105.7	-	13.5	WWTP

Future Conditions
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1653	106.4	-	14.3	WWTP
MH-1654	102.5	-	10.6	WWTP
MH-1655	99.6	-	11.4	WWTP
MH-1656	107.3	-	15.8	WWTP
MH-1657	107.3	-	19.4	WWTP
MH-1658	100.9	-	14.4	WWTP
MH-1659	101.3	-	18.2	WWTP
MH-1660	101.3	-	18.2	WWTP
MH-1661	100.7	-	15.1	WWTP
MH-1662	101.4	-	14.5	WWTP
MH-1664	101.1	-	14.3	WWTP
MH-1665	99.3	-	16.1	WWTP
MH-1668	100.0	-	16.7	WWTP
MH-1895	101.7	-	20.3	WWTP
MH-1896	100.7	-	13.8	WWTP
MH-1897	101.3	-	11.3	WWTP
MH-1908	107.1	-	9.8	WWTP
MH-1909	104.0	1.5	10.0	WWTP
MH-1910	100.9	-	7.3	WWTP
MH-1911	101.5	-	10.3	WWTP
MH-1912	101.3	-	13.6	WWTP
MH-1913	100.5	-	9.2	WWTP
MH-565	114.0	-	7.8	WWTP
MH-567	114.6	-	8.4	WWTP
MH-568	114.8	-	9.2	WWTP
MH-569	110.3	-	7.5	WWTP
MH-570	106.9	-	7.9	WWTP
MH-571	106.1	0.8	8.7	WWTP
MH-757	105.8	28.6	9.7	WWTP
MH-759	105.0	3.7	9.2	WWTP
MH-760	106.4	-	13.4	WWTP
MH-768	107.1	-	10.9	WWTP
MH-769	108.2	-	6.5	WWTP
MH-770	111.7	152.2	8.3	WWTP

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1000-999	8	292	112.51	111.33	59.4	1.2	20.6	59.4	80.0	0.33	0.23	Bell Village A	
1001-996	8	291	110.24	109.55	29.8	1.1	25.5	122.0	147.5	0.53	0.56	Bell Village A	
1032-1034	8	123	111.11	110.20	1.7	1.3	14.3	7.6	21.9	0.15	0.05	Bell Village A	
1033-1032	8	141	111.32	111.11	1.1	0.7	10.2	5.9	16.2	0.19	0.08	Bell Village A	
1034-994	15	349	110.20	108.82	205.6	1.9	120.8	651.5	772.3	0.45	0.42	Bell Village A	SS-4
1035-1033	8	155	112.18	111.32	1.2	1.0	6.6	4.8	11.4	0.12	0.03	Bell Village A	
1036-1035	8	300	113.51	112.18	2.3	0.8	3.8	3.6	7.4	0.10	0.02	Bell Village A	
1037-1036	8	144	114.08	113.51	1.4	0.5	1.3	1.4	2.7	0.06	0.01	Bell Village A	
1038-1034	15	205	110.89	110.20	8.4	1.7	101.8	438.3	540.1	0.39	0.32	Bell Village A	SS-4
1039-1038	15	142	111.03	110.89	9.0	1.1	100.0	429.9	529.9	0.56	0.60	Bell Village A	SS-4
1046-1889	10	260	112.98	111.39	24.9	2.2	96.9	393.7	490.6	0.58	0.64	Bell Village A	SS-12
1053-1046	10	296	114.20	112.98	30.3	1.8	78.5	368.7	447.2	0.62	0.70	Bell Village A	SS-12
1055-1053	10	101	114.88	114.20	1.6	2.0	67.0	338.5	405.5	0.50	0.50	Bell Village A	SS-12
1360-1361	8	110	119.66	119.34	7.4	1.3	44.0	234.9	278.9	0.78	0.96	Bell Village A	
1361-1367	10	382	119.34	118.03	73.5	1.4	45.8	308.5	354.3	0.57	0.61	Bell Village A	SS-12
1364-1055	10	132	115.48	114.88	16.9	1.7	60.5	336.9	397.5	0.56	0.60	Bell Village A	SS-12
1366-1364	10	434	117.62	115.48	9.0	1.7	51.1	320.0	371.2	0.52	0.54	Bell Village A	SS-12
1367-1366	10	124	118.03	117.62	2.6	1.4	51.0	311.1	362.0	0.58	0.64	Bell Village A	SS-12
1385-1360	8	476	121.11	119.66	110.2	1.4	42.7	227.5	270.2	0.74	0.90	Bell Village A	
1386-1385	8	125	121.45	121.11	8.4	1.2	32.4	117.2	149.6	0.52	0.53	Bell Village A	
1854-996	8	64	109.68	109.55	-	1.7	181.6	-	181.6	0.64	0.74	Bell Village A	
1855-1854	8	238	110.59	109.68	-	2.2	181.6	-	181.6	0.52	0.54	Bell Village A	
1856-1855	8	108	111.07	110.59	-	2.2	157.4	-	157.4	0.46	0.43	Bell Village A	
1857-1856	8	21	111.24	111.07	-	2.8	157.4	-	157.4	0.39	0.32	Bell Village A	
1889-1039	10	77	111.39	111.03	27.2	2.0	98.3	420.9	519.2	0.66	0.77	Bell Village A	
1903-995	8	272	108.95	108.03	15.8	2.2	209.1	145.7	354.8	1.00	1.12	Bell Village A	SS-16
88-1386	8	600	123.24	121.45	108.8	1.2	31.2	108.8	140.0	0.48	0.47	Bell Village A	
993-994	8	199	107.07	106.02	131.9	2.6	218.2	293.9	512.1	1.00	1.29	Bell Village A	SS-16
994-1022	15	107	105.62	104.61	1.4	3.5	339.9	946.8	1,286.7	0.47	0.45	Bell Village A	
995-993	8	278	108.03	107.07	16.2	2.2	212.9	161.9	374.8	1.00	1.17	Bell Village A	SS-16
996-1903	8	134	109.55	108.95	7.8	2.4	207.8	129.8	337.6	0.76	0.93	Bell Village A	
999-1001	8	290	111.33	110.24	32.7	1.2	24.8	92.1	116.8	0.41	0.35	Bell Village A	
1858-1857	8	166	111.82	111.24	-	2.0	157.4	-	157.4	0.49	0.49	Bell Village B	
1859-1858	8	160	112.33	111.82	-	2.0	157.4	-	157.4	0.51	0.51	Bell Village B	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1860-1859	8	77	112.58	112.33	-	2.0	155.3	-	155.3	0.50	0.50	Bell Village B	
1861-1860	8	25	112.66	112.58	-	2.0	155.3	-	155.3	0.50	0.50	Bell Village B	
1902-1861	8	64	112.86	112.66	-	2.0	155.3	-	155.3	0.51	0.51	Bell Village B	
1237-1243	6	207	123.86	122.26	1.1	2.6	123.1	53.0	176.0	0.67	0.79	Brooks A	
1238-1237	6	295	126.03	123.86	2.9	2.5	123.1	52.0	175.0	0.68	0.81	Brooks A	
1239-1238	6	151	126.87	126.03	2.2	2.3	122.4	49.1	171.5	0.75	0.91	Brooks A	
1243-927	8	102	122.26	121.75	18.4	2.3	161.5	71.4	232.9	0.56	0.61	Brooks A	
1244-1239	6	120	127.94	126.87	3.5	2.7	120.5	46.8	167.3	0.62	0.70	Brooks A	
1245-1244	6	93	128.92	127.94	1.0	2.8	108.0	43.3	151.2	0.55	0.58	Brooks A	
1246-1245	6	65	129.61	128.92	0.3	2.8	108.0	42.2	150.2	0.55	0.58	Brooks A	
1249-1246	6	352	134.01	129.61	3.9	3.0	108.0	41.9	149.9	0.52	0.53	Brooks A	
1251-1249	6	273	136.00	134.01	1.4	2.4	98.0	38.0	136.0	0.58	0.63	Brooks A	
1252-1251	6	107	137.09	136.00	36.6	2.7	97.5	36.6	134.1	0.52	0.53	Brooks A	
1651-1644	24	111	88.85	87.55	2.3	5.5	1,520.3	1,117.3	2,637.5	0.33	0.24	Brooks A	
1652-1651	24	145	89.31	88.85	3.0	3.4	1,520.3	1,115.0	2,635.2	0.48	0.46	Brooks A	
1-724	10	147	112.00	110.78	7.1	-	-	-	-	-	-	Brooks A	
1904-956	18	50	110.48	110.29	0.3	3.0	720.9	578.6	1,299.5	0.47	0.46	Brooks A	
724-901	10	8	110.78	110.72	0.1	1.1	9.0	0.1	9.0	0.07	0.01	Brooks A	
726-731	24	108	98.41	97.74	2.2	4.3	1,450.4	1,063.0	2,513.3	0.39	0.31	Brooks A	
730-726	24	123	99.17	98.41	2.5	4.3	1,450.4	1,060.7	2,511.1	0.38	0.31	Brooks A	
731-732	24	297	97.74	95.57	6.5	4.6	1,477.6	1,069.5	2,547.1	0.37	0.29	Brooks A	
732-733	24	391	95.57	94.00	6.7	3.7	1,486.1	1,076.2	2,562.2	0.44	0.40	Brooks A	
733-734	24	231	93.70	93.12	4.8	3.1	1,520.3	1,080.9	2,601.2	0.51	0.51	Brooks A	
734-735	24	90	93.12	92.87	1.8	3.3	1,520.3	1,082.8	2,603.1	0.49	0.48	Brooks A	
735-736	24	205	92.87	92.38	4.2	3.1	1,520.3	1,087.0	2,607.3	0.51	0.52	Brooks A	
736-742	24	252	92.38	91.77	5.2	3.1	1,520.3	1,092.2	2,612.5	0.51	0.52	Brooks A	
742-743	24	245	91.77	91.17	5.1	3.1	1,520.3	1,097.3	2,617.6	0.51	0.52	Brooks A	
743-744	24	151	91.17	90.77	3.1	3.2	1,520.3	1,100.4	2,620.7	0.50	0.50	Brooks A	SS-7
744-745	24	248	90.77	90.13	5.1	3.2	1,520.3	1,105.5	2,625.8	0.50	0.51	Brooks A	SS-7
745-1652	24	311	90.13	89.31	6.4	3.2	1,520.3	1,112.0	2,632.2	0.50	0.50	Brooks A	
898-899	10	224	111.58	111.20	11.2	1.7	235.7	111.2	346.9	0.72	0.86	Brooks A	
899-900	10	222	111.20	110.80	5.9	1.8	244.9	117.1	362.0	0.71	0.86	Brooks A	
900-901	10	13	110.80	110.72	0.1	2.8	251.5	117.2	368.7	0.48	0.47	Brooks A	
901-944	10	290	107.72	106.60	3.3	2.4	264.0	120.6	384.6	0.57	0.63	Brooks A	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
912-919	8	134	116.21	115.72	15.3	2.2	215.7	96.8	312.5	0.78	0.95	Brooks A	
913-912	8	152	116.66	116.21	0.8	1.9	166.0	81.4	247.5	0.70	0.84	Brooks A	
919-928	10	114	115.72	115.46	0.8	1.9	215.7	97.5	313.2	0.60	0.67	Brooks A	SS-13
920-913	8	231	117.64	116.66	3.5	2.2	166.0	80.7	246.7	0.61	0.70	Brooks A	
921-920	8	111	118.08	117.64	0.6	2.2	165.3	77.2	242.5	0.62	0.71	Brooks A	
922-921	8	151	119.21	118.08	0.8	2.7	164.4	76.6	241.0	0.51	0.51	Brooks A	
923-922	8	165	120.16	119.21	1.1	2.5	164.4	75.9	240.2	0.55	0.58	Brooks A	
924-923	8	143	120.86	120.16	1.6	2.3	164.4	74.8	239.1	0.57	0.63	Brooks A	
925-924	8	43	121.15	120.86	0.3	2.6	163.6	73.2	236.8	0.52	0.53	Brooks A	
927-925	8	98	121.75	121.15	1.5	2.5	162.5	72.9	235.5	0.53	0.55	Brooks A	
928-929	8	78	115.46	114.15	0.5	4.0	215.7	98.0	313.8	0.47	0.45	Brooks A	
929-930	8	155	114.15	112.07	1.1	3.6	215.7	99.1	314.8	0.50	0.50	Brooks A	
930-898	8	137	112.07	111.58	0.9	2.2	217.4	100.0	317.4	0.79	0.97	Brooks A	
944-730	24	310	100.30	99.17	6.4	3.6	1,449.6	1,058.2	2,507.8	0.45	0.41	Brooks A	
945-944	24	16	100.38	100.30	0.2	3.7	1,180.3	931.2	2,111.6	0.37	0.30	Brooks A	
947-945	24	246	101.02	100.38	5.2	3.0	1,178.7	931.0	2,109.7	0.44	0.40	Brooks A	
948-947	24	69	107.70	101.02	1.4	10.7	1,178.7	925.7	2,104.4	0.17	0.07	Brooks A	
949-948	24	128	108.44	107.70	19.4	4.0	1,178.7	924.3	2,103.0	0.36	0.27	Brooks A	
951-952	24	66	108.88	108.51	1.4	3.8	1,094.5	903.8	1,998.3	0.35	0.26	Brooks A	
952-949	24	53	108.51	108.44	1.1	2.3	1,094.5	904.9	1,999.4	0.52	0.53	Brooks A	
954-951	24	238	109.90	108.88	4.9	3.5	1,094.5	902.5	1,997.0	0.37	0.30	Brooks A	
956-954	18	75	110.29	109.90	1.2	3.4	720.9	579.7	1,300.6	0.43	0.38	Brooks A	
957-1904	18	98	110.76	110.48	0.5	2.8	720.9	578.3	1,299.2	0.50	0.51	Brooks A	SS-15
961-954	24	223	110.69	109.90	5.4	2.4	373.6	317.8	691.4	0.23	0.11	Brooks A	
1203-1209	8	308	164.77	162.57	26.5	1.7	33.2	26.4	59.6	0.24	0.13	Brooks B	
1209-1210	8	291	162.57	159.74	1.7	1.9	34.4	28.1	62.5	0.23	0.12	Brooks B	
1210-1211	8	247	159.74	154.87	1.7	2.5	36.4	29.8	66.2	0.20	0.09	Brooks B	
1211-1212	8	300	154.87	153.34	1.8	1.6	39.3	31.7	71.0	0.29	0.18	Brooks B	
1212-1213	8	181	153.34	152.79	0.7	1.3	41.0	32.4	73.4	0.34	0.24	Brooks B	
1213-1214	8	154	152.79	152.59	0.6	1.0	41.8	33.0	74.9	0.43	0.38	Brooks B	
1214-1220	10	359	152.59	150.97	1.8	1.5	41.8	34.8	76.6	0.23	0.12	Brooks B	
1220-1221	6	192	150.97	150.49	13.9	1.4	62.7	48.7	111.4	0.73	0.88	Brooks B	
1221-1453	10	333	150.49	149.18	3.5	1.6	63.8	52.1	115.9	0.29	0.19	Brooks B	
1242-968	18	328	114.14	113.13	1.3	2.2	317.5	287.3	604.9	0.33	0.23	Brooks B	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1277-1278	10	172	131.93	129.91	0.9	3.1	146.0	125.0	271.0	0.34	0.25	Brooks B	
1278-1280	10	267	129.91	129.02	2.3	2.0	147.3	127.3	274.5	0.49	0.48	Brooks B	
1280-1281	10	117	129.02	128.42	1.4	2.3	148.5	128.7	277.2	0.43	0.39	Brooks B	
1281-1282	10	151	128.42	128.09	1.1	1.7	149.2	129.8	278.9	0.56	0.61	Brooks B	
1282-1283	10	332	128.09	127.18	2.8	1.8	150.8	132.4	283.2	0.53	0.55	Brooks B	
1283-1284	10	154	127.18	126.42	1.6	2.3	152.7	134.0	286.8	0.45	0.42	Brooks B	
1284-1285	12	208	126.42	118.57	1.3	4.6	156.2	149.7	305.8	0.21	0.10	Brooks B	
1285-1286	18	228	118.57	117.68	2.1	2.4	283.4	251.9	535.3	0.29	0.18	Brooks B	
1286-1288	18	471	117.68	116.14	7.4	2.2	289.9	259.4	549.2	0.31	0.20	Brooks B	
1288-1289	18	113	116.14	115.82	9.4	2.1	304.9	268.8	573.6	0.32	0.23	Brooks B	
1289-1290	18	388	115.82	114.50	11.6	2.3	312.7	280.4	593.1	0.32	0.22	Brooks B	
1290-1242	18	124	114.50	114.14	5.6	2.2	317.5	286.0	603.5	0.33	0.24	Brooks B	
1299-1285	12	344	119.65	118.57	2.1	1.8	127.0	100.2	227.2	0.34	0.25	Brooks B	
1300-1299	12	343	119.99	119.65	2.1	1.2	125.9	98.1	224.0	0.47	0.45	Brooks B	
1301-1300	12	110	120.32	119.99	3.7	1.8	124.4	95.9	220.4	0.34	0.25	Brooks B	
1302-1301	12	69	120.50	120.32	0.5	1.6	119.3	92.2	211.5	0.35	0.26	Brooks B	
1305-1302	12	68	120.68	120.50	0.3	1.7	119.3	91.7	211.0	0.34	0.26	Brooks B	
1306-1305	12	161	121.09	120.68	14.0	1.6	119.3	91.3	210.6	0.35	0.26	Brooks B	
1453-1460	10	204	149.18	148.33	4.3	1.7	68.6	56.4	125.0	0.30	0.20	Brooks B	
1456-1461	10	310	140.34	135.67	2.7	2.8	77.1	66.1	143.1	0.23	0.12	Brooks B	
1457-1456	10	309	145.74	140.34	1.6	2.9	74.1	63.4	137.6	0.22	0.11	Brooks B	
1458-1457	10	112	146.50	145.74	4.1	2.1	73.0	61.9	135.0	0.28	0.17	Brooks B	
1460-1458	10	279	148.33	146.50	1.4	2.0	69.7	57.8	127.5	0.27	0.16	Brooks B	
1461-1462	10	280	135.67	132.89	2.4	2.4	79.7	68.5	148.2	0.26	0.15	Brooks B	
1462-1277	10	73	132.89	131.93	0.4	3.2	145.6	124.1	269.7	0.33	0.24	Brooks B	
1463-1462	8	261	136.73	132.89	1.1	2.7	64.9	55.3	120.3	0.29	0.18	Brooks B	
1466-1463	8	270	138.07	136.73	2.7	1.8	63.5	54.3	117.8	0.38	0.31	Brooks B	
1467-1466	8	131	139.24	138.07	0.5	2.2	60.8	51.6	112.4	0.32	0.22	Brooks B	
1468-1467	8	239	140.62	139.24	14.1	1.9	60.8	51.1	111.8	0.36	0.27	Brooks B	
1482-1483	8	352	146.34	142.25	4.2	2.1	39.8	35.7	75.5	0.24	0.13	Brooks B	
1483-1468	8	319	142.25	140.62	1.3	1.6	41.8	37.0	78.9	0.31	0.20	Brooks B	
1484-1482	8	154	146.95	146.34	2.9	1.4	36.0	31.6	67.7	0.30	0.20	Brooks B	
1486-1284	12	286	131.62	126.42	1.8	1.1	3.4	14.3	17.8	0.06	0.01	Brooks B	
1487-1486	12	466	133.72	131.62	3.0	0.5	1.6	12.5	14.1	0.08	0.01	Brooks B	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1488-1487	12	419	135.31	133.72	2.7	0.5	1.4	9.6	11.0	0.07	0.01	Brooks B	
1489-1488	12	48	135.73	135.31	0.3	0.7	1.4	6.8	8.2	0.05	0.01	Brooks B	
1490-1489	12	129	136.25	135.73	1.0	0.5	1.4	6.5	7.9	0.06	0.01	Brooks B	
1491-1490	12	420	147.46	145.15	2.8	0.6	1.4	5.5	6.9	0.05	0.01	Brooks B	
1495-1491	12	329	149.01	147.46	2.6	0.3	0.2	2.7	2.8	0.04	0.00	Brooks B	
1499-1484	8	231	148.21	146.95	8.4	1.5	31.8	28.8	60.5	0.26	0.15	Brooks B	
1501-1499	8	179	150.07	148.21	1.0	1.7	22.1	20.4	42.5	0.19	0.08	Brooks B	
1502-1501	8	336	160.62	150.07	1.4	2.5	22.1	19.4	41.5	0.14	0.04	Brooks B	
1503-1502	8	261	163.58	160.62	18.1	1.8	22.1	18.0	40.2	0.18	0.07	Brooks B	
1557-1306	12	179	121.56	121.09	1.1	1.6	96.6	77.4	174.0	0.31	0.21	Brooks B	
1558-1557	8	173	128.94	121.56	3.0	3.1	30.2	21.3	51.5	0.15	0.05	Brooks B	
1561-1558	8	344	129.61	128.94	1.4	1.0	29.6	18.3	47.9	0.30	0.20	Brooks B	
1562-1561	8	190	130.35	129.61	16.9	1.3	28.2	16.9	45.0	0.25	0.13	Brooks B	
1568-1557	12	100	121.91	121.56	0.6	1.6	66.0	54.9	120.9	0.24	0.13	Brooks B	
1569-1568	12	335	122.60	121.91	2.0	1.3	63.9	54.3	118.2	0.27	0.16	Brooks B	
1570-1569	12	259	122.85	122.60	4.8	1.0	63.0	52.2	115.2	0.33	0.23	Brooks B	
1571-1570	12	104	123.16	122.85	0.6	1.4	55.0	47.4	102.4	0.23	0.12	Brooks B	
1572-1571	12	123	123.36	123.16	5.8	1.1	55.0	46.8	101.8	0.27	0.16	Brooks B	
1573-1572	12	252	123.74	123.36	2.9	1.0	48.9	41.0	89.9	0.26	0.15	Brooks B	
1574-1573	12	203	124.25	123.74	1.2	1.2	44.7	38.1	82.8	0.22	0.10	Brooks B	
1595-1574	12	208	125.04	124.25	4.3	1.4	43.6	36.8	80.4	0.19	0.08	Brooks B	
1597-1595	12	243	125.25	125.04	6.4	0.8	41.8	32.5	74.3	0.27	0.16	Brooks B	
1599-1597	12	69	125.39	125.25	2.9	1.0	34.4	26.2	60.6	0.20	0.08	Brooks B	
1610-1611	12	97	125.75	125.53	15.4	1.0	29.1	22.4	51.5	0.18	0.07	Brooks B	
1611-1599	12	137	125.53	125.39	0.8	0.8	29.1	23.3	52.4	0.22	0.10	Brooks B	
1612-1610	12	302	126.36	125.75	1.8	0.6	6.4	7.1	13.5	0.09	0.02	Brooks B	
1613-1612	12	133	126.63	126.36	0.8	0.6	5.5	5.2	10.7	0.09	0.01	Brooks B	
1614-1613	12	125	126.92	126.63	0.8	0.6	5.4	4.3	9.7	0.08	0.01	Brooks B	
1615-1614	12	95	127.01	126.92	2.5	0.4	4.8	3.6	8.3	0.09	0.02	Brooks B	
1627-1615	12	92	127.40	127.01	1.1	-	0.1	1.1	1.2	0.03	0.00	Brooks B	
963-961	24	151	111.21	110.69	1.9	2.3	351.9	312.4	664.4	0.23	0.11	Brooks B	
964-963	24	121	111.61	111.21	1.7	2.3	351.9	310.5	662.4	0.23	0.11	Brooks B	
966-964	24	98	112.11	111.61	4.2	2.7	344.5	308.8	653.3	0.20	0.09	Brooks B	
967-966	18	403	113.02	112.11	4.0	2.0	338.5	304.6	643.1	0.37	0.29	Brooks B	

Future Conditions
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
968-967	18	47	113.13	113.02	13.3	2.0	331.4	300.6	632.1	0.36	0.28	Brooks B	
111-112	21	163	93.77	93.39	4.1	2.4	562.2	1,241.9	1,804.0	0.51	0.52	Conde A	
112-113	21	224	93.39	92.87	5.3	2.3	562.2	1,247.2	1,809.4	0.52	0.53	Conde A	
113-114	21	153	92.87	92.51	5.5	2.4	562.2	1,252.7	1,814.8	0.52	0.53	Conde A	
114-115	24	173	92.11	91.81	5.2	2.1	562.2	1,257.8	1,820.0	0.46	0.43	Conde A	
115-116	24	418	91.81	91.56	11.3	1.5	600.4	1,297.2	1,897.5	0.65	0.75	Conde A	
116-122	24	398	91.56	91.28	10.7	1.5	600.4	1,307.9	1,908.2	0.62	0.71	Conde A	
117-1872	8	89	97.58	97.19	0.8	1.4	33.2	24.1	57.3	0.27	0.16	Conde A	
119-117	8	502	100.15	97.58	5.5	1.5	33.2	23.3	56.5	0.26	0.14	Conde A	
120-119	8	71	100.64	100.15	17.9	1.7	33.2	17.9	51.1	0.23	0.11	Conde A	
122-123	27	230	91.28	91.11	7.5	1.6	607.0	1,315.3	1,922.4	0.50	0.51	Conde A	
123-124	27	274	91.11	90.92	8.3	1.5	607.0	1,323.7	1,930.7	0.52	0.53	Conde A	
124-125	27	297	90.92	90.71	15.9	1.5	607.5	1,339.6	1,947.1	0.52	0.53	Conde A	
125-202	27	408	90.71	90.42	10.3	1.5	607.5	1,349.8	1,957.3	0.52	0.53	Conde A	
1634-1638	10	302	94.23	93.48	3.4	1.7	116.6	128.9	245.6	0.50	0.50	Conde A	
1635-1634	8	239	95.28	94.23	10.1	1.0	10.9	10.1	21.0	0.16	0.06	Conde A	
1636-577	8	172	91.67	91.17	1.6	1.8	127.6	137.2	264.8	0.75	0.91	Conde A	
1637-1636	10	301	92.61	91.67	3.4	1.8	124.7	135.7	260.4	0.48	0.47	Conde A	
1638-1637	10	300	93.38	92.61	3.4	1.7	122.1	132.3	254.4	0.51	0.51	Conde A	
1642-1643	33	435	87.96	87.82	16.2	1.3	885.8	1,808.2	2,694.0	0.58	0.64	Conde A	
1643-1644	33	416	87.82	87.35	39.3	2.0	885.8	1,847.6	2,733.4	0.40	0.34	Conde A	
1799-330	8	167	103.97	103.38	8.7	1.2	21.3	8.7	30.0	0.21	0.09	Conde A	
1845-320	10	204	101.18	100.66	2.3	0.4	1.2	28.2	29.4	0.16	0.06	Conde A	
1846-1869	10	400	102.53	101.66	4.5	0.4	1.2	22.4	23.6	0.15	0.05	Conde A	
1847-1846	10	347	103.40	102.53	3.9	0.4	1.2	17.9	19.1	0.13	0.04	Conde A	
1848-1847	10	72	103.47	103.40	14.1	0.3	1.2	14.1	15.2	0.15	0.05	Conde A	
1869-1845	10	262	101.66	101.18	3.5	0.4	1.2	26.0	27.1	0.17	0.06	Conde A	
1872-115	8	159	97.19	96.41	4.1	1.5	35.9	28.1	64.0	0.28	0.17	Conde A	
1914-332	21	130	94.24	94.07	2.5	1.8	479.3	1,190.8	1,670.1	0.59	0.65	Conde A	
1915-311	10	118	99.86	99.71	1.3	0.5	4.8	11.1	15.9	0.14	0.05	Conde A	
202-252	27	500	90.42	90.06	198.4	1.6	745.8	1,548.2	2,294.0	0.57	0.61	Conde A	
214-215	27	327	89.83	89.60	9.9	1.6	747.8	1,566.8	2,314.7	0.57	0.63	Conde A	
215-216	27	323	89.60	89.37	9.8	1.6	747.8	1,576.7	2,324.5	0.57	0.62	Conde A	
216-217	27	500	89.37	89.01	15.2	1.6	747.8	1,591.9	2,339.8	0.58	0.63	Conde A	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
217-578	27	243	89.01	88.72	7.4	2.0	747.8	1,599.4	2,347.2	0.49	0.49	Conde A	
252-214	27	331	90.06	89.83	8.7	1.6	747.8	1,556.8	2,304.7	0.57	0.63	Conde A	
272-273	24	280	99.07	97.79	11.2	2.7	426.4	1,052.9	1,479.2	0.31	0.21	Conde A	
273-274	24	246	97.79	96.66	6.6	2.7	426.4	1,059.5	1,485.8	0.32	0.22	Conde A	
274-275	21	446	96.66	96.42	10.6	1.3	438.2	1,070.1	1,508.3	0.75	0.91	Conde A	
275-296	21	174	96.42	96.03	4.8	2.1	438.2	1,074.9	1,513.1	0.47	0.45	Conde A	
296-300	21	323	96.03	95.57	6.1	1.8	449.5	1,169.3	1,618.9	0.56	0.60	Conde A	
297-296	10	46	97.00	96.83	0.5	0.9	11.1	88.4	99.5	0.28	0.17	Conde A	
298-1914	21	210	94.67	94.24	5.4	2.1	479.3	1,188.3	1,667.6	0.51	0.52	Conde A	
299-298	21	333	94.91	94.67	6.3	1.5	471.8	1,183.0	1,654.7	0.72	0.87	Conde A	
300-299	21	309	95.57	94.91	7.3	2.1	449.5	1,176.7	1,626.2	0.50	0.49	Conde A	
301-297	10	286	97.40	97.00	3.2	0.7	11.1	87.8	99.0	0.35	0.27	Conde A	
302-301	10	202	98.21	97.40	15.7	1.0	11.1	84.6	95.8	0.26	0.15	Conde A	
303-302	10	153	98.49	98.21	5.2	0.7	11.1	68.9	79.9	0.30	0.19	Conde A	
304-303	10	84	98.63	98.49	0.9	0.7	10.5	63.6	74.1	0.29	0.18	Conde A	
310-304	10	312	99.36	98.63	3.5	0.8	9.3	16.7	26.0	0.16	0.05	Conde A	
311-310	10	192	99.71	99.36	2.2	0.6	4.8	13.2	18.0	0.14	0.04	Conde A	
312-1915	10	96	99.99	99.86	1.1	0.5	4.8	9.7	14.6	0.14	0.04	Conde A	
313-312	10	225	100.69	99.99	5.0	0.7	4.8	8.7	13.5	0.11	0.02	Conde A	
314-313	10	224	101.40	100.69	3.7	-	-	3.7	3.7	0.06	0.01	Conde A	
315-304	8	114	98.88	98.63	2.2	0.4	1.2	46.0	47.1	0.29	0.18	Conde A	
317-315	10	400	99.61	98.88	4.9	0.4	1.2	43.8	45.0	0.22	0.11	Conde A	
319-317	10	389	100.54	99.61	10.6	0.4	1.2	39.0	40.2	0.20	0.08	Conde A	
320-319	10	9	100.66	100.64	0.1	0.4	1.2	28.4	29.5	0.17	0.06	Conde A	
324-333	8	254	97.26	96.18	2.3	1.3	24.0	25.0	49.0	0.25	0.14	Conde A	
325-324	8	277	98.62	97.26	2.5	1.4	24.0	22.8	46.8	0.24	0.12	Conde A	
326-325	8	277	99.57	98.62	2.5	1.2	24.0	20.3	44.3	0.25	0.14	Conde A	
327-326	8	270	100.54	99.57	2.4	1.2	24.0	17.8	41.8	0.24	0.13	Conde A	
328-327	8	301	101.55	100.54	2.7	1.2	24.0	15.4	39.4	0.24	0.12	Conde A	
329-328	8	300	102.02	101.55	2.7	0.9	21.3	12.7	34.0	0.27	0.16	Conde A	
330-329	8	145	103.38	102.02	1.3	1.6	21.3	10.0	31.3	0.17	0.06	Conde A	
331-111	21	28	93.83	93.77	0.7	2.3	562.2	1,237.8	1,799.9	0.52	0.54	Conde A	
332-331	21	107	94.07	93.83	2.5	2.2	479.3	1,193.3	1,672.6	0.50	0.49	Conde A	
333-334	8	201	96.18	96.00	1.8	0.8	24.0	26.8	50.8	0.38	0.31	Conde A	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
334-335	8	57	96.00	95.54	0.5	1.6	24.0	27.4	51.3	0.22	0.11	Conde A	
335-331	8	174	95.54	94.53	2.8	2.1	82.8	43.8	126.6	0.38	0.31	Conde A	
430-1634	8	254	95.49	94.23	13.5	2.1	100.3	115.5	215.8	0.54	0.56	Conde A	
431-430	8	255	96.10	95.49	15.0	1.5	88.9	101.9	190.8	0.63	0.72	Conde A	
451-431	8	203	96.89	96.10	86.8	1.7	73.4	86.9	160.3	0.48	0.47	Conde A	
577-578	10	174	91.17	90.52	2.0	2.0	128.1	139.2	267.3	0.47	0.44	Conde A	
578-579	27	241	88.72	88.04	35.6	2.8	885.8	1,774.1	2,659.9	0.41	0.36	Conde A	
579-1642	33	460	88.04	87.96	17.9	1.0	885.8	1,792.0	2,677.8	0.70	0.84	Conde A	
151-152	10	187	113.90	112.83	8.8	2.2	108.2	314.1	422.3	0.54	0.57	Conde B North	
152-292	10	188	112.83	112.07	2.7	1.9	109.1	316.7	425.8	0.60	0.68	Conde B North	
154-151	10	295	115.01	113.90	4.2	1.9	104.4	305.3	409.6	0.60	0.68	Conde B North	
1810-351	12	938	122.21	121.36	15.9	0.6	15.7	112.7	128.5	0.35	0.27	Conde B North	
265-271	12	322	101.60	100.96	71.2	1.7	201.4	459.4	660.8	0.76	0.92	Conde B North	SS-5
267-265	10	20	105.28	101.70	0.3	8.5	181.8	388.2	570.0	0.25	0.14	Conde B North	SS-5
268-267	10	499	107.62	105.38	7.7	2.3	181.8	387.9	569.7	0.72	0.86	Conde B North	SS-5
269-268	10	501	108.94	107.62	7.9	1.8	154.4	380.3	534.7	1.00	1.06	Conde B North	SS-5
270-269	10	375	110.04	108.94	39.6	1.8	127.0	372.4	499.4	0.77	0.94	Conde B North	
271-272	12	317	100.96	99.87	5.4	2.1	201.5	464.9	666.4	0.62	0.71	Conde B North	SS-5
291-270	10	193	110.71	110.04	2.7	1.9	115.1	332.7	447.8	0.66	0.77	Conde B North	
292-291	10	289	112.07	110.71	13.3	2.1	114.0	330.0	444.0	0.59	0.66	Conde B North	
349-378	12	391	120.71	120.38	23.8	1.0	80.5	221.4	301.8	0.59	0.65	Conde B North	
350-349	12	215	120.94	120.71	68.0	1.0	62.2	197.7	259.9	0.50	0.50	Conde B North	
351-350	12	348	121.36	120.94	16.8	0.9	40.9	129.6	170.5	0.38	0.31	Conde B North	
378-391	12	548	120.38	119.59	9.3	1.2	81.4	230.7	312.1	0.51	0.51	Conde B North	
388-154	10	326	116.67	115.01	4.6	2.1	103.1	301.2	404.3	0.54	0.57	Conde B North	
389-388	10	325	117.93	116.67	6.5	1.9	102.0	296.6	398.6	0.59	0.65	Conde B North	
390-389	10	174	118.86	117.93	2.4	2.1	100.2	290.1	390.3	0.52	0.54	Conde B North	
391-406	12	326	119.59	119.33	20.1	1.0	90.0	250.8	340.8	0.65	0.75	Conde B North	
406-407	12	90	119.33	119.24	33.3	1.1	99.6	284.1	383.8	0.66	0.78	Conde B North	
407-390	12	207	119.24	118.96	3.5	1.3	99.6	287.6	387.3	0.59	0.65	Conde B North	
1808-1809	10	332	132.15	128.91	72.9	1.1	6.9	72.9	79.7	0.19	0.08	Conde B South	
1809-1811	10	563	128.91	123.16	80.6	1.7	25.6	153.5	179.1	0.29	0.18	Conde B South	
1810-1824	12	512	122.21	118.83	24.3	1.7	42.3	304.0	346.4	0.35	0.27	Conde B South	
1811-1810	12	59	123.16	122.21	7.0	2.0	25.6	160.5	186.1	0.20	0.09	Conde B South	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1818-337	15	218	111.37	110.24	13.0	2.4	188.3	417.5	605.8	0.37	0.29	Conde B South	
1819-1818	15	178	111.82	111.37	12.1	1.7	152.1	404.6	556.6	0.43	0.38	Conde B South	
1820-1819	12	253	113.69	111.82	36.1	2.6	152.1	392.5	544.6	0.44	0.40	Conde B South	
1821-1820	12	137	114.58	113.69	7.3	2.0	77.5	356.4	433.9	0.40	0.34	Conde B South	
1822-1821	12	190	115.77	114.58	18.3	2.0	75.2	349.1	424.3	0.40	0.33	Conde B South	
1824-1822	12	535	118.83	115.77	26.8	1.8	56.4	330.7	387.1	0.39	0.32	Conde B South	
1825-1810	12	16	122.42	122.21	0.8	2.0	32.2	216.0	248.2	0.25	0.13	Conde B South	
1826-1825	12	413	122.97	122.42	41.3	0.9	32.2	215.2	247.5	0.45	0.42	Conde B South	
1830-1826	12	773	123.70	122.97	36.7	0.4	4.8	173.9	178.7	0.42	0.36	Conde B South	
1831-1830	12	802	124.23	123.70	137.0	0.4	4.8	137.2	142.0	0.40	0.34	Conde B South	
1874-281	15	199	105.77	103.14	11.8	3.4	211.6	553.1	764.7	0.33	0.23	Conde B South	
276-277	15	232	108.84	108.17	14.8	1.9	200.2	466.8	667.0	0.46	0.43	Conde B South	
277-278	15	198	108.17	107.35	46.6	2.2	201.0	513.4	714.5	0.43	0.38	Conde B South	
278-279	15	215	107.25	106.63	14.6	1.9	201.0	528.0	729.1	0.48	0.47	Conde B South	
279-1874	15	174	106.63	105.77	13.3	2.4	211.6	541.3	752.9	0.42	0.37	Conde B South	
281-272	15	380	103.14	100.37	23.7	2.8	224.8	576.8	801.6	0.39	0.32	Conde B South	
336-276	15	237	109.49	108.84	18.5	1.9	190.9	452.0	642.8	0.45	0.42	Conde B South	
337-336	15	271	110.24	109.49	16.1	1.9	188.3	433.5	621.9	0.44	0.41	Conde B South	
516-520	18	298	122.60	122.09	5.5	1.4	118.0	5.5	123.5	0.17	0.06	Hembree A	
520-521	18	247	122.09	121.83	1.4	1.1	118.0	6.9	124.9	0.19	0.08	Hembree A	
521-523	18	384	121.83	121.41	2.2	1.2	118.0	9.2	127.2	0.19	0.08	Hembree A	
522-528	8	64	126.70	125.18	0.2	-	-	0.2	0.2	0.01	0.00	Hembree A	
523-524	18	154	121.41	121.07	0.9	1.7	182.1	11.3	193.3	0.20	0.09	Hembree A	
524-525	18	38	121.07	120.98	0.2	1.8	213.7	24.7	238.3	0.22	0.10	Hembree A	
525-526	18	92	120.98	120.86	0.5	1.5	213.7	25.2	238.9	0.25	0.14	Hembree A	
526-663	18	351	120.86	120.60	2.0	1.2	213.7	27.3	240.9	0.29	0.19	Hembree A	
528-529	8	323	125.18	124.00	0.8	1.6	64.1	1.0	65.1	0.30	0.20	Hembree A	
529-523	8	56	124.00	121.81	0.1	3.8	64.1	1.2	65.3	0.17	0.06	Hembree A	
530-524	10	187	122.44	121.07	0.6	1.6	31.6	13.2	44.8	0.16	0.05	Hembree A	
602-603	24	369	113.42	110.83	2.9	3.5	619.7	145.9	765.5	0.20	0.09	Hembree A	
603-604	24	390	110.83	108.61	3.0	3.3	619.7	148.8	768.5	0.21	0.10	Hembree A	
604-605	24	358	108.61	106.11	2.8	3.5	619.7	151.6	771.2	0.20	0.09	Hembree A	
605-606	24	385	106.11	103.90	3.0	3.3	619.7	154.5	774.2	0.21	0.10	Hembree A	
606-565	24	239	103.90	102.85	1.9	3.0	619.7	156.3	776.0	0.23	0.11	Hembree A	

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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
613-530	10	201	123.07	122.44	12.6	1.2	31.6	12.6	44.2	0.19	0.08	Hembree A	
635-636	10	89	124.06	123.61	5.6	1.2	15.8	5.6	21.4	0.12	0.03	Hembree A	
636-637	10	169	123.61	122.95	0.5	1.1	16.6	6.1	22.7	0.13	0.04	Hembree A	
637-638	10	317	122.95	122.28	1.5	0.9	19.8	7.5	27.4	0.17	0.06	Hembree A	
638-666	10	160	122.28	121.60	6.1	1.5	43.2	13.6	56.8	0.20	0.09	Hembree A	
647-665	10	161	122.41	122.00	4.6	1.3	51.8	18.4	70.2	0.25	0.14	Hembree A	
648-647	10	343	123.43	122.41	1.1	1.3	37.0	13.7	50.7	0.21	0.09	Hembree A	
649-648	10	108	123.91	123.43	1.5	1.4	35.6	12.7	48.2	0.18	0.07	Hembree A	
650-649	10	180	124.54	123.91	0.6	1.3	32.1	11.2	43.3	0.18	0.07	Hembree A	
651-650	8	229	125.80	124.54	0.6	1.5	30.9	10.6	41.5	0.22	0.10	Hembree A	
652-651	8	234	126.90	125.80	10.0	1.4	29.7	10.0	39.7	0.22	0.11	Hembree A	
663-667	18	344	120.60	120.12	2.1	1.5	213.7	29.4	243.1	0.25	0.14	Hembree A	
665-668	18	363	122.00	121.73	2.1	1.4	362.6	89.7	452.3	0.41	0.35	Hembree A	
666-669	18	351	121.10	120.56	2.3	1.9	405.8	107.8	513.6	0.36	0.28	Hembree A	
667-671	24	38	120.12	116.88	0.3	8.5	619.7	139.4	759.1	0.11	0.03	Hembree A	
668-666	18	350	121.73	121.10	2.0	1.9	362.6	91.8	454.4	0.32	0.23	Hembree A	
669-667	18	338	120.56	120.12	2.0	1.8	405.8	109.7	515.5	0.38	0.30	Hembree A	
670-602	24	328	115.65	113.42	2.6	3.5	619.7	143.1	762.7	0.20	0.09	Hembree A	
671-670	24	145	116.68	115.65	1.1	3.5	619.7	140.5	760.2	0.20	0.09	Hembree A	
889-890	10	276	123.03	122.60	0.9	1.8	306.6	67.3	373.9	0.79	0.97	Hembree A	
890-665	18	337	122.60	122.00	2.0	1.8	306.6	69.2	375.9	0.29	0.19	Hembree A	
1-711	10	240	111.00	110.24	9.3	-	-	16.3	16.3	0.12	0.03	Hembree B	
594-608	8	657	116.81	112.22	87.1	1.6	28.7	87.0	115.7	0.34	0.25	Hembree B	
601-607	12	144	107.18	106.73	2.4	2.1	208.2	488.5	696.7	0.67	0.78	Hembree B	
607-567	12	219	106.73	102.56	6.6	3.9	208.2	495.1	703.3	0.39	0.32	Hembree B	
608-601	8	729	112.22	107.48	89.2	1.9	54.1	176.0	230.1	0.51	0.52	Hembree B	
612-601	12	219	107.53	107.18	15.0	1.4	125.4	310.1	435.4	0.60	0.67	Hembree B	
681-685	12	463	109.05	108.39	20.2	1.1	69.4	85.5	154.8	0.34	0.26	Hembree B	
682-681	12	345	109.26	109.05	4.9	0.8	67.2	65.3	132.5	0.40	0.34	Hembree B	
685-686	12	21	108.39	108.38	137.6	0.8	109.3	223.1	332.4	1.00	1.01	Hembree B	SS-8
686-687	15	76	108.38	108.36	5.4	0.8	110.9	228.5	339.4	0.59	0.65	Hembree B	SS-8
687-689	15	31	108.36	108.11	7.6	2.3	112.0	236.1	348.2	0.25	0.13	Hembree B	SS-8
689-690	15	116	108.11	108.08	12.0	0.7	113.6	248.2	361.7	0.68	0.80	Hembree B	SS-8
690-692	12	191	108.08	107.96	16.0	1.0	116.7	264.2	380.9	0.77	0.93	Hembree B	

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
692-694	12	94	107.96	107.76	19.6	1.6	122.4	283.8	406.1	0.53	0.55	Hembree B	
694-612	12	101	107.76	107.53	11.2	1.6	123.8	295.0	418.8	0.53	0.55	Hembree B	
710-682	12	288	109.68	109.26	32.3	1.0	41.9	60.5	102.4	0.28	0.17	Hembree B	
711-710	12	339	110.24	109.68	11.9	0.5	3.9	28.2	32.1	0.15	0.05	Hembree B	
1142-883	8	123	129.91	129.38	0.6	1.7	54.2	43.2	97.4	0.36	0.27	Hembree C	
1143-1142	6	121	130.55	129.91	31.7	1.8	53.9	42.5	96.4	0.52	0.53	Hembree C	
880-884	8	181	127.55	126.86	5.1	1.7	64.7	53.1	117.8	0.41	0.35	Hembree C	
881-880	8	170	128.36	127.55	0.9	1.8	59.4	48.0	107.4	0.37	0.28	Hembree C	
882-881	8	124	129.09	128.36	1.4	1.9	59.2	47.1	106.3	0.34	0.26	Hembree C	
883-882	8	61	129.38	129.09	2.5	1.7	57.1	45.7	102.7	0.36	0.27	Hembree C	
884-885	10	240	126.86	125.76	12.9	1.8	74.5	66.0	140.6	0.31	0.21	Hembree C	
885-886	10	228	125.76	125.58	3.7	1.0	77.0	69.7	146.7	0.52	0.53	Hembree C	
886-887	10	336	125.58	124.80	2.2	1.4	77.0	71.8	148.9	0.38	0.31	Hembree C	
887-888	10	138	124.80	124.27	13.7	2.5	306.6	64.5	371.2	0.56	0.61	Hembree C	
888-889	10	296	124.27	123.03	1.9	2.6	306.6	66.4	373.0	0.55	0.58	Hembree C	
1056-985	18	213	117.55	117.22	45.5	2.2	716.1	547.3	1,263.4	0.60	0.68	Los Amigos	
1334-1056	18	281	117.97	117.55	13.8	2.1	705.2	501.8	1,207.0	0.60	0.66	Los Amigos	
1336-1334	18	279	118.52	117.97	13.6	2.4	702.5	488.0	1,190.5	0.54	0.57	Los Amigos	
1344-1336	18	292	118.96	118.52	14.2	2.2	701.3	474.4	1,175.7	0.58	0.64	Los Amigos	
1346-1344	18	71	119.13	118.96	20.3	2.6	699.8	460.1	1,159.9	0.50	0.50	Los Amigos	
1347-1346	18	130	119.22	119.13	6.4	1.6	693.4	439.8	1,133.3	0.77	0.95	Los Amigos	
1348-1347	18	245	119.85	119.22	12.0	2.6	691.8	433.5	1,125.3	0.48	0.47	Los Amigos	
1349-1350	18	233	120.35	120.00	25.0	2.2	689.7	413.3	1,103.1	0.56	0.60	Los Amigos	
1350-1348	18	167	120.00	119.85	8.2	1.8	689.7	421.5	1,111.2	0.67	0.79	Los Amigos	
1353-1349	18	97	120.74	120.35	4.8	3.1	685.0	388.3	1,073.2	0.41	0.36	Los Amigos	
1354-1353	18	325	121.28	120.74	15.9	2.2	685.0	383.5	1,068.5	0.53	0.55	Los Amigos	
1355-1354	18	323	121.77	121.28	15.8	2.1	685.0	367.6	1,052.6	0.54	0.57	Los Amigos	
1438-1449	18	277	124.80	124.06	49.6	2.6	673.3	304.8	978.1	0.44	0.40	Los Amigos	
1439-1438	18	183	125.08	124.80	10.9	2.2	658.0	255.2	913.2	0.49	0.49	Los Amigos	
1440-1439	18	229	125.64	125.08	15.2	2.5	658.0	244.3	902.3	0.43	0.39	Los Amigos	
1441-1440	18	185	125.95	125.64	11.0	2.2	658.0	229.1	887.1	0.48	0.46	Los Amigos	
1445-1451	18	251	123.34	122.85	6.1	2.3	679.3	325.6	1,004.8	0.49	0.49	Los Amigos	
1446-1445	18	43	123.45	123.34	7.0	2.6	676.7	319.5	996.2	0.45	0.41	Los Amigos	
1449-1446	18	234	124.06	123.45	7.7	2.6	673.7	312.5	986.2	0.45	0.41	Los Amigos	

Future Conditions
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1451-1580	18	294	122.85	122.26	10.5	2.4	681.6	336.1	1,017.7	0.49	0.48	Los Amigos	
1521-1524	12	30	131.19	130.86	7.3	2.7	111.7	29.9	141.6	0.20	0.08	Los Amigos	
1524-1525	12	234	130.86	130.36	-	1.5	111.7	29.9	141.6	0.30	0.19	Los Amigos	
1525-1526	12	221	130.36	130.04	20.7	1.3	112.2	50.7	162.8	0.35	0.27	Los Amigos	
1526-1527	12	227	130.04	129.69	21.3	1.3	112.2	72.0	184.1	0.37	0.29	Los Amigos	
1527-1528	12	143	129.69	129.23	13.4	1.8	114.6	85.4	199.9	0.32	0.22	Los Amigos	
1528-1529	12	430	129.23	128.49	40.3	1.4	114.6	125.7	240.2	0.42	0.36	Los Amigos	
1529-1530	12	269	128.49	128.00	25.2	1.4	114.6	150.9	265.5	0.43	0.39	Los Amigos	
1530-1531	12	269	128.00	127.47	25.2	1.5	114.6	176.2	290.7	0.45	0.41	Los Amigos	
1531-1532	12	266	127.47	126.52	24.9	1.8	114.9	201.1	316.0	0.40	0.33	Los Amigos	
1532-1441	18	165	126.32	125.95	11.9	2.5	648.1	213.0	861.2	0.43	0.38	Los Amigos	
1580-1355	18	322	122.26	121.77	15.7	2.2	685.0	351.9	1,036.8	0.54	0.56	Los Amigos	
958-957	18	153	110.89	110.76	-	1.7	720.9	577.8	1,298.8	0.78	0.95	Los Amigos	SS-15
976-983	18	287	116.09	115.26	-	2.8	720.9	577.8	1,298.8	0.51	0.51	Los Amigos	
981-958	18	145	110.94	110.89	-	1.2	720.9	577.8	1,298.8	1.00	1.46	Los Amigos	SS-15
982-981	18	258	111.50	110.94	-	2.5	720.9	577.8	1,298.8	0.55	0.59	Los Amigos	
983-982	8	117	115.26	111.50	-	5.5	301.9	225.1	526.9	0.52	0.54	Los Amigos	
983-982	12	111	115.26	111.50	-	5.9	419.1	352.8	771.8	0.35	0.26	Los Amigos	
984-976	18	394	116.65	116.09	19.2	2.1	716.1	577.8	1,294.0	0.63	0.73	Los Amigos	
985-984	18	231	117.22	116.65	11.3	2.6	716.1	558.6	1,274.7	0.53	0.54	Los Amigos	
1021-1022	18	144	104.86	104.61	17.1	1.8	278.6	1,340.1	1,618.7	0.68	0.81	North A	SS-9
1022-794	21	242	104.61	104.11	31.1	2.3	619.6	2,318.0	2,937.6	0.74	0.90	North A	SS-1
1023-1021	18	437	105.52	104.86	98.2	1.7	270.0	1,291.6	1,561.6	0.71	0.85	North A	SS-9
1057-1021	10	309	115.22	112.76	24.5	1.1	7.1	31.4	38.4	0.14	0.04	North A	
1666-1910	24	245	94.98	94.28	37.2	2.8	898.8	2,943.5	3,842.3	0.62	0.71	North A	SS-11
1667-1666	24	289	95.33	94.98	63.4	2.1	898.8	2,906.2	3,805.0	1.00	1.07	North A	SS-11
1907-808	24	279	98.81	97.32	22.1	3.5	854.1	2,820.8	3,674.9	0.50	0.49	North A	SS-1
790-797	24	57	103.46	103.37	114.7	2.2	795.9	2,536.5	3,332.5	0.69	0.82	North A	SS-1
794-790	24	531	104.11	103.46	103.8	1.9	650.2	2,421.9	3,072.1	0.72	0.86	North A	SS-1
797-798	24	210	103.37	103.03	25.0	2.2	797.2	2,561.5	3,358.8	0.69	0.83	North A	SS-1
798-801	24	203	103.03	102.71	71.7	2.3	825.1	2,633.2	3,458.3	0.71	0.85	North A	SS-1
801-802	24	85	102.71	102.57	35.7	2.3	825.1	2,668.9	3,494.0	0.71	0.85	North A	SS-1
802-804	24	97	102.57	102.42	49.4	2.3	837.9	2,718.3	3,556.1	0.73	0.88	North A	SS-1
804-807	24	402	102.42	101.88	79.5	2.1	854.1	2,797.8	3,651.9	0.80	0.98	North A	SS-1

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
807-1907	24	11	101.88	98.81	0.9	13.9	854.1	2,798.7	3,652.8	0.18	0.07	North A	SS-1
808-1667	24	278	97.32	95.33	22.0	4.0	898.8	2,842.7	3,741.5	0.46	0.43	North A	SS-1
831-1867	12	188	88.70	87.97	-	1.9	124.0	423.3	547.3	0.53	0.55	North A	
1081-1023	15	368	106.47	105.52	17.4	1.9	225.1	1,193.4	1,418.5	0.79	0.96	North B	
1082-1081	15	261	107.41	106.47	88.8	2.2	212.5	1,175.9	1,388.4	0.67	0.79	North B	
1083-1082	15	508	108.46	107.41	44.5	1.7	203.6	1,087.1	1,290.8	0.80	0.98	North B	
1087-1083	15	314	109.30	108.46	26.6	1.9	203.2	1,042.6	1,245.9	0.70	0.83	North B	
1378-1087	15	293	110.06	109.30	44.3	1.9	203.2	1,016.0	1,219.2	0.69	0.82	North B	
1390-1391	8	228	116.53	115.54	6.5	1.6	48.1	70.9	119.0	0.40	0.33	North B	
1391-1404	8	103	115.54	114.48	4.7	2.2	48.1	75.5	123.6	0.32	0.22	North B	
1392-1390	8	111	117.14	116.53	2.1	1.7	45.3	64.3	109.6	0.36	0.27	North B	
1393-1392	8	96	117.19	117.14	6.0	0.7	44.5	62.2	106.6	0.69	0.82	North B	
1394-1378	15	456	111.25	110.06	64.6	1.8	167.5	971.7	1,139.2	0.66	0.77	North B	
1400-1394	10	8	112.04	111.55	0.4	5.6	149.5	907.0	1,056.5	0.45	0.42	North B	
1401-1402	18	331	115.06	113.23	34.4	2.0	101.4	785.5	886.9	0.34	0.25	North B	SS-2
1402-1400	18	563	113.13	112.14	31.8	1.5	149.5	906.6	1,056.1	0.52	0.53	North B	SS-2
1403-1402	8	32	113.28	113.13	1.4	1.6	48.1	89.2	137.3	0.42	0.37	North B	
1404-1403	8	270	114.48	113.28	12.2	1.6	48.1	87.8	135.9	0.42	0.37	North B	
1416-1401	18	267	115.20	115.06	21.6	0.8	94.7	751.1	845.7	0.68	0.80	North B	SS-2
1417-1416	18	42	115.30	115.20	6.5	1.4	93.6	729.4	823.0	0.41	0.35	North B	SS-2
55-1393	8	202	118.11	117.19	56.2	1.5	39.5	56.2	95.7	0.35	0.26	North B	
1067-1057	10	299	117.12	115.22	6.9	0.5	0.9	7.0	7.9	0.07	0.01	North C	
1068-1070	6	185	110.48	107.03	6.9	1.1	2.3	10.8	13.0	0.13	0.04	North C	
1070-1073	6	361	104.23	102.89	5.0	0.7	2.6	15.8	18.4	0.23	0.12	North C	
1073-1074	12	9	102.89	102.31	20.3	4.0	48.1	36.1	84.2	0.10	0.02	North C	
1074-1075	12	182	95.11	94.87	5.1	1.3	124.0	407.9	531.8	0.75	0.91	North C	
1075-1076	12	42	94.87	94.52	1.2	2.5	124.0	409.0	533.0	0.42	0.37	North C	
1076-1077	12	59	94.52	94.07	1.6	2.4	124.0	410.7	534.6	0.43	0.38	North C	
1077-823	12	120	94.07	93.69	3.3	1.8	124.0	414.0	538.0	0.55	0.59	North C	
1078-1074	12	300	96.54	95.21	8.4	1.7	75.1	366.7	441.8	0.45	0.41	North C	
1098-1099	6	37	110.86	110.73	3.2	1.1	17.3	66.1	83.4	0.54	0.57	North C	
1099-1110	6	439	110.73	109.06	7.3	1.2	17.4	73.4	90.8	0.55	0.58	North C	
1101-1098	6	527	114.03	110.86	62.9	1.3	16.1	62.9	79.0	0.44	0.40	North C	
1106-1109	8	180	103.02	102.28	22.6	1.4	30.4	131.7	162.1	0.48	0.46	North C	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1107-1106	8	294	104.13	103.02	7.9	1.2	22.9	109.1	132.0	0.44	0.40	North C	
1108-1107	8	282	105.26	104.13	7.7	1.2	21.2	101.1	122.3	0.41	0.35	North C	
1109-1776	8	225	102.28	101.08	4.2	1.5	30.4	135.9	166.3	0.45	0.42	North C	
1110-1779	6	449	109.06	107.28	6.3	1.2	17.5	79.6	97.2	0.57	0.61	North C	
1114-1108	8	109	105.78	105.26	2.0	1.3	19.8	93.4	113.2	0.38	0.30	North C	
1120-1114	8	100	106.03	105.78	91.4	1.0	19.4	91.4	110.8	0.44	0.41	North C	
1776-1777	8	350	101.08	99.58	62.5	1.5	43.6	198.4	241.9	0.60	0.68	North C	
1777-1781	8	218	99.58	98.20	4.0	1.8	43.9	202.4	246.3	0.54	0.57	North C	
1778-1780	6	201	102.00	101.23	2.2	1.2	18.0	86.5	104.5	0.60	0.67	North C	
1779-1778	6	332	107.28	102.20	4.6	1.9	17.7	84.3	102.0	0.39	0.33	North C	
1780-1863	6	11	101.23	97.08	0.2	5.8	18.3	86.7	105.0	0.18	0.07	North C	
1781-1863	8	9	98.20	97.18	0.2	5.0	44.2	202.5	246.7	0.24	0.13	North C	
1782-1078	12	111	96.90	96.54	3.1	1.6	74.5	358.4	432.8	0.49	0.48	North C	
1863-1782	12	112	97.08	96.90	66.0	1.2	74.3	355.3	429.6	0.60	0.66	North C	
425-1068	6	277	116.47	110.48	3.9	0.7	0.5	3.9	4.4	0.08	0.01	North C	
820-824	12	186	92.37	91.71	-	1.9	124.0	423.3	547.3	0.54	0.57	North C	
821-820	12	24	92.45	92.37	0.7	1.9	124.0	423.3	547.3	0.55	0.58	North C	
822-821	12	260	93.37	92.45	7.2	1.9	124.0	422.7	546.6	0.54	0.57	North C	
823-822	12	51	93.69	93.37	1.4	2.3	124.0	415.4	539.4	0.45	0.42	North C	
824-825	12	72	91.71	91.46	-	1.8	124.0	423.3	547.3	0.55	0.58	North C	
825-826	12	74	91.46	91.29	-	1.6	124.0	423.3	547.3	0.62	0.71	North C	
826-828	12	292	91.29	89.66	-	2.2	124.0	423.3	547.3	0.47	0.46	North C	
828-830	12	142	89.66	89.11	-	1.9	124.0	423.3	547.3	0.53	0.55	North C	
830-831	12	61	89.11	88.70	-	2.3	124.0	423.3	547.3	0.45	0.42	North C	
1418-1417	18	93	115.36	115.30	266.1	0.9	92.5	722.9	815.4	0.60	0.68	North D	SS-2
1419-1418	12	325	116.33	115.36	21.3	1.5	78.9	456.8	535.6	0.56	0.61	North D	SS-2
1423-1419	12	176	116.65	116.33	11.5	1.3	77.2	435.5	512.7	0.64	0.75	North D	SS-2
1520-30	6	167	129.55	129.09	6.4	0.3	0.4	6.5	6.8	0.15	0.05	North D	
1533-1521	6	350	133.02	131.19	4.2	2.1	99.9	22.6	122.5	0.60	0.67	North D	
1534-1533	6	350	134.26	133.02	4.2	1.8	99.7	18.4	118.1	0.67	0.79	North D	
1536-1534	6	589	136.08	134.26	11.2	1.7	99.0	14.1	113.1	0.68	0.81	North D	
1537-1536	6	111	136.36	136.08	1.3	1.4	58.6	3.0	61.7	0.49	0.48	North D	
30-31	6	470	129.09	127.18	5.7	0.4	0.4	12.1	12.5	0.19	0.08	North D	
31-34	6	157	127.18	126.41	8.3	0.8	3.1	20.4	23.5	0.25	0.13	North D	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
34-35	6	267	126.41	125.46	3.2	0.7	3.6	23.6	27.2	0.29	0.18	North D	
35-39	6	352	125.46	123.50	30.2	1.1	7.9	53.8	61.7	0.39	0.33	North D	
39-40	6	58	123.50	123.17	2.7	1.1	8.2	56.5	64.7	0.40	0.34	North D	
40-41	6	318	123.17	119.64	14.8	1.4	8.2	71.2	79.4	0.37	0.30	North D	
41-42	6	110	119.64	117.20	5.1	1.8	8.9	76.3	85.2	0.32	0.23	North D	
42-1423	10	198	117.20	116.65	97.8	1.5	76.3	424.0	500.3	0.79	0.96	North D	
650-1537	6	141	136.72	136.36	1.7	1.4	58.4	1.7	60.1	0.48	0.47	North D	
9-11	10	83	122.91	122.27	168.0	1.8	39.5	168.0	207.5	0.33	0.24	North E	
11-12	10	339	122.27	121.35	35.6	1.3	44.1	203.5	247.6	0.49	0.48	North E	
12-13	10	125	121.35	121.03	22.1	1.3	45.8	225.7	271.5	0.53	0.55	North E	
13-23	10	88	121.03	120.85	24.3	1.2	55.9	250.0	305.9	0.61	0.68	North E	
23-24	10	218	120.85	120.29	-	1.4	57.9	250.0	307.9	0.57	0.62	North E	
24-43	10	483	120.29	119.05	-	1.4	63.7	250.0	313.7	0.57	0.63	North E	
43-44	10	62	119.05	118.76	-	1.8	64.6	250.0	314.5	0.48	0.46	North E	
44-42	10	634	118.76	117.30	-	1.4	66.9	250.0	316.8	0.60	0.67	North E	
185-187	12	211	111.27	110.49	5.1	2.1	180.4	394.3	574.7	0.55	0.59	South A	
187-188	12	252	110.49	109.81	10.1	1.9	183.8	404.4	588.3	0.62	0.71	South A	
188-239	12	227	109.81	108.74	-	2.3	186.2	404.4	590.6	0.52	0.54	South A	
234-247	14	264	107.07	106.55	31.7	1.9	296.0	610.3	906.3	0.71	0.85	South A	
239-234	12	233	108.74	107.07	10.4	3.1	294.1	578.6	872.7	0.58	0.64	South A	
240-239	8	258	110.80	109.14	3.1	2.3	106.7	163.8	270.5	0.57	0.62	South A	SS-3
241-240	8	126	111.32	110.80	6.2	2.0	106.7	160.6	267.4	0.66	0.77	South A	SS-3
244-241	8	150	111.78	111.32	38.4	1.8	105.3	154.5	259.7	0.71	0.86	South A	SS-3
247-248	14	640	106.55	105.71	22.5	1.6	296.0	633.0	929.0	1.00	1.06	South A	SS-14
248-249	14	39	105.71	105.45	1.1	3.0	296.7	634.1	930.8	0.48	0.46	South A	SS-14
249-566	14	346	105.45	104.99	15.0	1.7	299.2	649.1	948.3	1.00	1.08	South A	SS-14
564-565	14	978	104.42	102.85	30.6	1.9	368.9	699.3	1,068.2	1.00	1.10	South A	SS-14
566-564	14	437	104.99	104.42	19.3	1.7	300.3	668.5	968.8	1.00	1.11	South A	SS-14
580-244	8	254	112.79	111.78	9.3	1.8	79.9	116.0	195.9	0.54	0.57	South A	SS-3
581-580	6	178	113.60	112.79	39.7	1.9	75.0	106.8	181.8	1.00	1.07	South A	SS-3
582-581	6	181	114.26	113.60	41.5	1.6	52.6	67.0	119.6	0.67	0.78	South A	
589-582	6	120	114.86	114.26	25.5	1.5	31.4	25.5	56.9	0.39	0.32	South A	
155-157	12	185	117.33	116.65	17.9	1.2	23.6	45.1	68.7	0.18	0.07	South B	
157-178	12	327	116.65	116.13	49.2	0.9	30.4	94.3	124.7	0.30	0.19	South B	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
167-171	6	593	116.08	113.50	20.0	2.0	99.5	85.4	184.9	1.00	1.11	South B	SS-18
171-173	12	149	113.30	112.78	7.2	2.1	173.6	349.4	523.0	0.53	0.55	South B	
172-171	12	239	113.95	113.30	16.0	1.4	66.2	256.8	323.0	0.43	0.39	South B	
173-182	12	252	112.78	111.93	17.5	2.0	176.3	366.9	543.3	0.55	0.59	South B	
176-180	12	221	115.67	115.42	32.1	0.9	46.7	150.2	196.9	0.42	0.37	South B	
177-176	12	280	115.98	115.67	18.8	0.8	33.5	118.1	151.6	0.36	0.28	South B	
178-177	12	128	116.13	115.98	4.9	0.8	30.4	99.3	129.6	0.33	0.24	South B	
180-181	12	155	115.42	115.25	10.4	0.9	47.0	160.6	207.6	0.43	0.39	South B	
181-172	12	476	115.25	113.95	80.4	1.4	66.2	240.9	307.0	0.42	0.37	South B	
182-184	12	251	111.93	111.38	20.1	1.8	178.4	387.1	565.5	0.65	0.75	South B	
184-185	12	42	111.38	111.27	2.1	1.9	179.2	389.2	568.4	0.61	0.70	South B	
408-409	12	448	118.64	117.91	20.5	0.8	15.3	20.5	35.8	0.16	0.06	South B	
409-410	12	78	117.91	117.68	3.0	1.1	22.9	23.5	46.4	0.16	0.05	South B	
410-155	12	97	117.68	117.33	3.7	1.1	22.9	27.2	50.1	0.16	0.05	South B	
497-498	6	463	124.76	121.08	58.4	2.4	90.0	58.4	148.4	0.59	0.66	South B	
498-499	6	439	121.08	117.13	5.2	2.5	91.1	63.6	154.7	0.58	0.65	South B	
499-167	6	109	117.03	116.08	1.8	2.5	91.1	65.4	156.5	0.60	0.67	South B	
1782-1078	12	111	96.90	96.54	-	1.6	74.5	358.4	432.8	0.49	0.48	West	
1669-1668	24	106	81.36	81.26	19.9	1.5	353.1	754.0	1,107.1	0.41	0.35	West	
1674-1669	18	127	81.65	81.36	2.7	2.0	339.4	734.1	1,073.5	0.49	0.48	West	
1675-1674	15	241	82.05	81.65	4.1	1.8	296.8	654.5	951.4	0.68	0.80	West	
1676-1675	15	300	82.41	82.05	4.5	1.6	294.0	650.4	944.5	0.77	0.94	West	
1677-1674	8	230	81.93	81.65	13.9	1.0	41.2	76.8	118.1	0.57	0.62	West	
1680-1677	8	224	83.25	81.93	1.4	1.6	33.1	63.0	96.1	0.33	0.23	West	
1683-1680	8	224	84.07	83.25	1.4	1.4	33.1	61.6	94.7	0.37	0.29	West	
1684-1683	8	78	84.57	84.27	60.1	1.4	33.1	60.1	93.3	0.36	0.28	West	
1699-1676	15	242	82.95	82.41	2.8	2.0	293.3	645.9	939.1	0.61	0.68	West	
1700-1699	15	99	83.20	82.95	1.8	2.1	292.5	643.2	935.6	0.58	0.64	West	SS-17
1701-1700	15	106	83.27	83.20	1.2	1.3	292.1	641.4	933.5	1.00	1.25	West	SS-17
1728-1701	15	159	83.70	83.27	1.8	2.1	292.1	640.2	932.3	0.57	0.62	West	
1733-1728	15	159	83.97	83.70	30.5	1.8	291.8	638.4	930.2	0.66	0.78	West	
1736-1733	15	253	84.40	83.97	2.9	1.8	284.3	607.9	892.2	0.64	0.74	West	
1737-1736	15	236	84.70	84.40	9.4	1.6	283.4	605.1	888.5	0.71	0.86	West	
1741-1737	15	261	85.20	84.70	7.8	1.9	279.5	595.7	875.2	0.61	0.69	West	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1824-1822	12	535	118.83	115.77	-	1.8	56.4	330.7	387.1	0.39	0.32	West	
1867-1868	12	155	87.97	87.58	-	1.7	126.0	423.3	549.3	0.60	0.68	West	
1868-833	12	36	87.58	87.48	-	1.7	126.0	423.3	549.3	0.60	0.67	West	
1883-1906	15	176	86.06	85.73	2.0	1.8	272.4	574.8	847.2	0.60	0.67	West	
1905-1883	15	242	86.47	86.06	2.8	1.8	272.4	572.8	845.2	0.62	0.71	West	
1906-832	15	179	85.73	85.47	2.0	1.6	272.4	576.8	849.2	0.67	0.78	West	
340-840	8	95	94.95	94.38	0.6	0.6	1.4	0.6	2.0	0.05	0.00	West	
832-1741	15	248	85.47	85.20	11.3	1.5	276.3	588.0	864.3	0.74	0.89	West	
833-1905	15	460	87.18	86.47	5.2	1.7	272.4	570.1	842.5	0.64	0.74	West	
834-833	15	43	87.48	87.18	0.5	2.4	146.4	141.6	288.0	0.23	0.12	West	
835-834	12	184	90.36	88.68	1.7	2.7	146.4	141.1	287.5	0.29	0.19	West	
836-835	12	218	90.96	90.36	2.0	1.8	146.4	139.4	285.8	0.40	0.34	West	
837-836	12	14	91.20	90.96	0.1	3.4	146.4	137.5	283.9	0.25	0.14	West	
838-837	8	254	92.18	91.20	3.9	2.1	146.4	137.4	283.7	0.70	0.84	West	
839-838	8	269	93.27	92.18	1.6	0.6	2.0	4.1	6.1	0.09	0.02	West	
840-839	8	282	94.38	93.27	1.7	0.6	1.7	2.4	4.1	0.08	0.01	West	
1644-1655	42	173	86.75	86.61	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.41	WWTP	
1649-1653	20	112	91.04	90.58	-	3.6	1,197.6	1,350.7	2,548.3	0.58	0.63	WWTP	
1653-1654	24	180	90.58	90.43	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.93	WWTP	SS-10
1654-1656	24	497	90.43	90.01	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.92	WWTP	SS-10
1655-1657	42	474	86.61	86.24	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.42	WWTP	
1656-1913	24	241	90.01	89.80	-	2.1	1,383.6	1,350.7	2,734.3	0.75	0.91	WWTP	SS-10
1657-1912	42	378	86.24	85.94	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.42	WWTP	
1658-1895	42	18	85.52	85.32	-	6.6	3,789.7	4,315.5	8,105.3	0.28	0.17	WWTP	
1659-1895	30	39	80.23	80.61	-	0.6	1,251.9	3,697.4	4,949.3	1.00	-	WWTP	
1660-1659	24	30	80.32	80.23	-	2.2	353.1	754.0	1,107.1	0.30	0.20	WWTP	
1661-1659	24	24	85.19	80.23	-	12.8	898.8	2,943.5	3,842.3	0.20	0.08	WWTP	SS-11
1662-1661	24	98	85.36	85.19	-	2.4	898.8	2,943.5	3,842.3	0.74	0.90	WWTP	SS-11
1664-1662	24	24	85.64	85.36	-	4.7	898.8	2,943.5	3,842.3	0.41	0.35	WWTP	SS-11
1665-1660	24	268	80.91	80.32	-	2.0	353.1	754.0	1,107.1	0.33	0.23	WWTP	
1668-1665	24	233	81.26	80.91	-	1.7	353.1	754.0	1,107.1	0.36	0.28	WWTP	
1896-1658	42	32	85.87	85.52	-	6.5	3,789.7	4,315.5	8,105.3	0.28	0.17	WWTP	
1897-1896	24	15	89.64	87.87	-	12.0	1,383.6	1,350.7	2,734.3	0.19	0.08	WWTP	SS-10
1908-768	6	82	97.03	95.95	-	3.3	152.2	-	152.2	0.51	0.52	WWTP	

Future Conditions
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1909-760	8	129	93.77	92.56	-	3.1	186.1	-	186.1	0.41	0.35	WWTP	
1910-1664	24	59	93.18	85.64	-	10.9	898.8	2,943.5	3,842.3	0.22	0.11	WWTP	SS-11
1911-1897	24	52	89.68	89.64	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.92	WWTP	SS-10
1912-1896	42	87	86.94	85.87	-	6.0	2,406.1	2,964.9	5,370.9	0.22	0.11	WWTP	
1913-1911	24	144	89.80	89.68	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.93	WWTP	SS-10
565-567	14	11	102.85	102.56	-	6.7	988.6	855.6	1,844.2	0.49	0.48	WWTP	SS-6
567-568	14	48	102.56	102.18	-	4.6	1,196.8	1,350.7	2,547.5	1.00	1.19	WWTP	SS-6
568-569	15	356	102.18	100.12	-	4.1	1,196.8	1,350.7	2,547.5	1.00	1.15	WWTP	SS-6
569-570	14	347	100.12	97.66	-	4.4	1,196.8	1,350.7	2,547.5	1.00	1.25	WWTP	SS-6
570-571	14	102	97.66	96.70	-	4.9	1,196.8	1,350.7	2,547.5	1.00	1.09	WWTP	SS-6
571-1649	18	1,020	96.40	91.54	-	3.8	1,197.6	1,350.7	2,548.3	0.67	0.78	WWTP	SS-6
757-759	8	251	94.06	93.73	-	1.4	180.8	-	180.8	0.75	0.91	WWTP	
759-1909	8	188	95.53	93.77	-	3.1	184.5	-	184.5	0.41	0.35	WWTP	
760-1653	8	420	92.56	91.48	-	1.9	186.1	-	186.1	0.60	0.67	WWTP	
768-757	6	143	95.95	94.06	-	3.3	152.2	-	152.2	0.51	0.53	WWTP	
769-1908	6	332	101.40	97.03	-	3.3	152.2	-	152.2	0.51	0.53	WWTP	
770-769	6	416	103.03	101.40	-	2.0	152.2	-	152.2	0.79	0.96	WWTP	

DRAFT

Los Amigos
North E
Bell Village A
North B
North D
North C
Bell Village B
North A
WRF
West
Hembree B
Hembree A
Hembree C
Brooks A
Brooks B
South A
South B
Conde A
Conde B North
Conde B South

- Urban Growth Boundary
- Town Limit
- Sewer Basins
- Sewer Pipe & Diameter - Modeled
- Sewer Pipe - Not Modeled
- Sewer Manhole & ID - Modeled
- Sewer Cleanout & ID - Modeled
- Water Reclamation Facility Inlet Pump Station

Paper Size ANSI A

0 500 1,000 1,500 2,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

Sewer Model
Future Pipes and Manholes

Project No. **11151247**
Revision No. **1**
Date **8/20/2020**

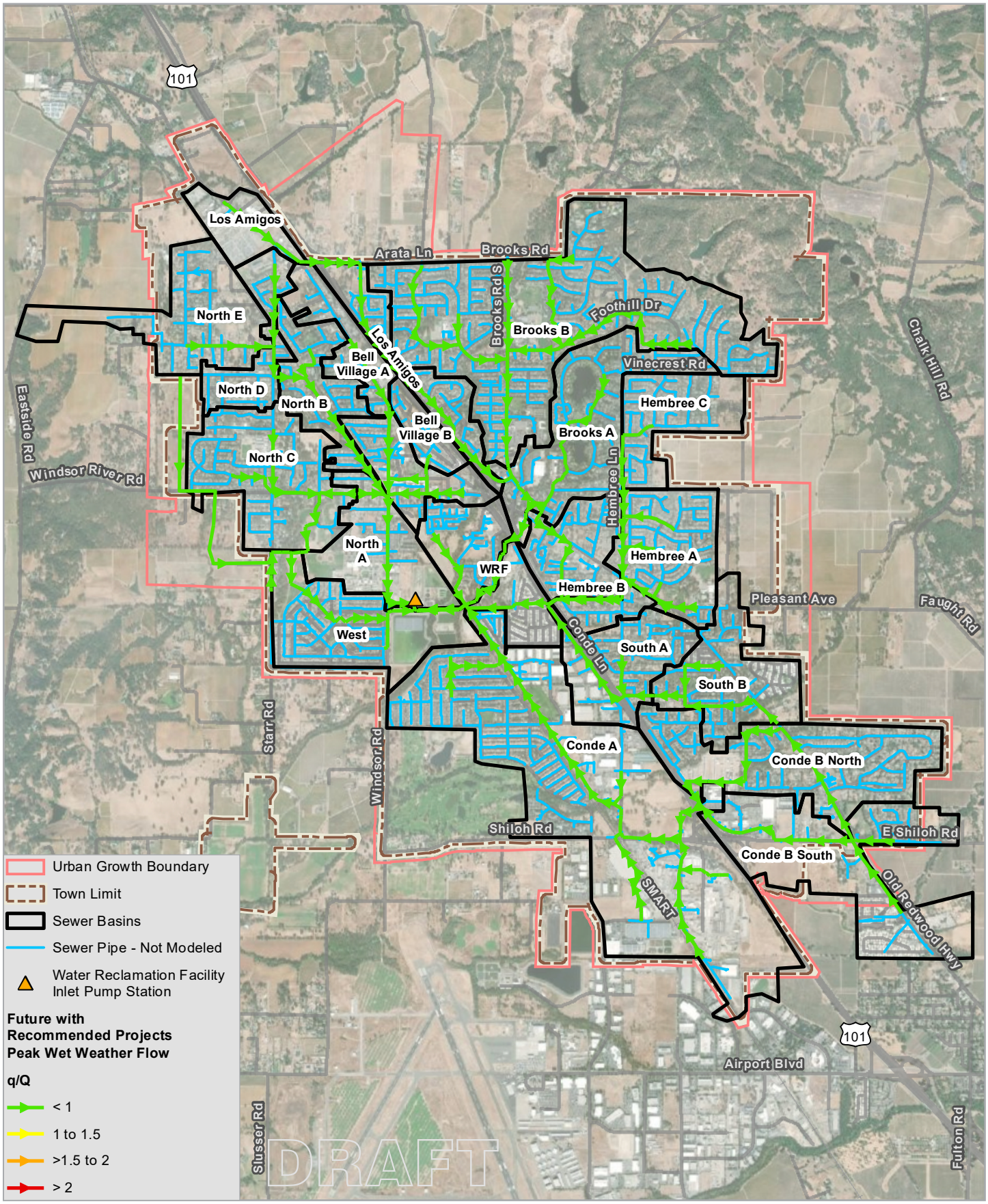
FIGURE E-3

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure E-3 - Sewer Model Future Pipes and Manholes.mxd
Print date: 20 Aug 2020 - 12:49

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Appendix G – Future Condition Model with CIP Fixes

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Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

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GHD

Town of Windsor
Sewer Collection System
Master Plan

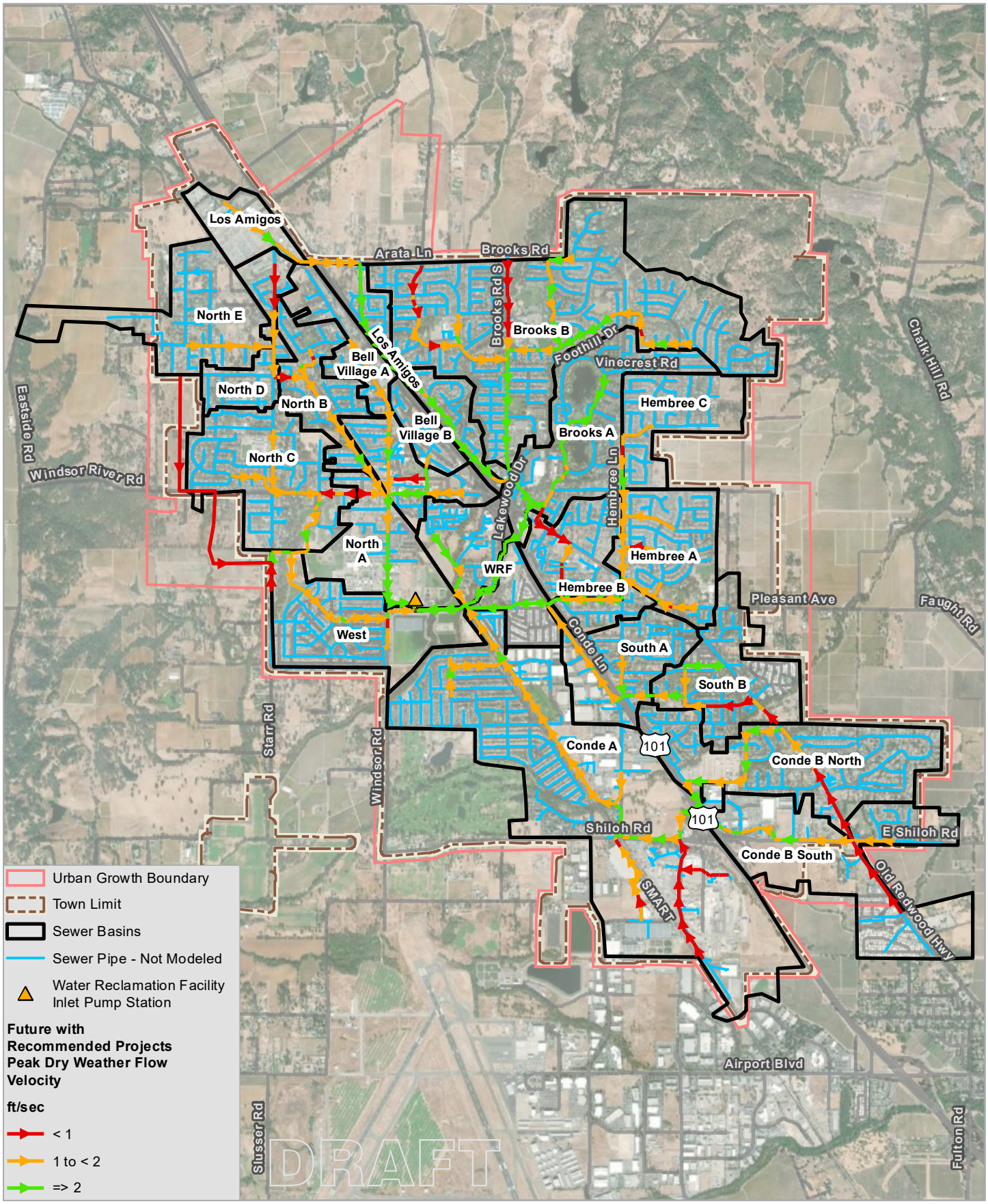
Future with Recommended Projects Peak Wet Weather Flow Capacity Deficiencies Severity

Project No. 11151247
Revision No. 1
Date 8/18/2020

FIGURE F-1

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure F-1 - Future with Recommended Projects Peak Wet Weather Flow Capacity Deficiencies Severity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2



Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

GHD

Town of Windsor
Sewer Collection System
Master Plan

Future with Recommended Projects Peak Dry Weather Flow Velocity

Project No. 11151247
Revision No. 1
Date 8/18/2020

FIGURE F-2

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure F-2 - Future with Recommended Project Peak Dry Weather Flow Velocity.mxd

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1000	118.4	20.6	5.7	Bell Village A
MH-1001	117.1	0.8	6.5	Bell Village A
MH-1032	120.8	4.1	9.6	Bell Village A
MH-1033	119.1	3.7	7.7	Bell Village A
MH-1034	122.1	4.6	11.3	Bell Village A
MH-1035	118.7	2.8	6.4	Bell Village A
MH-1036	120.5	2.5	6.9	Bell Village A
MH-1037	121.5	1.3	7.4	Bell Village A
MH-1038	122.2	1.8	10.8	Bell Village A
MH-1039	122.0	1.7	10.3	Bell Village A
MH-1046	121.3	18.5	7.8	Bell Village A
MH-1053	122.9	11.5	8.2	Bell Village A
MH-1055	123.2	6.4	7.9	Bell Village A
MH-1360	129.9	1.3	9.7	Bell Village A
MH-1361	129.4	1.8	9.6	Bell Village A
MH-1364	123.7	9.4	7.7	Bell Village A
MH-1366	126.9	0.2	8.9	Bell Village A
MH-1367	127.6	5.2	9.1	Bell Village A
MH-1385	129.7	10.3	8.1	Bell Village A
MH-1386	129.3	1.1	7.5	Bell Village A
MH-1854	118.3	-	8.2	Bell Village A
MH-1855	121.5	24.2	10.6	Bell Village A
MH-1856	122.0	-	10.6	Bell Village A
MH-1857	121.8	-	10.3	Bell Village A
MH-1858	120.8	-	8.7	Bell Village A
MH-1889	122.1	1.3	10.2	Bell Village A
MH-1903	118.7	1.3	9.2	Bell Village A
MH-88	133.0	31.2	9.5	Bell Village A
MH-993	118.9	5.4	11.3	Bell Village A
MH-994	118.8	0.9	12.6	Bell Village A
MH-995	118.2	3.8	9.7	Bell Village A
MH-996	118.9	0.7	8.8	Bell Village A
MH-999	116.0	4.2	4.4	Bell Village A
MH-1859	122.7	2.1	10.0	Bell Village B
MH-1860	123.9	-	11.0	Bell Village B
MH-1861	124.3	-	11.3	Bell Village B
MH-1902	124.5	155.3	11.3	Bell Village B
MH-1237	131.6	-	7.4	Brooks A
MH-1238	132.0	0.6	5.7	Brooks A
MH-1239	132.9	1.9	5.6	Brooks A
MH-1243	128.9	38.4	6.2	Brooks A
MH-1244	134.0	12.6	5.8	Brooks A
MH-1245	135.4	-	6.2	Brooks A

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1246	136.1	-	6.2	Brooks A
MH-1249	140.6	9.9	6.3	Brooks A
MH-1251	144.3	0.6	8.0	Brooks A
MH-1252	145.5	97.5	8.1	Brooks A
MH-1651	101.6	-	12.0	Brooks A
MH-1652	102.0	-	11.7	Brooks A
MH-1904	119.9	-	8.7	Brooks A
MH-724	120.3	9.0	9.4	Brooks A
MH-726	119.1	-	19.9	Brooks A
MH-730	117.8	0.8	17.8	Brooks A
MH-731	117.7	27.2	19.3	Brooks A
MH-732	115.9	8.5	19.4	Brooks A
MH-733	111.7	34.2	17.0	Brooks A
MH-734	108.6	-	14.5	Brooks A
MH-735	109.0	-	15.1	Brooks A
MH-736	110.2	-	16.8	Brooks A
MH-742	107.5	-	14.7	Brooks A
MH-743	103.8	-	11.6	Brooks A
MH-744	104.3	-	12.6	Brooks A
MH-745	105.0	-	13.9	Brooks A
MH-898	121.5	18.3	9.3	Brooks A
MH-899	121.3	9.2	9.5	Brooks A
MH-900	120.3	6.6	9.1	Brooks A
MH-901	120.4	3.6	12.2	Brooks A
MH-912	123.4	49.7	6.7	Brooks A
MH-913	123.8	-	6.6	Brooks A
MH-919	123.5	-	7.3	Brooks A
MH-920	124.6	0.7	6.6	Brooks A
MH-921	125.0	1.0	6.5	Brooks A
MH-922	125.7	-	6.2	Brooks A
MH-923	126.6	-	6.0	Brooks A
MH-924	127.6	0.8	6.3	Brooks A
MH-925	127.7	1.0	6.2	Brooks A
MH-927	128.4	1.1	6.3	Brooks A
MH-928	124.3	-	8.5	Brooks A
MH-929	122.9	-	8.5	Brooks A
MH-930	121.8	1.7	9.2	Brooks A
MH-944	118.9	5.3	17.7	Brooks A
MH-945	118.8	1.6	17.6	Brooks A
MH-947	120.3	-	18.4	Brooks A
MH-948	120.9	-	12.9	Brooks A
MH-949	120.6	84.2	11.5	Brooks A
MH-951	120.0	-	10.4	Brooks A

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-952	120.1	-	10.6	Brooks A
MH-954	120.1	-	9.5	Brooks A
MH-956	120.1	-	9.2	Brooks A
MH-957	120.8	-	9.2	Brooks A
MH-961	119.9	21.7	8.7	Brooks A
MH-1203	174.2	33.2	9.2	Brooks B
MH-1209	171.8	1.1	9.0	Brooks B
MH-1210	166.1	2.0	6.3	Brooks B
MH-1211	161.6	2.9	6.5	Brooks B
MH-1212	160.1	1.7	6.6	Brooks B
MH-1213	166.9	0.9	13.8	Brooks B
MH-1214	167.2	-	14.4	Brooks B
MH-1220	166.4	20.9	15.0	Brooks B
MH-1221	165.6	1.1	14.9	Brooks B
MH-1242	128.8	-	14.2	Brooks B
MH-1277	142.5	0.4	10.3	Brooks B
MH-1278	141.5	1.2	11.2	Brooks B
MH-1280	140.2	1.3	10.8	Brooks B
MH-1281	139.5	0.6	10.6	Brooks B
MH-1282	139.0	1.6	10.5	Brooks B
MH-1283	140.6	1.9	13.0	Brooks B
MH-1284	142.5	-	15.9	Brooks B
MH-1285	141.2	0.2	22.2	Brooks B
MH-1286	139.2	6.5	21.0	Brooks B
MH-1288	135.4	15.0	18.8	Brooks B
MH-1289	134.2	7.8	17.9	Brooks B
MH-1290	130.1	4.9	15.1	Brooks B
MH-1299	138.7	1.1	18.7	Brooks B
MH-1300	136.9	1.5	16.4	Brooks B
MH-1301	136.1	5.2	15.5	Brooks B
MH-1302	135.7	-	14.9	Brooks B
MH-1305	136.0	-	14.9	Brooks B
MH-1306	138.1	22.7	16.6	Brooks B
MH-1453	164.3	4.8	14.8	Brooks B
MH-1456	148.6	2.9	8.1	Brooks B
MH-1457	153.6	1.1	7.7	Brooks B
MH-1458	155.7	3.3	9.0	Brooks B
MH-1460	160.8	1.1	12.3	Brooks B
MH-1461	144.2	2.6	8.3	Brooks B
MH-1462	142.9	1.0	9.7	Brooks B
MH-1463	143.3	1.4	6.4	Brooks B
MH-1466	145.0	2.8	6.6	Brooks B
MH-1467	146.9	-	7.5	Brooks B

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1468	148.6	18.9	7.8	Brooks B
MH-1482	155.3	3.7	8.8	Brooks B
MH-1483	149.2	2.1	6.7	Brooks B
MH-1484	155.5	4.3	8.3	Brooks B
MH-1486	145.6	1.8	13.9	Brooks B
MH-1487	150.0	0.2	16.2	Brooks B
MH-1488	153.3	-	17.9	Brooks B
MH-1489	153.8	-	18.0	Brooks B
MH-1490	153.7	-	17.4	Brooks B
MH-1491	155.3	1.2	7.7	Brooks B
MH-1495	158.1	0.2	9.1	Brooks B
MH-1499	156.6	9.6	8.2	Brooks B
MH-1501	158.2	-	8.0	Brooks B
MH-1502	165.4	-	4.7	Brooks B
MH-1503	174.3	22.1	10.6	Brooks B
MH-1557	138.9	0.4	17.0	Brooks B
MH-1558	139.2	0.6	10.2	Brooks B
MH-1561	140.0	1.4	10.2	Brooks B
MH-1562	141.4	28.2	10.9	Brooks B
MH-1568	137.7	2.0	15.6	Brooks B
MH-1569	135.5	0.9	12.6	Brooks B
MH-1570	134.0	8.0	10.9	Brooks B
MH-1571	134.3	-	10.9	Brooks B
MH-1572	133.5	6.1	9.8	Brooks B
MH-1573	133.3	4.2	9.3	Brooks B
MH-1574	133.6	1.1	9.1	Brooks B
MH-1595	137.0	1.8	11.8	Brooks B
MH-1597	139.9	7.4	14.3	Brooks B
MH-1599	139.5	5.3	13.9	Brooks B
MH-1610	140.3	22.7	14.3	Brooks B
MH-1611	139.6	-	13.9	Brooks B
MH-1612	140.7	0.9	14.2	Brooks B
MH-1613	140.9	0.2	14.2	Brooks B
MH-1614	141.0	0.6	14.0	Brooks B
MH-1615	142.0	4.6	14.9	Brooks B
MH-1627	143.9	0.1	16.5	Brooks B
MH-963	120.8	-	9.1	Brooks B
MH-964	121.6	7.4	9.5	Brooks B
MH-966	122.3	6.1	9.8	Brooks B
MH-967	125.7	7.0	12.1	Brooks B
MH-968	126.1	13.9	12.5	Brooks B
MH-111	107.2	-	12.6	Conde A
MH-112	109.4	-	15.1	Conde A

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-113	107.9	-	14.2	Conde A
MH-114	106.9	-	13.7	Conde A
MH-115	105.8	2.3	12.7	Conde A
MH-116	104.7	-	11.9	Conde A
MH-117	107.8	-	10.0	Conde A
MH-119	108.6	-	8.2	Conde A
MH-120	109.0	33.2	8.2	Conde A
MH-122	104.6	6.7	12.2	Conde A
MH-123	103.2	-	10.9	Conde A
MH-124	103.1	0.5	11.1	Conde A
MH-125	101.7	-	9.8	Conde A
MH-1634	98.5	5.4	3.9	Conde A
MH-1635	99.3	10.9	3.9	Conde A
MH-1636	106.1	2.9	13.9	Conde A
MH-1637	103.8	2.6	10.8	Conde A
MH-1638	101.3	5.5	7.5	Conde A
MH-1642	103.2	-	13.6	Conde A
MH-1643	102.7	-	13.8	Conde A
MH-1799	111.6	21.3	7.5	Conde A
MH-1845	114.2	-	12.9	Conde A
MH-1846	114.1	-	11.5	Conde A
MH-1847	115.1	-	11.6	Conde A
MH-1848	115.4	1.2	11.8	Conde A
MH-1869	113.9	-	12.1	Conde A
MH-1872	108.8	2.6	11.4	Conde A
MH-1914	109.2	-	14.0	Conde A
MH-1915	115.2	-	15.2	Conde A
MH-202	104.8	138.2	13.1	Conde A
MH-214	108.1	-	17.0	Conde A
MH-215	108.4	-	17.5	Conde A
MH-216	108.5	-	17.9	Conde A
MH-217	113.5	-	23.4	Conde A
MH-252	109.0	2.1	17.7	Conde A
MH-272	117.2	-	17.5	Conde A
MH-273	111.7	-	13.3	Conde A
MH-274	111.9	11.8	13.9	Conde A
MH-275	113.1	-	15.9	Conde A
MH-296	111.8	0.2	14.8	Conde A
MH-297	111.5	-	14.3	Conde A
MH-298	109.0	7.6	13.4	Conde A
MH-299	109.7	22.2	13.5	Conde A
MH-300	110.3	-	13.8	Conde A
MH-301	114.0	-	16.3	Conde A

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-302	114.9	0.1	16.5	Conde A
MH-303	113.6	0.6	14.9	Conde A
MH-304	113.1	-	14.3	Conde A
MH-310	113.1	4.5	13.6	Conde A
MH-311	114.2	-	14.4	Conde A
MH-312	115.6	-	15.5	Conde A
MH-313	117.0	4.8	16.2	Conde A
MH-314	117.4	-	16.0	Conde A
MH-315	113.3	-	14.2	Conde A
MH-317	114.4	-	14.6	Conde A
MH-319	113.7	-	13.0	Conde A
MH-320	113.6	-	12.8	Conde A
MH-324	113.5	-	16.0	Conde A
MH-325	113.7	-	14.9	Conde A
MH-326	112.7	-	12.9	Conde A
MH-327	112.3	-	11.6	Conde A
MH-328	112.1	2.6	10.3	Conde A
MH-329	111.8	-	9.6	Conde A
MH-330	111.3	-	7.8	Conde A
MH-331	107.6	-	12.9	Conde A
MH-332	109.7	-	14.7	Conde A
MH-333	112.3	-	15.8	Conde A
MH-334	110.3	-	14.2	Conde A
MH-335	110.5	58.9	14.7	Conde A
MH-430	99.8	11.4	3.9	Conde A
MH-431	100.1	15.5	3.6	Conde A
MH-451	101.0	73.4	3.8	Conde A
MH-577	107.6	0.5	16.0	Conde A
MH-578	114.7	9.8	24.7	Conde A
MH-579	110.2	-	20.3	Conde A
MH-151	123.2	3.8	8.9	Conde B North
MH-152	122.4	0.8	9.1	Conde B North
MH-154	124.5	1.3	9.0	Conde B North
MH-265	115.2	19.6	12.8	Conde B North
MH-267	115.3	-	9.8	Conde B North
MH-268	116.5	27.4	8.4	Conde B North
MH-269	118.6	27.4	9.1	Conde B North
MH-270	120.6	11.9	10.0	Conde B North
MH-271	117.4	0.2	15.8	Conde B North
MH-291	121.4	1.1	10.2	Conde B North
MH-292	123.0	4.9	10.4	Conde B North
MH-349	135.0	18.2	13.7	Conde B North
MH-350	135.6	21.3	14.2	Conde B North

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-351	137.3	25.2	15.5	Conde B North
MH-378	132.9	1.0	12.0	Conde B North
MH-388	124.8	1.2	7.6	Conde B North
MH-389	128.0	1.7	9.6	Conde B North
MH-390	130.2	0.6	10.9	Conde B North
MH-391	130.5	8.6	10.3	Conde B North
MH-406	130.6	9.6	10.6	Conde B North
MH-407	130.1	-	10.3	Conde B North
MH-1808	145.3	6.9	13.0	Conde B South
MH-1809	142.6	18.8	13.5	Conde B South
MH-1810	138.0	0.2	15.4	Conde B South
MH-1811	138.0	-	14.6	Conde B South
MH-1818	122.4	36.3	10.5	Conde B South
MH-1819	122.8	-	10.5	Conde B South
MH-1820	123.9	74.5	9.8	Conde B South
MH-1821	124.7	2.3	9.7	Conde B South
MH-1822	126.3	18.8	10.1	Conde B South
MH-1824	131.0	14.0	11.8	Conde B South
MH-1825	138.1	-	15.5	Conde B South
MH-1826	138.2	27.4	14.7	Conde B South
MH-1830	136.8	-	12.7	Conde B South
MH-1831	134.8	4.8	10.2	Conde B South
MH-1874	117.5	-	11.3	Conde B South
MH-276	119.0	9.3	9.6	Conde B South
MH-277	119.1	0.8	10.4	Conde B South
MH-278	118.3	-	10.5	Conde B South
MH-279	118.0	10.6	10.9	Conde B South
MH-281	117.3	13.2	13.7	Conde B South
MH-336	120.1	2.5	10.0	Conde B South
MH-337	121.5	-	10.7	Conde B South
MH-516	136.5	118.0	13.6	Hembree A
MH-520	134.5	-	12.1	Hembree A
MH-521	134.3	-	12.2	Hembree A
MH-522	133.7	-	7.0	Hembree A
MH-523	131.9	-	10.2	Hembree A
MH-524	131.6	-	10.2	Hembree A
MH-525	131.2	-	9.8	Hembree A
MH-526	130.6	-	9.3	Hembree A
MH-528	132.4	64.1	7.0	Hembree A
MH-529	132.3	-	8.2	Hembree A
MH-530	132.6	-	10.1	Hembree A
MH-602	125.9	-	12.1	Hembree A
MH-603	123.0	-	11.8	Hembree A

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-604	119.6	-	10.6	Hembree A
MH-605	117.8	-	11.3	Hembree A
MH-606	116.1	-	11.7	Hembree A
MH-613	134.1	31.6	10.8	Hembree A
MH-635	135.2	15.8	11.0	Hembree A
MH-636	134.7	0.8	11.0	Hembree A
MH-637	134.0	3.3	11.0	Hembree A
MH-638	132.4	23.4	9.9	Hembree A
MH-647	132.9	14.9	10.3	Hembree A
MH-648	134.2	1.4	10.6	Hembree A
MH-649	135.1	3.4	11.0	Hembree A
MH-650	136.0	1.2	11.3	Hembree A
MH-651	136.0	1.2	10.1	Hembree A
MH-652	137.1	29.7	10.1	Hembree A
MH-663	129.4	-	8.4	Hembree A
MH-665	131.7	4.1	9.1	Hembree A
MH-666	130.3	-	8.7	Hembree A
MH-667	129.0	0.2	8.7	Hembree A
MH-668	131.7	-	9.5	Hembree A
MH-669	131.1	-	9.9	Hembree A
MH-670	126.4	-	10.3	Hembree A
MH-671	129.0	-	11.9	Hembree A
MH-889	135.0	-	11.3	Hembree A
MH-890	133.4	-	10.4	Hembree A
FAKECO-1	120.0	-	8.9	Hembree B
MH-594	126.0	28.7	9.0	Hembree B
MH-601	116.1	28.7	8.2	Hembree B
MH-607	116.2	-	9.1	Hembree B
MH-608	119.6	25.4	7.1	Hembree B
MH-612	117.0	1.6	8.9	Hembree B
MH-681	125.6	2.2	16.3	Hembree B
MH-682	124.0	25.3	14.3	Hembree B
MH-685	120.3	39.9	11.2	Hembree B
MH-686	119.4	1.6	10.3	Hembree B
MH-687	119.7	1.2	10.7	Hembree B
MH-689	119.0	1.5	10.1	Hembree B
MH-690	119.1	3.2	10.2	Hembree B
MH-692	118.1	5.6	9.6	Hembree B
MH-694	117.1	1.4	8.8	Hembree B
MH-710	122.3	38.0	12.3	Hembree B
MH-711	120.1	3.9	9.7	Hembree B
MH-1142	142.1	0.3	12.0	Hembree C
MH-1143	142.7	53.9	11.9	Hembree C

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-880	139.6	5.3	11.8	Hembree C
MH-881	140.3	0.1	11.7	Hembree C
MH-882	141.3	2.2	12.0	Hembree C
MH-883	141.5	2.8	11.9	Hembree C
MH-884	139.1	9.9	11.9	Hembree C
MH-885	136.8	2.5	10.6	Hembree C
MH-886	136.0	-	10.1	Hembree C
MH-887	133.1	229.6	7.8	Hembree C
MH-888	132.5	-	7.7	Hembree C
MH-1056	127.3	11.0	8.8	Los Amigos
MH-1334	127.5	2.7	8.6	Los Amigos
MH-1336	127.5	1.2	8.2	Los Amigos
MH-1344	127.2	1.5	7.3	Los Amigos
MH-1346	126.5	6.3	6.7	Los Amigos
MH-1347	126.6	1.6	6.2	Los Amigos
MH-1348	128.0	2.1	7.5	Los Amigos
MH-1349	130.8	4.8	9.6	Los Amigos
MH-1350	129.6	-	8.6	Los Amigos
MH-1353	132.4	-	11.1	Los Amigos
MH-1354	135.0	-	12.9	Los Amigos
MH-1355	134.9	-	12.3	Los Amigos
MH-1438	136.1	15.3	10.6	Los Amigos
MH-1439	137.3	-	11.5	Los Amigos
MH-1440	138.0	-	11.8	Los Amigos
MH-1441	138.8	9.9	12.2	Los Amigos
MH-1445	133.1	2.6	9.1	Los Amigos
MH-1446	132.8	3.0	8.7	Los Amigos
MH-1449	134.0	0.4	9.2	Los Amigos
MH-1451	133.7	2.4	10.1	Los Amigos
MH-1524	139.4	-	8.2	Los Amigos
MH-1525	139.1	0.5	8.3	Los Amigos
MH-1526	138.7	-	8.3	Los Amigos
MH-1527	138.6	2.4	8.6	Los Amigos
MH-1528	136.4	-	6.8	Los Amigos
MH-1529	137.9	-	9.0	Los Amigos
MH-1530	139.0	-	10.6	Los Amigos
MH-1531	139.1	0.3	11.2	Los Amigos
MH-1532	140.9	533.3	14.0	Los Amigos
MH-1580	134.2	3.3	11.1	Los Amigos
MH-958	121.3	-	9.5	Los Amigos
MH-976	122.0	4.8	5.1	Los Amigos
MH-981	121.8	-	9.9	Los Amigos
MH-982	120.1	-	7.8	Los Amigos

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-983	121.1	-	5.5	Los Amigos
MH-984	126.2	-	8.6	Los Amigos
MH-985	126.8	-	8.8	Los Amigos
MH-1021	118.9	1.5	12.8	North A
MH-1022	118.4	1.1	12.5	North A
MH-1023	119.5	44.9	12.9	North A
MH-1057	121.1	6.2	5.8	North A
MH-1666	101.8	-	10.4	North A
MH-1667	103.9	-	7.9	North A
MH-1907	108.5	-	8.7	North A
MH-790	114.4	145.7	9.5	North A
MH-794	115.4	30.7	9.9	North A
MH-797	113.7	1.3	9.0	North A
MH-798	112.8	27.9	8.3	North A
MH-801	113.9	-	9.8	North A
MH-802	114.4	12.8	10.4	North A
MH-804	114.7	16.2	10.7	North A
MH-807	109.0	-	6.7	North A
MH-808	104.0	44.7	5.8	North A
MH-831	107.6	-	18.4	North A
MH-1081	119.0	12.6	11.5	North B
MH-1082	117.8	8.8	9.6	North B
MH-1083	116.6	0.4	7.1	North B
MH-1087	119.4	-	9.2	North B
MH-1378	125.3	35.7	14.3	North B
MH-1390	128.7	2.8	11.9	North B
MH-1391	126.8	-	11.1	North B
MH-1392	129.2	0.8	11.9	North B
MH-1393	129.2	5.0	11.5	North B
MH-1394	125.8	18.0	13.8	North B
MH-1400	125.6	-	13.2	North B
MH-1401	126.3	6.7	10.7	North B
MH-1402	124.2	-	10.3	North B
MH-1403	123.2	-	9.2	North B
MH-1404	125.3	-	10.5	North B
MH-1416	120.3	1.1	4.1	North B
MH-1417	121.2	1.1	5.0	North B
MH-55	129.0	39.5	10.7	North B
CO-425	123.2	0.5	6.7	North C
MH-1067	122.6	0.9	5.4	North C
MH-1068	115.5	1.8	4.9	North C
MH-1070	114.1	0.3	9.8	North C
MH-1073	115.2	45.5	12.2	North C

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1074	115.2	0.7	19.3	North C
MH-1075	114.1	-	18.8	North C
MH-1076	113.1	-	18.2	North C
MH-1077	112.3	-	17.6	North C
MH-1078	111.6	0.6	14.7	North C
MH-1098	117.4	1.2	6.2	North C
MH-1099	117.4	0.1	6.4	North C
MH-1101	122.6	16.1	8.4	North C
MH-1106	123.6	7.5	20.3	North C
MH-1107	122.7	1.8	18.3	North C
MH-1108	121.0	1.4	15.4	North C
MH-1109	125.3	-	22.7	North C
MH-1110	117.7	0.1	8.3	North C
MH-1114	120.5	0.4	14.4	North C
MH-1120	120.0	19.4	13.7	North C
MH-1776	122.4	13.2	20.9	North C
MH-1777	112.0	0.4	12.0	North C
MH-1778	111.5	0.3	9.2	North C
MH-1779	121.6	0.2	14.1	North C
MH-1780	110.2	0.4	8.9	North C
MH-1781	110.8	0.2	12.4	North C
MH-1782	110.5	0.2	13.1	North C
MH-1863	110.2	11.8	12.5	North C
MH-820	109.3	-	16.4	North C
MH-821	108.7	-	15.7	North C
MH-822	110.9	-	17.0	North C
MH-823	111.3	-	17.1	North C
MH-824	110.9	-	18.7	North C
MH-825	110.6	-	18.5	North C
MH-826	109.3	-	17.5	North C
MH-828	108.5	-	18.3	North C
MH-830	108.0	-	18.4	North C
CO-650	138.6	58.4	1.6	North D
MH-1418	122.7	13.6	6.4	North D
MH-1419	122.4	1.6	5.5	North D
MH-1423	123.3	1.0	6.0	North D
MH-1520	136.5	0.4	6.9	North D
MH-1521	139.2	11.7	7.8	North D
MH-1533	139.3	0.2	6.0	North D
MH-1534	140.2	0.7	5.6	North D
MH-1536	142.2	40.4	5.8	North D
MH-1537	141.2	0.2	4.6	North D
MH-30	136.0	-	6.8	North D

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-31	133.4	2.7	6.1	North D
MH-34	132.9	0.5	6.4	North D
MH-35	133.5	4.3	7.8	North D
MH-39	131.3	0.3	7.6	North D
MH-40	130.9	-	7.5	North D
MH-41	124.9	0.7	5.1	North D
MH-42	124.0	0.5	6.1	North D
MH-11	132.1	4.6	9.4	North E
MH-12	132.2	1.7	10.5	North E
MH-13	130.7	10.1	9.2	North E
MH-23	130.1	2.0	8.7	North E
MH-24	131.0	5.8	10.2	North E
MH-43	131.7	0.8	12.2	North E
MH-44	131.6	2.3	12.3	North E
MH-9	130.9	39.5	7.7	North E
MH-185	119.2	1.2	7.3	South A
MH-187	118.1	3.4	7.0	South A
MH-188	117.2	2.4	6.9	South A
MH-234	116.4	1.9	8.5	South A
MH-239	117.7	1.2	8.4	South A
MH-240	118.1	-	6.9	South A
MH-241	118.3	1.4	6.6	South A
MH-244	119.2	25.4	6.9	South A
MH-247	117.9	0.1	10.5	South A
MH-248	117.4	0.7	11.2	South A
MH-249	117.2	2.4	11.0	South A
MH-564	118.0	68.7	12.8	South A
MH-566	117.6	1.1	11.8	South A
MH-580	120.7	4.9	7.5	South A
MH-581	122.4	22.4	8.5	South A
MH-582	122.9	21.2	8.3	South A
MH-589	123.3	31.4	8.2	South A
MH-155	129.8	0.7	12.3	South B
MH-157	131.1	6.8	14.1	South B
MH-167	123.7	8.4	7.3	South B
MH-171	122.4	7.9	8.6	South B
MH-172	124.3	-	9.9	South B
MH-173	120.9	2.7	7.5	South B
MH-176	126.2	13.2	10.1	South B
MH-177	127.8	3.1	11.5	South B
MH-178	130.0	-	13.6	South B
MH-180	127.4	0.3	11.6	South B
MH-181	126.8	19.2	11.2	South B

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-182	119.5	2.0	7.0	South B
MH-184	119.4	0.9	7.4	South B
MH-408	130.5	15.3	11.7	South B
MH-409	133.1	7.5	15.0	South B
MH-410	131.9	-	14.0	South B
MH-497	132.7	90.0	7.6	South B
MH-498	129.5	1.2	8.1	South B
MH-499	125.7	-	8.4	South B
CO-340	102.6	1.4	7.6	West
MH-1669	101.3	13.7	18.1	West
MH-1674	99.8	1.3	16.5	West
MH-1675	100.1	2.8	16.5	West
MH-1676	101.5	0.8	17.6	West
MH-1677	97.8	8.1	14.4	West
MH-1680	96.4	-	13.0	West
MH-1683	94.3	-	10.0	West
MH-1684	94.8	33.1	10.0	West
MH-1699	102.9	0.8	18.7	West
MH-1700	103.3	0.3	19.0	West
MH-1701	104.3	0.1	20.0	West
MH-1728	107.1	0.2	22.6	West
MH-1733	111.4	7.6	26.6	West
MH-1736	112.4	0.9	27.2	West
MH-1737	111.0	4.0	25.4	West
MH-1741	107.3	3.1	21.3	West
MH-1867	106.8	2.1	18.2	West
MH-1868	106.9	-	18.7	West
MH-1883	101.1	-	14.3	West
MH-1905	101.6	-	14.3	West
MH-1906	106.1	-	19.6	West
MH-832	106.8	3.9	20.4	West
MH-833	104.5	-	16.5	West
MH-834	103.8	-	15.8	West
MH-835	108.9	-	18.2	West
MH-836	117.1	-	25.7	West
MH-837	117.3	-	25.9	West
MH-838	112.7	0.6	20.0	West
MH-839	110.8	0.3	17.4	West
MH-840	104.6	0.3	10.1	West
MH-922	125.7	-	6.2	West
MH-923	126.6	-	6.0	West
MH-1644	105.8	-	17.4	WWTP
MH-1649	105.7	-	13.5	WWTP

Future Conditions with Recommended Projects
Inputs and Results
Modeled Manholes

Manhole ID	Rim Elevation (ft)	PDWF Base Flow (gpm)	PWWF Freeboard (ft)	Basin
MH-1653	106.4	-	14.3	WWTP
MH-1654	102.5	-	10.6	WWTP
MH-1655	99.6	-	11.4	WWTP
MH-1656	107.3	-	15.8	WWTP
MH-1657	107.3	-	19.4	WWTP
MH-1658	100.9	-	14.4	WWTP
MH-1659	101.3	-	18.2	WWTP
MH-1660	101.3	-	18.2	WWTP
MH-1661	100.7	-	15.1	WWTP
MH-1662	101.4	-	14.5	WWTP
MH-1664	101.1	-	14.3	WWTP
MH-1665	99.3	-	16.1	WWTP
MH-1668	100.0	-	16.7	WWTP
MH-1895	101.7	-	20.3	WWTP
MH-1896	100.7	-	13.8	WWTP
MH-1897	101.3	-	11.3	WWTP
MH-1908	107.1	-	9.8	WWTP
MH-1909	104.0	1.5	10.0	WWTP
MH-1910	100.9	-	13.5	WWTP
MH-1911	101.5	-	10.3	WWTP
MH-1912	101.3	-	13.6	WWTP
MH-1913	100.5	-	9.2	WWTP
MH-565	114.0	-	10.6	WWTP
MH-567	114.6	-	11.2	WWTP
MH-568	114.8	-	11.7	WWTP
MH-569	110.3	-	9.3	WWTP
MH-570	106.9	-	8.4	WWTP
MH-571	106.1	0.8	8.7	WWTP
MH-757	105.8	28.6	9.7	WWTP
MH-759	105.0	3.7	9.2	WWTP
MH-760	106.4	-	13.4	WWTP
MH-768	107.1	-	10.9	WWTP
MH-769	108.2	-	6.5	WWTP
MH-770	111.7	152.2	8.3	WWTP

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1000-999	8	292	112.51	111.33	59.4	1.2	20.6	59.4	80.0	0.33	0.23	Bell Village A	
1001-996	8	291	110.24	109.55	29.8	1.1	25.5	122.0	147.5	0.53	0.56	Bell Village A	
1032-1034	8	123	111.11	110.20	1.7	1.3	14.3	7.6	21.9	0.15	0.05	Bell Village A	
1033-1032	8	141	111.32	111.11	1.1	0.7	10.2	5.9	16.2	0.19	0.08	Bell Village A	
1034-994	15	349	110.20	108.82	205.6	1.9	120.8	651.5	772.3	0.45	0.42	Bell Village A	SS-4
1035-1033	8	155	112.18	111.32	1.2	1.0	6.6	4.8	11.4	0.12	0.03	Bell Village A	
1036-1035	8	300	113.51	112.18	2.3	0.8	3.8	3.6	7.4	0.10	0.02	Bell Village A	
1037-1036	8	144	114.08	113.51	1.4	0.5	1.3	1.4	2.7	0.06	0.01	Bell Village A	
1038-1034	15	205	110.89	110.20	8.4	1.7	101.8	438.3	540.1	0.39	0.32	Bell Village A	SS-4
1039-1038	15	142	111.03	110.89	9.0	1.1	100.0	429.9	529.9	0.56	0.60	Bell Village A	SS-4
1046-1889	10	260	112.98	111.39	24.9	2.2	96.9	393.7	490.6	0.58	0.64	Bell Village A	SS-12
1053-1046	10	296	114.20	112.98	30.3	1.8	78.5	368.7	447.2	0.62	0.70	Bell Village A	SS-12
1055-1053	10	101	114.88	114.20	1.6	2.0	67.0	338.5	405.5	0.50	0.50	Bell Village A	SS-12
1360-1361	8	110	119.66	119.34	7.4	1.3	44.0	234.9	278.9	0.78	0.96	Bell Village A	
1361-1367	10	382	119.34	118.03	73.5	1.4	45.8	308.5	354.3	0.57	0.61	Bell Village A	SS-12
1364-1055	10	132	115.48	114.88	16.9	1.7	60.5	336.9	397.5	0.56	0.60	Bell Village A	SS-12
1366-1364	10	434	117.62	115.48	9.0	1.7	51.1	320.0	371.2	0.52	0.54	Bell Village A	SS-12
1367-1366	10	124	118.03	117.62	2.6	1.4	51.0	311.1	362.0	0.58	0.64	Bell Village A	SS-12
1385-1360	8	476	121.11	119.66	110.2	1.4	42.7	227.5	270.2	0.74	0.90	Bell Village A	
1386-1385	8	125	121.45	121.11	8.4	1.2	32.4	117.2	149.6	0.52	0.53	Bell Village A	
1854-996	8	64	109.68	109.55	-	1.7	181.6	-	181.6	0.64	0.74	Bell Village A	
1855-1854	8	238	110.59	109.68	-	2.2	181.6	-	181.6	0.52	0.54	Bell Village A	
1856-1855	8	108	111.07	110.59	-	2.2	157.4	-	157.4	0.46	0.43	Bell Village A	
1857-1856	8	21	111.24	111.07	-	2.8	157.4	-	157.4	0.39	0.32	Bell Village A	
1889-1039	10	77	111.39	111.03	27.2	2.0	98.3	420.9	519.2	0.66	0.77	Bell Village A	
1903-995	8	272	108.95	108.03	15.8	2.2	209.1	145.7	354.8	0.57	0.62	Bell Village A	SS-16
88-1386	8	600	123.24	121.45	108.8	1.2	31.2	108.8	140.0	0.48	0.47	Bell Village A	
993-994	8	199	107.07	106.02	131.9	2.6	218.2	293.9	512.1	0.62	0.71	Bell Village A	SS-16
994-1022	15	107	105.62	104.61	1.4	3.5	339.9	946.8	1,286.7	0.47	0.45	Bell Village A	
995-993	8	278	108.03	107.07	16.2	2.2	212.9	161.9	374.8	0.59	0.65	Bell Village A	SS-16
996-1903	8	134	109.55	108.95	7.8	2.4	207.8	129.8	337.6	0.76	0.93	Bell Village A	
999-1001	8	290	111.33	110.24	32.7	1.2	24.8	92.1	116.8	0.41	0.35	Bell Village A	
1858-1857	8	166	111.82	111.24	-	2.0	157.4	-	157.4	0.49	0.49	Bell Village B	
1859-1858	8	160	112.33	111.82	-	2.0	157.4	-	157.4	0.51	0.51	Bell Village B	

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1860-1859	8	77	112.58	112.33	-	2.0	155.3	-	155.3	0.50	0.50	Bell Village B	
1861-1860	8	25	112.66	112.58	-	2.0	155.3	-	155.3	0.50	0.50	Bell Village B	
1902-1861	8	64	112.86	112.66	-	2.0	155.3	-	155.3	0.51	0.51	Bell Village B	
1237-1243	6	207	123.86	122.26	1.1	2.6	123.1	53.0	176.0	0.67	0.79	Brooks A	
1238-1237	6	295	126.03	123.86	2.9	2.5	123.1	52.0	175.0	0.68	0.81	Brooks A	
1239-1238	6	151	126.87	126.03	2.2	2.3	122.4	49.1	171.5	0.75	0.91	Brooks A	
1243-927	8	102	122.26	121.75	18.4	2.3	161.5	71.4	232.9	0.56	0.61	Brooks A	
1244-1239	6	120	127.94	126.87	3.5	2.7	120.5	46.8	167.3	0.62	0.70	Brooks A	
1245-1244	6	93	128.92	127.94	1.0	2.8	108.0	43.3	151.2	0.55	0.58	Brooks A	
1246-1245	6	65	129.61	128.92	0.3	2.8	108.0	42.2	150.2	0.55	0.58	Brooks A	
1249-1246	6	352	134.01	129.61	3.9	3.0	108.0	41.9	149.9	0.52	0.53	Brooks A	
1251-1249	6	273	136.00	134.01	1.4	2.4	98.0	38.0	136.0	0.58	0.63	Brooks A	
1252-1251	6	107	137.09	136.00	36.6	2.7	97.5	36.6	134.1	0.52	0.53	Brooks A	
1651-1644	24	111	88.85	87.55	2.3	5.5	1,520.3	1,117.3	2,637.5	0.33	0.24	Brooks A	
1652-1651	24	145	89.31	88.85	3.0	3.4	1,520.3	1,115.0	2,635.2	0.48	0.46	Brooks A	
1-724	10	147	112.00	110.78	7.1	-	-	-	-	-	-	Brooks A	
1904-956	18	50	110.48	110.29	0.3	3.0	720.9	578.6	1,299.5	0.47	0.46	Brooks A	
724-901	10	8	110.78	110.72	0.1	1.1	9.0	0.1	9.0	0.07	0.01	Brooks A	
726-731	24	108	98.41	97.74	2.2	4.3	1,450.4	1,063.0	2,513.3	0.39	0.31	Brooks A	
730-726	24	123	99.17	98.41	2.5	4.3	1,450.4	1,060.7	2,511.1	0.38	0.31	Brooks A	
731-732	24	297	97.74	95.57	6.5	4.6	1,477.6	1,069.5	2,547.1	0.37	0.29	Brooks A	
732-733	24	391	95.57	94.00	6.7	3.7	1,486.1	1,076.2	2,562.2	0.44	0.40	Brooks A	
733-734	24	231	93.70	93.12	4.8	3.1	1,520.3	1,080.9	2,601.2	0.51	0.51	Brooks A	
734-735	24	90	93.12	92.87	1.8	3.3	1,520.3	1,082.8	2,603.1	0.49	0.48	Brooks A	
735-736	24	205	92.87	92.38	4.2	3.1	1,520.3	1,087.0	2,607.3	0.51	0.52	Brooks A	
736-742	24	252	92.38	91.77	5.2	3.1	1,520.3	1,092.2	2,612.5	0.51	0.52	Brooks A	
742-743	24	245	91.77	91.17	5.1	3.1	1,520.3	1,097.3	2,617.6	0.51	0.52	Brooks A	
743-744	24	151	91.17	90.77	3.1	3.2	1,520.3	1,100.4	2,620.7	0.50	0.50	Brooks A	SS-7
744-745	24	248	90.77	90.13	5.1	3.2	1,520.3	1,105.5	2,625.8	0.50	0.51	Brooks A	SS-7
745-1652	24	311	90.13	89.31	6.4	3.2	1,520.3	1,112.0	2,632.2	0.50	0.50	Brooks A	
898-899	10	224	111.58	111.20	11.2	1.7	235.7	111.2	346.9	0.72	0.86	Brooks A	
899-900	10	222	111.20	110.80	5.9	1.8	244.9	117.1	362.0	0.71	0.86	Brooks A	
900-901	10	13	110.80	110.72	0.1	2.8	251.5	117.2	368.7	0.48	0.47	Brooks A	
901-944	10	290	107.72	106.60	3.3	2.4	264.0	120.6	384.6	0.57	0.63	Brooks A	

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
912-919	8	134	116.21	115.72	15.3	2.2	215.7	96.8	312.5	0.78	0.95	Brooks A	
913-912	8	152	116.66	116.21	0.8	1.9	166.0	81.4	247.5	0.70	0.84	Brooks A	
919-928	10	114	115.72	115.46	0.8	1.9	215.7	97.5	313.2	0.60	0.67	Brooks A	SS-13
920-913	8	231	117.64	116.66	3.5	2.2	166.0	80.7	246.7	0.61	0.70	Brooks A	
921-920	8	111	118.08	117.64	0.6	2.2	165.3	77.2	242.5	0.62	0.71	Brooks A	
922-921	8	151	119.21	118.08	0.8	2.7	164.4	76.6	241.0	0.51	0.51	Brooks A	
923-922	8	165	120.16	119.21	1.1	2.5	164.4	75.9	240.2	0.55	0.58	Brooks A	
924-923	8	143	120.86	120.16	1.6	2.3	164.4	74.8	239.1	0.57	0.63	Brooks A	
925-924	8	43	121.15	120.86	0.3	2.6	163.6	73.2	236.8	0.52	0.53	Brooks A	
927-925	8	98	121.75	121.15	1.5	2.5	162.5	72.9	235.5	0.53	0.55	Brooks A	
928-929	8	78	115.46	114.15	0.5	4.0	215.7	98.0	313.8	0.47	0.45	Brooks A	
929-930	8	155	114.15	112.07	1.1	3.6	215.7	99.1	314.8	0.50	0.50	Brooks A	
930-898	8	137	112.07	111.58	0.9	2.2	217.4	100.0	317.4	0.79	0.97	Brooks A	
944-730	24	310	100.30	99.17	6.4	3.6	1,449.6	1,058.2	2,507.8	0.45	0.41	Brooks A	
945-944	24	16	100.38	100.30	0.2	3.7	1,180.3	931.2	2,111.6	0.37	0.30	Brooks A	
947-945	24	246	101.02	100.38	5.2	3.0	1,178.7	931.0	2,109.7	0.44	0.40	Brooks A	
948-947	24	69	107.70	101.02	1.4	10.7	1,178.7	925.7	2,104.4	0.17	0.07	Brooks A	
949-948	24	128	108.44	107.70	19.4	4.0	1,178.7	924.3	2,103.0	0.36	0.27	Brooks A	
951-952	24	66	108.88	108.51	1.4	3.8	1,094.5	903.8	1,998.3	0.35	0.26	Brooks A	
952-949	24	53	108.51	108.44	1.1	2.3	1,094.5	904.9	1,999.4	0.52	0.53	Brooks A	
954-951	24	238	109.90	108.88	4.9	3.5	1,094.5	902.5	1,997.0	0.37	0.30	Brooks A	
956-954	18	75	110.29	109.90	1.2	3.4	720.9	579.7	1,300.6	0.43	0.38	Brooks A	
957-1904	18	98	110.59	110.48	0.5	2.0	720.9	578.3	1,299.2	0.68	0.80	Brooks A	SS-15
961-954	24	223	110.69	109.90	5.4	2.4	373.6	317.8	691.4	0.23	0.11	Brooks A	
1203-1209	8	308	164.77	162.57	26.5	1.7	33.2	26.4	59.6	0.24	0.13	Brooks B	
1209-1210	8	291	162.57	159.74	1.7	1.9	34.4	28.1	62.5	0.23	0.12	Brooks B	
1210-1211	8	247	159.74	154.87	1.7	2.5	36.4	29.8	66.2	0.20	0.09	Brooks B	
1211-1212	8	300	154.87	153.34	1.8	1.6	39.3	31.7	71.0	0.29	0.18	Brooks B	
1212-1213	8	181	153.34	152.79	0.7	1.3	41.0	32.4	73.4	0.34	0.24	Brooks B	
1213-1214	8	154	152.79	152.59	0.6	1.0	41.8	33.0	74.9	0.43	0.38	Brooks B	
1214-1220	10	359	152.59	150.97	1.8	1.5	41.8	34.8	76.6	0.23	0.12	Brooks B	
1220-1221	6	192	150.97	150.49	13.9	1.4	62.7	48.7	111.4	0.73	0.88	Brooks B	
1221-1453	10	333	150.49	149.18	3.5	1.6	63.8	52.1	115.9	0.29	0.19	Brooks B	
1242-968	18	328	114.14	113.13	1.3	2.2	317.5	287.3	604.9	0.33	0.23	Brooks B	

Future Conditions with Recommended Projects
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1277-1278	10	172	131.93	129.91	0.9	3.1	146.0	125.0	271.0	0.34	0.25	Brooks B	
1278-1280	10	267	129.91	129.02	2.3	2.0	147.3	127.3	274.5	0.49	0.48	Brooks B	
1280-1281	10	117	129.02	128.42	1.4	2.3	148.5	128.7	277.2	0.43	0.39	Brooks B	
1281-1282	10	151	128.42	128.09	1.1	1.7	149.2	129.8	278.9	0.56	0.61	Brooks B	
1282-1283	10	332	128.09	127.18	2.8	1.8	150.8	132.4	283.2	0.53	0.55	Brooks B	
1283-1284	10	154	127.18	126.42	1.6	2.3	152.7	134.0	286.8	0.45	0.42	Brooks B	
1284-1285	12	208	126.42	118.57	1.3	4.6	156.2	149.7	305.8	0.21	0.10	Brooks B	
1285-1286	18	228	118.57	117.68	2.1	2.4	283.4	251.9	535.3	0.29	0.18	Brooks B	
1286-1288	18	471	117.68	116.14	7.4	2.2	289.9	259.4	549.2	0.31	0.20	Brooks B	
1288-1289	18	113	116.14	115.82	9.4	2.1	304.9	268.8	573.6	0.32	0.23	Brooks B	
1289-1290	18	388	115.82	114.50	11.6	2.3	312.7	280.4	593.1	0.32	0.22	Brooks B	
1290-1242	18	124	114.50	114.14	5.6	2.2	317.5	286.0	603.5	0.33	0.24	Brooks B	
1299-1285	12	344	119.65	118.57	2.1	1.8	127.0	100.2	227.2	0.34	0.25	Brooks B	
1300-1299	12	343	119.99	119.65	2.1	1.2	125.9	98.1	224.0	0.47	0.45	Brooks B	
1301-1300	12	110	120.32	119.99	3.7	1.8	124.4	95.9	220.4	0.34	0.25	Brooks B	
1302-1301	12	69	120.50	120.32	0.5	1.6	119.3	92.2	211.5	0.35	0.26	Brooks B	
1305-1302	12	68	120.68	120.50	0.3	1.7	119.3	91.7	211.0	0.34	0.26	Brooks B	
1306-1305	12	161	121.09	120.68	14.0	1.6	119.3	91.3	210.6	0.35	0.26	Brooks B	
1453-1460	10	204	149.18	148.33	4.3	1.7	68.6	56.4	125.0	0.30	0.20	Brooks B	
1456-1461	10	310	140.34	135.67	2.7	2.8	77.1	66.1	143.1	0.23	0.12	Brooks B	
1457-1456	10	309	145.74	140.34	1.6	2.9	74.1	63.4	137.6	0.22	0.11	Brooks B	
1458-1457	10	112	146.50	145.74	4.1	2.1	73.0	61.9	135.0	0.28	0.17	Brooks B	
1460-1458	10	279	148.33	146.50	1.4	2.0	69.7	57.8	127.5	0.27	0.16	Brooks B	
1461-1462	10	280	135.67	132.89	2.4	2.4	79.7	68.5	148.2	0.26	0.15	Brooks B	
1462-1277	10	73	132.89	131.93	0.4	3.2	145.6	124.1	269.7	0.33	0.24	Brooks B	
1463-1462	8	261	136.73	132.89	1.1	2.7	64.9	55.3	120.3	0.29	0.18	Brooks B	
1466-1463	8	270	138.07	136.73	2.7	1.8	63.5	54.3	117.8	0.38	0.31	Brooks B	
1467-1466	8	131	139.24	138.07	0.5	2.2	60.8	51.6	112.4	0.32	0.22	Brooks B	
1468-1467	8	239	140.62	139.24	14.1	1.9	60.8	51.1	111.8	0.36	0.27	Brooks B	
1482-1483	8	352	146.34	142.25	4.2	2.1	39.8	35.7	75.5	0.24	0.13	Brooks B	
1483-1468	8	319	142.25	140.62	1.3	1.6	41.8	37.0	78.9	0.31	0.20	Brooks B	
1484-1482	8	154	146.95	146.34	2.9	1.4	36.0	31.6	67.7	0.30	0.20	Brooks B	
1486-1284	12	286	131.62	126.42	1.8	1.1	3.4	14.3	17.8	0.06	0.01	Brooks B	
1487-1486	12	466	133.72	131.62	3.0	0.5	1.6	12.5	14.1	0.08	0.01	Brooks B	

Future Conditions with Recommended Projects
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1488-1487	12	419	135.31	133.72	2.7	0.5	1.4	9.6	11.0	0.07	0.01	Brooks B	
1489-1488	12	48	135.73	135.31	0.3	0.7	1.4	6.8	8.2	0.05	0.01	Brooks B	
1490-1489	12	129	136.25	135.73	1.0	0.5	1.4	6.5	7.9	0.06	0.01	Brooks B	
1491-1490	12	420	147.46	145.15	2.8	0.6	1.4	5.5	6.9	0.05	0.01	Brooks B	
1495-1491	12	329	149.01	147.46	2.6	0.3	0.2	2.7	2.8	0.04	0.00	Brooks B	
1499-1484	8	231	148.21	146.95	8.4	1.5	31.8	28.8	60.5	0.26	0.15	Brooks B	
1501-1499	8	179	150.07	148.21	1.0	1.7	22.1	20.4	42.5	0.19	0.08	Brooks B	
1502-1501	8	336	160.62	150.07	1.4	2.5	22.1	19.4	41.5	0.14	0.04	Brooks B	
1503-1502	8	261	163.58	160.62	18.1	1.8	22.1	18.0	40.2	0.18	0.07	Brooks B	
1557-1306	12	179	121.56	121.09	1.1	1.6	96.6	77.4	174.0	0.31	0.21	Brooks B	
1558-1557	8	173	128.94	121.56	3.0	3.1	30.2	21.3	51.5	0.15	0.05	Brooks B	
1561-1558	8	344	129.61	128.94	1.4	1.0	29.6	18.3	47.9	0.30	0.20	Brooks B	
1562-1561	8	190	130.35	129.61	16.9	1.3	28.2	16.9	45.0	0.25	0.13	Brooks B	
1568-1557	12	100	121.91	121.56	0.6	1.6	66.0	54.9	120.9	0.24	0.13	Brooks B	
1569-1568	12	335	122.60	121.91	2.0	1.3	63.9	54.3	118.2	0.27	0.16	Brooks B	
1570-1569	12	259	122.85	122.60	4.8	1.0	63.0	52.2	115.2	0.33	0.23	Brooks B	
1571-1570	12	104	123.16	122.85	0.6	1.4	55.0	47.4	102.4	0.23	0.12	Brooks B	
1572-1571	12	123	123.36	123.16	5.8	1.1	55.0	46.8	101.8	0.27	0.16	Brooks B	
1573-1572	12	252	123.74	123.36	2.9	1.0	48.9	41.0	89.9	0.26	0.15	Brooks B	
1574-1573	12	203	124.25	123.74	1.2	1.2	44.7	38.1	82.8	0.22	0.10	Brooks B	
1595-1574	12	208	125.04	124.25	4.3	1.4	43.6	36.8	80.4	0.19	0.08	Brooks B	
1597-1595	12	243	125.25	125.04	6.4	0.8	41.8	32.5	74.3	0.27	0.16	Brooks B	
1599-1597	12	69	125.39	125.25	2.9	1.0	34.4	26.2	60.6	0.20	0.08	Brooks B	
1610-1611	12	97	125.75	125.53	15.4	1.0	29.1	22.4	51.5	0.18	0.07	Brooks B	
1611-1599	12	137	125.53	125.39	0.8	0.8	29.1	23.3	52.4	0.22	0.10	Brooks B	
1612-1610	12	302	126.36	125.75	1.8	0.6	6.4	7.1	13.5	0.09	0.02	Brooks B	
1613-1612	12	133	126.63	126.36	0.8	0.6	5.5	5.2	10.7	0.09	0.01	Brooks B	
1614-1613	12	125	126.92	126.63	0.8	0.6	5.4	4.3	9.7	0.08	0.01	Brooks B	
1615-1614	12	95	127.01	126.92	2.5	0.4	4.8	3.6	8.3	0.09	0.02	Brooks B	
1627-1615	12	92	127.40	127.01	1.1	-	0.1	1.1	1.2	0.03	0.00	Brooks B	
963-961	24	151	111.21	110.69	1.9	2.3	351.9	312.4	664.4	0.23	0.11	Brooks B	
964-963	24	121	111.61	111.21	1.7	2.3	351.9	310.5	662.4	0.23	0.11	Brooks B	
966-964	24	98	112.11	111.61	4.2	2.7	344.5	308.8	653.3	0.20	0.09	Brooks B	
967-966	18	403	113.02	112.11	4.0	2.0	338.5	304.6	643.1	0.37	0.29	Brooks B	

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
968-967	18	47	113.13	113.02	13.3	2.0	331.4	300.6	632.1	0.36	0.28	Brooks B	
111-112	21	163	93.77	93.39	4.1	2.4	562.2	1,241.9	1,804.0	0.51	0.52	Conde A	
112-113	21	224	93.39	92.87	5.3	2.3	562.2	1,247.2	1,809.4	0.52	0.53	Conde A	
113-114	21	153	92.87	92.51	5.5	2.4	562.2	1,252.7	1,814.8	0.52	0.53	Conde A	
114-115	24	173	92.11	91.81	5.2	2.1	562.2	1,257.8	1,820.0	0.46	0.43	Conde A	
115-116	24	418	91.81	91.56	11.3	1.5	600.4	1,297.2	1,897.5	0.65	0.75	Conde A	
116-122	24	398	91.56	91.28	10.7	1.5	600.4	1,307.9	1,908.2	0.62	0.71	Conde A	
117-1872	8	89	97.58	97.19	0.8	1.4	33.2	24.1	57.3	0.27	0.16	Conde A	
119-117	8	502	100.15	97.58	5.5	1.5	33.2	23.3	56.5	0.26	0.14	Conde A	
120-119	8	71	100.64	100.15	17.9	1.7	33.2	17.9	51.1	0.23	0.11	Conde A	
122-123	27	230	91.28	91.11	7.5	1.6	607.0	1,315.3	1,922.4	0.50	0.51	Conde A	
123-124	27	274	91.11	90.92	8.3	1.5	607.0	1,323.7	1,930.7	0.52	0.53	Conde A	
124-125	27	297	90.92	90.71	15.9	1.5	607.5	1,339.6	1,947.1	0.52	0.53	Conde A	
125-202	27	408	90.71	90.42	10.3	1.5	607.5	1,349.8	1,957.3	0.52	0.53	Conde A	
1634-1638	10	302	94.23	93.48	3.4	1.7	116.6	128.9	245.6	0.50	0.50	Conde A	
1635-1634	8	239	95.28	94.23	10.1	1.0	10.9	10.1	21.0	0.16	0.06	Conde A	
1636-577	8	172	91.67	91.17	1.6	1.8	127.6	137.2	264.8	0.75	0.91	Conde A	
1637-1636	10	301	92.61	91.67	3.4	1.8	124.7	135.7	260.4	0.48	0.47	Conde A	
1638-1637	10	300	93.38	92.61	3.4	1.7	122.1	132.3	254.4	0.51	0.51	Conde A	
1642-1643	33	435	87.96	87.82	16.2	1.3	885.8	1,808.2	2,694.0	0.58	0.64	Conde A	
1643-1644	33	416	87.82	87.35	39.3	2.0	885.8	1,847.6	2,733.4	0.40	0.34	Conde A	
1799-330	8	167	103.97	103.38	8.7	1.2	21.3	8.7	30.0	0.21	0.09	Conde A	
1845-320	10	204	101.18	100.66	2.3	0.4	1.2	28.2	29.4	0.16	0.06	Conde A	
1846-1869	10	400	102.53	101.66	4.5	0.4	1.2	22.4	23.6	0.15	0.05	Conde A	
1847-1846	10	347	103.40	102.53	3.9	0.4	1.2	17.9	19.1	0.13	0.04	Conde A	
1848-1847	10	72	103.47	103.40	14.1	0.3	1.2	14.1	15.2	0.15	0.05	Conde A	
1869-1845	10	262	101.66	101.18	3.5	0.4	1.2	26.0	27.1	0.17	0.06	Conde A	
1872-115	8	159	97.19	96.41	4.1	1.5	35.9	28.1	64.0	0.28	0.17	Conde A	
1914-332	21	130	94.24	94.07	2.5	1.8	479.3	1,190.8	1,670.1	0.59	0.65	Conde A	
1915-311	10	118	99.86	99.71	1.3	0.5	4.8	11.1	15.9	0.14	0.05	Conde A	
202-252	27	500	90.42	90.06	198.4	1.6	745.8	1,548.2	2,294.0	0.57	0.61	Conde A	
214-215	27	327	89.83	89.60	9.9	1.6	747.8	1,566.8	2,314.7	0.57	0.63	Conde A	
215-216	27	323	89.60	89.37	9.8	1.6	747.8	1,576.7	2,324.5	0.57	0.62	Conde A	
216-217	27	500	89.37	89.01	15.2	1.6	747.8	1,591.9	2,339.8	0.58	0.63	Conde A	

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
217-578	27	243	89.01	88.72	7.4	2.0	747.8	1,599.4	2,347.2	0.49	0.49	Conde A	
252-214	27	331	90.06	89.83	8.7	1.6	747.8	1,556.8	2,304.7	0.57	0.63	Conde A	
272-273	24	280	99.07	97.79	11.2	2.7	426.4	1,052.9	1,479.2	0.31	0.21	Conde A	
273-274	24	246	97.79	96.66	6.6	2.7	426.4	1,059.5	1,485.8	0.32	0.22	Conde A	
274-275	21	446	96.66	96.42	10.6	1.3	438.2	1,070.1	1,508.3	0.75	0.91	Conde A	
275-296	21	174	96.42	96.03	4.8	2.1	438.2	1,074.9	1,513.1	0.47	0.45	Conde A	
296-300	21	323	96.03	95.57	6.1	1.8	449.5	1,169.3	1,618.9	0.56	0.60	Conde A	
297-296	10	46	97.00	96.83	0.5	0.9	11.1	88.4	99.5	0.28	0.17	Conde A	
298-1914	21	210	94.67	94.24	5.4	2.1	479.3	1,188.3	1,667.6	0.51	0.52	Conde A	
299-298	21	333	94.91	94.67	6.3	1.5	471.8	1,183.0	1,654.7	0.72	0.87	Conde A	
300-299	21	309	95.57	94.91	7.3	2.1	449.5	1,176.7	1,626.2	0.50	0.49	Conde A	
301-297	10	286	97.40	97.00	3.2	0.7	11.1	87.8	99.0	0.35	0.27	Conde A	
302-301	10	202	98.21	97.40	15.7	1.0	11.1	84.6	95.8	0.26	0.15	Conde A	
303-302	10	153	98.49	98.21	5.2	0.7	11.1	68.9	79.9	0.30	0.19	Conde A	
304-303	10	84	98.63	98.49	0.9	0.7	10.5	63.6	74.1	0.29	0.18	Conde A	
310-304	10	312	99.36	98.63	3.5	0.8	9.3	16.7	26.0	0.16	0.05	Conde A	
311-310	10	192	99.71	99.36	2.2	0.6	4.8	13.2	18.0	0.14	0.04	Conde A	
312-1915	10	96	99.99	99.86	1.1	0.5	4.8	9.7	14.6	0.14	0.04	Conde A	
313-312	10	225	100.69	99.99	5.0	0.7	4.8	8.7	13.5	0.11	0.02	Conde A	
314-313	10	224	101.40	100.69	3.7	-	-	3.7	3.7	0.06	0.01	Conde A	
315-304	8	114	98.88	98.63	2.2	0.4	1.2	46.0	47.1	0.29	0.18	Conde A	
317-315	10	400	99.61	98.88	4.9	0.4	1.2	43.8	45.0	0.22	0.11	Conde A	
319-317	10	389	100.54	99.61	10.6	0.4	1.2	39.0	40.2	0.20	0.08	Conde A	
320-319	10	9	100.66	100.64	0.1	0.4	1.2	28.4	29.5	0.17	0.06	Conde A	
324-333	8	254	97.26	96.18	2.3	1.3	24.0	25.0	49.0	0.25	0.14	Conde A	
325-324	8	277	98.62	97.26	2.5	1.4	24.0	22.8	46.8	0.24	0.12	Conde A	
326-325	8	277	99.57	98.62	2.5	1.2	24.0	20.3	44.3	0.25	0.14	Conde A	
327-326	8	270	100.54	99.57	2.4	1.2	24.0	17.8	41.8	0.24	0.13	Conde A	
328-327	8	301	101.55	100.54	2.7	1.2	24.0	15.4	39.4	0.24	0.12	Conde A	
329-328	8	300	102.02	101.55	2.7	0.9	21.3	12.7	34.0	0.27	0.16	Conde A	
330-329	8	145	103.38	102.02	1.3	1.6	21.3	10.0	31.3	0.17	0.06	Conde A	
331-111	21	28	93.83	93.77	0.7	2.3	562.2	1,237.8	1,799.9	0.52	0.54	Conde A	
332-331	21	107	94.07	93.83	2.5	2.2	479.3	1,193.3	1,672.6	0.50	0.49	Conde A	
333-334	8	201	96.18	96.00	1.8	0.8	24.0	26.8	50.8	0.38	0.31	Conde A	

Future Conditions with Recommended Projects
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
334-335	8	57	96.00	95.54	0.5	1.6	24.0	27.4	51.3	0.22	0.11	Conde A	
335-331	8	174	95.54	94.53	2.8	2.1	82.8	43.8	126.6	0.38	0.31	Conde A	
430-1634	8	254	95.49	94.23	13.5	2.1	100.3	115.5	215.8	0.54	0.56	Conde A	
431-430	8	255	96.10	95.49	15.0	1.5	88.9	101.9	190.8	0.63	0.72	Conde A	
451-431	8	203	96.89	96.10	86.8	1.7	73.4	86.9	160.3	0.48	0.47	Conde A	
577-578	10	174	91.17	90.52	2.0	2.0	128.1	139.2	267.3	0.47	0.44	Conde A	
578-579	27	241	88.72	88.04	35.6	2.8	885.8	1,774.1	2,659.9	0.41	0.36	Conde A	
579-1642	33	460	88.04	87.96	17.9	1.0	885.8	1,792.0	2,677.8	0.70	0.84	Conde A	
151-152	10	187	113.90	112.83	8.8	2.2	108.2	314.1	422.3	0.54	0.57	Conde B North	
152-292	10	188	112.83	112.07	2.7	1.9	109.1	316.7	425.8	0.60	0.68	Conde B North	
154-151	10	295	115.01	113.90	4.2	1.9	104.4	305.3	409.6	0.60	0.68	Conde B North	
1810-351	12	938	122.21	121.36	15.9	0.6	15.7	112.7	128.5	0.35	0.27	Conde B North	
265-271	12	322	101.60	100.96	71.2	1.7	201.4	459.4	660.8	0.76	0.92	Conde B North	SS-5
267-265	10	20	105.28	101.70	0.3	8.3	181.8	388.2	570.0	0.20	0.08	Conde B North	SS-5
268-267	10	499	107.62	105.38	7.7	2.3	181.8	387.9	569.7	0.52	0.53	Conde B North	SS-5
269-268	10	501	108.94	107.62	7.9	1.8	154.4	380.3	534.7	0.59	0.65	Conde B North	SS-5
270-269	10	375	110.04	108.94	39.6	1.8	127.0	372.4	499.4	0.77	0.94	Conde B North	
271-272	12	317	100.96	99.87	5.4	2.1	201.5	464.9	666.4	0.62	0.71	Conde B North	SS-5
291-270	10	193	110.71	110.04	2.7	1.9	115.1	332.7	447.8	0.66	0.77	Conde B North	
292-291	10	289	112.07	110.71	13.3	2.1	114.0	330.0	444.0	0.59	0.66	Conde B North	
349-378	12	391	120.71	120.38	23.8	1.0	80.5	221.4	301.8	0.59	0.65	Conde B North	
350-349	12	215	120.94	120.71	68.0	1.0	62.2	197.7	259.9	0.50	0.50	Conde B North	
351-350	12	348	121.36	120.94	16.8	0.9	40.9	129.6	170.5	0.38	0.31	Conde B North	
378-391	12	548	120.38	119.59	9.3	1.2	81.4	230.7	312.1	0.51	0.51	Conde B North	
388-154	10	326	116.67	115.01	4.6	2.1	103.1	301.2	404.3	0.54	0.57	Conde B North	
389-388	10	325	117.93	116.67	6.5	1.9	102.0	296.6	398.6	0.59	0.65	Conde B North	
390-389	10	174	118.86	117.93	2.4	2.1	100.2	290.1	390.3	0.52	0.54	Conde B North	
391-406	12	326	119.59	119.33	20.1	1.0	90.0	250.8	340.8	0.65	0.75	Conde B North	
406-407	12	90	119.33	119.24	33.3	1.1	99.6	284.1	383.8	0.66	0.78	Conde B North	
407-390	12	207	119.24	118.96	3.5	1.3	99.6	287.6	387.3	0.59	0.65	Conde B North	
1808-1809	10	332	132.15	128.91	72.9	1.1	6.9	72.9	79.7	0.19	0.08	Conde B South	
1809-1811	10	563	128.91	123.16	80.6	1.7	25.6	153.5	179.1	0.29	0.18	Conde B South	
1810-1824	12	512	122.21	118.83	24.3	1.7	42.3	304.0	346.4	0.35	0.27	Conde B South	
1811-1810	12	59	123.16	122.21	7.0	2.0	25.6	160.5	186.1	0.20	0.09	Conde B South	

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1818-337	15	218	111.37	110.24	13.0	2.4	188.3	417.5	605.8	0.37	0.29	Conde B South	
1819-1818	15	178	111.82	111.37	12.1	1.7	152.1	404.6	556.6	0.43	0.38	Conde B South	
1820-1819	12	253	113.69	111.82	36.1	2.6	152.1	392.5	544.6	0.44	0.40	Conde B South	
1821-1820	12	137	114.58	113.69	7.3	2.0	77.5	356.4	433.9	0.40	0.34	Conde B South	
1822-1821	12	190	115.77	114.58	18.3	2.0	75.2	349.1	424.3	0.40	0.33	Conde B South	
1824-1822	12	535	118.83	115.77	26.8	1.8	56.4	330.7	387.1	0.39	0.32	Conde B South	
1825-1810	12	16	122.42	122.21	0.8	2.0	32.2	216.0	248.2	0.25	0.13	Conde B South	
1826-1825	12	413	122.97	122.42	41.3	0.9	32.2	215.2	247.5	0.45	0.42	Conde B South	
1830-1826	12	773	123.70	122.97	36.7	0.4	4.8	173.9	178.7	0.42	0.36	Conde B South	
1831-1830	12	802	124.23	123.70	137.0	0.4	4.8	137.2	142.0	0.40	0.34	Conde B South	
1874-281	15	199	105.77	103.14	11.8	3.4	211.6	553.1	764.7	0.33	0.23	Conde B South	
276-277	15	232	108.84	108.17	14.8	1.9	200.2	466.8	667.0	0.46	0.43	Conde B South	
277-278	15	198	108.17	107.35	46.6	2.2	201.0	513.4	714.5	0.43	0.38	Conde B South	
278-279	15	215	107.25	106.63	14.6	1.9	201.0	528.0	729.1	0.48	0.47	Conde B South	
279-1874	15	174	106.63	105.77	13.3	2.4	211.6	541.3	752.9	0.42	0.37	Conde B South	
281-272	15	380	103.14	100.37	23.7	2.8	224.8	576.8	801.6	0.39	0.32	Conde B South	
336-276	15	237	109.49	108.84	18.5	1.9	190.9	452.0	642.8	0.45	0.42	Conde B South	
337-336	15	271	110.24	109.49	16.1	1.9	188.3	433.5	621.9	0.44	0.41	Conde B South	
516-520	18	298	122.60	122.09	5.5	1.4	118.0	5.5	123.5	0.17	0.06	Hembree A	
520-521	18	247	122.09	121.83	1.4	1.1	118.0	6.9	124.9	0.19	0.08	Hembree A	
521-523	18	384	121.83	121.41	2.2	1.2	118.0	9.2	127.2	0.19	0.08	Hembree A	
522-528	8	64	126.70	125.18	0.2	-	-	0.2	0.2	0.01	0.00	Hembree A	
523-524	18	154	121.41	121.07	0.9	1.7	182.1	11.3	193.3	0.20	0.09	Hembree A	
524-525	18	38	121.07	120.98	0.2	1.8	213.7	24.7	238.3	0.22	0.10	Hembree A	
525-526	18	92	120.98	120.86	0.5	1.5	213.7	25.2	238.9	0.25	0.14	Hembree A	
526-663	18	351	120.86	120.60	2.0	1.2	213.7	27.3	240.9	0.29	0.19	Hembree A	
528-529	8	323	125.18	124.00	0.8	1.6	64.1	1.0	65.1	0.30	0.20	Hembree A	
529-523	8	56	124.00	121.81	0.1	3.8	64.1	1.2	65.3	0.17	0.06	Hembree A	
530-524	10	187	122.44	121.07	0.6	1.6	31.6	13.2	44.8	0.16	0.05	Hembree A	
602-603	24	369	113.42	110.83	2.9	3.5	619.7	145.9	765.5	0.20	0.09	Hembree A	
603-604	24	390	110.83	108.61	3.0	3.3	619.7	148.8	768.5	0.21	0.10	Hembree A	
604-605	24	358	108.61	106.11	2.8	3.5	619.7	151.6	771.2	0.20	0.09	Hembree A	
605-606	24	385	106.11	103.90	3.0	3.3	619.7	154.5	774.2	0.21	0.10	Hembree A	
606-565	24	239	103.90	102.85	1.9	3.0	619.7	156.3	776.0	0.23	0.11	Hembree A	

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Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
613-530	10	201	123.07	122.44	12.6	1.2	31.6	12.6	44.2	0.19	0.08	Hembree A	
635-636	10	89	124.06	123.61	5.6	1.2	15.8	5.6	21.4	0.12	0.03	Hembree A	
636-637	10	169	123.61	122.95	0.5	1.1	16.6	6.1	22.7	0.13	0.04	Hembree A	
637-638	10	317	122.95	122.28	1.5	0.9	19.8	7.5	27.4	0.17	0.06	Hembree A	
638-666	10	160	122.28	121.60	6.1	1.5	43.2	13.6	56.8	0.20	0.09	Hembree A	
647-665	10	161	122.41	122.00	4.6	1.3	51.8	18.4	70.2	0.25	0.14	Hembree A	
648-647	10	343	123.43	122.41	1.1	1.3	37.0	13.7	50.7	0.21	0.09	Hembree A	
649-648	10	108	123.91	123.43	1.5	1.4	35.6	12.7	48.2	0.18	0.07	Hembree A	
650-649	10	180	124.54	123.91	0.6	1.3	32.1	11.2	43.3	0.18	0.07	Hembree A	
651-650	8	229	125.80	124.54	0.6	1.5	30.9	10.6	41.5	0.22	0.10	Hembree A	
652-651	8	234	126.90	125.80	10.0	1.4	29.7	10.0	39.7	0.22	0.11	Hembree A	
663-667	18	344	120.60	120.12	2.1	1.5	213.7	29.4	243.1	0.25	0.14	Hembree A	
665-668	18	363	122.00	121.73	2.1	1.4	362.6	89.7	452.3	0.41	0.35	Hembree A	
666-669	18	351	121.10	120.56	2.3	1.9	405.8	107.8	513.6	0.36	0.28	Hembree A	
667-671	24	38	120.12	116.88	0.3	8.5	619.7	139.4	759.1	0.11	0.03	Hembree A	
668-666	18	350	121.73	121.10	2.0	1.9	362.6	91.8	454.4	0.32	0.23	Hembree A	
669-667	18	338	120.56	120.12	2.0	1.8	405.8	109.7	515.5	0.38	0.30	Hembree A	
670-602	24	328	115.65	113.42	2.6	3.5	619.7	143.1	762.7	0.20	0.09	Hembree A	
671-670	24	145	116.68	115.65	1.1	3.5	619.7	140.5	760.2	0.20	0.09	Hembree A	
889-890	10	276	123.03	122.60	0.9	1.8	306.6	67.3	373.9	0.79	0.97	Hembree A	
890-665	18	337	122.60	122.00	2.0	1.8	306.6	69.2	375.9	0.29	0.19	Hembree A	
1-711	10	240	111.00	110.24	9.3	-	-	16.3	16.3	0.12	0.03	Hembree B	
594-608	8	657	116.81	112.22	87.1	1.6	28.7	87.0	115.7	0.34	0.25	Hembree B	
601-607	12	144	107.18	106.73	2.4	2.1	208.2	488.5	696.7	0.67	0.78	Hembree B	
607-567	12	219	106.73	102.56	6.6	3.9	208.2	495.1	703.3	0.39	0.32	Hembree B	
608-601	8	729	112.22	107.48	89.2	1.9	54.1	176.0	230.1	0.51	0.52	Hembree B	
612-601	12	219	107.53	107.18	15.0	1.4	125.4	310.1	435.4	0.60	0.67	Hembree B	
681-685	12	463	109.05	108.39	20.2	1.1	69.4	85.5	154.8	0.34	0.26	Hembree B	
682-681	12	345	109.26	109.05	4.9	0.8	67.2	65.3	132.5	0.40	0.34	Hembree B	
685-686	12	21	108.39	108.38	137.6	0.8	109.3	223.1	332.4	0.53	0.56	Hembree B	SS-8
686-687	15	76	108.38	108.36	5.4	0.8	110.9	228.5	339.4	0.59	0.65	Hembree B	SS-8
687-689	15	31	108.36	108.11	7.6	2.3	112.0	236.1	348.2	0.25	0.13	Hembree B	SS-8
689-690	15	116	108.11	108.08	12.0	0.7	113.6	248.2	361.7	0.68	0.80	Hembree B	SS-8
690-692	12	191	108.08	107.96	16.0	1.0	116.7	264.2	380.9	0.77	0.93	Hembree B	

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692-694	12	94	107.96	107.76	19.6	1.6	122.4	283.8	406.1	0.53	0.55	Hembree B	
694-612	12	101	107.76	107.53	11.2	1.6	123.8	295.0	418.8	0.53	0.55	Hembree B	
710-682	12	288	109.68	109.26	32.3	1.0	41.9	60.5	102.4	0.28	0.17	Hembree B	
711-710	12	339	110.24	109.68	11.9	0.5	3.9	28.2	32.1	0.15	0.05	Hembree B	
1142-883	8	123	129.91	129.38	0.6	1.7	54.2	43.2	97.4	0.36	0.27	Hembree C	
1143-1142	6	121	130.55	129.91	31.7	1.8	53.9	42.5	96.4	0.52	0.53	Hembree C	
880-884	8	181	127.55	126.86	5.1	1.7	64.7	53.1	117.8	0.41	0.35	Hembree C	
881-880	8	170	128.36	127.55	0.9	1.8	59.4	48.0	107.4	0.37	0.28	Hembree C	
882-881	8	124	129.09	128.36	1.4	1.9	59.2	47.1	106.3	0.34	0.26	Hembree C	
883-882	8	61	129.38	129.09	2.5	1.7	57.1	45.7	102.7	0.36	0.27	Hembree C	
884-885	10	240	126.86	125.76	12.9	1.8	74.5	66.0	140.6	0.31	0.21	Hembree C	
885-886	10	228	125.76	125.58	3.7	1.0	77.0	69.7	146.7	0.52	0.53	Hembree C	
886-887	10	336	125.58	124.80	2.2	1.4	77.0	71.8	148.9	0.38	0.31	Hembree C	
887-888	10	138	124.80	124.27	13.7	2.5	306.6	64.5	371.2	0.56	0.61	Hembree C	
888-889	10	296	124.27	123.03	1.9	2.6	306.6	66.4	373.0	0.55	0.58	Hembree C	
1056-985	18	213	117.55	117.22	45.5	2.2	716.1	547.3	1,263.4	0.60	0.68	Los Amigos	
1334-1056	18	281	117.97	117.55	13.8	2.1	705.2	501.8	1,207.0	0.60	0.66	Los Amigos	
1336-1334	18	279	118.52	117.97	13.6	2.4	702.5	488.0	1,190.5	0.54	0.57	Los Amigos	
1344-1336	18	292	118.96	118.52	14.2	2.2	701.3	474.4	1,175.7	0.58	0.64	Los Amigos	
1346-1344	18	71	119.13	118.96	20.3	2.6	699.8	460.1	1,159.9	0.50	0.50	Los Amigos	
1347-1346	18	130	119.22	119.13	6.4	1.6	693.4	439.8	1,133.3	0.77	0.95	Los Amigos	
1348-1347	18	245	119.85	119.22	12.0	2.6	691.8	433.5	1,125.3	0.48	0.47	Los Amigos	
1349-1350	18	233	120.35	120.00	25.0	2.2	689.7	413.3	1,103.1	0.56	0.60	Los Amigos	
1350-1348	18	167	120.00	119.85	8.2	1.8	689.7	421.5	1,111.2	0.67	0.79	Los Amigos	
1353-1349	18	97	120.74	120.35	4.8	3.1	685.0	388.3	1,073.2	0.41	0.36	Los Amigos	
1354-1353	18	325	121.28	120.74	15.9	2.2	685.0	383.5	1,068.5	0.53	0.55	Los Amigos	
1355-1354	18	323	121.77	121.28	15.8	2.1	685.0	367.6	1,052.6	0.54	0.57	Los Amigos	
1438-1449	18	277	124.80	124.06	49.6	2.6	673.3	304.8	978.1	0.44	0.40	Los Amigos	
1439-1438	18	183	125.08	124.80	10.9	2.2	658.0	255.2	913.2	0.49	0.49	Los Amigos	
1440-1439	18	229	125.64	125.08	15.2	2.5	658.0	244.3	902.3	0.43	0.39	Los Amigos	
1441-1440	18	185	125.95	125.64	11.0	2.2	658.0	229.1	887.1	0.48	0.46	Los Amigos	
1445-1451	18	251	123.34	122.85	6.1	2.3	679.3	325.6	1,004.8	0.49	0.49	Los Amigos	
1446-1445	18	43	123.45	123.34	7.0	2.6	676.7	319.5	996.2	0.45	0.41	Los Amigos	
1449-1446	18	234	124.06	123.45	7.7	2.6	673.7	312.5	986.2	0.45	0.41	Los Amigos	

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Modeled Pipes

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1451-1580	18	294	122.85	122.26	10.5	2.4	681.6	336.1	1,017.7	0.49	0.48	Los Amigos	
1521-1524	12	30	131.19	130.86	7.3	2.7	111.7	29.9	141.6	0.20	0.08	Los Amigos	
1524-1525	12	234	130.86	130.36	-	1.5	111.7	29.9	141.6	0.30	0.19	Los Amigos	
1525-1526	12	221	130.36	130.04	20.7	1.3	112.2	50.7	162.8	0.35	0.27	Los Amigos	
1526-1527	12	227	130.04	129.69	21.3	1.3	112.2	72.0	184.1	0.37	0.29	Los Amigos	
1527-1528	12	143	129.69	129.23	13.4	1.8	114.6	85.4	199.9	0.32	0.22	Los Amigos	
1528-1529	12	430	129.23	128.49	40.3	1.4	114.6	125.7	240.2	0.42	0.36	Los Amigos	
1529-1530	12	269	128.49	128.00	25.2	1.4	114.6	150.9	265.5	0.43	0.39	Los Amigos	
1530-1531	12	269	128.00	127.47	25.2	1.5	114.6	176.2	290.7	0.45	0.41	Los Amigos	
1531-1532	12	266	127.47	126.52	24.9	1.8	114.9	201.1	316.0	0.40	0.33	Los Amigos	
1532-1441	18	165	126.32	125.95	11.9	2.5	648.1	213.0	861.2	0.43	0.38	Los Amigos	
1580-1355	18	322	122.26	121.77	15.7	2.2	685.0	351.9	1,036.8	0.54	0.56	Los Amigos	
958-957	18	153	110.77	110.59	-	2.0	720.9	577.8	1,298.8	0.68	0.80	Los Amigos	SS-15
976-983	18	287	116.09	115.26	-	2.8	720.9	577.8	1,298.8	0.51	0.51	Los Amigos	
981-958	18	145	110.94	110.77	-	2.0	720.9	577.8	1,298.8	0.67	0.79	Los Amigos	SS-15
982-981	18	258	111.50	110.94	-	2.5	720.9	577.8	1,298.8	0.55	0.59	Los Amigos	
983-982	8	117	115.26	111.50	-	5.5	301.9	225.1	526.9	0.52	0.54	Los Amigos	
983-982	12	111	115.26	111.50	-	5.9	419.1	352.8	771.8	0.35	0.26	Los Amigos	
984-976	18	394	116.65	116.09	19.2	2.1	716.1	577.8	1,294.0	0.63	0.73	Los Amigos	
985-984	18	231	117.22	116.65	11.3	2.6	716.1	558.6	1,274.7	0.53	0.54	Los Amigos	
1021-1022	18	144	104.86	104.61	17.1	1.8	278.6	1,340.1	1,618.7	0.68	0.81	North A	SS-9
1022-794	21	242	104.61	104.11	31.1	2.3	619.6	2,318.0	2,937.6	0.74	0.90	North A	SS-1
1023-1021	18	437	105.52	104.86	98.2	1.7	270.0	1,291.6	1,561.6	0.71	0.85	North A	SS-9
1057-1021	10	309	115.22	112.76	24.5	1.1	7.1	31.4	38.4	0.14	0.04	North A	
1666-1910	24	245	90.61	86.61	37.2	5.3	898.8	2,943.5	3,842.3	0.37	0.30	North A	SS-11
1667-1666	24	289	95.33	90.61	63.4	5.3	898.8	2,906.2	3,805.0	0.37	0.29	North A	SS-11
1907-808	24	279	98.81	97.32	22.1	3.5	854.1	2,820.8	3,674.9	0.50	0.49	North A	SS-1
790-797	24	57	103.46	103.37	114.7	2.2	795.9	2,536.5	3,332.5	0.69	0.82	North A	SS-1
794-790	24	531	104.11	103.46	103.8	1.9	650.2	2,421.9	3,072.1	0.72	0.86	North A	SS-1
797-798	24	210	103.37	103.03	25.0	2.2	797.2	2,561.5	3,358.8	0.69	0.83	North A	SS-1
798-801	24	203	103.03	102.71	71.7	2.3	825.1	2,633.2	3,458.3	0.71	0.85	North A	SS-1
801-802	24	85	102.71	102.57	35.7	2.3	825.1	2,668.9	3,494.0	0.71	0.85	North A	SS-1
802-804	24	97	102.57	102.42	49.4	2.3	837.9	2,718.3	3,556.1	0.73	0.88	North A	SS-1
804-807	24	402	102.42	101.88	79.5	2.1	854.1	2,797.8	3,651.9	0.80	0.98	North A	SS-1

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807-1907	24	11	101.88	98.81	0.9	13.9	854.1	2,798.7	3,652.8	0.18	0.07	North A	SS-1
808-1667	24	278	97.32	95.33	22.0	4.0	898.8	2,842.7	3,741.5	0.46	0.43	North A	SS-1
831-1867	12	188	88.70	87.97	-	1.9	124.0	423.3	547.3	0.53	0.55	North A	
1081-1023	15	368	106.47	105.52	17.4	1.9	225.1	1,193.4	1,418.5	0.79	0.96	North B	
1082-1081	15	261	107.41	106.47	88.8	2.2	212.5	1,175.9	1,388.4	0.67	0.79	North B	
1083-1082	15	508	108.46	107.41	44.5	1.7	203.6	1,087.1	1,290.8	0.80	0.98	North B	
1087-1083	15	314	109.30	108.46	26.6	1.9	203.2	1,042.6	1,245.9	0.70	0.83	North B	
1378-1087	15	293	110.06	109.30	44.3	1.9	203.2	1,016.0	1,219.2	0.69	0.82	North B	
1390-1391	8	228	116.53	115.54	6.5	1.6	48.1	70.9	119.0	0.40	0.33	North B	
1391-1404	8	103	115.54	114.48	4.7	2.2	48.1	75.5	123.6	0.32	0.22	North B	
1392-1390	8	111	117.14	116.53	2.1	1.7	45.3	64.3	109.6	0.36	0.27	North B	
1393-1392	8	96	117.19	117.14	6.0	0.7	44.5	62.2	106.6	0.69	0.82	North B	
1394-1378	15	456	111.25	110.06	64.6	1.8	167.5	971.7	1,139.2	0.66	0.77	North B	
1400-1394	10	8	112.04	111.55	0.4	5.6	149.5	907.0	1,056.5	0.45	0.42	North B	
1401-1402	18	331	115.06	113.23	34.4	2.0	101.4	785.5	886.9	0.34	0.25	North B	SS-2
1402-1400	18	563	113.13	112.14	31.8	1.5	149.5	906.6	1,056.1	0.52	0.53	North B	SS-2
1403-1402	8	32	113.28	113.13	1.4	1.6	48.1	89.2	137.3	0.42	0.37	North B	
1404-1403	8	270	114.48	113.28	12.2	1.6	48.1	87.8	135.9	0.42	0.37	North B	
1416-1401	18	267	115.20	115.06	21.6	0.8	94.7	751.1	845.7	0.68	0.80	North B	SS-2
1417-1416	18	42	115.30	115.20	6.5	1.4	93.6	729.4	823.0	0.41	0.35	North B	SS-2
55-1393	8	202	118.11	117.19	56.2	1.5	39.5	56.2	95.7	0.35	0.26	North B	
1067-1057	10	299	117.12	115.22	6.9	0.5	0.9	7.0	7.9	0.07	0.01	North C	
1068-1070	6	185	110.48	107.03	6.9	1.1	2.3	10.8	13.0	0.13	0.04	North C	
1070-1073	6	361	104.23	102.89	5.0	0.7	2.6	15.8	18.4	0.23	0.12	North C	
1073-1074	12	9	102.89	102.31	20.3	4.0	48.1	36.1	84.2	0.10	0.02	North C	
1074-1075	12	182	95.11	94.87	5.1	1.3	124.0	407.9	531.8	0.75	0.91	North C	
1075-1076	12	42	94.87	94.52	1.2	2.5	124.0	409.0	533.0	0.42	0.37	North C	
1076-1077	12	59	94.52	94.07	1.6	2.4	124.0	410.7	534.6	0.43	0.38	North C	
1077-823	12	120	94.07	93.69	3.3	1.8	124.0	414.0	538.0	0.55	0.59	North C	
1078-1074	12	300	96.54	95.21	8.4	1.7	75.1	366.7	441.8	0.45	0.41	North C	
1098-1099	6	37	110.86	110.73	3.2	1.1	17.3	66.1	83.4	0.54	0.57	North C	
1099-1110	6	439	110.73	109.06	7.3	1.2	17.4	73.4	90.8	0.55	0.58	North C	
1101-1098	6	527	114.03	110.86	62.9	1.3	16.1	62.9	79.0	0.44	0.40	North C	
1106-1109	8	180	103.02	102.28	22.6	1.4	30.4	131.7	162.1	0.48	0.46	North C	

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1107-1106	8	294	104.13	103.02	7.9	1.2	22.9	109.1	132.0	0.44	0.40	North C	
1108-1107	8	282	105.26	104.13	7.7	1.2	21.2	101.1	122.3	0.41	0.35	North C	
1109-1776	8	225	102.28	101.08	4.2	1.5	30.4	135.9	166.3	0.45	0.42	North C	
1110-1779	6	449	109.06	107.28	6.3	1.2	17.5	79.6	97.2	0.57	0.61	North C	
1114-1108	8	109	105.78	105.26	2.0	1.3	19.8	93.4	113.2	0.38	0.30	North C	
1120-1114	8	100	106.03	105.78	91.4	1.0	19.4	91.4	110.8	0.44	0.41	North C	
1776-1777	8	350	101.08	99.58	62.5	1.5	43.6	198.4	241.9	0.60	0.68	North C	
1777-1781	8	218	99.58	98.20	4.0	1.8	43.9	202.4	246.3	0.54	0.57	North C	
1778-1780	6	201	102.00	101.23	2.2	1.2	18.0	86.5	104.5	0.60	0.67	North C	
1779-1778	6	332	107.28	102.20	4.6	1.9	17.7	84.3	102.0	0.39	0.33	North C	
1780-1863	6	11	101.23	97.08	0.2	5.8	18.3	86.7	105.0	0.18	0.07	North C	
1781-1863	8	9	98.20	97.18	0.2	5.0	44.2	202.5	246.7	0.24	0.13	North C	
1782-1078	12	111	96.90	96.54	3.1	1.6	74.5	358.4	432.8	0.49	0.48	North C	
1863-1782	12	112	97.08	96.90	66.0	1.2	74.3	355.3	429.6	0.60	0.66	North C	
425-1068	6	277	116.47	110.48	3.9	0.7	0.5	3.9	4.4	0.08	0.01	North C	
820-824	12	186	92.37	91.71	-	1.9	124.0	423.3	547.3	0.54	0.57	North C	
821-820	12	24	92.45	92.37	0.7	1.9	124.0	423.3	547.3	0.55	0.58	North C	
822-821	12	260	93.37	92.45	7.2	1.9	124.0	422.7	546.6	0.54	0.57	North C	
823-822	12	51	93.69	93.37	1.4	2.3	124.0	415.4	539.4	0.45	0.42	North C	
824-825	12	72	91.71	91.46	-	1.8	124.0	423.3	547.3	0.55	0.58	North C	
825-826	12	74	91.46	91.29	-	1.6	124.0	423.3	547.3	0.62	0.71	North C	
826-828	12	292	91.29	89.66	-	2.2	124.0	423.3	547.3	0.47	0.46	North C	
828-830	12	142	89.66	89.11	-	1.9	124.0	423.3	547.3	0.53	0.55	North C	
830-831	12	61	89.11	88.70	-	2.3	124.0	423.3	547.3	0.45	0.42	North C	
1418-1417	18	93	115.36	115.30	266.1	0.9	92.5	722.9	815.4	0.60	0.68	North D	SS-2
1419-1418	12	325	116.33	115.36	21.3	1.5	78.9	456.8	535.6	0.56	0.61	North D	SS-2
1423-1419	12	176	116.65	116.33	11.5	1.3	77.2	435.5	512.7	0.64	0.75	North D	SS-2
1520-30	6	167	129.55	129.09	6.4	0.3	0.4	6.5	6.8	0.15	0.05	North D	
1533-1521	6	350	133.02	131.19	4.2	2.1	99.9	22.6	122.5	0.60	0.67	North D	
1534-1533	6	350	134.26	133.02	4.2	1.8	99.7	18.4	118.1	0.67	0.79	North D	
1536-1534	6	589	136.08	134.26	11.2	1.7	99.0	14.1	113.1	0.68	0.81	North D	
1537-1536	6	111	136.36	136.08	1.3	1.4	58.6	3.0	61.7	0.49	0.48	North D	
30-31	6	470	129.09	127.18	5.7	0.4	0.4	12.1	12.5	0.19	0.08	North D	
31-34	6	157	127.18	126.41	8.3	0.8	3.1	20.4	23.5	0.25	0.13	North D	

Future Conditions with Recommended Projects
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
34-35	6	267	126.41	125.46	3.2	0.7	3.6	23.6	27.2	0.29	0.18	North D	
35-39	6	352	125.46	123.50	30.2	1.1	7.9	53.8	61.7	0.39	0.33	North D	
39-40	6	58	123.50	123.17	2.7	1.1	8.2	56.5	64.7	0.40	0.34	North D	
40-41	6	318	123.17	119.64	14.8	1.4	8.2	71.2	79.4	0.37	0.30	North D	
41-42	6	110	119.64	117.20	5.1	1.8	8.9	76.3	85.2	0.32	0.23	North D	
42-1423	10	198	117.20	116.65	97.8	1.5	76.3	424.0	500.3	0.79	0.96	North D	
650-1537	6	141	136.72	136.36	1.7	1.4	58.4	1.7	60.1	0.48	0.47	North D	
9-11	10	83	122.91	122.27	168.0	1.8	39.5	168.0	207.5	0.33	0.24	North E	
11-12	10	339	122.27	121.35	35.6	1.3	44.1	203.5	247.6	0.49	0.48	North E	
12-13	10	125	121.35	121.03	22.1	1.3	45.8	225.7	271.5	0.53	0.55	North E	
13-23	10	88	121.03	120.85	24.3	1.2	55.9	250.0	305.9	0.61	0.68	North E	
23-24	10	218	120.85	120.29	-	1.4	57.9	250.0	307.9	0.57	0.62	North E	
24-43	10	483	120.29	119.05	-	1.4	63.7	250.0	313.7	0.57	0.63	North E	
43-44	10	62	119.05	118.76	-	1.8	64.6	250.0	314.5	0.48	0.46	North E	
44-42	10	634	118.76	117.30	-	1.4	66.9	250.0	316.8	0.60	0.67	North E	
185-187	12	211	111.27	110.49	5.1	2.1	180.4	394.3	574.7	0.55	0.59	South A	
187-188	12	252	110.49	109.81	10.1	1.9	183.8	404.4	588.3	0.62	0.71	South A	
188-239	12	227	109.81	108.74	-	2.3	186.2	404.4	590.6	0.52	0.54	South A	
234-247	14	264	107.07	106.55	31.7	1.9	296.0	610.3	906.3	0.71	0.85	South A	
239-234	12	233	108.74	107.07	10.4	3.1	294.1	578.6	872.7	0.58	0.64	South A	
240-239	8	258	110.80	109.14	3.1	2.3	106.7	163.8	270.5	0.57	0.62	South A	SS-3
241-240	8	126	111.32	110.80	6.2	2.0	106.7	160.6	267.4	0.66	0.77	South A	SS-3
244-241	8	150	111.78	111.32	38.4	1.8	105.3	154.5	259.7	0.71	0.86	South A	SS-3
247-248	14	640	106.55	105.71	22.5	1.6	296.0	633.0	929.0	0.73	0.88	South A	SS-14
248-249	14	39	105.71	105.45	1.1	3.0	296.7	634.1	930.8	0.43	0.38	South A	SS-14
249-566	14	346	105.45	104.99	15.0	1.6	299.2	649.1	948.3	0.53	0.55	South A	SS-14
564-565	14	978	104.42	102.85	30.6	1.9	368.9	699.3	1,068.2	0.54	0.56	South A	SS-14
566-564	14	437	104.99	104.42	19.3	1.6	300.3	668.5	968.8	0.54	0.57	South A	SS-14
580-244	8	254	112.79	111.78	9.3	1.8	79.9	116.0	195.9	0.54	0.57	South A	SS-3
581-580	6	178	113.60	112.79	39.7	1.8	75.0	106.8	181.8	0.50	0.50	South A	SS-3
582-581	6	181	114.26	113.60	41.5	1.6	52.6	67.0	119.6	0.67	0.78	South A	
589-582	6	120	114.86	114.26	25.5	1.5	31.4	25.5	56.9	0.39	0.32	South A	
155-157	12	185	117.33	116.65	17.9	1.2	23.6	45.1	68.7	0.18	0.07	South B	
157-178	12	327	116.65	116.13	49.2	0.9	30.4	94.3	124.7	0.30	0.19	South B	

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
167-171	6	593	116.08	113.50	20.0	2.0	99.5	85.4	184.9	0.51	0.52	South B	SS-18
171-173	12	149	113.30	112.78	7.2	2.1	173.6	349.4	523.0	0.53	0.55	South B	
172-171	12	239	113.95	113.30	16.0	1.4	66.2	256.8	323.0	0.43	0.39	South B	
173-182	12	252	112.78	111.93	17.5	2.0	176.3	366.9	543.3	0.55	0.59	South B	
176-180	12	221	115.67	115.42	32.1	0.9	46.7	150.2	196.9	0.42	0.37	South B	
177-176	12	280	115.98	115.67	18.8	0.8	33.5	118.1	151.6	0.36	0.28	South B	
178-177	12	128	116.13	115.98	4.9	0.8	30.4	99.3	129.6	0.33	0.24	South B	
180-181	12	155	115.42	115.25	10.4	0.9	47.0	160.6	207.6	0.43	0.39	South B	
181-172	12	476	115.25	113.95	80.4	1.4	66.2	240.9	307.0	0.42	0.37	South B	
182-184	12	251	111.93	111.38	20.1	1.8	178.4	387.1	565.5	0.65	0.75	South B	
184-185	12	42	111.38	111.27	2.1	1.9	179.2	389.2	568.4	0.61	0.70	South B	
408-409	12	448	118.64	117.91	20.5	0.8	15.3	20.5	35.8	0.16	0.06	South B	
409-410	12	78	117.91	117.68	3.0	1.1	22.9	23.5	46.4	0.16	0.05	South B	
410-155	12	97	117.68	117.33	3.7	1.1	22.9	27.2	50.1	0.16	0.05	South B	
497-498	6	463	124.76	121.08	58.4	2.4	90.0	58.4	148.4	0.59	0.66	South B	
498-499	6	439	121.08	117.13	5.2	2.5	91.1	63.6	154.7	0.58	0.65	South B	
499-167	6	109	117.03	116.08	1.8	2.5	91.1	65.4	156.5	0.60	0.67	South B	
1782-1078	12	111	96.90	96.54	-	1.6	74.5	358.4	432.8	0.49	0.48	West	
1669-1668	24	106	81.36	81.26	19.9	1.5	353.1	754.0	1,107.1	0.41	0.35	West	
1674-1669	18	127	81.65	81.36	2.7	2.0	339.4	734.1	1,073.5	0.49	0.48	West	
1675-1674	15	241	82.05	81.65	4.1	1.8	296.8	654.5	951.4	0.68	0.80	West	
1676-1675	15	300	82.41	82.05	4.5	1.6	294.0	650.4	944.5	0.77	0.94	West	
1677-1674	8	230	81.93	81.65	13.9	1.0	41.2	76.8	118.1	0.57	0.62	West	
1680-1677	8	224	83.25	81.93	1.4	1.6	33.1	63.0	96.1	0.33	0.23	West	
1683-1680	8	224	84.07	83.25	1.4	1.4	33.1	61.6	94.7	0.37	0.29	West	
1684-1683	8	78	84.57	84.27	60.1	1.4	33.1	60.1	93.3	0.36	0.28	West	
1699-1676	15	242	82.95	82.41	2.8	2.0	293.3	645.9	939.1	0.61	0.68	West	
1700-1699	15	99	83.10	82.95	1.8	1.7	292.5	643.2	935.6	0.69	0.83	West	SS-17
1701-1700	15	106	83.27	83.10	1.2	1.8	292.1	641.4	933.5	0.68	0.80	West	SS-17
1728-1701	15	159	83.70	83.27	1.8	2.1	292.1	640.2	932.3	0.57	0.62	West	
1733-1728	15	159	83.97	83.70	30.5	1.8	291.8	638.4	930.2	0.66	0.78	West	
1736-1733	15	253	84.40	83.97	2.9	1.8	284.3	607.9	892.2	0.64	0.74	West	
1737-1736	15	236	84.70	84.40	9.4	1.6	283.4	605.1	888.5	0.71	0.86	West	
1741-1737	15	261	85.20	84.70	7.8	1.9	279.5	595.7	875.2	0.61	0.69	West	

Future Conditions with Recommended Projects
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Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1824-1822	12	535	118.83	115.77	-	1.8	56.4	330.7	387.1	0.39	0.32	West	
1867-1868	12	155	87.97	87.58	-	1.7	126.0	423.3	549.3	0.60	0.68	West	
1868-833	12	36	87.58	87.48	-	1.7	126.0	423.3	549.3	0.60	0.67	West	
1883-1906	15	176	86.06	85.73	2.0	1.8	272.4	574.8	847.2	0.60	0.67	West	
1905-1883	15	242	86.47	86.06	2.8	1.8	272.4	572.8	845.2	0.62	0.71	West	
1906-832	15	179	85.73	85.47	2.0	1.6	272.4	576.8	849.2	0.67	0.78	West	
340-840	8	95	94.95	94.38	0.6	0.6	1.4	0.6	2.0	0.05	0.00	West	
832-1741	15	248	85.47	85.20	11.3	1.5	276.3	588.0	864.3	0.74	0.89	West	
833-1905	15	460	87.18	86.47	5.2	1.7	272.4	570.1	842.5	0.64	0.74	West	
834-833	15	43	87.48	87.18	0.5	2.4	146.4	141.6	288.0	0.23	0.12	West	
835-834	12	184	90.36	88.68	1.7	2.7	146.4	141.1	287.5	0.29	0.19	West	
836-835	12	218	90.96	90.36	2.0	1.8	146.4	139.4	285.8	0.40	0.34	West	
837-836	12	14	91.20	90.96	0.1	3.4	146.4	137.5	283.9	0.25	0.14	West	
838-837	8	254	92.18	91.20	3.9	2.1	146.4	137.4	283.7	0.70	0.84	West	
839-838	8	269	93.27	92.18	1.6	0.6	2.0	4.1	6.1	0.09	0.02	West	
840-839	8	282	94.38	93.27	1.7	0.6	1.7	2.4	4.1	0.08	0.01	West	
1644-1655	42	173	86.75	86.61	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.41	WWTP	
1649-1653	20	112	91.04	90.58	-	3.6	1,197.6	1,350.7	2,548.3	0.58	0.63	WWTP	
1653-1654	24	180	90.58	90.43	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.93	WWTP	SS-10
1654-1656	24	497	90.43	90.01	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.92	WWTP	SS-10
1655-1657	42	474	86.61	86.24	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.42	WWTP	
1656-1913	24	241	90.01	89.80	-	2.1	1,383.6	1,350.7	2,734.3	0.75	0.91	WWTP	SS-10
1657-1912	42	378	86.24	85.94	-	2.3	2,406.1	2,964.9	5,370.9	0.45	0.42	WWTP	
1658-1895	42	18	85.52	85.32	-	6.6	3,789.7	4,315.5	8,105.3	0.28	0.17	WWTP	
1659-1895	30	39	80.23	80.61	-	0.6	1,251.9	3,697.4	4,949.3	1.00	-	WWTP	
1660-1659	24	30	80.32	80.23	-	2.2	353.1	754.0	1,107.1	0.30	0.20	WWTP	
1661-1659	24	24	85.19	80.23	-	12.8	898.8	2,943.5	3,842.3	0.20	0.08	WWTP	SS-11
1662-1661	24	98	85.36	85.19	-	2.4	898.8	2,943.5	3,842.3	0.74	0.90	WWTP	SS-11
1664-1662	24	24	85.64	85.36	-	4.7	898.8	2,943.5	3,842.3	0.41	0.35	WWTP	SS-11
1665-1660	24	268	80.91	80.32	-	2.0	353.1	754.0	1,107.1	0.33	0.23	WWTP	
1668-1665	24	233	81.26	80.91	-	1.7	353.1	754.0	1,107.1	0.36	0.28	WWTP	
1896-1658	42	32	85.87	85.52	-	6.5	3,789.7	4,315.5	8,105.3	0.28	0.17	WWTP	
1897-1896	24	15	89.64	87.87	-	12.0	1,383.6	1,350.7	2,734.3	0.19	0.08	WWTP	SS-10
1908-768	6	82	97.03	95.95	-	3.3	152.2	-	152.2	0.51	0.52	WWTP	

Future Conditions with Recommended Projects
Inputs and Results
Modeled Pipes

Pipe ID	Diameter (in)	Length (ft)	Up Invert (ft)	Down Invert (ft)	Pipe I/I (gpm)	PDWF Velocity (ft/s)	PWWF Base Flow (gpm)	PWWF I&I Flow (gpm)	PWWF Total Peak Flow (gpm)	PWWF d/D	PWWF q/Q	Basin	CIP ID
1909-760	8	129	93.77	92.56	-	3.1	186.1	-	186.1	0.41	0.35	WWTP	
1910-1664	24	59	86.61	85.64	-	5.3	898.8	2,943.5	3,842.3	0.37	0.29	WWTP	SS-11
1911-1897	24	52	89.68	89.64	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.92	WWTP	SS-10
1912-1896	42	87	86.94	85.87	-	6.0	2,406.1	2,964.9	5,370.9	0.22	0.11	WWTP	
1913-1911	24	144	89.80	89.68	-	2.1	1,383.6	1,350.7	2,734.3	0.76	0.93	WWTP	SS-10
565-567	14	11	102.85	102.56	-	6.6	988.6	855.6	1,844.2	0.34	0.24	WWTP	SS-6
567-568	14	48	102.56	102.18	-	4.6	1,196.8	1,350.7	2,547.5	0.56	0.61	WWTP	SS-6
568-569	15	356	102.18	100.12	-	4.1	1,196.8	1,350.7	2,547.5	0.62	0.71	WWTP	SS-6
569-570	14	347	100.12	97.66	-	4.4	1,196.8	1,350.7	2,547.5	0.58	0.64	WWTP	SS-6
570-571	14	102	97.66	96.70	-	4.9	1,196.8	1,350.7	2,547.5	0.53	0.56	WWTP	SS-6
571-1649	18	1,020	96.40	91.54	-	3.8	1,197.6	1,350.7	2,548.3	0.67	0.78	WWTP	SS-6
757-759	8	251	94.06	93.73	-	1.4	180.8	-	180.8	0.75	0.91	WWTP	
759-1909	8	188	95.53	93.77	-	3.1	184.5	-	184.5	0.41	0.35	WWTP	
760-1653	8	420	92.56	91.48	-	1.9	186.1	-	186.1	0.60	0.67	WWTP	
768-757	6	143	95.95	94.06	-	3.3	152.2	-	152.2	0.51	0.53	WWTP	
769-1908	6	332	101.40	97.03	-	3.3	152.2	-	152.2	0.51	0.53	WWTP	
770-769	6	416	103.03	101.40	-	2.0	152.2	-	152.2	0.79	0.96	WWTP	

DRAFT

Los Amigos
North E
Bell Village A
North B
North D
North C
Bell Village B
North A
WRF
West
Hembree B
Hembree A
Hembree C
Brooks A
Brooks B
South A
South B
Conde A
Conde B North
Conde B South

Urban Growth Boundary
Town Limit
Sewer Basins
Sewer Pipe & Diameter - Modeled
Sewer Pipe - Not Modeled
Sewer Manhole & ID - Modeled
Sewer Cleanout & ID - Modeled
Water Reclamation Facility Inlet Pump Station

Paper Size ANSI A

0 500 1,000 1,500 2,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

GHD

Town of Windsor
Sewer Collection System
Master Plan

Sewer Model
Future with Recommended Projects
Pipes and Manholes

Project No. **11151247**
Revision No. **1**
Date **8/20/2020**

FIGURE F-3

N:\US\Santa Rosa\Projects\111\11151247 TOW Sewer Collection System PH3\08-GIS\Maps\Deliverables\Master Plan Figures\Rev 1\Figure F-3 - Sewer Model Future with Recommended Project Pipes and Manholes.mxd
Print date: 20 Aug 2020 - 13:09

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: afisher2

Appendix H – Recommended CIP Project Descriptions

This appendix includes individual project description sheets for recommended CIP projects, including summary of cost to address existing and future deficiencies. For detailed estimates of probable cost, see Appendix K.



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Recommended CIP Project Descriptions

Table 1: Summary of Recommended Sewer Collection System CIP Projects

Recommended CIP Project	Fix Existing Project Cost	Fix Future Project Cost
SS-1 Windsor Road, Windsor River Road to Unnamed Road North of Plant Road	$4,530,000	$0
SS-2 Starr Road, Starr Circle to Star View Drive, and East to Railroad, and Southeast Parallel to Railroad	$2,870,000	$0
SS-3 Hembree Lane, Shannon Way to Billington Lane	$950,000	$240,000
SS-4 Windsor Road, Emily Rose Circle to Windsor River Road	$1,090,000	$0
SS-5 Victory Lane, Amie Drive to Hembree Lane and Hembree Lane, Victory Lane to Walmart Access Road	$900,000	$1,360,000
SS-6 Lake Drive, Conde Lane to Bell Road	$2,170,000	$2,660,000
SS-7 Enzos Way and Oakfield Lane, Near Beverly Lane	$870,000	$0
SS-8 Bluebird Drive, South of Old Redwood Highway to North of Stonebarger Lane	$480,000	$140,000
SS-9 Wild Oak Drive, Wild Oak Drive to Windsor River Road	$1,240,000	$0
SS-10 Plant Road, Bell Road to the Treatment Plant	2,320,000	$0
SS-11 Unnamed Road North of Plant Road to Plant Road	$440,000	$1,140,000
SS-12 Old Redwood Highway, Godfrey Drive to Windsor Road, and Windsor Road, Old Redwood Highway to Emily Rose	$2,130,000	$0
SS-13 Bluebird Drive, Fawn Lily Court, South of Lakewood Drive	$210,000	$0
SS-14 Conde Lane, Denbeste Court to Lake Drive	$0	$3,870,000
SS-15 Edgewood Place, South of Los Amigos Road to Brooks Road South	$0	$830,000
SS-16 Windsor River Road, Honsa Avenue to Windsor Road	$0	$1,020,000
SS-17 Winemaker way near Decanter Circle	$0	$460,000
SS-18 Robbins Park, Cornell St to Billington Lane	$0	$660,000
Total Budget	**$20,200,000**	**$12,380,000**

SS-1 Windsor Road, Windsor River Road to Unnamed Road North of Plant Road

Problem

Hydraulic evaluation of the existing 10-inch and 15-inch gravity sewer in Windsor Road from Windsor River Road to Unnamed Road North of Plant Road finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-1 includes upsizing of approximately 0.18 miles of 10-inch gravity sewer and 0.27 miles of 15-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.18 miles of 10-inch with 24-inch, replacement of 0.27 miles of 15-inch with 24-inch and the replacement of twelve 60-inch manholes. Sewer depth is 7.7 to 12.6 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 4.10 MGD. In order to avoid the capacity increase project, I/I reduction of 4.74 MGD is needed. I/I reduction to eliminate the CIP is not possible; I/I reduction of a lesser extent could reduce the scope of the capacity project.

Risk/Level of Service

The proximity of this project to a large residential area, the high school, and municipal services, makes this deficiency high risk. The high flow (5.39 mgd) and Q_{max}/Q_{cap} (9.35), combined with sewer depths of almost 8 ft to under 13 ft, have a high chance to result in an SSO, which makes this deficiency very high risk overall.

Traffic at the high school will have an impact on construction; therefore, suggest construction during the summer. This project is downstream of SS-9 and could be coordinated in conjunction with this other project and the roundabout project in the vicinity of where SS-1 and SS-9 meet.

Figure SS-1 provides an illustration of project improvements.

Figure SS-1

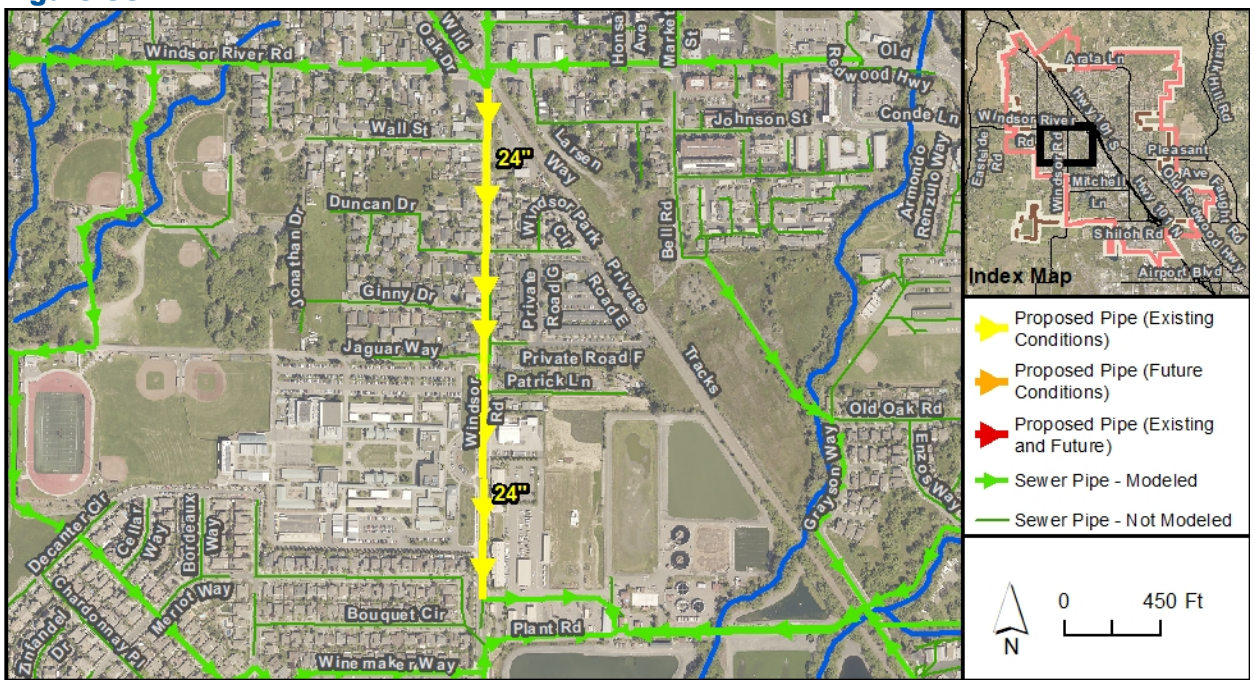


Table SS-1: SS-1 Summary

CIP Component	Description	
Proposed Improvements to Address Existing Need	• Replace 970 LF (0.18 miles) of 10-inch with 24-inch gravity sewer • Replace 1,425 LF (0.27 miles) of 15-inch with 24-inch gravity sewer • Replace twelve 60-inch manholes	
Proposed Improvements to Address Future Need	• None	
I/I Reduction Potential	• I/I_{max} = 4.10 MGD • Quantity of I/I reduction to avoid project = 4.74 MGD	
Additional Project Considerations	• Q_{max} = 5.39 MGD • Q_{max}/Q_{cap} = 9.35	• Distance to creek = 1,034 ft • Distance to SD inlet = 16 ft
Project Cost Total (1)	$4,530,000 – Existing	

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-2 Starr Road, Starr Circle to Starr View Drive, and East to Railroad and Southeast Parallel to Railroad

Problem

Hydraulic evaluation of the existing 10-inch gravity sewer in Starr Road from Starr Circle to Starr View Drive, and East to Railroad, then Southeast parallel to Railroad finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-2 includes upsizing of approximately 0.34 miles of the existing 10-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.09 miles of 10-inch with 12-inch, 0.25 miles of 10-inch with 18-inch gravity sewers, the replacement of two 48-inch manholes and the replacement of six 60-inch manholes. Sewer depth is 6.4 to 12.3 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.31 MGD. In order to avoid the capacity increase project, I/I reduction of 0.92 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project.

Risk/Level of Service

The proximity of this project to a residential area makes this deficiency high risk. The medium flow (1.52 mgd) and very high Q_{max}/Q_{cap} (3.71), combined with relatively shallow sewer depths of just over 6 ft to 12 ft, have a high chance to result in an SSO, which makes this deficiency high risk overall.

The construction area is narrow through the easement and tree removal may necessitate tree planting in a mitigation area. If the Town desires relocating the pipe outside of the railroad, this project presents a good opportunity to do so.

Figure SS-2 provides an illustration of project improvements.

Figure SS-2

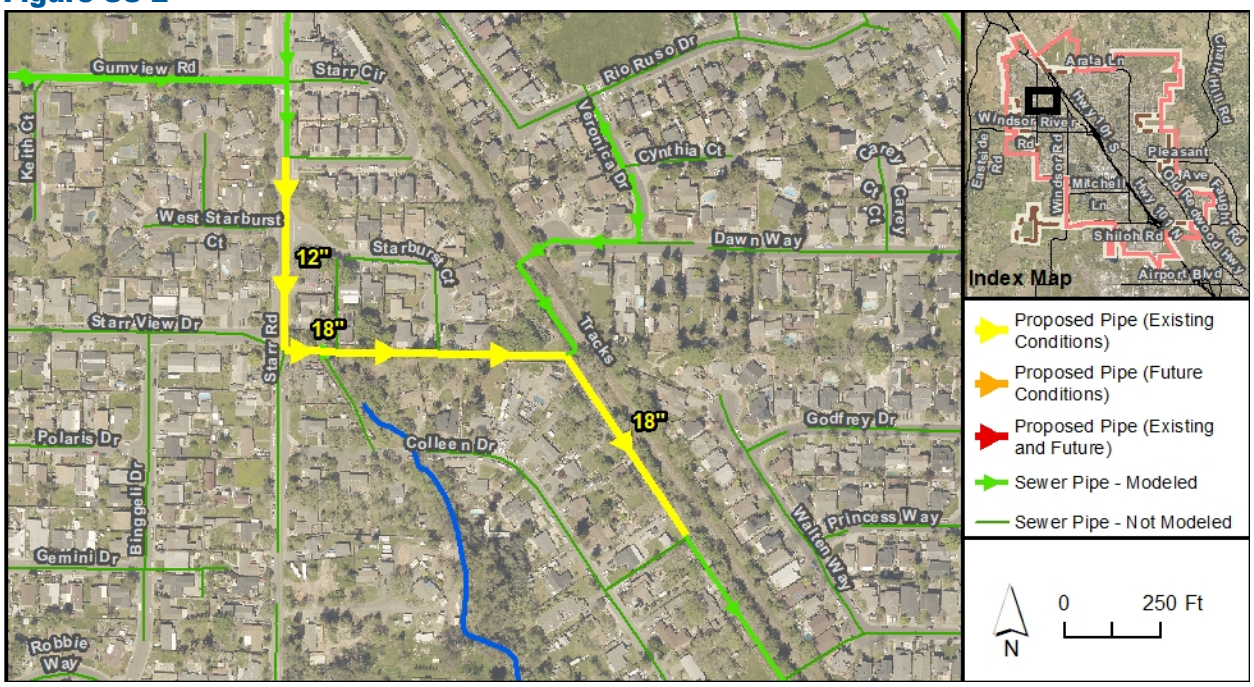


Table SS-2: SS-2 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 501 LF (0.09 miles) of 10-inch with 12-inch gravity sewer • Replace 1,296 LF (0.25 miles) of 10-inch with 18-inch gravity sewer • Replace two 48-inch manholes • Replace six 60-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 1.31 MGD • Quantity of I/I reduction to avoid project = 0.92 MGD
Additional Project Considerations	• Q_{max} = 1.52 MGD • Q_{max}/Q_{cap} = 3.71 • Distance to creek = 136 ft • Distance to SD inlet = 12 ft
Project Cost Total (1)	$2,870,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-3 Hembree Lane, Shannon Way to Billington Lane

Problem

Hydraulic evaluation of the existing 6-inch gravity sewer in Hembree Lane from Shannon Way to Billington Lane finds that the pipeline is undersized to convey existing and future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-3 includes upsizing of approximately 0.18 miles of the existing 6-inch gravity sewer to address both existing and future capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.15 miles of 6-inch with 8-inch gravity sewers, and the replacement of five 48-inch manholes. Sewer depth is 7.2 to 8.0 ft.

Future Portion

To address future deficiencies, the project includes replacement of 0.03 miles of 6-inch with 8-inch gravity sewers, the replacement of one 48-inch manhole. Sewer depth is 8.3 to 8.4 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.24 MGD. In order to avoid the capacity increase project, I/I reduction of 0.17 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Risk/Level of Service

The proximity of this project to a residential area and creek(s), plus the medium Q_{max}/Q_{cap} (1.66) make this deficiency medium risk. The Town noted that this area of Hembree Ln extending north of Billington Ln to Cornell St. requires cleaning multiple times a year driving the risk towards high. However, the relatively low flow (0.39 mgd) is less likely to result in an SSO, which makes this deficiency a medium-high risk overall.

Figure SS-3 provides an illustration of project improvements.

Figure SS-3

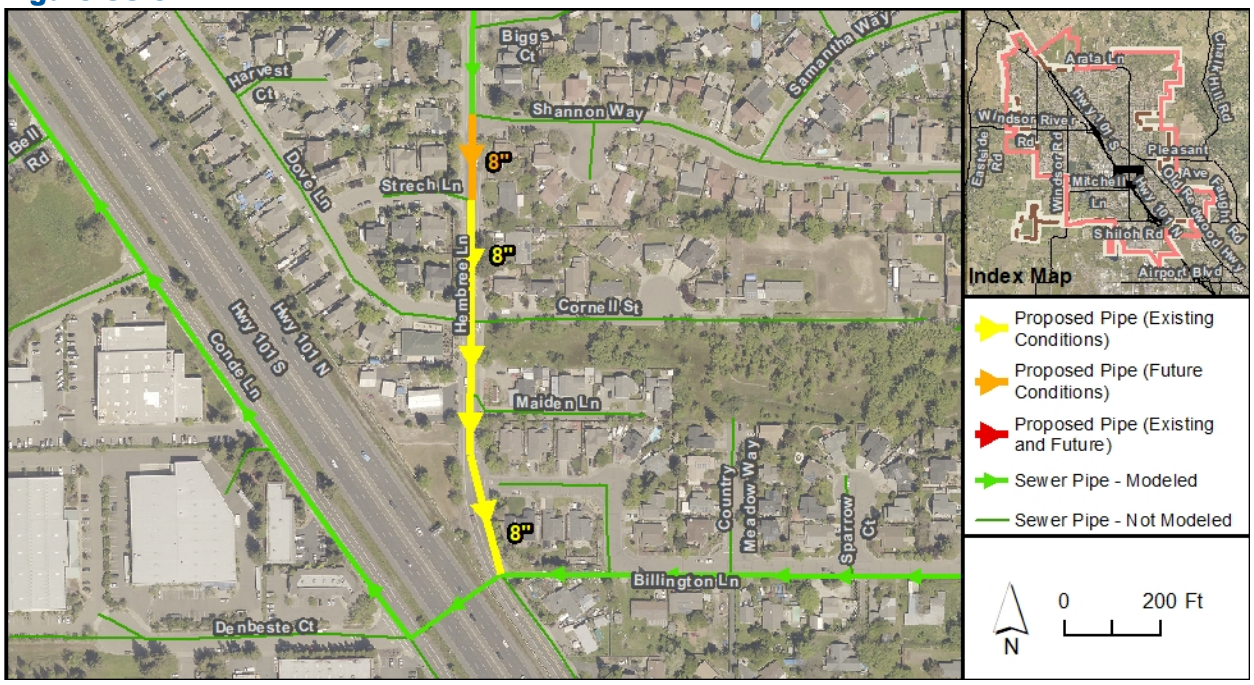


Table SS-3: SS-3 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 788 LF (0.15 miles) of 6-inch with 8-inch gravity sewer • Replace five 48-inch manholes
Proposed Improvements to Address Future Need	• Replace 178 LF (0.03 miles) of 6-inch with 8-inch gravity sewer • Replace one 48-inch manhole
Key Developments driving Future Need	• Hembree Lane Subdivision
I/I Reduction Potential	• I/I_{max} = 0.24MGD • Quantity of I/I reduction to avoid project = 0.17 MGD
Additional Project Considerations	• Q_{max} = 0.39 MGD • Q_{max}/Q_{cap} = 1.66 • Distance to creek = 809 ft • Distance to SD inlet = 18 ft
Project Cost Total (1)	$950,000 – Existing $240,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-4 Windsor Road, Emily Rose Circle to Windsor River Road

Problem

Hydraulic evaluation of the existing 10-inch gravity sewer in Windsor Road from Emily Rose Circle to Windsor River Road finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-4 includes upsizing of approximately 0.13 miles of 10-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.13 miles of 10-inch with 15-inch, and the replacement of four 48-inch manholes. Sewer depth is 11.0 to 11.6 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.94 MGD. In order to avoid the capacity increase project, I/I reduction of 0.33 MGD is needed. I/I reduction has a good chance to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Upstream CIP SS-12 and downstream CIPs SS-1 and SS-11 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for SS-4 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SS-4 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-1 and SS-11 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a high density commercial area makes this deficiency high risk. The lower flow (1.11 mgd) and medium Q_{max}/Q_{cap} (1.63), combined with sewer depths of just over 11 ft, have a medium chance to result in an SSO, which makes this deficiency medium-high risk overall.

Figure SS-4 provides an illustration of project improvements.

Figure SS-4

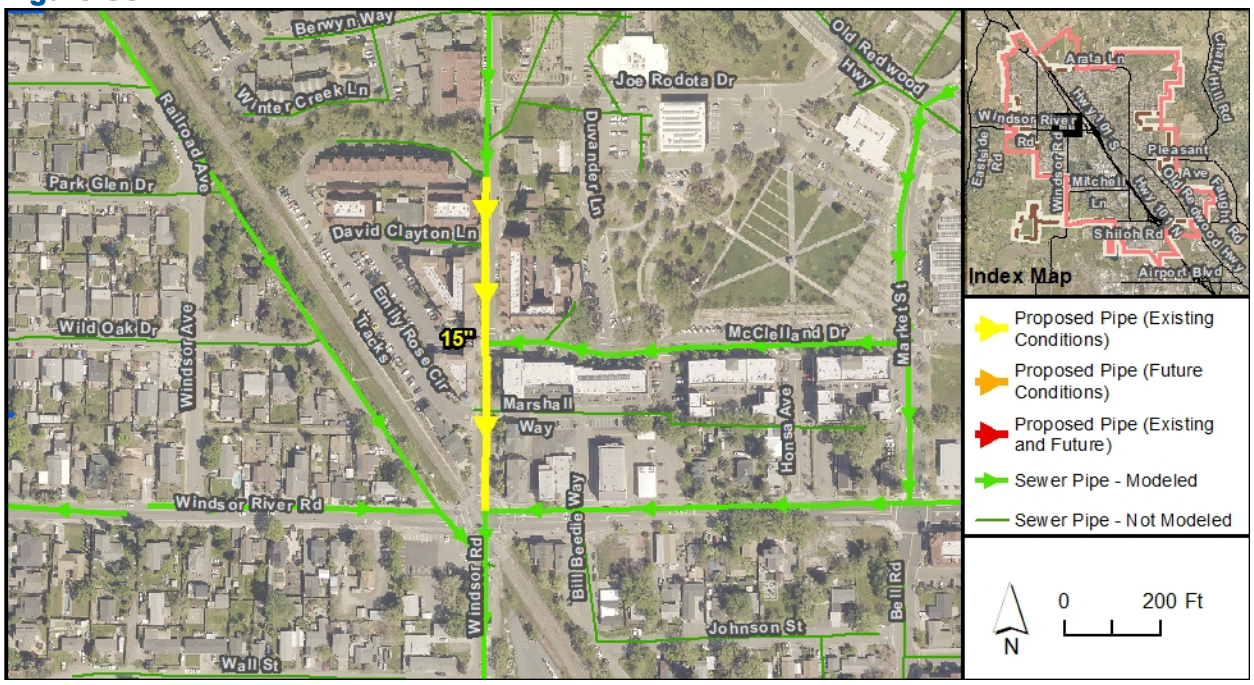


Table SS-4: SS-4 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 697 LF (0.13 miles) of 10-inch with 15-inch gravity sewer • Replace four 48-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 0.94 MGD • Quantity of I/I reduction to avoid project = 0.33 MGD
Additional Project Considerations	• Q_{max} = 1.11 MGD • Q_{max}/Q_{cap} = 1.63 • Distance to creek = 987 ft • Distance to SD inlet = 24 ft
Project Cost Total (1)	$1,090,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-5 Victory Lane, Amie Drive to Hembree Lane and Hembree Lane, Victory Lane to Walmart Access Road

Problem

Hydraulic evaluation of the existing 10-inch gravity sewer in Victory Lane from Amie Drive to Hembree Lane and Hembree Lane from Victory Lane to Walmart Access Road finds that the pipeline is undersized to convey existing and future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow. This area has been identified as a hot spot requiring more frequent maintenance.

Project Summary

SS-5 includes upsizing of approximately 0.31 miles of the existing 10-inch gravity sewer to address both existing and future capacity limitations. Addressing the capacity issue by upsizing the pipe (and possibly increasing the slope) might alleviate the maintenance and associated costs of frequent inspection and cleaning.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.12 miles of 10-inch with 12-inch gravity sewers, and the replacement of three 48-inch manholes. Sewer depth is 15.0 to 16.9 ft.

Future Portion

To address future deficiencies, the project includes replacement of 0.19 miles of 10-inch with 12-inch gravity sewers, the replacement of three 48-inch manholes. Sewer depth is 9.3 to 11.8 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.67 MGD. In order to avoid the capacity increase project, I/I reduction of 0.32 MGD is needed. I/I reduction of nearly 50% is possible but not probable and is would not be a cost effective alternative to the capacity project.

Risk/Level of Service

The proximity of this project to a commercial shopping area and creek(s), in addition to being a hot spot area (per Town), makes this deficiency high risk. The low flow (0.96 mgd) and medium Q_{max}/Q_{cap} (1.42), combined with sewer depths mostly over 10 ft, are less likely to result in an SSO, which makes this deficiency medium risk overall.

Figure SS-5 provides an illustration of project improvements.

Figure SS-5



Table SS-5: SS-5 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 639 LF (0.12 miles) of 10-inch with 12-inch gravity sewer • Replace two 48-inch manholes
Proposed Improvements to Address Future Need	• Replace 1,020 LF (0.19 miles) of 10-inch with 12-inch gravity sewer • Replace two 48-inch manholes
Key Developments driving Future Need	• The Oaks • 6100 Old Redwood Highway
I/I Reduction Potential	• I/I_{max} = 0.67 MGD • Quantity of I/I reduction to avoid project = 0.32 MGD
Additional Project Considerations	• Q_{max} = 0.96 MGD • Q_{max}/Q_{cap} = 1.42 • Distance to creek = 48 ft • Distance to SD inlet = 6 ft
Project Cost Total (1)	$900,000 – Existing $1,360,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-6 Lake Drive, Conde Lane to Bell Road

Problem

Hydraulic evaluation of the existing 14-inch gravity sewer in Lake Drive from Conde Lane to Bell Road finds that the pipeline is undersized to convey existing and future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-6 includes upsizing of approximately 0.36 miles of the existing 14-inch gravity sewer to address both existing and future capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.07 miles of 14-inch with 15-inch and 0.19 miles of 14-inch with 18-inch gravity sewers, and the replacement of two 48-inch and two 60-inch manholes. Sewer depth is 11.4 to 12.0 ft.

Future Portion

To address future deficiencies, the project includes replacement of 0.10 miles of 14-inch with 18-inch gravity sewers, the replacement of two 48-inch and five 60-inch manholes, further upsizing of the 0.07 miles of 14-inch gravity sewer needed to address existing deficiencies to 18-inch (instead of 15-inch), and further upsizing of the 48-inch manholes needed to address existing capacity limitations to 60-inch manholes. Sewer depth is 9.3 to 14.2 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.96 MGD. In order to avoid the capacity increase project, I/I reduction of 1.25 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Risk/Level of Service

The proximity of this project to a large residential area and creek(s), plus the high peak flows (3.68 mgd) make this deficiency high risk. The relatively low Q_{max}/Q_{cap} (1.25) is unlikely to result in an SSO, and makes this deficiency a medium risk overall.

Figure SS-6 provides an illustration of project improvements.

Figure SS-6

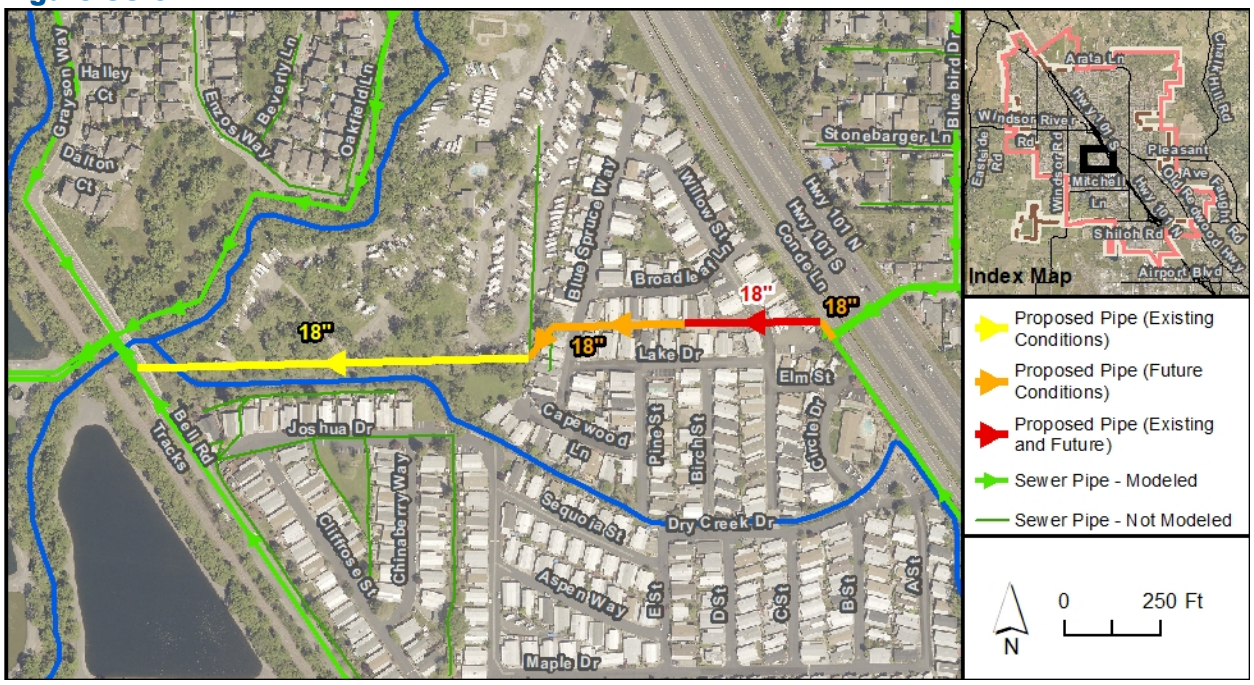


Table SS-6: SS-6 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 360 LF (0.07 miles) of 14-inch with 15-inch gravity sewer • Replace 1,020 LF (0.19 miles) of 14-inch with 18-inch gravity sewer • Replace two 48-inch manholes • Replace two 60-inch manholes
Proposed Improvements to Address Future Need	• Replace 499 LF (0.09 miles) of 14-inch with 18-inch gravity sewer • Upsize 360 LF of 14-inch from Existing CIP Project to 18-inch gravity sewer • Replace two 48-inch manholes • Replace five 60-inch manholes • Upsize Existing CIP Project 48-inch manholes (2) with 60-inch manholes
Key Developments driving Future Need	• Creekwalk • 6500 Old Redwood Hwy • Hembree Ln Subdivision • The Artesian • Heritage Park • Jensen Lane • Ross Ranch
I/I Reduction Potential	• I/I_{max} = 1.96 MGD • Quantity of I/I reduction to avoid project = 1.28 MGD
Additional Project Considerations	• Q_{max} = 3.68 MGD • Q_{max}/Q_{cap} = 1.25 • Distance to creek = 0 ft • Distance to SD inlet = 2 ft
Project Cost Total [1]	$2,170,000 – Existing $2,660,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-7 Enzos Way and Oakfield Lane, Near Beverly Lane

Problem

Hydraulic evaluation of the existing 24-inch gravity sewer in Enzos Way and Oakfield Lane, Near Beverly Lane finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-7 includes installation at a new slope of approximately 0.08 miles of the existing 24-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.08 miles of 24-inch with 24-inch gravity sewers at a new slope, and the replacement of three 60-inch manholes. Sewer depth is 12.9 to 14.0 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.58 MGD. In order to avoid the capacity increase project, I/I reduction of 1.92 MGD is needed. I/I reduction is not viable option to reduce the scope of the capacity project.

Risk/Level of Service

The proximity of this project to a residential area, but less than 10 houses, makes this deficiency low risk. The high flow (3.77 mgd) and medium Q_{max}/Q_{cap} (1.53), combined with sewer depths of over 12 ft, have a greater chance to result in an SSO, in addition to the proximity to creek(s), makes this deficiency medium-low risk.

Figure SS-7 provides an illustration of project improvements.

Figure SS-7

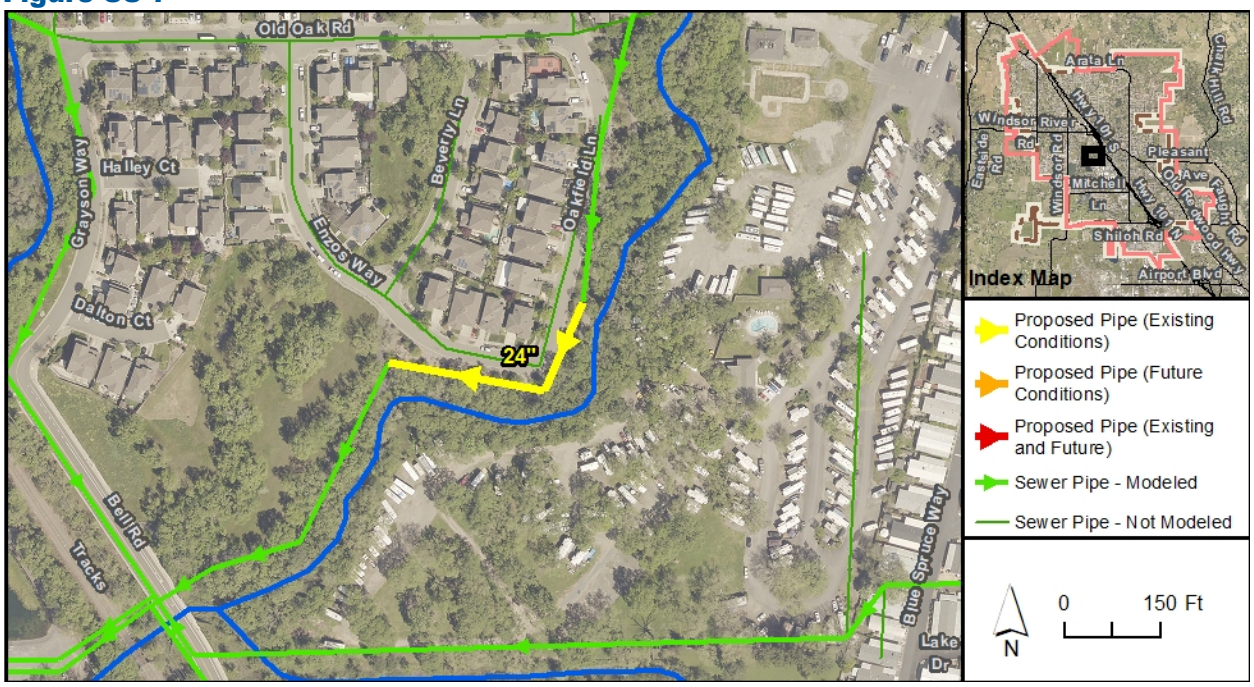


Table SS-7: SS-7 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 399 LF (0.08 miles) of 24-inch with 24-inch gravity sewer at a new slope • Replace three 60-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 1.58 MGD • Quantity of I/I reduction to avoid project = 1.92 MGD
Additional Project Considerations	• Q_{max} = 3.77 MGD • Q_{max}/Q_{cap} = 1.53 • Distance to creek = 33 ft • Distance to SD inlet = 26 ft
Project Cost Total (1)	$870,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-8 Bluebird Drive, South of Old Redwood Highway to North of Stonebarger Lane

Problem

Hydraulic evaluation of the existing 12-inch gravity sewer in Bluebird Drive from South of Old Redwood Highway to North of Stonebarger Lane finds that the pipeline is undersized to convey existing and future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-8 includes upsizing of approximately 0.05 miles of the existing 12-inch gravity sewer to address both existing and future capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.04 miles of 12-inch with 15-inch gravity sewers, and the replacement of four 48-inch manholes. Sewer depth is 11.0 to 11.2 ft.

Future Portion

To address future deficiencies, the project includes replacement of 0.01 miles of 12-inch with 15-inch gravity sewers, the replacement of one 48-inch manhole. Sewer depth is 11.5 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.36 MGD. In order to avoid the capacity increase project, I/I reduction of 0.16 MGD is needed. I/I reduction is likely to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Downstream CIPs SS-6, SS-10, and SS-14 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for CIP SS-8 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this CIP SS-8 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for SS-6, SS-10, and SS-14 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a residential area, but less than 10 houses, makes this deficiency medium risk. The low flow (0.52 mgd) and Q_{max}/Q_{cap} (1.39), combined with sewer depths over 11 ft, are less likely to result in an SSO, which makes this deficiency medium-low risk overall.

Figure SS-8 provides an illustration of project improvements.

Figure SS-8



Table SS-8: SS-8 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 223 LF (0.04 miles) of 12-inch with 15-inch gravity sewer • Replace four 48-inch manholes
Proposed Improvements to Address Future Need	• Replace 21 LF (0.01 miles) of 12-inch with 15-inch gravity sewer • Replace two 48-inch manholes
Key Developments driving Future Need	• Heritage Park
I/I Reduction Potential	• I/I_{max} = 0.67 MGD • Quantity of I/I reduction to avoid project = 0.16 MGD
Additional Project Considerations	• Q_{max} = 0.52 MGD • Q_{max}/Q_{cap} = 1.39 • Distance to creek = 1,016 ft • Distance to SD inlet = 39 ft
Project Cost Total (1)	$480,000 – Existing $140,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-9 Wild Oak Drive, Wild Oak Drive to Windsor River Road

Problem

Hydraulic evaluation of the existing 15-inch gravity sewer in Wild Oak Drive from Wild Oak Drive to Windsor River Road finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-9 includes upsizing of approximately 0.11 miles of 15-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.11 miles of 15-inch with 18-inch, and the replacement of two 60-inch manholes. Sewer depth is 13.9 to 14.0 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.93 MGD. In order to avoid the capacity increase project, I/I reduction of 0.63 MGD is needed. I/I reduction has a good chance to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Upstream SS-2 and downstream CIPs SS-1 and SS-11 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for SS-9 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SS-9 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-1 and SS-11 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a residential area, but less than 10 houses, makes this deficiency low risk. The higher flow (2.33 mgd) and lower Q_{max}/Q_{cap} (1.36), combined with sewer depths of over 13 ft, have a medium-low chance to result in an SSO, which makes this deficiency low-medium risk overall.

This project is upstream of SS-1 and overlaps with the roundabout project which could cause additional traffic issues. It is recommended that construction take place during the summer. If the Town desires to relocate the pipe out of the road, this would be a good time to do so.

Figure SS-9 provides an illustration of project improvements.

Figure SS-9

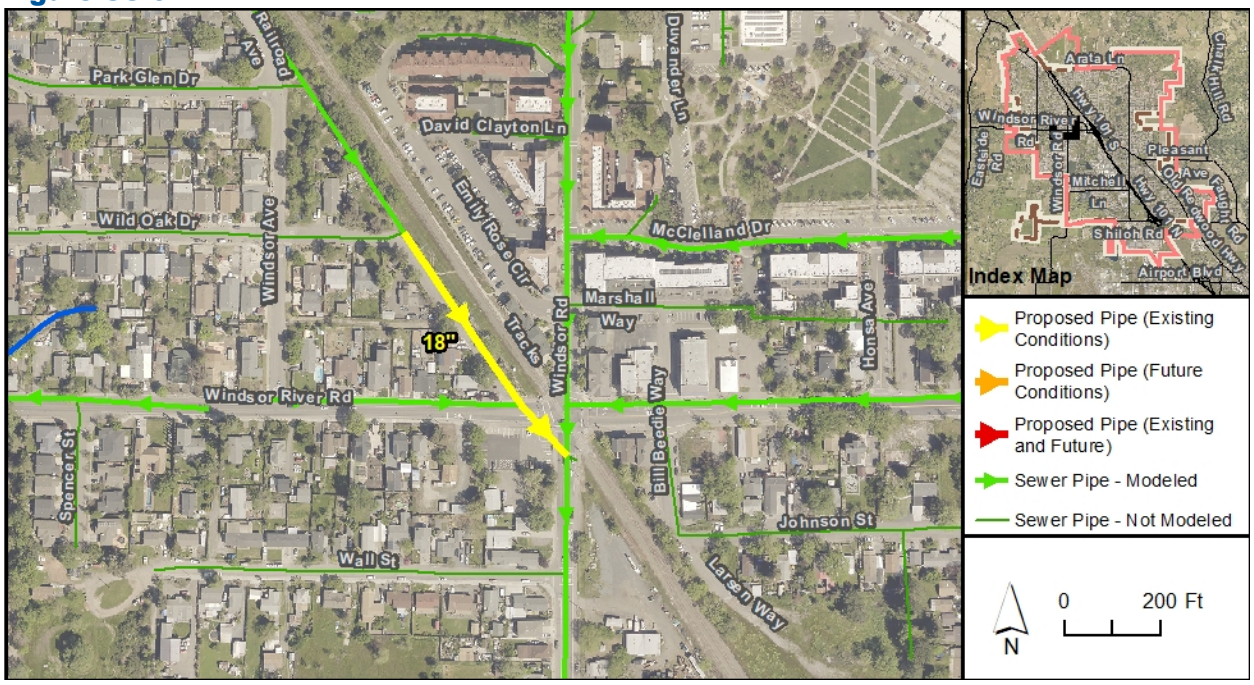


Table SS-9: SS-9 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 581 LF (0.11 miles) of 15-inch with 18-inch gravity sewer • Replace two 60-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 1.93 MGD • Quantity of I/I reduction to avoid project = 0.63 MGD
Additional Project Considerations	• Q_{max} = 2.33 MGD • Q_{max}/Q_{cap} = 1.36 • Distance to creek = 663 ft • Distance to SD inlet = 31 ft
Project Cost Total (1)	$1,240,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-10 Plant Road, Bell Road to Treatment Plan

Problem

Hydraulic evaluation of the existing 20-inch gravity sewer in Plant Road from Bell Road to the Treatment Plant finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-10 includes installation of approximately 0.21 miles of the existing 20-inch gravity sewer to address existing capacity limitations. Note, there is adequate capacity in the parallel line to the south. If the condition of the southern pipes are good, the project could simply create an overflow/tie-in to the south line at the most upstream point in the project. This alternate project would be significantly less expensive.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.21 miles of 20-inch with 24-inch gravity sewers, and the replacement of seven 60-inch manholes. Sewer depth is 11.3 to 14.7 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.96 MGD. In order to avoid the capacity increase project, I/I reduction of 1.35 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project.

Risk/Level of Service

This project is immediately upstream of the treatments plant, its location makes this deficiency low risk. The proximity to creek(s) is high risk, but the high flow (3.95 mgd) and low Q_{max}/Q_{cap} (1.15), combined with sewer depths of over 11 ft, have a low chance to result in an SSO, which makes this deficiency low risk overall.

Figure SS-10 provides an illustration of project improvements.

Figure SS-10

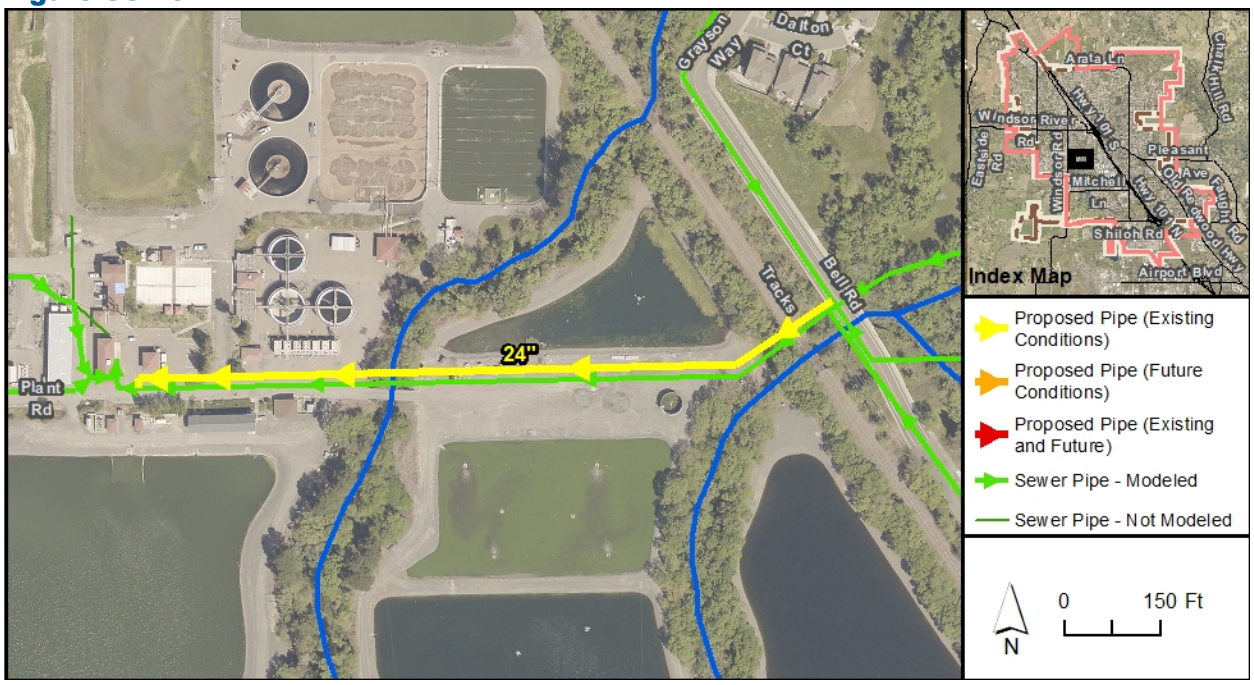


Table SS-10: SS-10 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 1,130 LF (0.21 miles) of 20-inch with 24-inch gravity sewer • Replace seven 60-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 1.96 MGD • Quantity of I/I reduction to avoid project = 1.35 MGD
Additional Project Considerations	• Q_{max} = 3.95 MGD • Q_{max}/Q_{cap} = 1.15 • Distance to creek = 0 ft • Distance to SD inlet = 1 ft
Project Cost Total (1)	$2,320,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-11 Unnamed Road North of Plant Road, Windsor Road to Plant Road

Problem

Hydraulic evaluation of the existing 20-inch, 21-inch, and 24-inch gravity sewer in Unnamed Road North of Plant Road to Plant Road finds that the pipeline is undersized to convey existing and future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-11 includes upsizing of approximately 0.01 miles of 20-inch gravity sewer, 0.02 miles of 21-inch gravity sewer, and 0.11 miles of 24-inch gravity sewer to address existing and future capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.01 miles of 20-inch with 24-inch, replacement of 0.02 miles of 21-inch with 24-inch and the replacement of three 60-inch manholes. Sewer depth is 15.8 to 18.3 ft.

Future Portion

To address future deficiencies, the project includes replacement of 0.11 miles of 24-inch with 24-inch at a new slope and the replacement of three 60-inch manholes. Sewer depth is 6.7 to 15.7 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 4.24 MGD. In order to avoid the capacity increase project, I/I reduction of 1.22 MGD is needed. I/I reduction has a good chance to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Upstream CIPs SS-1, SS-2, SS-4, SS-4, SS-9 and SS-16 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for CIP Q includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SS-11 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-1, SS-2, SS-4, SS-4, SS-9 and SS-16 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a residential area and the treatment plant, makes this deficiency lower risk. The high flow (5.53 mgd) and low Q_{max}/Q_{cap} (1.19), combined with sewer depths of almost 7 ft to over 18 ft, have a lower chance to result in an SSO, coupled with this project mostly being a future need, which makes this deficiency low risk overall.

Figure SS-11 provides an illustration of project improvements.

Figure SS-11



Table SS-11: SS-11 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 24 LF (0.01 miles) of 20-inch with 24-inch gravity sewer • Replace 98 LF (0.02 miles) of 21-inch with 24-inch gravity sewer • Replace three 60-inch manholes
Proposed Improvements to Address Future Need	• Replace 593 LF (0.11 miles) of 24-inch with 24-inch gravity sewer at a new slope • Replace three 60-inch manholes
Key Developments driving Future Need	• Town Green Hotel • Richardson Street Mixed-Use • Chevron Remodel • Town Hall Expansion • Vintage Oaks on the Town Green • Civic Center Block A • Duncan Village • Windsor Veteran Village • Draper Estates
I/I Reduction Potential	• I/I_{max} = 4.24 MGD • Quantity of I/I reduction to avoid project = 1.22 MGD
Additional Project Considerations	• Q_{max} = 5.53 MGD • Q_{max}/Q_{cap} = 1.19 • Distance to creek = 445 ft • Distance to SD inlet = 11 ft
Project Cost Total [1]	$440,000 – Existing $1,140,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-12 Old Redwood Highway, Godfrey Drive to Windsor Road, and Windsor Road, Old Redwood Highway to Emily Rose Circle

Problem

Hydraulic evaluation of the existing 8-inch gravity sewer in Old Redwood Highway from Godfrey Drive to Windsor Road, and Windsor Road from Old Redwood Highway to Emily Rose finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-12 includes upsizing of approximately 0.33 miles of 8-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.33 miles of 8-inch with 10-inch, and the replacement of eight 48-inch manholes. Sewer depth is 8.3 to 9.9 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.57 MGD. In order to avoid the capacity increase project, I/I reduction of 0.14 MGD is needed. I/I reduction is likely to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Downstream CIPs SS-1, SS-4, and SS-11 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for CIP SS-12 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this L may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-1, SS-4, and SS-11 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a large residential area makes this deficiency higher risk. The low flow (0.71 mgd) and Q_{max}/Q_{cap} (1.20), combined with relatively shallow sewer depths of just over 8 ft to 10 ft, have a low chance to result in an SSO, which makes this deficiency low risk overall.

Figure SS-12 provides an illustration of project improvements.

Figure SS-12



Table SS-12: SS-12 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 1,729 LF (0.33 miles) of 8-inch with 10-inch gravity sewer • Replace eight 48-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 0.57 MGD • Quantity of I/I reduction to avoid project = 0.14 MGD
Additional Project Considerations	• Q_{max} = 0.71 MGD • Q_{max}/Q_{cap} = 1.20 • Distance to creek = 998 ft • Distance to SD inlet = 12 ft
Project Cost Total (1)	$2,130,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-13 Bluebird Drive, Fawn Lily Court, South of Lakewood Drive

Problem

Hydraulic evaluation of the existing 8-inch gravity sewer in Fawn Lily Court South of Bluebird Drive finds that the pipeline is undersized to convey existing peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-13 includes upsizing of approximately 0.02 miles of the existing 8-inch gravity sewer to address existing capacity limitations.

Existing Portion

To address existing deficiencies, the project includes replacement of 0.02 miles of 8-inch with 10-inch gravity sewers, and the replacement of two 48-inch manholes. Sewer depth is 8.3 ft.

Future Portion

None.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.14 MGD. In order to avoid the capacity increase project, I/I reduction of 0.08 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project.

Risk/Level of Service

The proximity of this project to a residential area (but less than 5 houses) and creek(s), makes this deficiency medium-low risk. The low flow (0.45 mgd) and Q_{max}/Q_{cap} (1.21) are less likely to result in an SSO, which makes this deficiency low risk overall.

Figure SS-13 provides an illustration of project improvements.

Figure SS-13



Table SS-13: SS-13 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• Replace 114 LF (0.02 miles) of 8-inch with 10-inch gravity sewer • Replace two 48-inch manholes
Proposed Improvements to Address Future Need	• None
I/I Reduction Potential	• I/I_{max} = 0.14 MGD • Quantity of I/I reduction to avoid project = 0.08 MGD
Additional Project Considerations	• Q_{max} = 0.45 MGD • Q_{max}/Q_{cap} = 1.21 • Distance to creek = 40 ft • Distance to SD inlet = 26 ft
Project Cost Total (1)	$210,000 – Existing

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-14 Conde Lane, Denbeste Court to Lake Drive

Problem

Hydraulic evaluation of the existing 14-inch gravity sewer in Conde Lane from Denbeste Court to Lake Drive finds that the pipeline is undersized to convey future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-14 includes upsizing of approximately 0.46 miles of the existing 14-inch gravity sewer to address future capacity limitations.

Existing Portion

None.

Future Portion

To address future deficiencies, the project includes replacement of 0.13 miles of 14-inch with 15-inch and 0.33 miles of 14-inch with 18-inch gravity sewers, the replacement of two 48-inch and five 60-inch manholes. Sewer depth is 11.4 to 13.6 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 1.00 MGD. In order to avoid the capacity increase project, I/I reduction of 0.14 MGD is needed. I/I reduction has a high potential to eliminate the need of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Upstream CIPs SS-3, SS-8, SS-18 and downstream CIPs SS-6 and I should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for CIP SS-14 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SS-14 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-3, SS-6, SS-8, and SS-18 if adequate I/I reduction can be achieved in the pipelines located upstream of those projects.

Risk/Level of Service

The proximity of this project to a large residential area and the medium peak flows (1.54 mgd) make this deficiency medium risk. The relatively low Q_{max}/Q_{cap} (1.10) is unlikely to result in an SSO, and makes this deficiency a medium-low risk overall.

Figure SS-14 provides an illustration of project improvements.

Figure SS-14

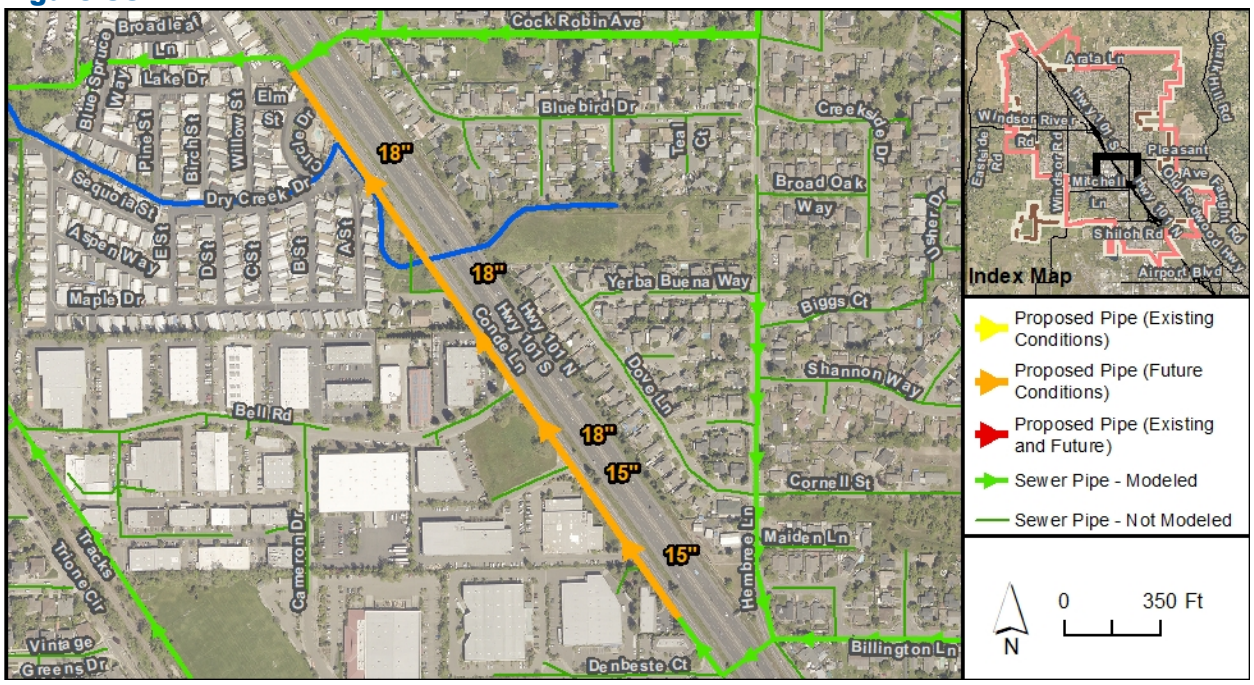


Table SS-14: SS-14 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• None
Proposed Improvements to Address Future Need	• Replace 680 LF (0.13 miles) of 14-inch with 15-inch gravity sewer • Replace 1,761 LF (0.33 miles) of 14-inch with 18-inch gravity sewer • Replace two 48-inch manholes • Replace five 60-inch manholes
Key Developments driving Future Need	• Creekwalk • 6500 Old Redwood Highway • Hembree Lane Subdivision
I/I Reduction Potential	• I/I_{max} = 1.00 MGD • Quantity of I/I reduction to avoid project = 0.14 MGD
Additional Project Considerations	• Q_{max} = 1.54 MGD • Q_{max}/Q_{cap} = 1.10 • Distance to creek = 0 ft • Distance to SD inlet = 3 ft
Project Cost Total (1)	$3,870,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-15 Edgewood Place, South of Los Amigos Road to Brooks Road South

Problem

Hydraulic evaluation of the existing 18-inch gravity sewer in Edgewood Place, South of Los Amigos Road to Brooks Road South finds that the pipeline is undersized to convey future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-15 includes installation at a new slope of approximately 0.08 miles of the existing 18-inch gravity sewer to address future capacity limitations.

Existing Portion

None.

Future Portion

To address future deficiencies, the project includes replacement of 0.08 miles of 18-inch with 18-inch gravity sewers at a new slope, and the replacement of four 60-inch manholes. Sewer depth is 9.7 to 10.7 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.83 MGD. In order to avoid the capacity increase project, I/I reduction of 0.59 MGD is needed. I/I reduction greater than 50% is probably unrealistic; however, I/I reduction of a lesser extent could reduce the scope of the capacity project.

Risk/Level of Service

The proximity of this project to a commercial area (a restaurant and Inn), makes this deficiency medium risk. The medium flow (1.86 mgd) and Q_{max}/Q_{cap} (1.46), combined with sewer depths of over 9 ft, have a medium chance to result in an SSO, in addition to being fully driven by development, makes this deficiency low risk overall (note that this is low risk partly because it is a future condition project, if all the upstream developments were completed, the risk would be higher).

Figure SS-15 provides an illustration of project improvements.

Figure SS-15



Table SS-15: SS-15 Summary

CIP Component	Description	
Proposed Improvements to Address Existing Need	• None	
Proposed Improvements to Address Future Need	• Replace 396 LF (0.08 miles) of 18-inch with 18-inch gravity sewer at a new slope • Replace four 60-inch manholes	
Key Developments driving Future Need	• Sherlock Subdivision • 280 Arata Lane • 330 Arata Lane	• North of Arata Annexation • North Annexation School
I/I Reduction Potential	• I/I_{max} = 0.83 MGD • Quantity of I/I reduction to avoid project = 0.59 MGD	
Additional Project Considerations	• Q_{max} = 1.86 MGD • Q_{max}/Q_{cap} = 1.46	• Distance to creek = 262 ft • Distance to SD inlet = 15 ft
Project Cost Total (1)	$830,000 – Future	

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-16 Windsor River Road, Honsa Avenue to Windsor Road

Problem

Hydraulic evaluation of the existing 8-inch gravity sewer in Windsor River Road from Honsa Avenue to Windsor Road finds that the pipeline is undersized to convey future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-16 includes upsizing of approximately 0.14 miles of 10-inch gravity sewer to address future capacity limitations.

Existing Portion

None.

Future Portion

To address future deficiencies, the project includes replacement of 0.14 miles of 8-inch with 10-inch, and the replacement of three 48-inch manholes. Sewer depth is 10.0 to 12.3 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.43 MGD. In order to avoid the capacity increase project, I/I reduction of 0.17 MGD is needed. I/I reduction has a good chance to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Downstream CIPs SS-1 and SS-11 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for CIP SS-16 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SSSS-16 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-1 and SS-11 if adequate I/I reduction can be achieved in the pipelines located upstream of that project.

Risk/Level of Service

The proximity of this project to a high density commercial area makes this deficiency high risk. The low flow (0.74 mgd) and Q_{max}/Q_{cap} (1.29), combined with sewer depths of over 10 ft, have a low chance to result in an SSO, coupled with this project being a future need, makes this deficiency low risk overall.

Figure SS-16 provides an illustration of project improvements.

Figure SS-16

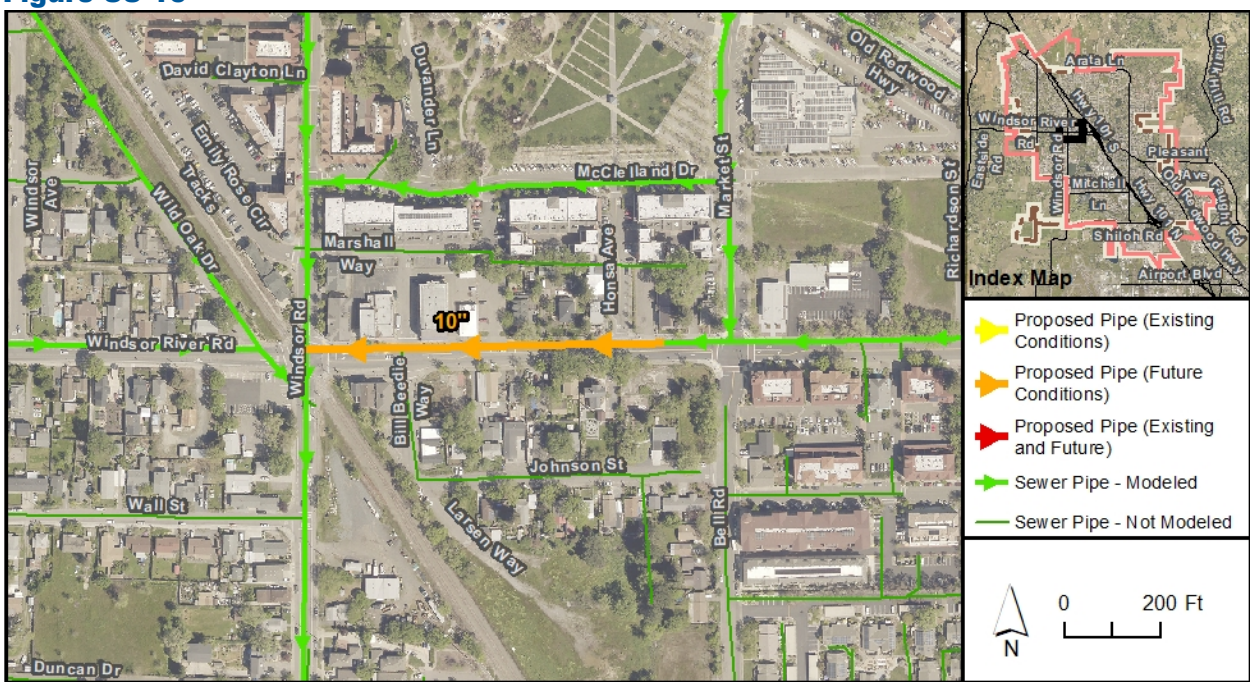


Table SS-16: SS-16 Summary

CIP Component	Description	
Proposed Improvements to Address Existing Need	• None	
Proposed Improvements to Address Future Need	• Replace 749 LF (0.14 miles) of 8-inch with 10-inch gravity sewer • Replace three 48-inch manholes	
Key Developments driving Future Need	• Town Green Hotel • Richardson Street Mixed-Use • Chevron Remodel	• Town Hall Expansion • Vintage Oaks on the Town Green
I/I Reduction Potential	• I/I $_{max}$ = 0.43 MGD • Quantity of I/I reduction to avoid project = 0.17 MGD	
Additional Project Considerations	• Q $_{max}$ = 0.74 MGD • Q $_{max}$/Q $_{cap}$ = 1.29	• Distance to creek = 1,005 ft • Distance to SD inlet = 8 ft
Project Cost Total (1)	$1,020,000 – Future	

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-17 Winemaker Way, Near Decanter Circle

Problem

Hydraulic evaluation of the existing 15-inch gravity sewer in Winemaker way near Decanter Circle finds that the pipeline is undersized to convey future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

SS-17 includes installation at a new slope of approximately 0.04 miles of the existing 15-inch gravity sewer to address existing capacity limitations.

Existing Portion

None.

Future Portion

To address future deficiencies, the project includes replacement of 0.04 miles of 15-inch with 15-inch gravity sewers at a new slope, and the replacement of three 48-inch manholes. Sewer depth is 20.0 to 20.6 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.93 MGD. In order to avoid the capacity increase project, I/I reduction of 0.29 MGD is needed. I/I reduction has a good potential to eliminate or reduce the scope of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for SS-17 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced.

Risk/Level of Service

The proximity of this project to a residential area, but less than 20 houses, makes this deficiency medium risk. The lower flow (1.37 mgd) and Q_{max}/Q_{cap} (1.27), combined with sewer depths of over 20 ft, have a low chance to result in an SSO, coupled with this project being a future need, makes this deficiency low risk overall.

Figure SS-17 provides an illustration of project improvements.

Figure SS-17

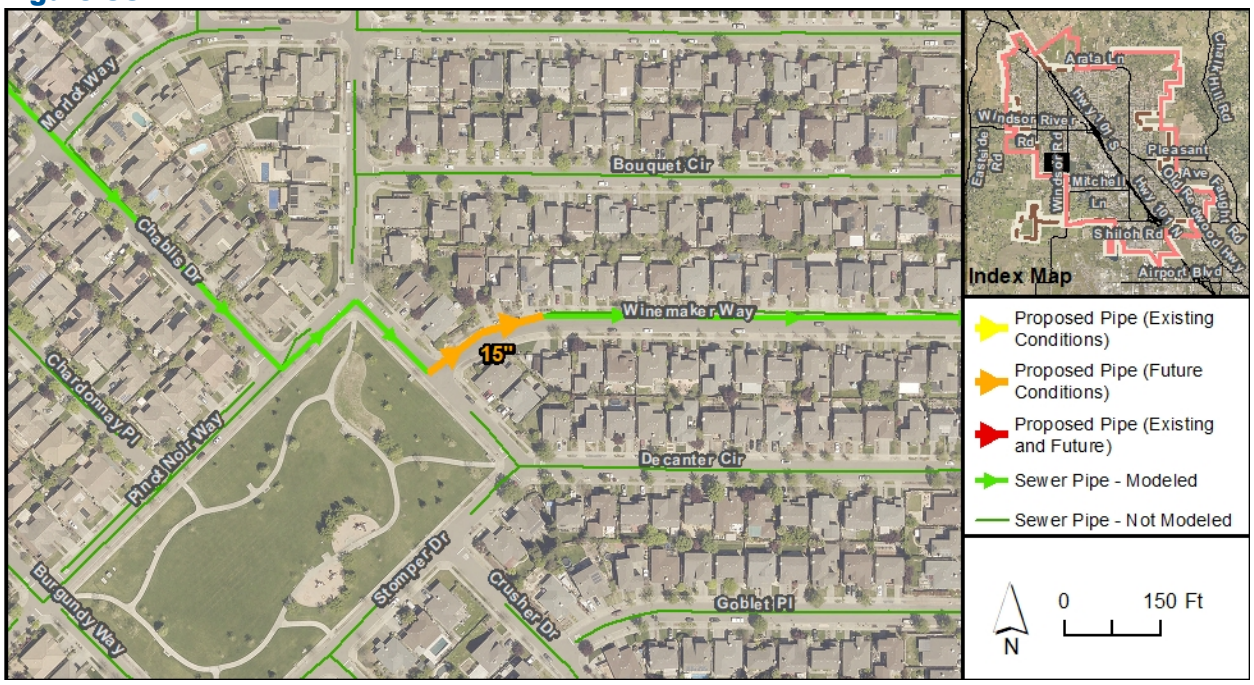


Table SS-17: SS-17 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• None
Proposed Improvements to Address Future Need	• Replace 206 LF (0.04 miles) of 15-inch with 15-inch gravity sewer at a new slope • Replace three 48-inch manholes
Key Developments driving Future Need	• Lytton
I/I Reduction Potential	• I/I_{max} = 0.93 MGD • Quantity of I/I reduction to avoid project = 0.29 MGD
Additional Project Considerations	• Q_{max} = 1.37 MGD • Q_{max}/Q_{cap} = 1.27 • Distance to creek = 1,529 ft • Distance to SD inlet = 12 ft
Project Cost Total (1)	$460,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

SS-18 Robbins Park, Cornell Street to Billington Lane

Problem

Hydraulic evaluation of the existing 6-inch gravity sewer that skirts the west edge of Robbins Park from Cornell St to Billington Lane finds that the pipeline is undersized to convey future peak wet weather flows. This capacity deficiency has the potential to result in sanitary sewer overflow.

Project Summary

CIP SS-18 includes upsizing of approximately 0.11 miles of the existing 6-inch gravity sewer to address future capacity limitations.

Existing Portion

None.

Future Portion

To address future deficiencies, the project includes replacement of 0.11 miles of 6-inch with 8-inch gravity sewers, the replacement of two 48-inch manholes. Sewer depth is 8.3 ft.

Infiltration and Inflow

Maximum infiltration and inflow (I/I) in the sewer basin tributary to this pipeline is 0.12 MGD. In order to avoid the capacity increase project, I/I reduction of 0.03 MGD is needed. I/I reduction has a high potential to eliminate the need of the capacity project. Predesign for the project should characterize the distribution of I/I within the sewer basin, including the location and quantity of infiltration and inflow sources.

Characterization of I/I within the project area is recommended prior to beginning project design and should include other CIP projects that would benefit. Downstream CIPs SS-6, SS-10 and SS-14 should be evaluated together to understand the impact of I/I reduction on needed capacity projects.

Pre- and post-construction flow monitoring is also recommended to quantify the amount of I/I in the project area relative to the scope of improvements and associated cost for the I/I rehabilitation. The project cost for SS-18 includes budget for flow monitoring and further study of the sewer basin, with the goal to define the scope of project improvements.

Additionally, by removing I/I in upstream basins, the amount of flow pumped at the pump stations and treated at the Town's wastewater treatment plant would be reduced; costs associated with pump station improvements and conveying and treating flows would also be reduced. I/I reductions as part of this SS-18 may also be combined with related CIP projects in the sewer basin tributary area and might contribute to I/I reduction in lieu of capacity enhancement for those projects. This may result in a reduced scope of improvements for CIPs SS-6, SS-10 and SS-14 if adequate I/I reduction can be achieved in the pipelines located upstream of those projects.

Risk/Level of Service

The proximity of this project to a residential area, but less than 10 houses, makes this deficiency medium risk. The low flow (0.27 mgd) and Q_{max}/Q_{cap} (1.11) are less likely to result in an SSO, which makes this deficiency low risk overall.

Figure SS-18 provides an illustration of project improvements.

Figure SS-18

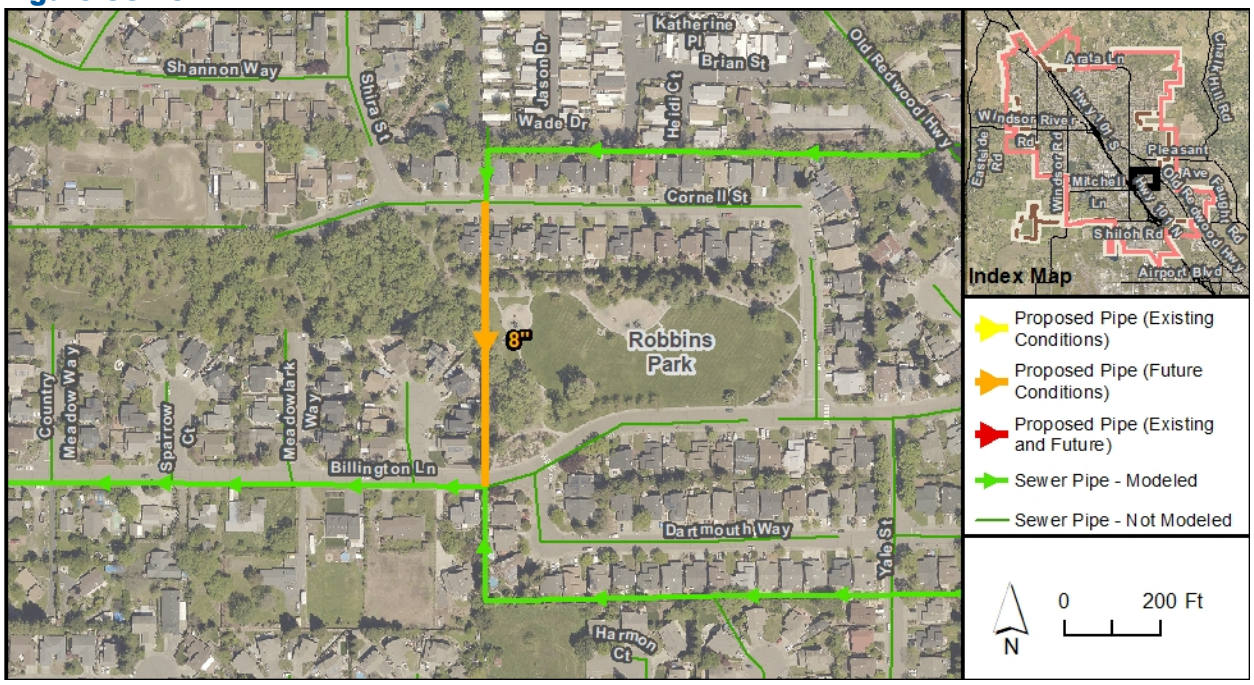


Table SS-18: SS-18 Summary

CIP Component	Description
Proposed Improvements to Address Existing Need	• None
Proposed Improvements to Address Future Need	• Replace 593 LF (0.11 miles) of 6-inch with 8-inch gravity sewer • Replace two 48-inch manholes
Key Developments driving Future Need	• 6500 Old Redwood Highway
I/I Reduction Potential	• I/I_{max} = 0.12MGD • Quantity of I/I reduction to avoid project = 0.03 MGD
Additional Project Considerations	• Q_{max} = 0.27 MGD • Q_{max}/Q_{cap} = 1.11 • Distance to creek = 1,252 ft • Distance to SD inlet = 23 ft
Project Cost Total (1)	$660,000 – Future

(1) Detailed information for the project cost is provided separately. Cost does not include I/I reduction projects that might reduce the scope of the project as outlined above. Cost does not include asbestos abatement for any existing pipe that is asbestos concrete pipe (ACP).

Appendix I – Recommended CIP Projects CEQA Summaries

The memo included in Appendix I includes a summary of California Environmental Quality Act approaches for each project. It is intended to be a quick reference to guide staff in complying with CEQA as projects come forward.

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Memorandum

July 29, 2020

To:	Garrett Broughton, Town of Windsor	Ref. No.:	11151247
From:	Charles Smith and Haley Cahill, GHD	Tel:	(949) 585-5257
cc:	Sandi Potter, Town of Windsor		

Subject: Windsor Sewer Master Plan CIP Projects and CEQA Implications

As part of the Town of Windsor's (Town's) 2020 Collection System Master Plan (CSMP), 18 capital improvement projects were identified to address system deficiencies, increase reliability, and address other operations and maintenance needs. Before these projects can be implemented, they must be reviewed and assessed for potential environmental impacts as required by CEQA. Based on this review, the 18 new projects may be cleared per the following terms for CEQA exemptions:

- Statutory Exemption – Per §21080.21 of the CEQA Statute, pipelines less than one mile in length within a public street or highway or any other public right of way are statutorily exempt from CEQA as long as they demonstrate independent utility (i.e. the improvement is independent of other projects in the CIP) and that the pipeline improvements do not include surface facilities related to operation of the underground facility.
- Categorical Exemption – Per §15302 of the CEQA Guidelines, replacement or reconstruction of existing utility facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced qualifies for a Class 2 Categorical Exemption.

In accordance with §15300.2 of the CEQA Guidelines, individual projects would only qualify for exemptions if they are not located in a sensitive environment, would not result in cumulatively significant impacts, would not have a significant effect on the environment due to unusual circumstances, would not adversely impact scenic resources, would not be located on a hazards waste site, and would not cause a substantial adverse change in the significance of a historic resource. A summary of the CIP projects and the proposed approach for CEQA clearance is presented in Table 1.

GHD
2235 Mercury Way Suite 150 Santa Rosa California 95407 USA
T 707 523 1010 **F** 707 527 8679

Table 1 CIP Project Summary and Proposed Approach

Project No.	Project Location	Project Type	Project Classification	Project Size		Project Description[1]	Potential CEQA Impacts	CEQA Clearance
				Length (ft)	Pipe Diam. (in)			
SS-1	Located within Windsor Road in between Windsor River Road and Unnamed Road north of Plant Road	Remove and replace existing pipe	Independent Utility	970	24	Remove and replace 970 linear feet of 10-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing pipe		1,425	24	Remove and replace 1,425 linear feet of 15-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace twelve 60-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
SS-2	Beginning at Starr Road from Starr Circle to Starr View Drive; East to Railroad, then Southeast parallel to Railroad	Remove and replace existing pipe	Independent Utility	501	12	Remove and replace 501 linear feet of 10-inch sanitary sewer pipe with 12-inch gravity sewer pipe.	Potential environmental impact – Install new pipe in road and easement. New pipe in easement should be aligned to avoid existing trees/habitat as much as possible.	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat.
		Remove and replace existing pipe		1,296	18	Remove and replace 1,296 linear feet of 10-inch sanitary sewer pipe with 18-inch gravity sewer pipe.	Potential environmental impact – Install new pipe in road and easement. New pipe in easement should be aligned to avoid existing trees/habitat as much as possible.	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat.
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch and six 60-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
SS-3	Located int Hembree Lane from Shannon Way to Billington Lane	Remove and replace existing pipe	Independent Utility	788	8	Remove and replace 788 linear feet of 6-inch sanitary sewer pipe with 8-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace five 48-inch manholes	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
		Remove and replace existing pipe		178	8	Remove and replace 178 linear feet of 6-inch sanitary sewer pipe with 8-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace one 48-inch manholes. (F)	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption

Project No.	Project Location	Project Type	Project Classification	Project Size		Project Description[1]	Potential CEQA Impacts	CEQA Clearance
				Length (ft)	Pipe Diam. (in)			
SS-4	Located in Windsor Road from Emily Rose Circle to Windsor River Road	Remove and replace existing pipe	Independent Utility	697	15	Remove and replace 697 linear feet of 10-inch sanitary sewer pipe with 15-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace four 48-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
SS-5	Beginning in Victory Lane from Amie Drive to Hembree Lane and in Hembree Lane from Victory Lane to Walmart Access Road	Remove and replace existing pipe	Independent Utility	639	12	Remove and replace 639 linear feet of 10-inch sanitary sewer pipe with 12-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Replace two 48-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
		Remove and replace existing pipe		1,020	12	Remove and replace 1,020 linear feet of 10-inch sanitary sewer pipe with 12-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Replace two 48-inch manholes. (F)	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
SS-6	Located in Lake Drive from Conde Lane to Bell Road	Remove and replace existing pipe	Independent Utility	360	15	Remove and replace 360 linear feet of 14-inch sanitary sewer pipe with 15-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing pipe		1,020	18	Remove and replace 1,020 linear feet of 14-inch sanitary sewer pipe with 18-inch gravity sewer pipe.	Potential environmental impact – Pipeline installation would occur near and across East Windsor Creek Tributary and within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch and two 60-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
		Remove and replace existing pipe		499	18	Remove and replace 499 linear feet of 14-inch sanitary sewer pipe with 18-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing pipe		360	18	Upsize 360 linear feet of 14-inch sanitary sewer pipe from Existing CIP Project to 18-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch and two 60-inch manholes.(F)	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
		Remove and replace existing manholes		N/A	N/A	Upsize existing CIP Project 48-inch manholes (2) with 60-inch manholes.(F)	Limited environmental impact – Remove and replace manholes	Class 2 Exemption

Project No.	Project Location	Project Type	Project Classification	Project Size		Project Description[1]	Potential CEQA Impacts	CEQA Clearance
				Length (ft)	Pipe Diam. (in)			
SS-7	Located adjacent to Enzos Way and Oakfield Lane, Near Beverly Lane	Remove and replace existing pipe	Independent Utility	399	24	Remove and replace 399 linear feet of 24-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Potential environmental impact – Pipeline installation near East Windsor Creek and within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace three 60-inch manholes.	Potential environmental impact – Manhole replacement located adjacent to East Windsor Creek and within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
SS-8	Located within Bluebird Drive from South of Old Redwood Highway to North of Stonebarger Lane	Remove and replace existing pipe	Independent Utility	223	15	Remove and replace 223 linear feet of 12-inch sanitary sewer pipe with 15-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace four 48-inch manholes.	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
		Remove and replace existing pipe		21	15	Remove and replace 21 linear feet of 12-inch sanitary sewer pipe with 15-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch manholes. (F)	Limited environmental impact – Remove and replace manholes in road	Class 2 Exemption
SS-9	Located within easement from Wild Oak Drive to Windsor River Road	Remove and replace existing pipe	Independent Utility	581	18	Remove and replace 581 linear feet of 15-inch sanitary sewer pipe with 18-inch gravity sewer pipe.	Potential environmental impact – Install new pipe in easement. New pipe should be aligned to avoid existing trees/habitat as much as possible.	Class 2 Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 60-inch manholes.	Potential environmental impact – Install new manholes in easement. Construction should be designed to avoid existing trees/habitat as much as possible.	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
SS-10	Beginning from Bell Road to the Treatment Plant	Remove and replace existing pipe	Independent Utility	1,130	24	Remove and replace 1,130 linear feet of 20-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Potential environmental impact – Pipeline replacement to cross Windsor Creek and may disturb potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 60-inch manholes.	Limited environmental impact – Remove and replace existing manholes in road	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat

Project No.	Project Location	Project Type	Project Classification	Project Size		Project Description[1]	Potential CEQA Impacts	CEQA Clearance
				Length (ft)	Pipe Diam. (in)			
SS-11	Located within the Treatment Plant from Unnamed Road North of Plant Road to Plant Road	Remove and replace existing pipe	Independent Utility	24	24	Remove and replace 24 linear feet of 20-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing pipe		98	24	Remove and replace 98 linear feet of 21-inch sanitary sewer pipe with 24-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace three 60-inch manholes.	Limited environmental impact – Remove and replace existing manholes in road	Class 2 Exemption
		Remove and replace existing pipe		593	24	Remove and replace 593 linear feet of 24-inch sanitary sewer pipe with 24-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace three 60-inch manholes. (F)	Limited environmental impact – Remove and replace existing manholes in road	Class 2 Exemption
SS-12	Beginning within Old Redwood Highway from Godfrey Drive to Windsor Road, and Windsor Road from Old Redwood Highway to Emily Rose	Remove and replace existing pipe	Independent Utility	1,729	10	Remove and replace 1,729 linear feet of 8-inch sanitary sewer pipe with 10-inch gravity sewer pipe.	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace eight 48-inch manholes.	Limited environmental impact – Remove and replace existing manholes in road	Class 2 Exemption
SS-13	Located in Fawn Lily Court South of Bluebird Drive	Remove and replace existing pipe	Independent Utility	114	10	Remove and replace 114 linear feet of 8-inch sanitary sewer pipe with 10-inch gravity sewer pipe.	Potential environmental impact – Pipe replacement located within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch manholes.	Potential environmental impact – Manhole replacement located within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat

Project No.	Project Location	Project Type	Project Classification	Project Size		Project Description[1]	Potential CEQA Impacts	CEQA Clearance
				Length (ft)	Pipe Diam. (in)			
SS-14	Located within and adjacent to Conde Lane from Denbeste Court to Lake Drive	Remove and replace existing pipe	Independent Utility	680	15	Remove and replace 680 linear feet of 14-inch sanitary sewer pipe with 15-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing pipe		1,761	18	Remove and replace 1,761 linear feet of 14-inch sanitary sewer pipe with 18-inch gravity sewer pipe. (F)	Potential environmental impact – Pipe replacement located by East Windsor Creek and within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch manholes and five 60-inch manholes.(F)	Limited environmental impact – Remove and replace existing manhole in road	Class 2 Exemption
SS-15	Located within Edgewood Place, South of Los Amigos Road to Brooks Road South	Remove and replace existing pipe	Independent Utility	396	18	Remove and replace 396 linear feet of 18-inch sanitary sewer pipe with 18-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace four 60-inch manholes.(F)	Limited environmental impact – Remove and replace existing manhole in road	Class 2 Exemption
SS-16	Located within Windsor River Road from Honsa Avenue to Windsor Road	Remove and replace existing pipe	Independent Utility	749	10	Remove and replace 749 linear feet of 8-inch sanitary sewer pipe with 10-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace three 48-inch manholes. (F)	Limited environmental impact – Remove and replace existing manhole in road	Class 2 Exemption
SS-17	Located within Winemaker Way near Decanter Circle	Remove and replace existing pipe	Independent Utility	206	15	Remove and replace 206 linear feet of 15-inch sanitary sewer pipe with 15-inch gravity sewer pipe. (F)	Limited environmental impact – Remove and replace existing pipe in road	Statutory Exemption
		Remove and replace existing manholes		N/A	N/A	Remove and replace three 48-inch manholes. (F)	Limited environmental impact – Remove and replace existing manhole in road	Class 2 Exemption
SS-18	Located along the west edge of Robbins Park from Cornell St to Billington Lane	Remove and replace existing pipe	Independent Utility	593	8	Remove and replace 593 linear feet of 6-inch sanitary sewer pipe with 8-inch gravity sewer pipe. (F)	Potential environmental impact – Pipe replacement located within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat
		Remove and replace existing manholes		N/A	N/A	Remove and replace two 48-inch manholes. (F)	Potential environmental impact – Manhole replacement located within potential habitat	May qualify for Class 2 Exemption if work can be designed to avoid adverse effects on sensitive habitat

1. (F)-Upgrades required to address future deficiencies.

Appendix J –Infiltration and Inflow(I/I) Analysis

This appendix includes the infiltration and inflow (I/I) analysis to compare an I/I reduction program approach versus a capacity upsizing project to address existing and future flow deficiencies. This analysis is limited to the I/I information available from V&A Consulting Engineers (V&A) assessment and assumptions regarding the effectiveness of such programs at reducing I/I. It is recommended that the Town conduct targeted I/I investigation prior to undertaking I/I reduction programs to determine the costs and benefits of such a program targeting a particular area of the collection system.

Note, the I&I projects presented here were developed for comparison purposes for this analysis, they are not included as recommended CIP projects in the main document.

I/I Effectiveness Analysis

The following Capacity Projects could be eliminated by reducing upstream I/I by 40 percent or less:

- SS-4
- SS-9
- SS-11
- SS-12
- SS-14
- SS-16
- SS-17
- SS-18
- Additional projects impacted, but not eliminated by I/I reduction:
  - SS-1
  - SS-6
  - SS-10

The following 5 I/I reduction projects were investigated for their effectiveness at reducing I/I.

I/I 1 – Bell Village A Phase 1

- Area:
  - Upstream of capacity Projects SS-4 and SS-12
- Impact:
  - 0.33 mgd I/I reduction
- Cost:
  - **$4,430,000**
- Cost of Avoided Capacity Projects:
  - SS-4 - $1,090,000
  - SS-11 – $426,600 (27% of $1,580,000)
  - SS-12 - $2,130,000
  - **Total: $3,646,600**
- Other Projects Impacted:
  - SS-1 – very small impact, if any, on this project
  - SS-11 – removes 0.33 of 1.22 mgd peak I/I needed to eliminate project
- Other Impacts:
  - Reduced pumping costs

- Reduced treatment costs
- Storage at the Treatment Plan
- R/R program due to age/condition

- Cost/Avoided Cost ratio:
  - 1.21
- Recommendation:
  - Not recommended unless:
    - Other saved costs are significant
    - Other nearby I/I projects have a better cost/avoided cost ratio, then this one could make sense due to impact on project SS-11

I/I 2 – Bell Village A Phase 2

- Area:
  - Upstream of capacity Project SS-16
- Impact:
  - 0.17 mgd I/I reduction
- Cost:
  - **$1,230,000**
- Cost of Avoided Capacity Projects:
  - SS-11 – $221,200 (14% of $1,580,000)
  - SS-16 - $1,020,000
  - **Total: $1,241,200**
- Other Projects Impacted:
  - SS-1 – very small impact, if any, on this project
  - SS-11 – removes 0.17 of 1.22 mgd peak I/I needed to eliminate project
- Other Impacts:
  - Reduced pumping costs
  - Reduced treatment costs
  - Storage at the Treatment Plan
  - R/R program due to age/condition
- Cost to Avoided Cost ratio:
  - 0.99
- Recommendation:
  - Neutral:
    - Project SS-16 is completely eliminated and is low priority
    - Project SS-11 is partially eliminated and is medium priority
    - Other I/I reduction projects have a Cost to Avoided Cost ratio well over 1; therefore, they are unlikely to be constructed, which makes this project not needed to avoid SS-11
    - Other factors to consider:
      - Other saved costs are significant
      - Other nearby I/I projects have a better cost/avoided cost ratio, then this one could make sense due to impact on Project SS-11

I/I 3 – North A, B, C, D

- Area:
  - Upstream of capacity Project SS-9
- Impact:

- 0.72 mgd I/I reduction (0.63 mgd to avoid Project SS-9, additional 0.09 mgd to avoid Project SS-11)
- Cost:
  - **$11,380,000**
- Cost of Avoided Capacity Projects:
  - SS-9 - $1,240,000
  - SS-11 – $932,200 (59% of $1,580,000)
  - **Total: $2,172,200**
- Other Projects Impacted:
  - SS-1 – very small impact, if any, on this project
  - SS-11 – removes 0.72 of 1.22 mgd peak I/I needed to eliminate project
- Other Impacts:
  - Reduced pumping costs
  - Reduced treatment costs
  - Storage at the Treatment Plan
  - R/R program due to age/condition
- Cost to Avoided Cost ratio:
  - 5.24
- Recommendation:
  - Not recommended unless:
    - Other saved costs are significant
    - Other nearby I/I projects have a better cost/avoided cost ratio, then this one could make sense due to impact on project SS-11

I/I 1, 2, and 3 Cumulative (this combines the first three I/I reduction projects to understand cumulative impact)

- Area:
  - Upstream of capacity Projects SS-4, SS-9, SS-12, and SS-16
- Impact:
  - 1.22 mgd I/I reduction
- Cost:
  - **$17,040,000**
- Cost of Avoided Capacity Projects:
  - SS-4 - $1,090,000
  - SS-9 - $1,240,000
  - SS-11 – $1,580,000
  - SS-12 - $2,130,000
  - SS-16 – $1,020,000
  - **Total: $7,060,000**
- Other Projects Impacted:
  - SS-1 – very small impact, if any, on this project
- Other Impacts:
  - Reduced pumping costs
  - Reduced treatment costs
  - Storage at the Treatment Plan
  - R/R program due to age/condition
- Cost to Avoided Cost ratio:

- 2.41
- Recommendation:
  - Not recommended unless:
    - Other saved costs are significant

I/I 4 – West

- Area:
  - Upstream of capacity Project SS-17
- Impact:
  - 0.29 mgd I/I reduction
- Cost:
  - **$2,500,000**
- Cost of Avoided Capacity Projects:
  - SS-17 - $460,000
- Other Projects Impacted:
  - None
- Other Impacts:
  - Reduced pumping costs
  - Reduced treatment costs
  - Storage at the Treatment Plan
  - R/R program due to age/condition
- Cost to Avoided Cost ratio:
  - 5.43
- Recommendation:
  - Not recommended unless:
    - Other saved costs are significant

I/I 5 – South A and B

- Area:
  - Upstream of capacity Projects SS-14 and SS-18
- Impact:
  - 0.14 mgd I/I reduction
- Cost:
  - **$3,660,000**
- Cost of Avoided Capacity Projects:
  - SS-14 - $3,870,000
  - SS-18 – $660,000
  - **Total: $4,530,000**
- Other Projects Impacted:
  - SS-6 – very small impact, if any, on this project
  - SS-10 – very small impact, if any, on this project
- Other Impacts:
  - Reduced pumping costs
  - Reduced treatment costs
  - Storage at the Treatment Plant
  - R/R program due to age/condition
- Cost to Avoided Cost ratio:
  - 0.81

- Recommendation:
  - Recommended, but:
    - Both projects eliminated are low priority and driven by development
      - Even once the developments occur, the projects are low priority



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Appendix K – Recommended CIP Project Opinions of Probable Cost

This appendix contains the opinion of probable cost for the recommended CIP projects. Note that the opinion of probable cost for I/I reduction projects used in the I/I analysis (Appendix J) and cost comparison are also included and have project IDs I/I 1 through I/I 5.



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I/I-1 - I&I Reduction in Basin Bell Village A - Phase I

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Target 35% reduction of I/I in Basin Bell Village A (0.33 mgd of peak I/I)					
Mobilization and Demobilization (6%)		1	LS	$145,000	$145,000
Temporary Traffic Control (5%)		1	LS	$121,000	$121,000
Temporary Bypass Pumping		1	LS	$203,000	$203,000
Cleaning and CCTV Inspection		7,370	LF	$10	$73,700
4" Pipe - CIPP Rehabilitation (44% of system)	4	610	LF	$48	$29,280
6" Pipe - CIPP Rehabilitation (44% of system)	6	3,330	LF	$72	$239,760
8" Pipe - CIPP Rehabilitation (44% of system)	8	3,090	LF	$96	$296,640
10" Pipe - CIPP Rehabilitation (44% of system)	10	340	LF	$120	$40,800
Sewer Lateral Rehabilitation (44% of system laterals)		160	EA	$8,000	$1,280,000
Sewer Manhole Rehabilitation (44% of system manholes)		41	EA	$6,000	$246,750
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$2,676,000
Construction Subtotal (Rounded)					$2,680,000
Contingency (25%) (Rounded)					$670,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$3,350,000**

Design, Survey, Geotechnical, Environmental Review, Permits (20% of Construction) [2]	$670,000
Inspection/CM/ESDC (12% of Construction)	$402,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$4,430,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Design Services includes Pre- and Post-Construction I/I Assessment.

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ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

I/I-2 - I&I Reduction in Basin Bell Village A - Phase II

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Target 40% reduction of I/I in Basin Bell Village A (0.17 mgd of peak I/I)					
Mobilization and Demobilization (6%)		1	LS	$51,000	$51,000
Temporary Traffic Control (5%)		1	LS	$43,000	$43,000
Temporary Bypass Pumping		1	LS	$58,000	$58,000
Cleaning and CCTV Inspection		2,240	LF	$10	$22,400
4" Pipe - CIPP Rehabilitation (50% of system)	4	310	LF	$48	$14,880
6" Pipe - CIPP Rehabilitation (50% of system)	6	1,450	LF	$72	$104,400
8" Pipe - CIPP Rehabilitation (50% of system)	8	480	LF	$96	$46,080
Sewer Lateral Rehabilitation (50% of system laterals)		40	EA	$8,000	$320,000
Sewer Manhole Rehabilitation (50% of system manholes)		47	EA	$6,000	$282,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$942,000
Construction Subtotal (Rounded)					$950,000
Contingency (25%) (Rounded)					$238,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,190,000**

Design, Survey, Geotechnical, Environmental Review, Permits (20% of Construction) [2]	$238,000
Inspection/CM/ESDC (12% of Construction)	$142,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$1,580,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Design Services includes Pre- and Post-Construction I/I Assessment.

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ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

II-3 - I&I Reduction in Basins North A, B, D, and E

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Target 37% reduction of I/I in Basins North A, B, D, and E (0.72 mgd of peak I/I)					
Mobilization and Demobilization (6%)		1	LS	$216,000	$216,000
Temporary Traffic Control (5%)		1	LS	$180,000	$180,000
Temporary Bypass Pumping		1	LS	$578,000	$578,000
Cleaning and CCTV Inspection		20,540	LF	$10	$205,400
4" Pipe - CIPP Rehabilitation (46% of system)	4	1,290	LF	$48	$61,920
6" Pipe - CIPP Rehabilitation (46% of system)	6	13,760	LF	$72	$990,720
8" Pipe - CIPP Rehabilitation (46% of system)	8	2,620	LF	$96	$251,520
10" Pipe - CIPP Rehabilitation (46% of system)	10	2,870	LF	$120	$344,400
15" Pipe - CIPP Rehabilitation (46% of system)	15	1,290	LF	$180	$232,200
Sewer Lateral Rehabilitation (46% of system laterals)		43	EA	$8,000	$347,800
Sewer Manhole Rehabilitation (46% of system manholes)		96	EA	$6,000	$574,425
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$3,983,000
Construction Subtotal (Rounded)					$3,990,000
Contingency (25%) (Rounded)					$998,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$4,990,000**

Design, Survey, Geotechnical, Environmental Review, Permits (20% of Construction) [2]	$998,000
Inspection/CM/ESDC (12% of Construction)	$598,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$6,590,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Design Services includes Pre- and Post-Construction I/I Assessment.

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I/I-4 - I&I Reduction in Basin West

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Target 31% reduction of I/I in Basin West (0.29 mgd of peak I/I)					
Mobilization and Demobilization (6%)		1	LS	$70,000	$70,000
Temporary Traffic Control (5%)		1	LS	$59,000	$59,000
Temporary Bypass Pumping		1	LS	$116,000	$116,000
Cleaning and CCTV Inspection		3,840	LF	$10	$38,400
6" Pipe - CIPP Rehabilitation (39% of system)	6	60	LF	$72	$4,320
8" Pipe - CIPP Rehabilitation (39% of system)	8	3,610	LF	$96	$346,560
12" Pipe - CIPP Rehabilitation (39% of system)	12	170	LF	$144	$24,480
15" Pipe - CIPP Rehabilitation (39% of system)	15	1,020	LF	$180	$183,600
Sewer Lateral Rehabilitation (39% of system laterals)		36	EA	$8,000	$291,400
Sewer Manhole Rehabilitation (39% of system manholes)		26	EA	$6,000	$158,100
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,292,000
Construction Subtotal (Rounded)					$1,300,000
Contingency (25%) (Rounded)					$325,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,630,000**

Design, Survey, Geotechnical, Environmental Review, Permits (20% of Construction) [2]	$326,000
Inspection/CM/ESDC (12% of Construction)	$195,600
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,160,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Design Services includes Pre- and Post-Construction I/I Assessment.

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ENR Construction Cost Index:	
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Date: 6/12/2020

I/I-5 - I&I Reduction in Basins South A and B

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Target 25% reduction of I/I in Basin South B (0.03 mgd of peak I/I) and 13% reduction of I/I in Basin South A (0.11 mgd of peak I/I)					
Mobilization and Demobilization (6%)		1	LS	$115,000	$115,000
Temporary Traffic Control (5%)		1	LS	$96,000	$96,000
Temporary Bypass Pumping		1	LS	$203,000	$203,000
Cleaning and CCTV Inspection		6,760	LF	$10	$67,600
4" Pipe - CIPP Rehabilitation (16% of system in South A)	4	60	LF	$48	$2,880
6" Pipe - CIPP Rehabilitation (16% of system in South A; 31% of system in South B)	6	5,390	LF	$72	$388,080
8" Pipe - CIPP Rehabilitation (16% of system in South A; 31% of system in South B)	8	690	LF	$96	$66,240
12" Pipe - CIPP Rehabilitation (16% of system in South A)	12	680	LF	$144	$97,920
14" Pipe - CIPP Rehabilitation (50% of system)	14	-	LF	$168	
Sewer Lateral Rehabilitation (16% of system laterals in South A; 31% of system laterals in South B)		110	EA	$8,000	$880,000
Sewer Manhole Rehabilitation ((16% of system manholes in South A; 31% of system manholes in South B)		34	EA	$6,000	$205,313
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$2,123,000
Construction Subtotal (Rounded)					$2,130,000
Contingency (25%) (Rounded)					$533,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$2,670,000**

Design, Survey, Geotechnical, Environmental Review, Permits (20% of Construction) [2]	$534,000
Inspection/CM/ESDC (12% of Construction)	$320,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$3,530,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Design Services includes Pre- and Post-Construction I/I Assessment.

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SS-1 - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$135,000	$135,000
Temporary Traffic Control (10%)		1	LS	$225,000	$225,000
Potholing		1	LS	$29,000	$29,000
Shoring and Trench Safety		1	LS	$48,000	$48,000
Dewatering		1	LS	$144,000	$144,000
Temporary Bypass Pumping		1	LS	$120,000	$120,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$24,000	$24,000
24" Pipe (invert 10' or less)	24	1,613	LF	$570	$919,410
24" Pipe (invert over 10' to 18')	24	782	LF	$620	$484,840
60" Manholes for 18" - 36" Pipes (invert 10' or less)		8	EA	$25,000	$200,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		4	EA	$35,000	$140,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$167,000	$167,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$2,637,000
Construction Subtotal (Rounded)					$2,640,000
Contingency (25%) (Rounded)					$660,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$3,300,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$825,000
Inspection/CM/ESDC (12% of Construction)	$396,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$4,530,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-2 - Increase Capacity

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$89,000	$89,000
Temporary Traffic Control (5%)		1	LS	$75,000	$75,000
Potholing		1	LS	$22,000	$22,000
Shoring and Trench Safety		1	LS	$36,000	$36,000
Dewatering		1	LS	$108,000	$108,000
Temporary Bypass Pumping		1	LS	$100,000	$100,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$18,000	$18,000
12" Pipe (invert 10' or less)	12	501	LF	$420	$210,420
18" Pipe (invert 10' or less)	18	595	LF	$495	$294,525
18" Pipe (invert over 10' to 18')	18	700	LF	$545	$381,500
48" Manholes for 10" - 15" Pipes (invert 10' or less)		2	EA	$16,000	$32,000
60" Manholes for 18" - 36" Pipes (invert 10' or less)		2	EA	$25,000	$50,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		4	EA	$35,000	$140,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$110,000	$110,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,667,000
Construction Subtotal (Rounded)					$1,670,000
Contingency (25%) (Rounded)					$418,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$2,090,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$522,500
Inspection/CM/ESDC (12% of Construction)	$250,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,870,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-3 Existing - Increase Capacity

ENR Construction Cost Index:	
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Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$29,000	$29,000
Temporary Traffic Control (5%)		1	LS	$25,000	$25,000
Potholing		1	LS	$10,000	$10,000
Shoring and Trench Safety		1	LS	$16,000	$16,000
Dewatering		1	LS	$48,000	$48,000
Temporary Bypass Pumping		1	LS	$40,000	$40,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$8,000	$8,000
8" Pipe (invert 10' or less)	8	788	LF	$320	$252,160
48" Manholes for 10" - 15" Pipes (invert 10' or less)		5	EA	$16,000	$80,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$36,000	$36,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$545,000
Construction Subtotal (Rounded)					$550,000
Contingency (25%) (Rounded)					$138,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$690,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$172,500
Inspection/CM/ESDC (12% of Construction)	$82,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$950,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
Apr-20	12,816.67

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SS-3 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$7,000	$7,000
Temporary Traffic Control (5%)		1	LS	$6,000	$6,000
Potholing		1	LS	$3,000	$3,000
Shoring and Trench Safety		1	LS	$4,000	$4,000
Dewatering		1	LS	$11,000	$11,000
Temporary Bypass Pumping		1	LS	$10,000	$10,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$2,000	$2,000
8" Pipe (invert 10' or less)	8	178	LF	$320	$56,960
48" Manholes for 10" - 15" Pipes (invert 10' or less)		1	EA	$16,000	$16,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$8,000	$8,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$124,000
Construction Subtotal (Rounded)					$130,000
Contingency (25%) (Rounded)					$33,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$170,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$42,500
Inspection/CM/ESDC (12% of Construction)	$20,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$240,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-4 - Increase Capacity

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$34,000	$34,000
Temporary Traffic Control (5%)		1	LS	$28,000	$28,000
Potholing		1	LS	$9,000	$9,000
Shoring and Trench Safety		1	LS	$14,000	$14,000
Dewatering		1	LS	$42,000	$42,000
Temporary Bypass Pumping		1	LS	$40,000	$40,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$7,000	$7,000
15" Pipe (invert over 10' to 18')	15	697	LF	$470	$327,590
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		4	EA	$20,000	$80,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$41,000	$41,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$623,000
Construction Subtotal (Rounded)					$630,000
Contingency (25%) (Rounded)					$158,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$790,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$197,500
Inspection/CM/ESDC (12% of Construction)	$94,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$1,090,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

SS-5 Existing - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$3,000	$3,000
Temporary Traffic Control (5%)		1	LS	$3,000	$3,000
Potholing		1	LS		
Shoring and Trench Safety		1	LS		
Dewatering		1	LS		
Temporary Bypass Pumping		1	LS		
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS		
12" Pipe (invert over 10' to 18')	12	-	LF	$445	
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$4,000	$4,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$50,000
Construction Subtotal (Rounded)					$50,000
Contingency (25%) (Rounded)					$13,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$70,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$17,500
Inspection/CM/ESDC (12% of Construction)	$8,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$100,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

SS-5 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$3,000	$3,000
Temporary Traffic Control (5%)		1	LS	$3,000	$3,000
Potholing		1	LS		
Shoring and Trench Safety		1	LS		
Dewatering		1	LS		
Temporary Bypass Pumping		1	LS		
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS		
12" Pipe (invert over 10' to 18')	12	-	LF	$445	
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$4,000	$4,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$50,000
Construction Subtotal (Rounded)					$50,000
Contingency (25%) (Rounded)					$13,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$70,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$17,500
Inspection/CM/ESDC (12% of Construction)	$8,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$100,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-6 Existing - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$67,000	$67,000
Temporary Traffic Control (5%)		1	LS	$56,000	$56,000
Potholing		1	LS	$17,000	$17,000
Shoring and Trench Safety		1	LS	$28,000	$28,000
Dewatering		1	LS	$83,000	$83,000
Temporary Bypass Pumping		1	LS	$70,000	$70,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$14,000	$14,000
15" Pipe (invert over 10' to 18')	15	360	LF	$470	$169,200
18" Pipe (invert over 10' to 18')	18	1,020	LF	$545	$555,900
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		2	EA	$35,000	$70,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$83,000	$83,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,254,000
Construction Subtotal (Rounded)					$1,260,000
Contingency (25%) (Rounded)					$315,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,580,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$395,000
Inspection/CM/ESDC (12% of Construction)	$189,600
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,170,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

Town of Windsor
Sewer Collection System Master Plan
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ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

SS-6 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$83,000	$83,000
Temporary Traffic Control (5%)		1	LS	$69,000	$69,000
Potholing		1	LS	$19,000	$19,000
Shoring and Trench Safety		1	LS	$31,000	$31,000
Dewatering		1	LS	$92,000	$92,000
Temporary Bypass Pumping		1	LS	$80,000	$80,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$16,000	$16,000
15" Pipe (invert over 10' to 18')	15	499	LF	$470	$234,530
18" Pipe (invert over 10' to 18')	18	1,020	LF	$545	$555,900
Upsize Existing CIP Project 15" to 18" (invert over 10' to 18')	18	360	LF	$50	$18,000
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		5	EA	$35,000	$175,000
Upsize Existing CIP Project 15" to 18" (invert over 10' to 18')		2	EA	$15,000	$30,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$100,000	$100,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,544,000
Construction Subtotal (Rounded)					$1,550,000
Contingency (25%) (Rounded)					
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,550,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$387,500
Inspection/CM/ESDC (12% of Construction)	$186,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,130,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-7 - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$27,000	$27,000
Temporary Traffic Control (5%)		1	LS	$23,000	$23,000
Potholing		1	LS	$5,000	$5,000
Shoring and Trench Safety		1	LS	$8,000	$8,000
Dewatering		1	LS	$24,000	$24,000
Temporary Bypass Pumping		1	LS	$20,000	$20,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$4,000	$4,000
24" Pipe (invert over 10' to 18')	24	399	LF	$620	$247,380
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		3	EA	$35,000	$105,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$33,000	$33,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$497,000
Construction Subtotal (Rounded)					$500,000
Contingency (25%) (Rounded)					$125,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$630,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$157,500
Inspection/CM/ESDC (12% of Construction)	$75,600
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$870,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-8 Existing - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$15,000	$15,000
Temporary Traffic Control (5%)		1	LS	$13,000	$13,000
Potholing		1	LS	$3,000	$3,000
Shoring and Trench Safety		1	LS	$5,000	$5,000
Dewatering		1	LS	$14,000	$14,000
Temporary Bypass Pumping		1	LS	$20,000	$20,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$3,000	$3,000
15" Pipe (invert over 10' to 18')	15	223	LF	$470	$104,810
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		4	EA	$20,000	$80,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$19,000	$19,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$277,000
Construction Subtotal (Rounded)					$280,000
Contingency (25%) (Rounded)					$70,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$350,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$87,500
Inspection/CM/ESDC (12% of Construction)	$42,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$480,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-8 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$5,000	$5,000
Temporary Traffic Control (5%)		1	LS	$4,000	$4,000
Potholing		1	LS	$1,000	$1,000
Shoring and Trench Safety		1	LS	$1,000	$1,000
Dewatering		1	LS	$2,000	$2,000
Temporary Bypass Pumping		1	LS	$10,000	$10,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$1,000	$1,000
15" Pipe (invert over 10' to 18')	15	21	LF	$470	$9,870
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$6,000	$6,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$80,000
Construction Subtotal (Rounded)					$80,000
Contingency (25%) (Rounded)					$20,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$100,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$25,000
Inspection/CM/ESDC (12% of Construction)	$12,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$140,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-9 - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$36,000	$36,000
Temporary Traffic Control (12%)		1	LS	$80,000	$80,000
Potholing		1	LS	$7,000	$7,000
Shoring and Trench Safety		1	LS	$12,000	$12,000
Dewatering		1	LS	$60,000	$60,000
Temporary Bypass Pumping		1	LS	$80,000	$80,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$6,000	$6,000
18" Pipe (invert over 10' to 18')	18	581	LF	$545	$316,645
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		2	EA	$35,000	$70,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$44,000	$44,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$712,000
Construction Subtotal (Rounded)					$720,000
Contingency (25%) (Rounded)					$180,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$900,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$225,000
Inspection/CM/ESDC (12% of Construction)	$108,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$1,240,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-10 - Increase Capacity

ENR Construction Cost Index:	
Apr-20	12,816.67

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Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$72,000	$72,000
Temporary Traffic Control (5%)		1	LS	$60,000	$60,000
Potholing		1	LS	$14,000	$14,000
Shoring and Trench Safety		1	LS	$23,000	$23,000
Dewatering		1	LS	$68,000	$68,000
Temporary Bypass Pumping		1	LS	$60,000	$60,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$12,000	$12,000
24" Pipe (invert over 10' to 18')	24	1,130	LF	$620	$700,600
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		7	EA	$35,000	$245,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$89,000	$89,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,344,000
Construction Subtotal (Rounded)					$1,350,000
Contingency (25%) (Rounded)					$338,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,690,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$422,500
Inspection/CM/ESDC (12% of Construction)	$202,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,320,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-11 Existing - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$14,000	$14,000
Temporary Traffic Control (5%)		1	LS	$12,000	$12,000
Potholing		1	LS	$2,000	$2,000
Shoring and Trench Safety		1	LS	$3,000	$3,000
Dewatering		1	LS	$8,000	$8,000
Temporary Bypass Pumping		1	LS	$10,000	$10,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$2,000	$2,000
24" Pipe (invert over 10' to 18')	24	122	LF	$620	$75,640
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		3	EA	$35,000	$105,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$17,000	$17,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$249,000
Construction Subtotal (Rounded)					$250,000
Contingency (25%) (Rounded)					$63,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$320,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$80,000
Inspection/CM/ESDC (12% of Construction)	$38,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$440,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-11 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$35,000	$35,000
Temporary Traffic Control (5%)		1	LS	$29,000	$29,000
Potholing		1	LS	$8,000	$8,000
Shoring and Trench Safety		1	LS	$12,000	$12,000
Dewatering		1	LS	$36,000	$36,000
Temporary Bypass Pumping		1	LS	$30,000	$30,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$6,000	$6,000
24" Pipe (invert 10' or less)	24	217	LF	$570	$123,690
24" Pipe (invert over 10' to 18')	24	376	LF	$620	$233,120
60" Manholes for 18" - 36" Pipes (invert 10' or less)		1	EA	$25,000	$25,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		2	EA	$35,000	$70,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$43,000	$43,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$651,000
Construction Subtotal (Rounded)					$660,000
Contingency (25%) (Rounded)					$165,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$830,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$207,500
Inspection/CM/ESDC (12% of Construction)	$99,600
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$1,140,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-12 - Increase Capacity

ENR Construction Cost Index:	
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Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$66,000	$66,000
Temporary Traffic Control (5%)		1	LS	$55,000	$55,000
Potholing		1	LS	$21,000	$21,000
Shoring and Trench Safety		1	LS	$35,000	$35,000
Dewatering		1	LS	$104,000	$104,000
Temporary Bypass Pumping		1	LS	$90,000	$90,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$18,000	$18,000
10" Pipe (invert 10' or less)	10	1,729	LF	$370	$639,730
48" Manholes for 10" - 15" Pipes (invert 10' or less)		8	EA	$16,000	$128,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$82,000	$82,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$1,239,000
Construction Subtotal (Rounded)					$1,240,000
Contingency (25%) (Rounded)					$310,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$1,550,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$387,500
Inspection/CM/ESDC (12% of Construction)	$186,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$2,130,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-13 - Increase Capacity

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$7,000	$7,000
Temporary Traffic Control (5%)		1	LS	$6,000	$6,000
Potholing		1	LS	$2,000	$2,000
Shoring and Trench Safety		1	LS	$3,000	$3,000
Dewatering		1	LS	$7,000	$7,000
Temporary Bypass Pumping		1	LS	$10,000	$10,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$2,000	$2,000
10" Pipe (invert 10' or less)	10	114	LF	$370	$42,180
48" Manholes for 10" - 15" Pipes (invert 10' or less)		2	EA	$16,000	$32,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$8,000	$8,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$120,000
Construction Subtotal (Rounded)					$120,000
Contingency (25%) (Rounded)					$30,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$150,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$37,500
Inspection/CM/ESDC (12% of Construction)	$18,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$210,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-14 - Increase Capacity

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$120,000	$120,000
Temporary Traffic Control (5%)		1	LS	$100,000	$100,000
Potholing		1	LS	$30,000	$30,000
Shoring and Trench Safety		1	LS	$49,000	$49,000
Dewatering		1	LS	$147,000	$147,000
Temporary Bypass Pumping		1	LS	$130,000	$130,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$25,000	$25,000
15" Pipe (invert over 10' to 18')	15	680	LF	$470	$319,600
18" Pipe (invert over 10' to 18')	18	1,761	LF	$545	$959,745
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		2	EA	$20,000	$40,000
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		5	EA	$35,000	$175,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$148,000	$148,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$2,244,000
Construction Subtotal (Rounded)					$2,250,000
Contingency (25%) (Rounded)					$563,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$2,820,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$705,000
Inspection/CM/ESDC (12% of Construction)	$338,400
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$3,870,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-15 - Increase Capacity

ENR Construction Cost Index:	
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Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$26,000	$26,000
Temporary Traffic Control (5%)		1	LS	$22,000	$22,000
Potholing		1	LS	$5,000	$5,000
Shoring and Trench Safety		1	LS	$8,000	$8,000
Dewatering		1	LS	$24,000	$24,000
Temporary Bypass Pumping		1	LS	$20,000	$20,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$4,000	$4,000
18" Pipe (invert 10' or less)	18	396	LF	$495	$196,020
60" Manholes for 18" - 36" Pipes (invert over 10' to 18')		4	EA	$35,000	$140,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$32,000	$32,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$478,000
Construction Subtotal (Rounded)					$480,000
Contingency (25%) (Rounded)					$120,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$600,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$150,000
Inspection/CM/ESDC (12% of Construction)	$72,000
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$830,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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SS-16 - Increase Capacity

ENR Construction Cost Index:	
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Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$32,000	$32,000
Temporary Traffic Control (5%)		1	LS	$27,000	$27,000
Potholing		1	LS	$9,000	$9,000
Shoring and Trench Safety		1	LS	$15,000	$15,000
Dewatering		1	LS	$45,000	$45,000
Temporary Bypass Pumping		1	LS	$40,000	$40,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$8,000	$8,000
10" Pipe (invert over 10' to 18')	10	749	LF	$420	$314,580
48" Manholes for 10" - 15" Pipes (invert over 10' to 18')		3	EA	$20,000	$60,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$39,000	$39,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$590,000
Construction Subtotal (Rounded)					$590,000
Contingency (25%) (Rounded)					$148,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$740,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$185,000
Inspection/CM/ESDC (12% of Construction)	$88,800
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$1,020,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.

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ENR Construction Cost Index:	
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SS-17- Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$13,000	$13,000
Temporary Traffic Control (5%)		1	LS	$11,000	$11,000
Potholing		1	LS	$3,000	$3,000
Shoring and Trench Safety		1	LS	$5,000	$5,000
Dewatering		1	LS	$13,000	$13,000
Temporary Bypass Pumping		1	LS	$20,000	$20,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$3,000	$3,000
Cleaning and CCTV Inspection		206	LF	$10	$2,060
15" Pipe (invert 18' or more)	15	206	LF	$450	$92,700
48" Manholes for 10" - 15" Pipes (invert 18' or more)		3	EA	$25,000	$75,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$17,000	$17,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$255,000
Construction Subtotal (Rounded)					$260,000
Contingency (25%) (Rounded)					
Total Estimate of Probable Construction Cost (Rounded) [1]					**$260,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$65,000
Inspection/CM/ESDC (12% of Construction)	$31,200
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$360,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.
(2) Does not include abatement/removal cost for Asbestos Concrete Pipe (ACP).

Town of Windsor
Sewer Collection System Master Plan
Planning Level Opinion of Probable Cost

ENR Construction Cost Index:	
Apr-20	12,816.67

Date: 6/12/2020

SS-18 Future - Increase Capacity

Description	Diameter (in)	Quantity	Unit	Unit Cost	Total Cost
Mobilization and Demobilization (6%)		1	LS	$20,000	$20,000
Temporary Traffic Control (5%)		1	LS	$17,000	$17,000
Potholing		1	LS	$8,000	$8,000
Shoring and Trench Safety		1	LS	$12,000	$12,000
Dewatering		1	LS	$36,000	$36,000
Temporary Bypass Pumping		1	LS	$30,000	$30,000
Handling, Treatment, and Disposal of Contaminated Soil and GW		1	LS	$6,000	$6,000
8" Pipe (invert 10' or less)	8	593	LF	$320	$189,760
48" Manholes for 10" - 15" Pipes (invert 10' or less)		2	EA	$16,000	$32,000
Misc. Utility Relocations and Lateral/Service Replacements		1	LS	$25,000	$25,000
TOTAL ESTIMATE OF PROBABLE CONSTRUCTION COST					
Subtotal (Rounded)					$376,000
Construction Subtotal (Rounded)					$380,000
Contingency (25%) (Rounded)					$95,000
Total Estimate of Probable Construction Cost (Rounded) [1]					**$480,000**

Design, Survey, Geotechnical, Environmental Review, Permits (25% of Construction)	$120,000
Inspection/CM/ESDC (12% of Construction)	$57,600
Easement/Land Acquisition [1]	0
Project Total (Rounded)	**$660,000**

Notes:
(1) Does not include property acquisition, permit costs, or City degredation fees.