Downtown Specific Plan (DSP) Amendments Project
Utility Impact Study

Prepared for
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and

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Executive Summary

Schaaf & Wheeler has been retained by David J. Powers & Associates to determine impacts from the Downtown Specific Plan (DSP) Amendments Project (Project) on the City of Sunnyvale's (City) water and sanitary sewer systems as part of the CEQA documentation for the project. The DSP encompasses 125 acres bounded by the railroad/Caltrain tracks to the north, Bayview Avenue to the east, El Camino Real to the south, and Charles Street to the west (Figure A-1). The DSP is split into 22 Blocks, with Block 18 divided into six smaller sub-blocks. The Project proposes amendments to six sites within three Blocks of the DSP (Blocks 1a, 18, and 22) to change the land use mix and intensity of development.

Project impacts are analyzed for both Existing and Future Cumulative Condition for the water system. Hydraulic models simulating pre- and post-Project development scenarios are performed to examine hydraulic deficiencies. The Existing and Future Cumulative Condition models are based on models originally developed for the *Water Utility Master Plan* (WUMP; IEC, 2010) and later updated as part of the *Potable Water System Comprehensive Preliminary Design Study* Report (CPDS; Hydroscience, 2013). Both models are further updated using Innovyze InfoWater software to reflect recent pipeline construction within the DSP area. The Future Cumulative Condition model includes Capital Improvement Projects (CIPs) and other recommended pipeline upsizing from the WUMP.

Project impacts to the sewer system are analyzed for Existing and Future Cumulative Conditions. Hydraulic models simulating pre- and post-Project development scenarios are performed to examine hydraulic deficiencies. The Existing Condition sewer model is based on the *Wastewater Collection System Master Plan* (WWMP; IEC, December 2015) with updates to the DSP area based on surveyed manholes and invert elevations. The model also includes the 2015 WWMP recommended CIP 9, closing of the pipe segment at Fair Oaks Railroad crossing, as an existing condition as directed by the City since this project is expected to be completed in the next year.

The Future Cumulative Condition sewer model is based on the 2015 WWMP 25-year scenario (2035) in the model. The model does not include any of the recommended sewer CIPs in the 2015 WWMP, except for CIP 9 as previously stated, since these improvement projects are not scheduled or budgeted to be built. Both models are updated using Innovyze InfoSWMM software. DSP CIPs are then added to the Future Cumulative Condition model after the post-Project development scenario is performed in order to alleviate hydraulic deficiencies in the sewer system.

Water System Project Impacts

The Project development does not significantly impact the water system under peak hour demand (PHD) at Existing Condition. Under the Future Cumulative Condition, assuming all of the CIPs and pipeline upsizing projects recommended in the WUMP have been constructed, the system also meets performance criteria under PHD pre- and post-Project.

The anticipated fire flow requirements are met during Existing and Future Cumulative Condition within the Project area. The Project fire flow requirement used in this analysis is based on fire flow requirements developed as part of the WUMP. The actual fire flow requirements may change as the planning process continues and

Project specific requirements are determined by the City Fire Marshal. If the Project conditions require higher fire flow than what is analyzed, revised modeling should be conducted.

To be consistent with the WUMP and CPDS, these results assume limited controls on the turnouts from the City's water wholesalers. As demands increase in the future, the City should be aware of the turnout capacity and system operational constraints to ensure adequate pressures are maintained.

Sewer System Project Impacts

The sewer system does not meet City performance design criteria in the Existing Condition with or without the estimated increase in incremental Project flow downstream of the project sites. In the Pre-Project condition, model results indicate that 42 pipe segments (approximately 10,477 feet of pipe) do not meet the d/D performance criteria along the sewer conveyance path and 4 of the 42 pipe segments are at risk of surcharging. City performance criteria defines a pipe as not meeting standards when flow depth to pipe diameter ratio is greater than 0.75 for 12 inch and larger diameter pipes and when flow depth ratio is greater than 0.5 for 10 inch and smaller diameter pipes. For surcharged pipes, adjacent manholes are then analyzed to determine the water level below the rim elevation. Model results indicate that 3 manholes have water levels 5 to 10 feet below the rim elevation. With the Project development, 48 pipe segments (approximately 11,340 feet of pipe) are deficient with 4 (approximately 876 feet of pipe) of the total 48 pipe segments at risk of surcharging. Model results also indicate that 5 manholes have water levels 5 to 10 feet below rim elevation.

In the Future Cumulative Condition, 70 pipe segments (approximately 16,379 feet of pipe) do not meet d/D performance criteria along the sewer conveyance path downstream of the Project. 20 of the total 70 pipe segments are at risk of surcharging. Model results indicate that 3 manholes have water levels 1 to 5 feet below rim elevation, 13 manholes have water levels 5 to 10 feet below rim elevation, and 3 manholes have water levels 10 to 20 feet below rim elevation. Schaaf & Wheeler recommends constructing nine CIPs (DSP-1 through DSP-9) in order to meet City performance criteria along the downtown specific plan area conveyance path. The recommended CIPs are grouped into three planning horizons: 0 to 5 years, 5 to 10 years, and 10 or more years based on the prioritization criteria to help the City with prioritizing CIPs affected by the downtown specific plan area. Total estimated project construction cost for each of the nine recommended CIPs is provided. ADWF is used to compare the flow contribution between development project and non-development project (City) for pipe segments that are identified as needing Capital Improvements. The comparison is presented in terms of percent of total flow. Future development projects that contribute flow to pipes that are identified as requiring improvements will be required to contribute their fair share for funding Capital Improvement Projects.

Chapter 1. Introduction

1.1. Project Description

The Downtown Specific Plan Amendments Project (Project) encompasses 125 acres, bounded by the railroad/Caltrain tracks to the north, Bayview Avenue to the east, El Camino Real to the south, and Charles Street to the west (Figure A-1). Currently, the area is distinguished by transit mixed use developments that include a mix of residential uses at various densities, high-intensity commercial uses, regional commercial uses, and office uses located near rail stops and other mass transit situated on 22 blocks and organized into "Downtown Districts".

The Downtown Specific Plan Amendments, however, describes a vision for an increased commercial and office land use in 3 of the 22 downtown blocks. The Project area is split into six development sites that define the desired character and amount of land uses within the different parts of the Project area. The buildout of the project sites under the DSP with the proposed amendments for the Project will result in a net increase of 750 residential units, 79,063 square feet of commercial uses, 842,728 square feet of office uses, and a net decrease of 200 hotel rooms compared to the currently adopted DSP. Table 1-1 summarizes the existing project development levels at the 6 project sites versus the proposed project development levels. Table 1-2 summarizes the project development levels at the 6 project sites in the currently adopted DSP versus the DSP with proposed amendments.

Table 1-1: Summary of Existing and Proposed Development on the Six Project Sites

Development Site	Existing[1]			Proposed		
	Housing (units)	Commercial (SF)	Office (SF)	Housing (units)	Commercial (SF)	Office (SF)
100 Altair Way (Block 1a/1)	20	4,000	8,000	0	0	134,324
300 Mathilda Ave (Sub-block 1)	0	0	0	0	10,700	172,200
300 W.Washington Ave (Sub-block 2)	0	0	0	1	0	0
Macy's & Redwood Sq. (Sub-block 3)	0	177,000	0	400	188,178	485,000
Sub-block 6	0	0	0	392	61,185	0
Murphy Square (Block 22)	0	0	0	0	0	69,100
Total	**20**	**181,000**	**8,000**	**793**	**260,063**	**860,624**

[1]Existing Development depicts existing structures that will be removed to accommodate the proposed development

Source: David J. Powers & Associates

Table 1-2: Summary of Allowed by Adopted DSP and Allowed by DSP with Proposed Amendments

Development Site	Allowed by Adopted DSP				Allowed by DSP with Proposed Amendments			
	Housing (units)	Commercial (SF)	Office (SF)	Hotel (rooms)	Housing (units)	Commercial (SF)	Office (SF)	Hotel (rooms)
100 Altair Way (Block 1a/1)	43	4,000	8,000	0	0	0	134,324	0
300 Mathilda Ave (Sub-block 1)	0	0	0	0	0	10,700	172,200	0
300 W.Washington Ave (Sub-block 2)	50	8,720	0	0	51	8,720	0	0
Macy's & Redwood Sq. (Sub-block 3)	0	188,178	0	200	400	188,178	485,000	0
Sub-block 6	0	61,185	0	0	392	61,185	0	0
Murphy Square (Block 22)	0	0	9,896	0	0	0	69,100	0
Total	**93**	**189,720**	**17,896**	**200**	**843**	**268,783**	**860,624**	**0**

Source: David J. Powers & Associates

1.2. Water System Analysis Approach

Project impacts are analyzed using the City's water models for two conditions: Existing and Future Cumulative. As a baseline for system performance, each condition is evaluated pre-Project for existing hydraulic deficiencies. The estimated incremental water demand resulting from Project development is added to the model and post-Project deficiencies are examined. In total, four model simulations of the water system are performed, as shown in Figure 1.

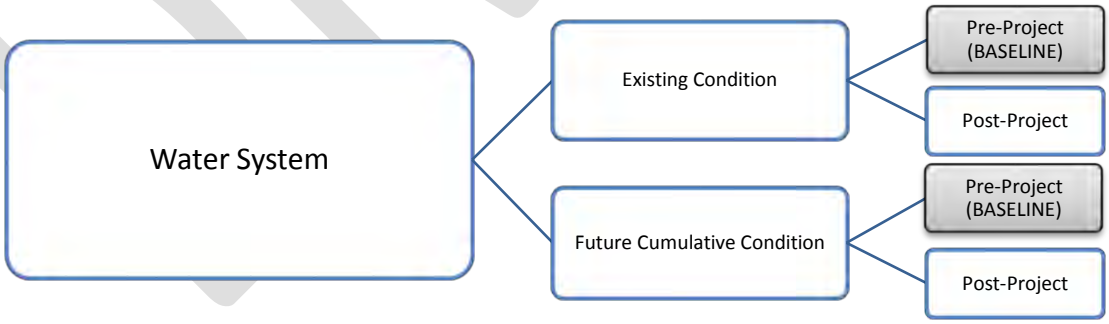


Figure 1. Water System Model Simulations

The Existing Condition model consists of the existing distribution system and operating parameters along with water demands based on existing land use from the *Water Utility Master Plan* (WUMP; IEC, 2010) as updated by the *Potable Water System Comprehensive Preliminary Design Study Report* (CPDS; Hydroscience, 2013) to

reflect current operation strategies and infrastructure. Within the Downtown Specific Plan (DSP) boundary, water demands, fire flow requirements, and the distribution system are updated to be consistent with current land use and recently constructed water pipes based on information from the *Wastewater Collection System Master Plan* (WWMP; IEC, 2015), WUMP, and as-builts and improvement plans provided by the City and BKF Engineers.

The Future Cumulative Condition water demand is based on City specific plans, Association of Bay Area Governments projections and City projections, as described in the WUMP. The Future Cumulative Condition model is based on the model originally developed for the WUMP, which was later updated as part of the CPDS to reflect current operation strategies and infrastructure. In the model, it is assumed that all of the CIPs and pipeline upsizing projects recommended in the WUMP have been constructed. Within the DSP boundary, the distribution system is updated to reflect recently constructed water pipes based on as-builts and improvement plans provided by BKF Engineers. Demands within the DSP area are also updated to reflect development types and intensities in the currently adopted DSP.

To be consistent with the WUMP and CPDS, supply from the San Francisco Public Utilities Commission and Santa Clara Valley Water District is unconstrained. As demands increase in the future, the City should evaluate turnout capacity and other supply constraints to ensure adequate pressures are maintained.

1.3. Sewer System Analysis Approach

Project impacts to the sewer system are analyzed using the City's sewer models for two conditions: Existing and Future Cumulative. As a baseline for system performance, each condition is evaluated pre-Project for existing hydraulic deficiencies. The estimated sewer flow resulting from Project development is added to the model and post-Project deficiencies are examined. In total, four model simulations of the sewer system are performed, as shown in Figure 2.

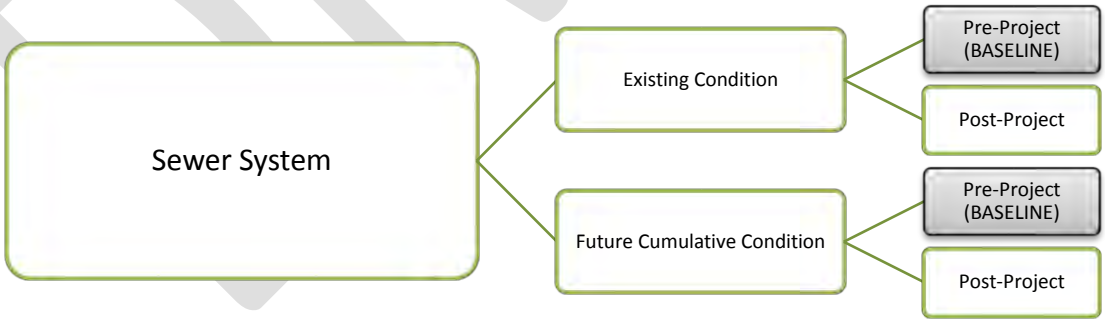


Figure 2. Sewer System Model Simulations

The Existing Condition model consists of the existing collection system and operating parameters from the *Wastewater Collection System Master Plan* (WWMP; IEC, 2015). Within the Downtown Specific Plan boundary, sewer pipe sizes, invert elevations, and flows were updated to be consistent with current land use and conditions

based on information provided in the WWMP, from field surveyed data and flow monitoring, and from David J. Powers & Associates for the six project development sites. The model also includes the 2015 WWMP recommended CIP 9, closing of the pipe segment at Fair Oaks Railroad crossing, as an existing condition. The City prefers to include CIP 9 since this project is expected to be completed in the next year.

The Future Cumulative Condition includes the operating parameters in the 25-year scenario (2035) in the model and assumes that none of the sewer system CIPs recommended in the WWMP have been constructed except for CIP 9 as previously stated. The Future Cumulative Condition sewer flows within the DSP are updated to reflect the 2013 Downtown Specific Plan Report's (DSP Report) maximum designated land uses and development intensities. This study determines sewer system improvements to meet city performance criteria and further develops CIP projects.

1.4. Report Organization

This report is organized into five following sections. Chapter 2 discusses the water demand estimates for the Project and Chapter 3 covers the impacts and capital improvement recommendations for the water system. Chapter 4 discusses the sewer flow estimates and Chapter 5 covers the capital improvement recommendations for the sewer system and estimated project costs for the recommended CIPs.

Chapter 2. Water Demand Projections

This chapter discusses the estimated water demand and required fire flow for the Project development. The proposed Project demand is added to the Existing and Future Cumulative Condition models as an incremental difference from the baseline water demand modeled at the Project site. The pre-Project baseline demand in the Existing and Future Cumulative Condition follows the methodology described in the *Water Utility Master Plan* (WUMP; IEC, 2010). Within the Project area, pre-Project baseline demand in the Existing Condition is set to match land use types and densities provided in the *Wastewater Collection System Master Plan* (WWMP; IEC, 2015). The water unit duty factor for estimating Project demand is taken from previous technical studies (2010 WUMP and 2015 WWMP) to remain consistent with the City-wide demand projections used in the hydraulic models.

Water demand in this section represents Average Daily Demand (ADD). The ADD is an estimated daily average of water use patterns that varies by season and customer type.

2.1. Project Water Demand

Project water demand is estimated using proposed land use types and densities as provided by David J. Powers & Associates and water unit duty factors developed for the City as part of the 2015 WWMP. Table 2-1 provides the demand estimation for the Project area. The Project area includes six development sites that represent a small subset within the entire DSP area. Since the Project involves moving and increasing development land use densities within the DSP area, the total DSP area water demands pre- and post-Project are used to calculate the percent increase in water demand for both Existing and Future Cumulative Conditions. The Project results in a 64% increase in water demand over the Existing Condition demand and a 27% increase in water demand over Future Cumulative Condition demands for the entire DSP area.

Table 2-1: Project Estimated Water Demand

Condition	Water Demand (gpd)
Project	395,953

2.1.1. Project Required Fire Flow

Anticipated fire flow requirements for the Project are based on fire flow requirements developed as part of the WUMP (Table 2-3 in the WUMP). The fire flow requirement for hydrants in the Project area is based on the Downtown Specific Plan land use type and is consistent with planning level fire flow rates for urban centers and denser mixed-use developments. The actual fire flow requirements may change as the planning process continues and Project specific requirements are determined by the City Fire Marshal. If the Project conditions require higher fire flow than what is analyzed, revised modeling should be conducted.

Table 2-2: Anticipated Project Fire Flow Requirements

Land Use	Required Fire Flow Rate (gpm)
Downtown Specific Plan	3,500

2.2. Existing Condition

2.2.1. Pre-Project (Baseline) Demand

The pre-Project (baseline) condition is based on existing land use types and densities provided by the David J. Powers & Associates and water unit duty factors developed for the City as part of the 2015 WWMP. Table 2-3 provides the estimated demand for existing pre-Project conditions.

Table 2-3: Baseline Demand for Existing Condition

Condition	Water Demand (gpd)
Pre-Project	67,482

2.2.2. Post-Project Incremental Demand

For the Project impact analysis in the Existing Condition, Project demand is added to the Existing Condition model as an incremental difference from the pre-Project demand. This incremental demand is spread across the Project based on the specific development levels proposed for each project site. The percent increase in water demand when comparing only the Project area demands from pre-Project to post-Project results in a 487% increase for the Existing Condition. However, when comparing the percent increase in water demand for the six developments over the entire DSP area, the percent increase in demand is 64% for the Existing Condition. The incremental Project demand in the Existing Condition is given in Table 2-4.

Table 2-4: Incremental Project Demand for Existing Condition

	Water Demand (gpd)
Pre-Project (Baseline) Demand	67,482
Project Demand	395,953
Incremental Project Demand	***+ 328,471***

2.3. Future Cumulative Condition

2.3.1. Pre-Project (Baseline) Land Use and Demand

Future Cumulative (baseline) demand for the Project sites is based on land use types and intensities under the currently adopted DSP as provided by David J. Powers & Associates. Table 2-5 presents the pre-project Future Cumulative Condition demand.

Table 2-5 – Baseline Demand for Future Cumulative Condition

Condition	Water Demand (gpd)
Pre-Project	102,707

2.3.2. Post-Project Incremental Demand

Project demand for the Future Cumulative Condition is based on the net change in water demand from the development intensities allowed by the currently adopted DSP to the development intensities allowed by the

DSP with the proposed amendments. Project demand is added to the model as an incremental difference from the pre-Project demand. The incremental Project demand in the Future Cumulative Condition is given in Table 2-6. As with the Existing Condition model, this incremental demand is spread across the Project sites according to land use types and densities developed as part of the Downtown Specific Plan Amendments. The percent increase in demand when comparing on the Project area flows from pre-Project to post-Project results in a 286% increase for the Future Cumulative Condition. However, when comparing the percent increase in water demand for the six development sites over the entire DSP area demands, the percent increase in demand is 27% for the Future Cumulative Condition.

Table 2-6: Incremental Project Demand for Future Cumulative Condition

	Water Demand (gpd)
Pre-Project (Baseline) Demand	102,707
Project Demand	395,953
Incremental Project Demand	***+ 293,276***

Chapter 3. Water System Impact

Project impacts to water supply, water storage, hydraulic conveyance, and fire flow requirements are evaluated in this chapter to ensure the Project demand can be adequately met. Hydraulic conveyance and available fire flow are assessed for both Existing and Future Cumulative Condition. Water supply and water storage are evaluated for the Future Cumulative Condition.

3.1. Demand Scenarios and Performance Criteria

Hydraulic deficiencies within the water system are evaluated under two demand scenarios: Peak Hour Demand (PHD) and Maximum Day Demand with Fire Flow (MDD + FF). The MDD and PHD peaking factors from the *Water Utility Master Plan* (WUMP; IEC, 2010) are used for this analysis. As detailed in the WUMP, MDD and PHD peaking factors are developed based on the City of Mountain View MDD factor and the American Water Works Association typical range for PHD to MDD factors. During the WUMP process, the City of Mountain View MDD factor was used because it is a comparable city and had more easily accessible flow data than Sunnyvale. The peaking factors, presented in Table 3-1, are applied to Average Day Demand (ADD).

Table 3-1: Peaking Factors

Category	Peaking Factor
Maximum Day	1.84
Peak Hour	3.04

Established design criteria used to evaluate the Project impact for all scenarios are summarized in Table 3-2.

Table 3-2: Water System Performance Criteria

Criteria	PHD	MDD + FF
Minimum Allowable Pressure (psi)	40	20

3.2. Water Supply Analysis

The increased water demand from Project development in the Future Cumulative Condition is compared with the City's supply turnouts and groundwater well capacities to ensure demand can be met. The Sunnyvale water system is divided into three pressure zones to maintain reasonable pressures throughout the City's rising topography moving south, further from the Bay. The Project is located in Pressure Zone 2, which covers approximately the middle third of the City.

As shown in Table 3-3, the additional Project demand does not impact the City's ability to meet total demand based on total supply. Total supply in Table 3-3 is based on Table 6-23 in the WUMP. Pre- and post-Project demand in Pressure Zone 1 cannot be met by supply alone, but excess supply in Pressure Zones 2 and 3 could be moved to Pressure Zone 1 to meet demand. As demand increases, the City will have to determine operational constraints as they apply to supply and demand within the pressure zones in order to maintain adequate pressure.

Table 3-3: Future Cumulative Condition Demand Versus Supply

Pressure Zone	Future Cumulative Demand		Imported Water Allocation (mgd)	Total Supply (mgd)*
	Pre-Project ADD (mgd)	Post-Project ADD (mgd)		
1	14.99	14.99	12.57	12.57
2 and 3	9.42	9.72	15.55	23.97
Total	**24.41**	**24.71**	**28.12**	**36.54**

** Total Supply from Table 6-23 in the WUMP (IEC, 2010)*

3.3. Water Storage Analysis

Project impact to water storage volume requirements is evaluated according to the State Water Resources Control Board Division of Drinking Water (DDW). DDW requires storage equal to 8 hours of Maximum Day Demand (MDD) plus fire flow storage in each pressure zone. The required storage versus active storage in the City is detailed in Table 3-4 pre- and post-Project. The maximum active storage in the City is 25 MG. However, the City estimates that the total available storage capacity is 19.7 MG due to operational constraints and seismic retrofits.

The fire flow volume in Table 3-4 revises the requirement in the WUMP and is estimated from the largest fire flow requirement in each pressure zone. Based on CFC requirements the fire flow volume is calculated as 5,000 gpm for 4 hours.

Since the City has the storage volume available to meet DDW requirements in the Future Cumulative Condition pre- and post-Project, no additional storage improvements are recommended. In the future, when City demand and storage requirements exceed the current operating storage, the City may need to alter reservoir operation schemes.

Table 3-4: DDW Storage Requirements

Pressure Zone	Maximum Active Storage* (MG)	Operational Active Storage* (MG)	Fire Flow (MG)	Future Cumulative Condition Demand					
				Pre-Project			Post-Project		
				ADD (mgd)	8 Hours of MDD (MG)	DDW Requirement (MG)	ADD (mgd)	8 Hours of MDD (MG)	DDW Requirement (MG)
1	15.00	13.13	1.2	14.99	9.19	10.39	14.99	9.19	10.39
2 and 3	10.00	6.57	2.4	9.42	5.78	8.18	9.71	5.95	8.35
Total	**25.00**	**19.70**	**3.6**	**24.41**	**14.97**	**18.57**	**24.70**	**15.14**	**18.74**

** Maximum and Operational Active Storage from Table 6-24 in the WUMP (IEC, 2010)*

3.4. Existing Condition (2010) Results

3.4.1. Peak Hour Demand (PHD) – Pre and Post Project

System pressures are evaluated under Peak Hour Demand (PHD) pre-Project (Figure A-2) and post-Project (Figure A-3). At Existing Condition, the system meets performance criteria system-wide. Pressures are slightly

lower in Pressure Zone 2 with Project development, but the system still meets performance criteria. Pressures near the Project area within Pressure Zone 2 drop by approximately 6 pounds per square inch (psi) with Project development.

3.4.2. Maximum Day Demand with Fire Flow (MDD+FF) – Pre and Post Project

In the Existing Condition, the system is able to meet fire flow requirements within the Project area, as shown on Figure A-4, though there are deficiencies outside of the Project area. With Project development, no additional deficiencies occur outside of the Project area, as shown in Figure A-5.

In this fire flow analysis, available flow is evaluated at the end of hydrant laterals to be consistent with the WUMP. In most areas, this results in a conservatively low available fire flow than if the fire flow was analyzed on the water main at the same location. This analysis method particularly impacts locations where required fire flow is greater than 1,500 gpm. Other fire flow nodes are located on existing 4-inch diameter mains, which also results in a low available fire flow. However, per the WUMP and CPDS recommendations, those should be upsized to minimum water works standards to provide adequate fire flow capacity.

3.4.3. Deficiencies – Pre and Post Project

With Existing Condition demand, the water system meets system design criteria at PHD and is able to adequately supply the increased Project demand. Fire flow deficiencies exist pre-Project outside of the Project area and 10 of those deficiencies show between a 1% and 3% reduction in available fire flow due to Project development. No additional deficiencies occur as a result of Project development.

3.5. Existing Condition Recommended CIPs

Ten deficiencies show greater than 1% impact to available fire flow with Project development, as detailed in Table 3-5. These fire flow deficiencies are present both pre- and post-Project.

Table 3-5: Existing Condition Fire Flow Deficiencies with Greater than 1% Project Impact

Model ID	Location	Required Fire Flow (gpm)	Available Flow Pre-Project (gpm)	Available Flow Post-Project
6422	Charles St	2,500	**2,310**	**2,252**
17745	All America Way	4,000	**3,155**	**3,083**
17750	All America Way	4,000	**3,122**	**3,054**
17737	S Murphy Ave	1,500	**1,311**	**1,284**
17998	S Taafe St	1,500	**1,280**	**1,255**
17924	S Frances St	1,500	**1,323**	**1,297**
17870	S Murphy Ave	1,500	**1,209**	**1,186**
17017	El Camino Real between Fair Oaks Ave and Wolfe Road	3,500	**3,479**	**3,439**
16866	El Camino Real between Fair Oaks Ave and Wolfe Road	3,500	**3,396**	**3,360**
16863	El Camino Real between Fair Oaks Ave and Wolfe Road	3,500	**3,307**	**3,272**

Note: Bold red font indicates fire flow deficiency

Some of these locations appear deficient; however, were they to be evaluated at the main rather than the hydrant lateral, there would be enough available fire flow with a minimum residual pressure of 20 psi. Others are mitigated with CIPs previously recommended in the WUMP. Finally, some require improvements in addition to the CIPs recommended in the WUMP. Table 3-6 details the required improvements; with these CIPs, the required fire flow is met at the main adjacent to the deficiency with a minimum residual pressure of 20 psi. The fire flow deficiencies requiring CIPs are shown in Figure 3 and the fire flow deficiencies for which no mitigation is recommended are shown in Figure 4.

Table 3-6: Existing Condition Selected Recommended CIPs in Pressure Zone 2*

CIP #	CIP Source	Location	Length (ft)	Existing Diameter (in)	Proposed Diameter (in)	Deficiency Addressed
P-25-4-V	WUMP	Charles St	40	4	6	6422
P-5Y-3-V	WUMP	Olive Ave	190	8	10	17745
P-EX-50-	WUMP	S Murphy Ave	371	4	6	17737, 17870
**	**	S Taafe St	412	4	6	17998
SW CIP 1	S&W	All America Way	260	6	8	17750, 17745
SW CIP 2	S&W	All America Way	285	6	8	17745
SW CIP 3	S&W	S Frances St	865	4	6	17924
SW CIP 4	S&W	All America Way	35	6	8	17745

Notes:

** Fire flow deficiencies at Model ID 17017, 16866, and 16863 do not require mitigation as the required fire flow can be met along the main adjacent to the hydrant lateral. Apparent deficiency is a result of evaluating required fire flow along 6-inch diameter hydrant lateral.*

*** CIP not specifically identified in WUMP, but pipe diameter does change from Existing Condition to Future Cumulative Condition model. Improvement is consistent with WUMP general recommendation to upsize to minimum water work standards to provide adequate fire flow capacity.*

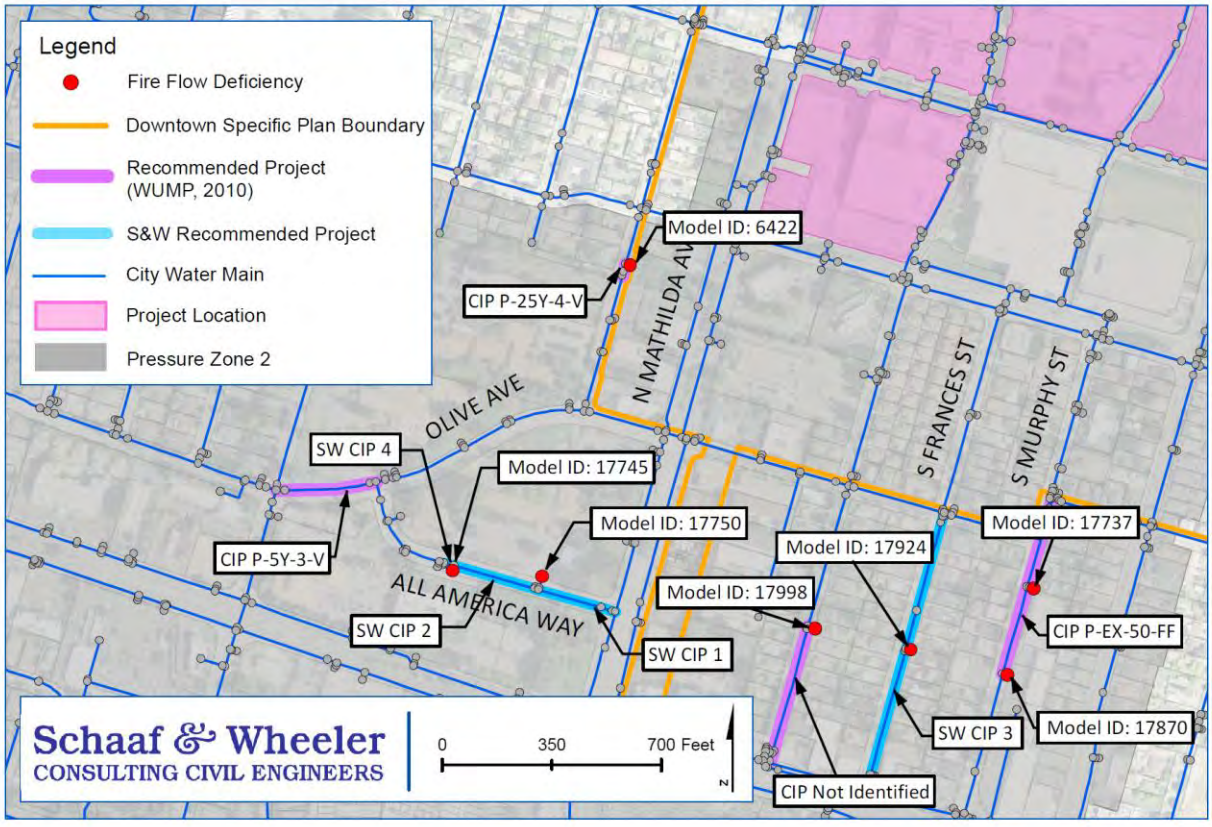


Figure 3. Existing Condition Fire Flow Deficiencies with Recommended Mitigation

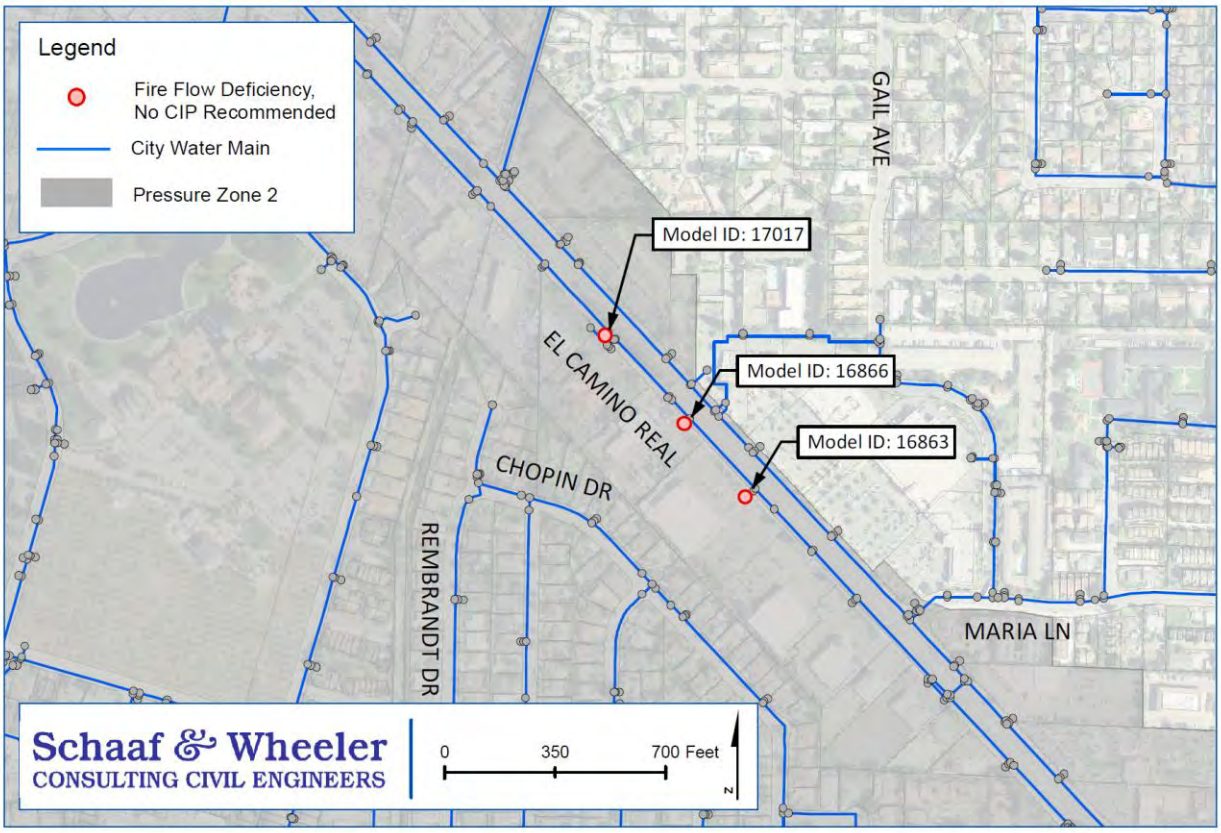


Figure 4. Existing Condition Fire Flow Deficiencies with No Recommended Mitigation

CIP #P-25-4-V from the WUMP is recommended to address a required fire flow of 2,500 gpm along a 4-inch diameter main. This is consistent with the WUMP and CPDS recommendation that all 4-inch diameter mains be upsized to minimum water works standards to provide adequate fire flow capacity.

CIP #P-EX-50-FF from the WUMP is recommended to mitigate two fire flow deficiencies along South Murphy Avenue of 1,500 gpm each along a 4-inch diameter main. As with CIP #P-25-4-V, this is consistent with the WUMP and CPDS recommendation that all 4-inch diameter mains be upsized to minimum water works standards to provide adequate fire flow capacity.

CIP #P-5Y-3-EV and SW CIPs #1, 2, and 4 are recommended to address a fire flow of 4,000 gpm along All America Way at Model ID 17745 and 17750. This relatively high fire flow is fed by 6-inch and 8-inch diameter pipes that must be upsized to reach a minimum 20 psi residual pressure at the main near the hydrant location. All three CIPs must be constructed to meet the 20 psi residual pressure.

SW CIP #3 is recommended to mitigate a required fire flow of 1,500 gpm along a 4-inch diameter main at Model ID 17924. The City has indicated that it is in the process of replacing all 4-inch diameter mains with 6- or 8-inch diameter mains. Per the WUMP and CPDS recommendations, this main should be upsized to minimum water works standards to provide adequate fire flow capacity. If the main is upsized to a 6-inch diameter pipe, the required fire flow can be met at the main with a minimum residual pressure of 20 psi.

While not specifically identified as a CIP in the WUMP, approximately 412 feet of 4-inch diameter pipe is recommended to be upsized to mitigate a fire flow deficiency of 1,500 gpm along S Taafe Street. This CIP may have been added to the model when the WUMP was developed as part of the general recommendation that all 4-inch diameter mains be upsized to minimum water works standards to provide adequate fire flow capacity.

3.6. Future Cumulative Condition (2030) Results

3.6.1. Peak Hour Demand (PHD) – Pre and Post Project

The system has adequate pressure pre-Project (Figure A-6) and is able to satisfy post-Project demands while meeting the design criteria at PHD (Figure A-7) at Future Cumulative Condition.

3.6.2. Maximum Day Demand with Fire Flow (MDD+FF) – Pre and Post Project

In the Future Cumulative Condition, the system is able to meet the fire flow requirements within the Project area pre- and post-Project as shown on Figures A-8 and A-9, though there are deficiencies outside of the Project area. With Project development, two additional deficiencies occur.

As with the Existing Condition analysis, available flow is evaluated at the end of hydrant laterals to be consistent with the WUMP. In most areas, this results in a conservatively low available fire flow than if the fire flow was analyzed on the water main at the same location. This analysis method particularly impacts locations where required fire flow is greater than 1,500 gpm. Other fire flow deficiencies are also located on existing 4-inch diameter mains and per the WUMP and CPDS recommendations, those should be upsized to minimum water works standards to provide adequate fire flow capacity.

3.6.3. Deficiencies – Pre and Post Project

With the recommended CIPs and pipeline upsizing projects, the system has adequate pressures pre- and post-Project and is able to meet fire flow requirements within the Project area. Fire flow deficiencies existing pre-Project outside of the Project area, and two additional deficiencies occur with Project development. Both of these deficiencies, were they to be evaluated at the main rather than at the hydrant, would have enough available fire flow both with and without the Project; as a result, no mitigation for the apparent additional deficiencies is recommended at this time. The majority of the existing deficiencies outside of the Project area show less than 1% impact reduction in available fire flow due to Project development.

As noted before, as demands increase, the City should evaluate turnout capacity and other supply constraints to ensure adequate pressures are maintained. The City will have to evaluate booster pump capacity to meet peak hour and fire flow conditions in the future when operational constraints are realized.

3.7. Future Cumulative Condition Recommended CIPs

Several fire flow deficiencies show greater than 1% impact due to the Project in the Future Cumulative Condition. These fire flow deficiencies are present both pre- and post-Project, regardless of whether the fire flow is located at the hydrant location or along the adjacent main. The fire flow deficiencies, based on requiring flow at the hydrant, are detailed in Table 3-7 below. As indicated in Table 3-7, these fire flow deficiencies are present both pre- and post-Project.

Table 3-7: Future Cumulative Condition Fire Flow Deficiencies with Greater than 1% Project Impact

Model ID	Location	Required Fire Flow (gpm)	Available Flow Pre-Project (gpm)	Available Flow Post-Project
17750	All America Way	4,000	**3,081**	**3,022**
17745	All America Way	4,000	**3,125**	**3,067**
17924	S Frances St	1,500	**1,272**	**1,246**
6394	N Mathilda Ave and W McKinley Ave	3,500	**2,942**	**2,895**

Note: Bold red font indicates fire flow deficiency

Several CIPs are recommended to mitigate these deficiencies, as detailed in Table 3-8 and shown in Figure 5. These CIPs are in addition to all of the CIPs previously recommended in the WUMP. With these CIPs, the required fire flow is met at the main adjacent to the deficiency with a minimum residual pressure of 20 psi.

Table 3-8: Future Cumulative Condition Selected Recommended CIPs in Pressure Zone 2

SW CIP #	Location	Length (ft)	Existing Diameter (in)	Proposed Diameter (in)	Deficiency Addressed
1	All America Way	260	6	8	17750, 17745
2	All America Way	285	6	8	17745
3	S Frances St	865	4	6	17924
5	N Mathilda Ave	530	8	10	6394

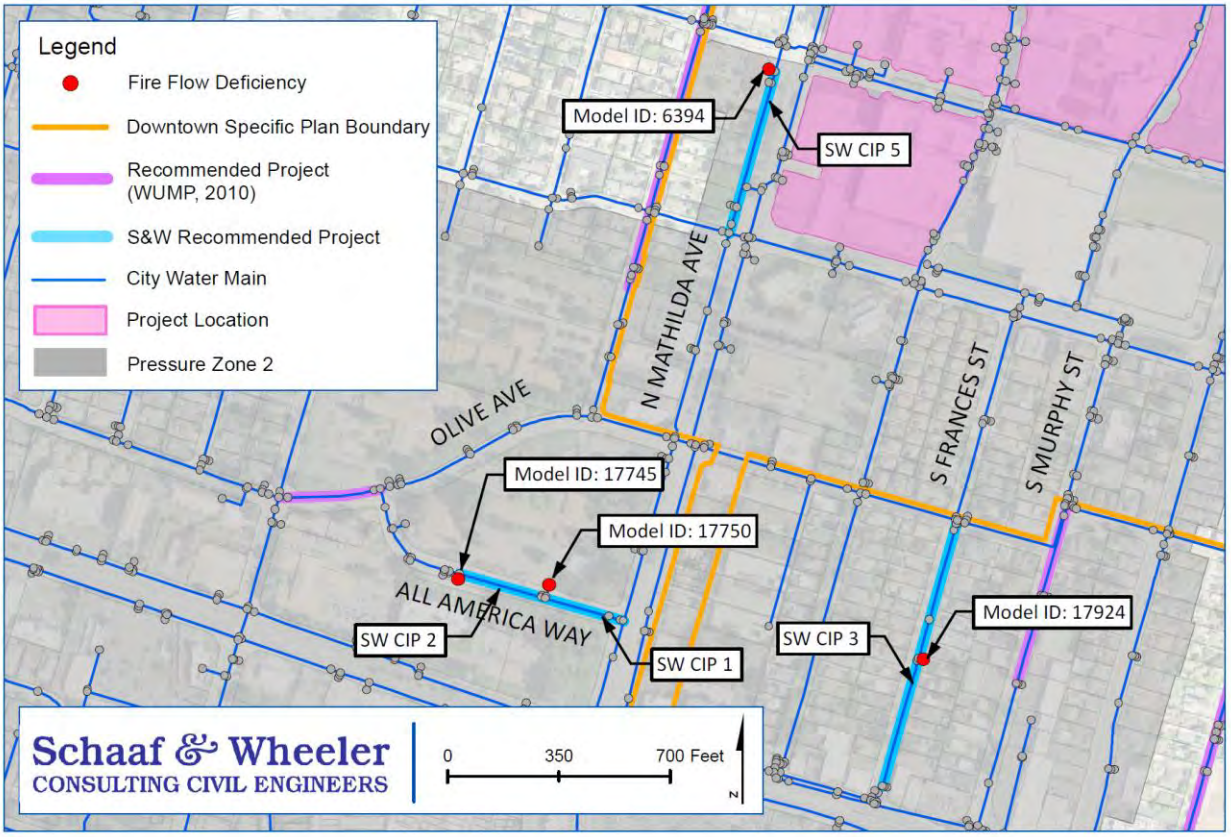


Figure 5. Future Cumulative Condition Fire Flow Deficiencies with Recommended Mitigation

SW CIPs #1 and 2 are recommended to address required fire flows of 4,000 gpm along a 6-inch diameter main. SW CIP #1 alone addresses the fire flow deficiencies at Model ID 17750. Both CIPs #1 and #2 must be constructed to meet the required fire flow at Model ID 17745 Note that SW CIP #4 from the Existing Condition is not needed assuming all of the other recommended CIPs from the WUMP are constructed.

SW CIP #3 is recommended to mitigate a required fire flow of 1,500 gpm along a 4-inch diameter main at model ID 17924. The City has indicated that it is in the process of replacing all 4-inch diameter mains with 6- or 8-inch diameter mains. Per the WUMP and CPDS recommendations, this main should be upsized to minimum water works standards to provide adequate fire flow capacity. If the main is upsized to a 6-inch diameter pipe, the required fire flow can be met at the main with a minimum residual pressure of 20 psi.

SW CIP #5 is recommended to address a required fire flow of 3,500 gpm at model ID 6394. Due to the proximity to the zone boundary between Pressure Zones 1 and 2, the Zone 2 8-inch main that serves this hydrant essentially acts as a dead end pipe. It is recommended that the City reconfigure piping and/or valve settings to connect this pipe to nearby Pressure Zone 2 pipes to eliminate the dead-end connection. The City shall consider reconfiguring the Zone 2 pipe network in this area as part of the Project improvements to better serve the new development and surrounding area. If the City decides not to reconfigure the network near this hydrant, the main serving the hydrant is recommended to be upsized from 8-inch diameter pipe to 10-inch diameter pipe.

Chapter 4. Sewer Flow Projections

This chapter discusses the sewer flow estimate for Project development and provides a comparison to pre-Project baseline condition. The incremental Project flow is determined for the Existing and Future Cumulative Condition as discussed in the following sections. The pre-Project baseline sewer flow in the Existing and Future Cumulative Conditions follows the methodology described in the *Wastewater Collection System Master Plan* (WWMP; IEC, 2015). The sewer generation factor for estimating Project sewer flow is taken from previous technical studies (2010 WUMP and 2015 WWMP) to remain consistent with the City-wide flow projections used in the hydraulic models.

Three types of sewer flow loading are used to model the sewer system: base wastewater flow, groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I). GWI includes base infiltration (BI) and pumped groundwater discharged to the sewer system. RDI/I is stormwater that enters the sewer system. GWI values are modeled as constant flows. RDI/I values are modeled as peaked flows.

Base wastewater flow (BWF) is from residential, commercial, institutional, and industrial sources. As described in the WWMP, BWF is developed on an individual parcel level using the 2009 and 2010 water billing records and applying a return-to-sewer (RTS) ratio calculated for land use type. Change in BWF throughout the day due to daily use patterns is known as diurnal variation and is accounted for by applying residential and non-residential diurnal curves. BWF and diurnal curves used in this analysis are taken from the WWMP to remain consistent with previous City-wide modeling. The sewer flows discussed in this section are the BWF values representing average flows and are not peaked.

Flow Monitoring was performed at six locations around the downtown area as shown in Figure A-18a and A-18b. Due to project timeline constrains, only dry weather flows were recorded during the monitor period from September to October 2018. The flow monitoring data was used to compare current flow conditions and peaking factors to verify that land use unit duty factors were appropriate. The data was also used to update the WWMP BWF in the DSP area to be consistent with current land use. The WWMP original model showed lower flows in the existing condition than field observations since the flows were calculated by using a generic per-acre unit duty factor for all of the DSP area rather than by specific land use. Parcel level unit duty factors based on published existing land use were applied to determine the BWF for the DSP Area. Since there were no PWWF recorded during the flow monitoring period, RDI/I that was calculated in the WWMP is used.

RDI/I is distributed uniformly throughout the entire model based on inch-diameter per length of pipeline of all the sewer pipelines in the system as described in the WWMP. Due to how the WWMP distributed the RDI/I in the model, impacts of localized RDI/I may be understated at known areas of high RDI/I flows. Further RDI/I refinement is recommended to more accurately account for significant peak RDI/I flows in the system.

4.1. Project Sewer Flow

Project generated sewer flow for the six development sites is estimated using proposed land use types and densities as provided by David J. Powers & Associates. A return-to-sewer (RTS) ratio is applied to water duty factors for each of the land use types. The RTS ratios are based on the RTS ratios provided in the WWMP (Table 4-5). Table 4-1 provides the sewer flow estimation for the Project area. The Project area includes six

development sites that represent a small subset within the entire DSP area. Since the Project involves moving and increasing development land use densities within the DSP area, the total DSP area sewer flows pre- and post-Project are used to calculate the percent increase in sewer flows for both the Existing and Future Cumulative Conditions. The Project results in a 66% increase in sewer flow over the existing condition flows and a 27% increase in sewer flow over the future cumulative condition flows for the entire DSP area.

Table 4-1: Project Estimated Sewer Flow

Condition	Sewer Flow (gpd)
Project	296,458

4.2. Existing Condition

4.2.1. Pre-Project (Baseline)

The pre-Project (baseline) condition sewer flow is based on existing land use types and densities provided by the WWMP. Recommended Wastewater Duty Factors provided in the WWMP were also used. The Wastewater Duty Factors for each land use type were determined by using RTS ratios from Table 4-5 Sanitary Sewer Flow Generation Factors and Calculated Water Unit Duty Factors based on adjusted 09-10 water demands for the City as part of the WWMP. Table 4-2 provides the estimated flow for existing pre-Project conditions.

Table 4-2: Baseline Flow for Existing Condition

Condition	Sewer Flow (gpd)
Pre-Project	47,705

4.2.2. Post-Project Incremental Demand

For the Project impact analysis in the Existing Condition, Project sewer flow is added to the Existing Condition model as an incremental difference from pre-Project demand. This overall incremental flow is spread across the Project area given land use types and densities developed as part of the Downtown Specific Plan Amendments. The percent increase in sewer flow when comparing only the Project area flows from pre-Project to post-Project results in a 521% increase for the existing condition. However, when comparing the percent increase in sewer flow for the six development sites over the entire existing Downtown Specific Plan area, the percent increase in flows is 66% for the existing condition. The Project incremental sewer flow for the Existing Condition is given in Table 4-3.

Table 4-3: Incremental Project Flow for Existing Condition

	Sewer Flow (gpd)
Pre-Project (Baseline) Flow	47,705
Project Flow	296,458
Incremental Project Flow	***+ 248,753***

4.3. Future Cumulative Condition

4.3.1. Pre-Project (Baseline)

Future Cumulative (baseline) flow for the Project is based on the City's currently adopted Downtown Specific Plan maximum designated land uses and development intensities. The City's InfoSWMM model developed as part of the WWMP was taken as the base future cumulative condition and the maximum development intensities were updated within the DSP boundary including the project areas as the Pre-project condition. In the WWMP model, sewer flows are based on the 2013 DSP Report land use; these demands have remained the same since the DSP land uses and intensities have not been updated since the 2015 WWMP was provided to the City. Table 4-4 presents the pre-project demand.

Table 4-4: Baseline Flow for Future Cumulative Condition

Condition	Sewer Flow (gpd)
Pre-Project	78,824

4.3.2. Post-Project Incremental Demand

Project flow for the future cumulative condition is based on the net change in sewer flow from the development intensities allowed by the currently adopted DSP to the development intensities allowed by the DSP with proposed amendments. The project flow is added to the Future Cumulative Condition model as an incremental difference from pre-Project flow. The incremental Project flow is given in Table 4-5. As with the Existing Condition model, this incremental flow is spread across the Project area following land use types and densities developed as part of the Downtown Specific Plan Amendments. The percent increase in sewer flow when comparing only the Project area flows from pre-Project to post-Project results in a 276% increase for the future cumulative condition. However, when comparing the percent increase in sewer flows for the six development sites over the entire future Downtown Specific Plan flows, the percent increase in flows is 27% for the future cumulative condition.

Table 4-5: Incremental Project Flow for Future Cumulative Condition

	Sewer Flow (gpd)
Pre-Project (Baseline) Flow	78,824
Project Flow	296,458
Incremental Project Flow	***+ 217,634***

Chapter 5. Sewer System Impact

The impact of Project development on the sewer system is analyzed under Existing and Future Cumulative Conditions. The specific affected area of the gravity system evaluated for Project impact begins at the six Project Development Sites and flows either north along the Mathilda Ave Trunk to the Donald M. Somers Water Pollution Control Plant (WPCP) via the Borregas Interceptor or east along the Washington Ave Trunk to the WPCP via the Cannery Interceptor. Flow paths are designated by green manholes in Fig10a-Fig17b in Appendix A.

5.1. Scenarios and Performance Criteria

Sewer capacity is analyzed under Peak Wet Weather Flow (PWWF). PWWF is used to determine hydraulic deficiencies according to the performance criteria in Table 5-1. Performance criteria used for this analysis is based on City standard design guidelines. The WWMP used more lenient performance criteria of 0.9 for all pipe diameters for determining higher priority projects for planning purposes.

The PWWF scenario is developed in the model by taking the Base Wastewater Flow and applying the diurnal peaking curves for residential and non-residential flows. The PWWF scenario also simulates system response to rainfall dependent inflow and infiltration. The diurnal peaking curves are adopted from the City's WWMP. Groundwater Infiltration (GWI) and rainfall-dependent infiltration/inflow (RDI/I) are included. GWI is not peaked. RDI/I is peaked and the diurnal peaking curve is adopted from the City's WWMP.

Table 5-1: Sewer System Performance Criteria

Criteria	Pipe Diameter ≤ 10 inch	Pipe Diameter ≥ 12 inch
Maximum Flow Depth/Pipe Diameter (d/D)	0.50	0.75

5.2. Existing Condition Results

5.2.1. Peak Wet Weather Flow (PWWF) Scenario – Pre and Post Project

The sewer system does not meet City performance criteria downstream of the Project area with either the pre-Project and post-Project flows in the Existing Condition for flows exiting the DSP area in the Washington Ave trunk to the Cannery Interceptor as shown in Figures A-10a, A-10b, A-11a, and A-11b due to existing sewer system constraints.

5.2.2. Deficiencies – Pre and Post Project

In the pre-Project condition, 42 pipe segments (approximately 10,477 feet of pipe) do not meet the d/D performance criteria along the sewer conveyance path and 4 (approximately 876 feet of pipe) of the total 42 pipe segments are at risk for surcharging. Pipes are determined to be at risk of surcharging when d/D is near 1 (0.95 to 1). In proximity to surcharged pipes, model results indicate that 3 manholes have water levels 5 to 10 feet below the rim elevation. Manholes are color-coded based on water level below rim elevation in feet in the figures.

With the incremental increase in flow due to Project development, 48 pipe segments (approximately 11,340 feet of pipe) do not meet the d/D performance criteria and 4 (approximately 876 feet of pipe) of the total 48 deficient pipe segments are at risk for surcharging . In proximity to surcharged pipes, model results also indicate that 5 manholes have water levels 5 to 10 feet below rim elevation.

Model results are included in Table B-1. For all pipes not meeting City performance criteria along the sewer conveyance flow path, the percent of pipe capacity remaining values are bolded in red.

Results are summarized in Table 5-2 to show the percent distribution of level of exceedance along the sewer conveyance path for the DSP area from highest level of exceedance to lowest level. Exceedance is defined as pipes and corresponding manholes that do not meet City performance design criteria. When City performance design criteria are exceeded, pipes and manholes are then categorized into different priority levels of more refined performance categories. Pipes are grouped into three performance categories based on flow depth ratio. When pipe segments fall into the top priority performance category; i.e. are flowing nearly full (0.95 to 1), downstream manholes are then analyzed to determine next priority based on depth to water level from rim elevation. Recommended CIPs discussed in the following sections are prioritized using the criteria presented in Table 5-2.

Figures A-10a and 10b through Figures A-17a and 17b also show all pipe segments and manhole junctions along the sewer conveyance path color-coded to represent level of exceedance.

Table 5-2: Prioritization Criteria – Existing Condition

Priority	Performance Category	EX Pre Project		EX Post Project	
		% of Total Exceedance*	Total # of Exceedance*	% of Total Exceedance*	Total # of Exceedance*
Pipes					
1	d/D of 0.95 to 1	10%	4	8.3%	4
2	d/D of 0.8 to 0.95	33%	14	35.4%	17
3	Above d/D Design Criteria to 0.8	57%	24	56.3%	27
Manhole – Depth below Rim when pipe d/D=1					
1A	1-5 feet	0%	0	0%	0
1B	5-10 feet	100%	3	100%	5
1C	10-20 feet	0%	0	0%	0

**Exceedance is defined as pipes and corresponding manholes that do not meet City performance design criteria*

5.3. Future Cumulative Condition Results

5.3.1. Peak Wet Weather Flow (PWWF) Scenario – Pre and Post Project

The sewer system does not meet City performance criteria downstream of the Project area with either the pre-Project and post-Project flows in the Future Cumulative Condition for flows exiting the DSP area in the Washington Ave Trunk to the Cannery Interceptor and Mathilda Ave Trunk to the Borregas Interceptor as shown in Figures A-12a, A-12b, A-13a, and A-13b due to existing deficiencies.

According to the WWMP, gravity sewers were permitted to flow up to 90 percent full at the PWWF before improvement projects were identified. Exceptions were also made for short sections of flat pipe which may be allowed to flow full with only localized effects. CIPs 7-9 recommended in the WWMP help to address some of these deficiencies.

5.3.2. Deficiencies – Pre and Post Project

In the pre-Project Condition, 70 pipe segments (approximately 16,379 feet of pipe) do not meet d/D performance criteria along the sewer conveyance path downstream of the Project in the Future Cumulative Condition as shown in Figures A-12a, A-12b. 20 of the total 70 pipe segments are at risk of surcharging. Pipes are determined to be at risk of surcharging when d/D is near 1 (0.95 to 1). At locations where pipes are near surcharging, model results indicate that 3 manholes have water levels 1 to 5 feet below rim elevation, 13 manholes have water levels 5 to 10 feet below rim elevation, and 3 manholes have water levels 10 to 20 feet below rim elevation.

With the incremental increase in flow due to Project development, 74 pipe segments (approximately 16,871 feet of pipe) do not meet the d/D performance criteria and 26 of the 74 pipe segments are at risk of surcharging. At locations where pipes are near surcharging, model results indicate that 8 manholes have water levels 1 to 5 feet below rim elevation, 14 manholes have water levels 5 to 10 feet below rim elevation, and 4 manholes have water levels 10 to 20 feet below rim elevation.

Model results are included in Table B-2. For all pipes not meeting City performance criteria along the sewer conveyance flow path, the percent of pipe capacity remaining values are bolded in red. Results are summarized in Table 5-3 to show the percent distribution of level of exceedance along the sewer conveyance path for the DSP area from highest level of priority to lowest level.

Table 5-3: Prioritization Criteria – Future Cumulative Condition

Priority	Performance Category	FCC Pre Project		FCC Post Project	
		% of Total Exceedance*	Total # of Exceedance*	% of Total Exceedance*	Total # of Exceedance*
Pipes					
1	d/D of 0.95 to 1	28.5%	20	35%	26
2	d/D of 0.8 to 0.95	43%	30	35%	26
3	Above d/D Design Criteria to 0.8	28.5%	20	30%	22
Manhole – Depth below Rim when pipe d/D=1					
1A	1-5 feet	16%	3	31%	8
1B	5-10 feet	68%	13	54%	14
1C	10-20 feet	16%	3	15%	4

**Exceedance is defined as pipes and corresponding manholes that do not meet City performance design criteria*

5.4. Recommended Sewer CIPs

Schaaf & Wheeler recommends constructing nine CIPs in order to alleviate constraints along the downtown specific plan area sewer conveyance path. The recommended CIPs are grouped into three planning horizons: 0 to 5 years, 5 to 10 years, and 10 or more years based on the prioritization criteria to help the City with prioritizing CIPs affected by the downtown specific plan area. CIPs that help to address the most immediate needs such as pipes flowing full and adjacent manholes with water levels near the rim elevation are recommended as top priority. Then, additional CIPs are recommended to address other major areas of constraints along the conveyance path in order to meet City performance design criteria. Table 5-4 summarizes the nine recommended DSP CIPs. Figures A-14a and A-14b also show the nine recommended DSP CIPs. All recommended CIPs are determined from sewer capacity analysis under Peak Wet Weather Flow in the Future Cumulative Condition with project development flows.

5.4.1. 0-5 Years CIP Planning Horizon

CIPs DSP-1 through DSP-3 are recommended to alleviate the most immediate needs along the conveyance path particularly to divert flows from the Cannery Interceptor to the Borregas Interceptor. With these three CIPs in place, model results indicate that 43 pipe segments (approximately 10,328 feet of pipe) do not meet the d/D performance criteria and 2 of the 43 pipe segments are at risk of surcharging as shown in Figures A-15a and A-15b. Model results indicate that 1 manhole has water levels 1 to 5 feet below rim elevation and 2 manholes have water levels 5 to 10 feet below rim elevation.

DSP-1 consists of approximately 2,965 feet of new 12 inch pipe within the DSP area boundary along Mathilda Ave between El Camino Real and Washington Ave. DSP-1 helps divert flows from El Camino Real away from the Cannery Interceptor to the Borregas Interceptor along Mathilda Ave which alleviates several pipes from flowing full. DSP-2 consists of removing or abandoning an 18 inch pipe to prevent surcharging of downstream pipes on Borregas Ave at Arbor Ave. DSP-3 consists of upsizing approximately 400 feet of 12 inch pipe in Mathilda between Evelyn Ave and California Ave to 15 inch pipe in order to increase capacity needed to handle the diverted flows from DSP-1. DSP-1 and DSP-2 are recommended to be constructed at the same time in order to alleviate sewer system constraints with the highest level of exceedance along the sewer conveyance path. DSP-3 is recommended to be constructed shortly after in order to increase pipe capacity to convey the diverted flows from DSP-1.

5.4.2. 5-10 Years CIP Planning Horizon

CIPs DSP-4 through DSP-6 are recommended to alleviate constraints along the conveyance path after the immediate needs of the system have been met with the first three recommended CIPs. With these additional three CIPs, model results indicate that 29 pipe segments (approximately 7,969 feet of pipe) do not meet the d/D performance criteria and 2 of the 29 pipe segments are at risk of surcharging as shown in Figures A-16a and A-16b. Model results indicate that 2 manholes have water levels 5 to 10 feet below rim elevation; however, these surcharged pipe segments and manholes are the result of local hydraulic constraints and not overall system capacities.

DSP-4 consists of upsizing 290 feet of 8 inch pipe to 12 inch pipe in order to convey flows from the proposed development sites in Block 18 on Washington Ave between Mathilda Ave and Taaffe St. Construction of DSP-4

should be scheduled to correspond with Project timing and be built concurrently. DSP-5 consists of upsizing approximately 1,355 feet of pipe that varies in size from 10 to 15 inches to 18 inch pipe along Washington Ave trunk in order to convey downtown flows to the Cannery interceptor. DSP-6 consists of upsizing approximately 2,260 feet of 27 inch pipe to 30 inch pipe along the Borregas Interceptor between Weddell Dr and CA-237 where there are several pipe segments flowing nearly full and manholes have water levels 1 to 5 feet below rim elevation. DSP-6 is recommended to be constructed first in order to alleviate these constraints. Since DSP-4 and DSP-5 are located along separate interceptors, construction of one CIP prior to the other CIP would not affect the performance of either project. Therefore construction of either CIP can occur at any time within this planning horizon; however, the construction of DSP-5 would alleviate more feet of pipe segments that do not meet City performance criteria compared to DSP-4.

5.4.3. 10+ Years CIP Planning Horizon

CIPs DSP-7 through DSP-9 are recommended to alleviate the remaining constraints along the conveyance path after the first six recommended CIPs have been constructed. With these last three CIPs, model results indicate that 15 pipe segments (approximately 2,591 feet of pipe) do not meet the d/D performance criteria and 2 of the 15 pipe segments are at risk of surcharging as shown in Figures A-17a and A-17b. Model results indicate that 2 manholes have water levels 5 to 10 feet below rim elevation; however, these surcharged pipe segments and manholes are the result of local hydraulic constraints and not overall system capacities.

DSP-7 involves upsizing approximately 1,550 feet of 18 inch pipe to 21 inch pipe in order to convey flows along the Cannery interceptor between north of the Railroad Crossing and California Ave. DSP-8 involves upsizing approximately 3,085 feet of 27 inch pipe to 30 inch pipe along the Borregas Interceptor between Maude Ave and Weddell Dr in order to meet the City performance criteria. DSP-9 involves upsizing approximately 1,230 feet of 24 inch pipe to 27 inch pipe and approximately 2,605 feet of 21 inch pipe to 24 inch pipe along the Cannery interceptor in Maude Ave and Mathilda Ave to meet City performance criteria. DSP-9 is recommended to be constructed first to alleviate more pipe segments that do not meet City performance criteria. DSP-9 is also located downstream of DSP-7 therefore it should be constructed prior to DSP-7. Since DSP-7 and DSP-8 are located along separate interceptors, construction of one CIP prior to the other CIP would not significantly affect the performance of either project. Therefore, construction of either CIP can occur at any time within this planning horizon.

Table 5-4: Recommended DSP Sewer CIPs

Planning Priority	Recommended CIP No.	Location Description	Existing Diameter (in)	Proposed Diameter (in)
0-5 Years	DSP-1	Mathilda Ave between El Camino Real and Washington Ave	-	12
	DSP-2	Borregas Ave at Arbor Ave	18	Close Pipe
	DSP-3	Mathilda Ave between Evelyn Ave and California Ave	12	15
5-10 Years	DSP-4	Washington Ave between Mathilda Ave and Taaffe St	8	12
	DSP-5	Washington Ave between Evelyn Ave and Fair Oaks Ave	10-15	18
	DSP-6	Borregas Ave between Weddell Dr and CA-237	27	30
10+ Years	DSP-7	Fair Oaks Ave between Railroad Crossing and California Ave	18	21
	DSP-8	Borregas Ave between Maude Ave and Weddell Dr	27	30
	DSP-9	Maude Ave between Mathilda Ave and Borregas Ave	24	27
		Mathilda Ave between Maude Ave and San Aleso Ave	21	24

5.5. Construction Costs

Schaaf & Wheeler has developed CIP construction costs detailed in the S&W Memorandum Sunnyvale DSP – CIP Construction Cost Matrix and Priority Ranking and further updated in the Sunnyvale DSP Recommended CIP Costs provided to the City on August 6, 2019. Recommended construction cost for each of the 9 recommended CIPs is provided in Table 5-5. Cost is given in dollar per linear foot of pipe segment and includes cost for mobilization, demobilization, traffic control, shoring, trenching, manholes, laterals, bypass pumping, offhaul and disposal.

Table 5-5: Recommended Construction Cost

Pipe Diameter	Recommended Costs ($/LF)
6” diameter PVC pipe	$450
8” diameter PVC pipe	$500
10” diameter PVC pipe	$600
12” diameter PVC pipe	$700
15” diameter PVC pipe	$800
18” diameter PVC pipe	$900
21” diameter PVC pipe	$1,000
24” diameter PVC pipe	$1,200
27” diameter PVC pipe	$1,400
30” diameter PVC pipe	$1,600

An estimated total project construction cost was then determined for each CIP by factoring in additional anticipated project costs. These additional project costs account for construction contingency, design,

inspection, miscellaneous costs, and city administration cost as summarized in Table 5-6. The estimated total project construction cost for each recommended CIP is provided in Table 5-7.

Table 5-6: Additional Project Costs

Description Item	Percentage Adder
Construction	25%
Design	20%
Inspection	10%
Miscellaneous Costs	10%
City Administration	5%

5.6. Project Contribution to Deficient Sewer Pipes

Table 5-8 provides a comparison of ADWF in order to determine the Project contribution for the recommended pipe improvement projects. Flow contribution is based upon the Future Cumulative (2035) Condition ADWF with all proposed DSP CIPs except for DSP-1 and 2 since DSP-1 does not convey downtown flows and DSP-2 involves closing of a pipe segment.

Table 5-7: Estimated Total Project Construction Costs

CIP No.	Location Description	Existing Diameter (in)	Proposed Diameter (in)	Pipe Length (ft)	N=New R=Replace P=Parallel	Unit Cost ($/LF)	Estimated Const. Cost ($)	Construction Contingency (%)	Design (20%), Inspection (10%) Misc. Costs (10%) 40%	City Admin Fees (5%)	Total Estimated Cost ($)
DSP-1	Mathilda Ave from El Camino Real to Washington Ave	-	12	2,965	N	$700	$2,075,500	$518,875	$1,037,750	$181,606	$3,814,000
DSP-2	Close 18-in pipe between 27-in and 16-in pipes in Borregas Ave at Arbor Ave	18	-	35	-	-	$27,210	$6,803	$13,605	$2,381	$50,000
DSP-3	Mathilda Between Evelyn Ave and California Ave	12	15 Casing	400 245	R	$800 $1,000	$565,000	$141,250	$282,500	$49,438	$1,039,000
DSP-4	Washington Ave between Mathilda Ave and Taaffe St	8	12	290	R	$700	$203,000	$50,750	$101,500	$17,763	$374,000
DSP-5	Washington Ave between Evelyn Ave and Fair Oaks Ave	10-15 inch	18	1,355	R	$900	$1,219,500	$304,875	$609,750	$106,706	$2,241,000
DSP-6	Borregas Ave between Weddell Dr and CA-237	27	30	2,260	R	$1,600	$3,616,000	$904,000	$1,808,000	$316,400	$6,645,000
DSP-7	Fair Oaks Ave between Railroad Crossing and California Ave	18	21	1,550	R	$1,000	$1,550,000	$387,500	$775,000	$135,625	$2,849,000
DSP-8	Borregas Ave between Maude Ave and Weddell Dr	27	30 Casing	3,085 220	R	$1,600 $1,000	$5,156,000	$1,289,000	$2,578,000	$451,150	$9,475,000
DSP-9	Maude Ave between Mathilda and Borregas Ave	24	27	1,230	R	$1,400	$1,722,000	$430,500	$861,000	$150,675	$3,165,000
	Mathilda Ave between Maude Ave and San Aleso Ave	21	24	2,605	R	$1,200	$3,126,000	$781,500	$1,563,000	$273,525	$5,745,000

Table 5-8: Pipes Recommended for Upsizing and Percentage of Contributed Flow

CIP No.	Sewer Main ID	Upstream MH ID	Downstream MH ID	Model Diameter (in)	Proposed Diameter (in)	Total Future Cumulative ADWF Flow with Project (MGD)	Project Incremental Contribution		City of Sunnyvale Contribution	
							ADWF (MGD)	Percentage of Total Flow (%)	ADWF (MGD)	Percentage of Total Flow (%)
DSP-3	S3680204-3680216	S368-204	S368-216	12	15	0.987	0.101	10	0.886	90
	S3680216-3680215	S368-216	S368-215	12	15	0.987	0.101	10	0.886	90
DSP-4	S3530213-3530206	S353-213	S353-272	8	12	0.167	0.085	51	0.082	49
	S3530272-3530206	S353-272	S353-206	8	12	0.167	0.085	51	0.082	49
DSP-5	S3300204-3300202	S330-204	S330-202	14	18	0.961	0.117	12	0.844	88
	S3300202-3300227	S330-202	S330-227	14	18	0.961	0.117	12	0.844	88
	S3300227-3300225	S330-227	S330-225	15	18	1.002	0.117	12	0.885	88
	S3300225-3300213	S330-225	S330-213	15	18	1.003	0.117	12	0.886	88
	S3300213-3300211	S330-213	S330-211	15	18	1.003	0.116	12	0.887	88
	S3300211-3300210	S330-211	S330-210	15	18	0.474	0.064	14	0.410	86
	S3300210-3300209	S330-210	S330-209	15	18	0.474	0.064	14	0.410	86
	S3300209-3300228	S330-209	S330-228	10	18	0.474	0.064	14	0.410	86
	S3300228-3310206	S330-228	S331-206	10	18	0.475	0.064	13	0.411	87
	S3310206-3310204	S331-206	S331-204	10	18	0.475	0.064	13	0.411	87
	S3310204-3310203	S331-204	S331-203	10	18	0.475	0.064	13	0.411	87
	S3310203-3310207	S331-203	S331-207	12	18	0.475	0.064	13	0.411	87

Table 5-8: Pipes Recommended for Upsizing and Percentage of Contributed Flow (Continued)

CIP No.	Sewer Main ID	Upstream MH ID	Downstream MH ID	Model Diameter (in)	Proposed Diameter (in)	Total Future Cumulative ADWF Flow with Project (MGD)	Project Incremental Contribution		City of Sunnyvale Contribution	
							ADWF (MGD)	Percentage of Total Flow (%)	ADWF (MGD)	Percentage of Total Flow (%)
DSP-6	S5110229-5110211	S511-229	S511-211	27	30	3.400	0.098	3	3.302	97
	S5110211-5110209	S511-211	S511-209	27	30	3.404	0.097	3	3.307	97
	S5110209-5110218	S511-209	S511-218	27	30	3.409	0.097	3	3.312	97
	S5110218-5300219	S511-218	S530-219	27	30	3.414	0.097	3	3.317	97
	S5300219-5300202	S530-219	S530-202	27	30	3.420	0.097	3	3.323	97
	S5300202-5310212	S530-202	S531-212	27	30	3.479	0.097	3	3.382	97
	S5310212-5500209	S531-212	S550-209	27	30	3.484	0.097	3	3.387	97
	S5500209-5500207	S550-209	S550-207	27	30	3.484	0.097	3	3.387	97
DSP-7	D3311559-3501554	D331-1559	D350-1554	18	21	1.885	0.064	3	1.821	97
	D3501554-3500103	D350-1554	D350-103	18	21	1.886	0.064	3	1.822	97
	D3500103-3500109	D350-103	D350-109	18	21	1.889	0.064	3	1.825	97
	D3500109-3500110	D350-109	D350-110	18	21	1.927	0.063	3	1.864	97
	D3500110-3500113	D350-110	D350-113	18	21	1.893	0.064	3	1.829	97
	D3500113-3500114	D350-113	D350-114	18	21	1.893	0.063	3	1.830	97
	D3500114-3500115	D350-114	D350-115	18	21	1.894	0.063	3	1.831	97
	D3500115-3711002	D350-115	S371-210	18	21	1.898	0.063	3	1.835	97
	S3710210-3710205	S371-210	S371-205	18	21	1.901	0.063	3	1.838	97

Table 5-8: Pipes Recommended for Upsizing and Percentage of Contributed Flow (Continued)

CIP No.	Sewer Main ID	Upstream MH ID	Downstream MH ID	Model Diameter (in)	Proposed Diameter (in)	Total Future Cumulative ADWF Flow with Project (MGD)	Project Incremental Contribution		City of Sunnyvale Contribution	
							ADWF (MGD)	Percentage of Total Flow (%)	ADWF (MGD)	Percentage of Total Flow (%)
DSP-8	S4500210-4500207	S450-210	S450-207	27	30	3.079	0.096	3	2.983	97
	S4500207-4710213	S450-207	S471-213	27	30	3.149	0.096	3	3.053	97
	S4710213-4900224	S471-213	S490-224	27	30	3.188	0.097	3	3.091	97
	S4900224-4900207	S490-224	S490-207	27	30	3.193	0.098	3	3.095	97
	CDT-51	S490-207	S490-201	27	30	3.282	0.117	4	3.165	96
	S4900201-4900219	S490-201	S490-219	27	30	3.364	0.104	3	3.260	97
	S4900219-5110214	S490-219	S511-214	27	30	3.399	0.101	3	3.298	97
	S5110214-5110229	S511-214	S511-229	27	30	3.399	0.100	3	3.299	97
DSP-9	S4320219-4320212	S432-219	S432-212	24	27	2.043	0.069	3	1.974	97
	CDT-47	S432-212	S432-229	24	27	2.049	0.069	3	1.980	97
	S4320229-4330201	S432-229	S433-201	24	27	2.053	0.069	3	1.984	97
	S4330201-4330231	S433-201	S433-231	21	27	2.055	0.069	3	1.986	97
	S4330231-4480216	S433-231	S448-216	21	24	2.060	0.069	3	1.991	97
	S4480216-4490205	S448-216	S449-205	21	24	2.065	0.069	3	1.996	97
	S4490205-4720204	S449-205	S472-204	21	24	2.070	0.069	3	2.001	97
	S4720204-4720207	S472-204	S472-207	21	24	2.075	0.069	3	2.006	97
	S4720207-4720209	S472-207	S472-209	21	24	2.079	0.069	3	2.010	97

Table 5-8: Pipes Recommended for Upsizing and Percentage of Contributed Flow (Continued)

CIP No.	Sewer Main ID	Upstream MH ID	Downstream MH ID	Model Diameter (in)	Proposed Diameter (in)	Total Future Cumulative ADWF Flow with Project (MGD)	Project Incremental Contribution		City of Sunnyvale Contribution	
							ADWF (MGD)	Percentage of Total Flow (%)	ADWF (MGD)	Percentage of Total Flow (%)
DSP-9	S4720209-4720211	S472-209	S472-211	21	24	2.080	0.069	3	2.011	97
	S4720211-4721006	S472-211	S472TEE1006	21	24	2.083	0.069	3	2.014	97
	S4721006-4720212	S472TEE1006	S472-212	21	24	2.085	0.069	3	2.016	97

References

California Building Standards Commission. 2016 California Fire Code. July 2016.

City of Sunnyvale. Potable Water System Comprehensive Preliminary Design Study Report Prepared by HydroScience Engineers, Inc. October 2013.

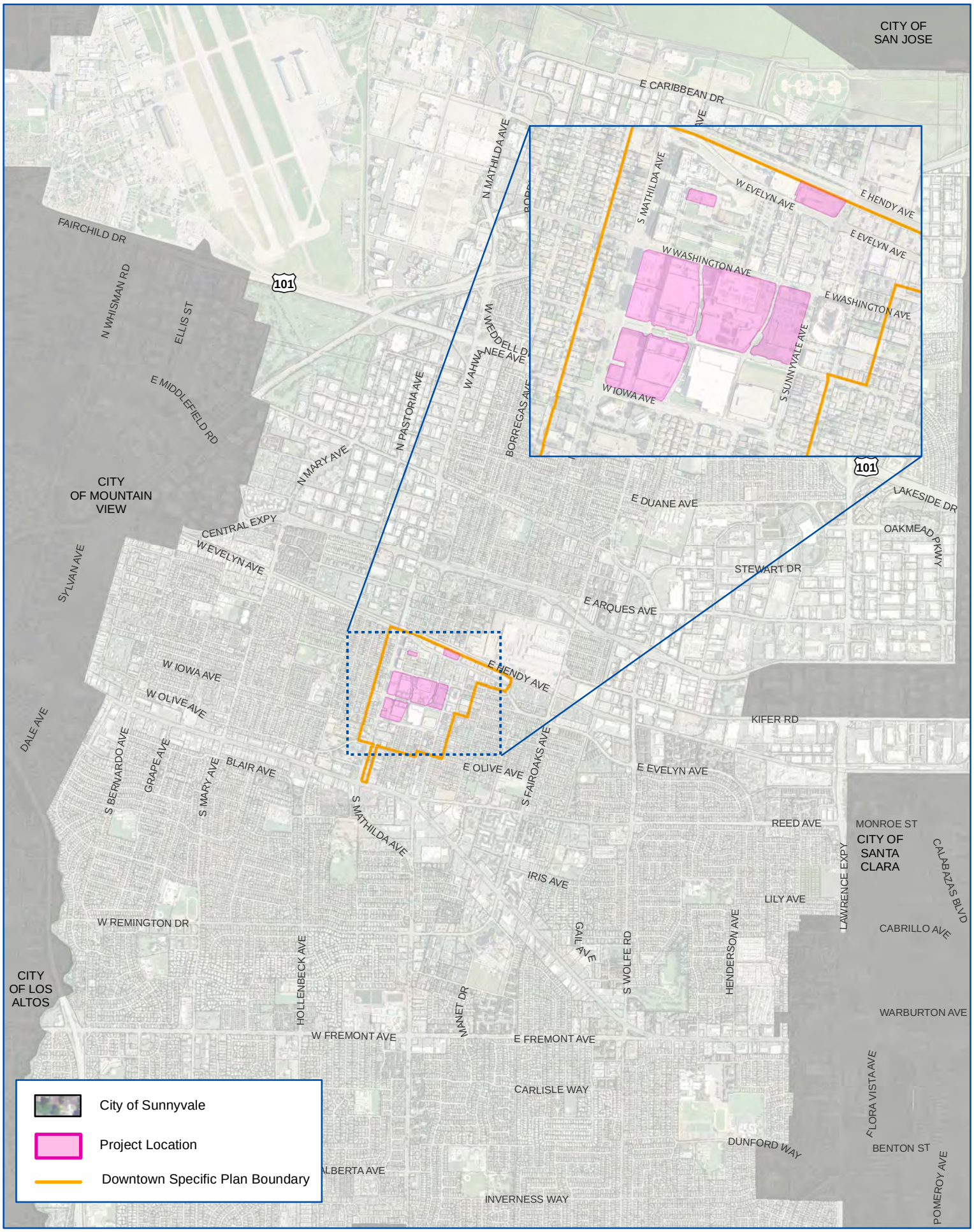
City of Sunnyvale. Sunnyvale Downtown Specific Plan. Adopted by City Council October 2003, Amended March 2013.

City of Sunnyvale. Wastewater Collection System Master Plan. Prepared by Infrastructure Engineering Corporation. December 2015.

City of Sunnyvale. Water Utility Master Plan. Prepared by Infrastructure Engineering Corporation. November 2010.

APPENDIX A:

Figures



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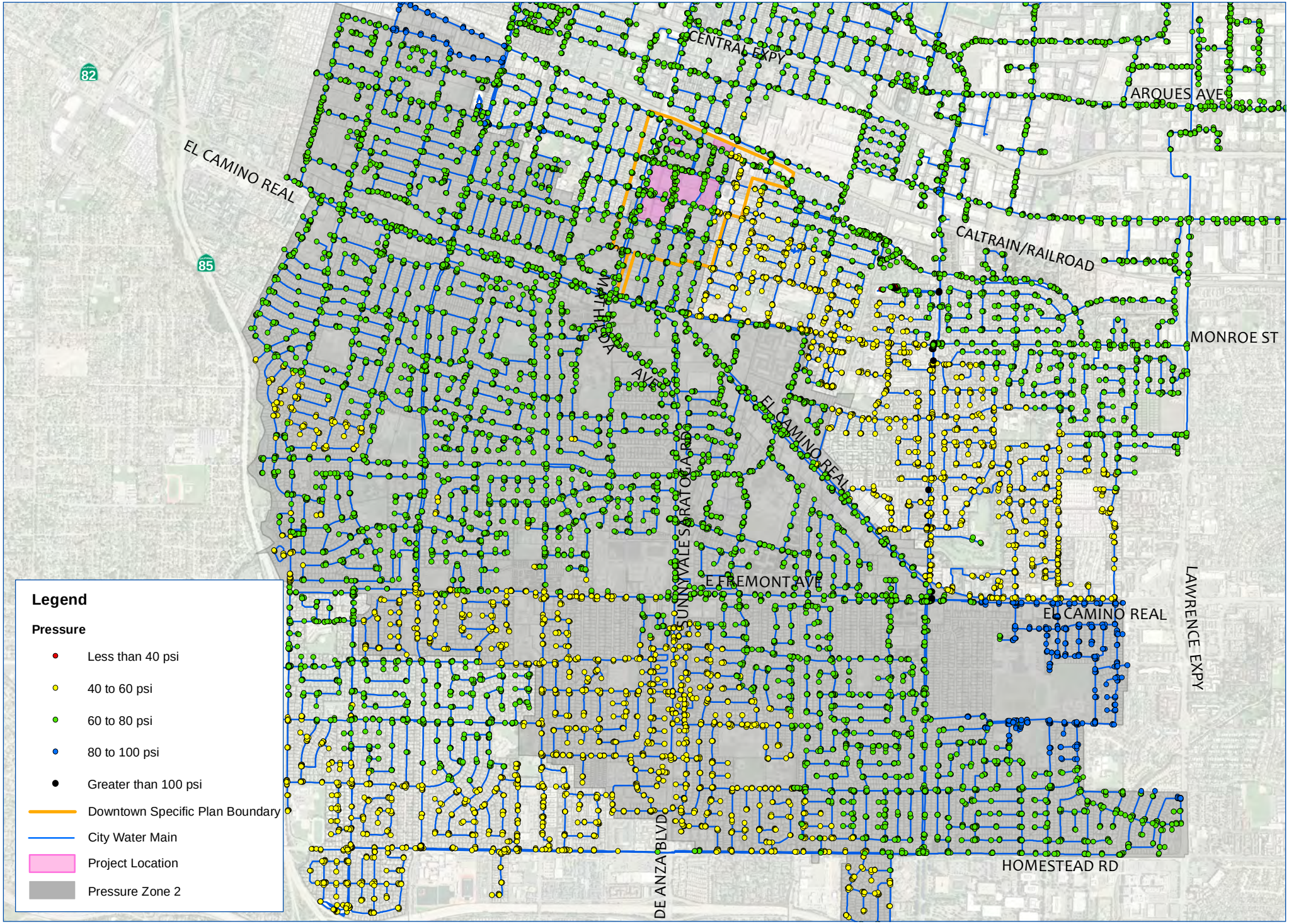
0 1,500 3,000 Feet

FIGURE A-1: **Project Location**



Schaaf & Wheeler
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0 1,250 2,500 Feet

N

FIGURE A-2:

Peak Hour Demand (PHD) - Without Project

Water System Model - Existing Condition

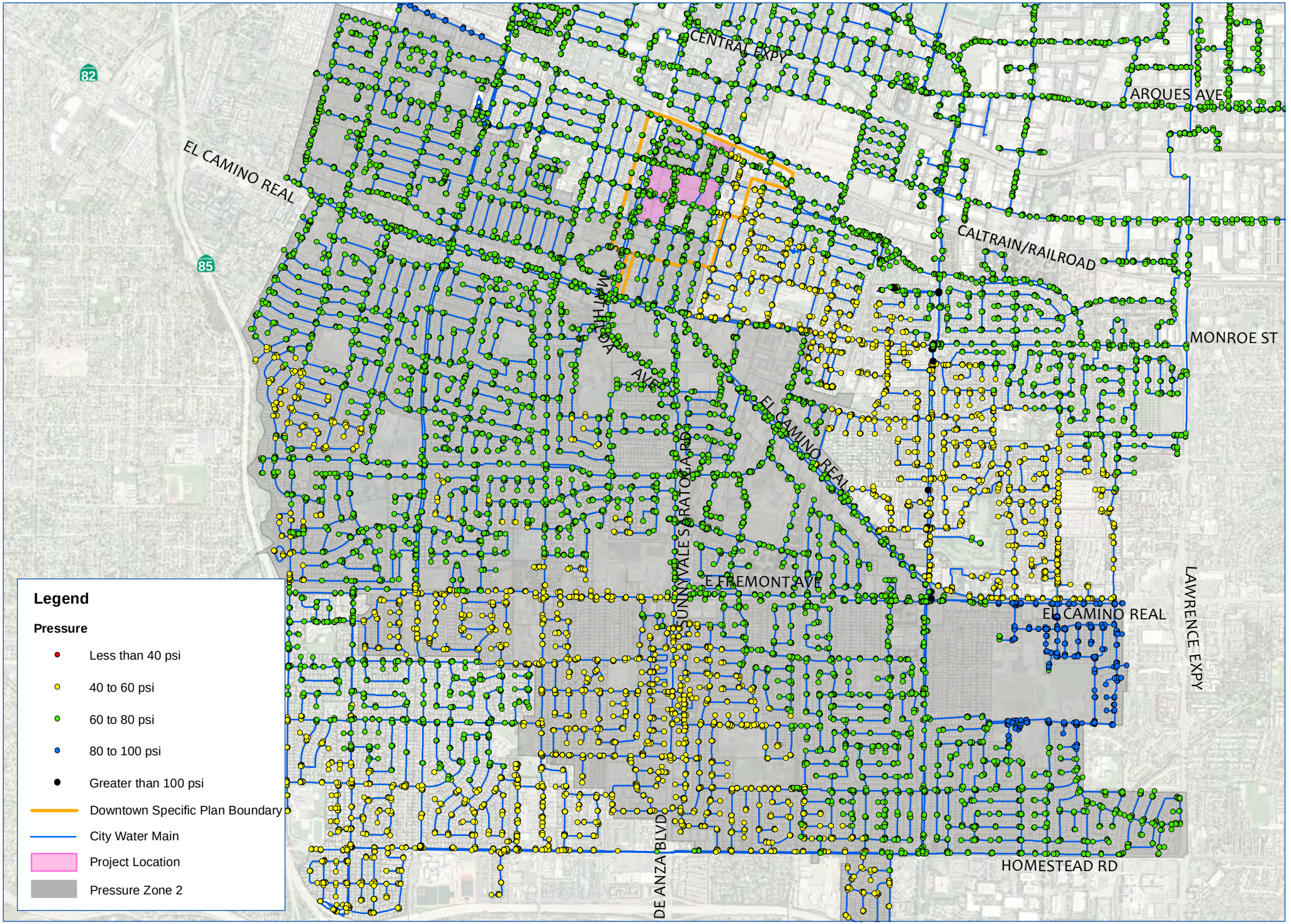

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FIGURE A-3:

Peak Hour Demand (PHD) - With Project

Water System Model - Existing Condition

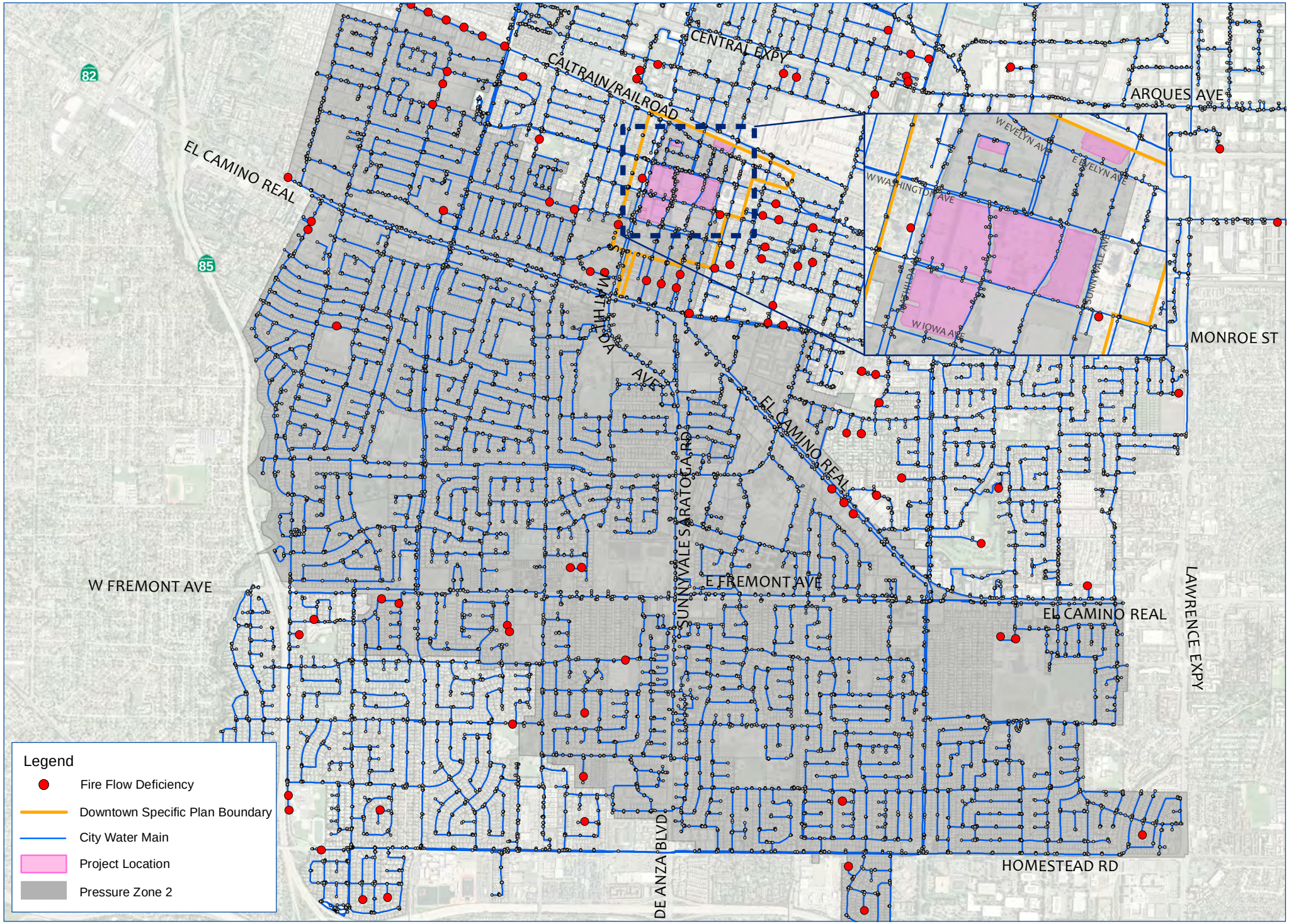

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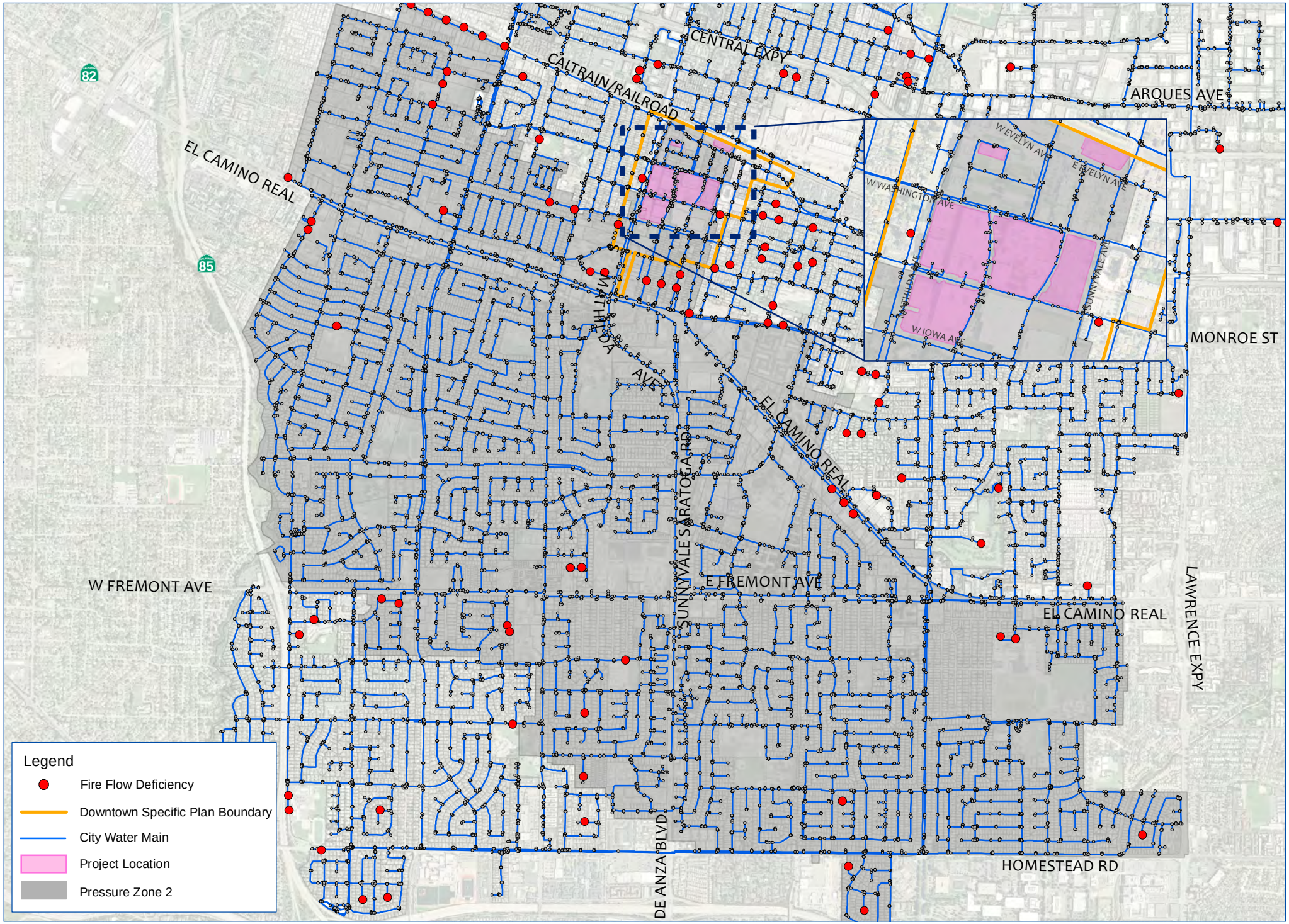
FIGURE A-4:

Fire Flow Analysis - Without Project

Water System Model - Existing Condition



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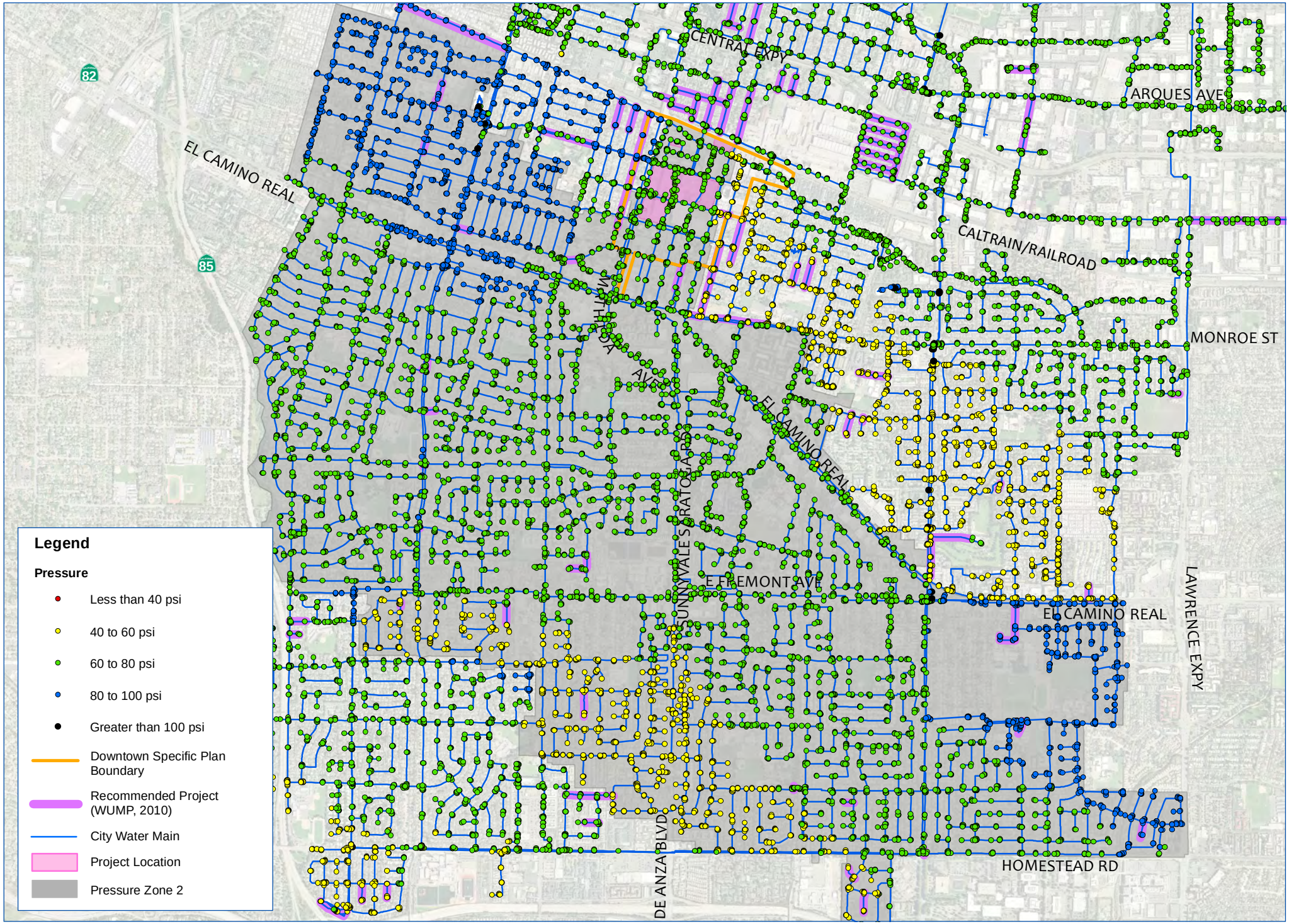
0 1,250 2,500 Feet

N

FIGURE A-5:

Fire Flow Analysis - With Project
Water System Model - Existing Condition



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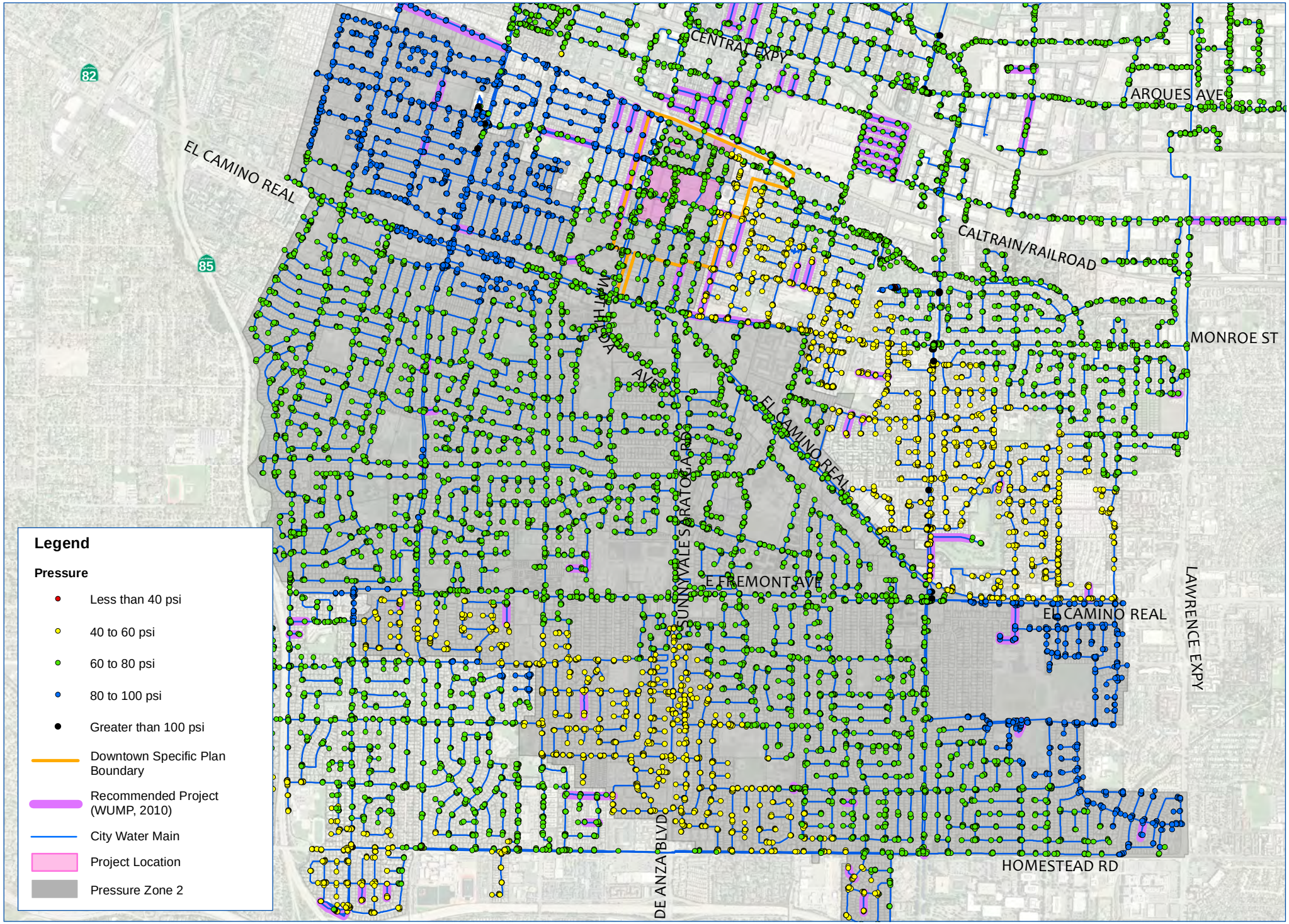
0 1,250 2,500 Feet

N

FIGURE A-6:

Peak Hour Demand (PHD) - Without Project

Water System Model - Future Cumulative Condition



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0 1,250 2,500 Feet

N

FIGURE A-7:

Peak Hour Demand (PHD) - With Project

Water System Model - Future Cumulative Condition

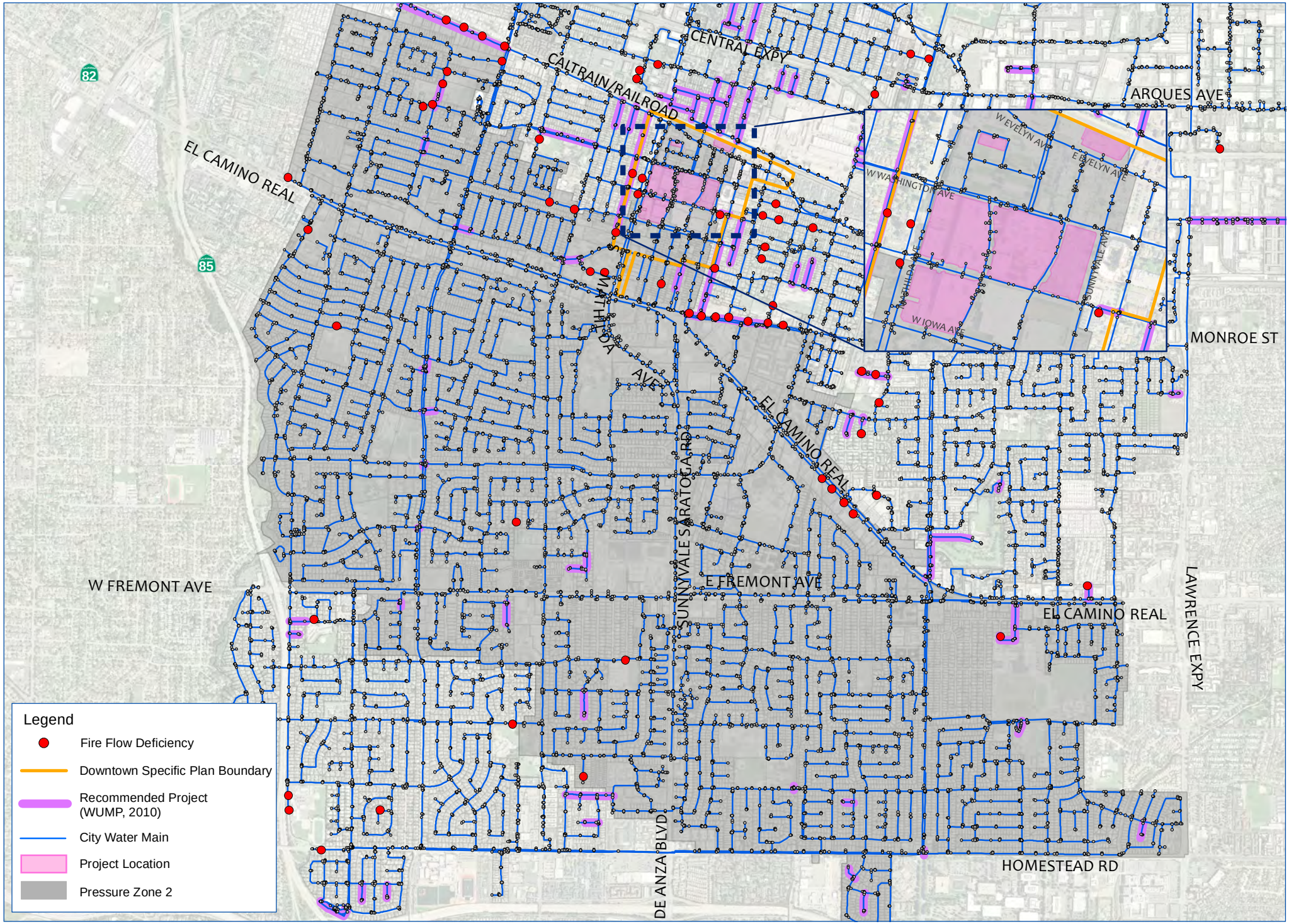

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FIGURE A-8:

Fire Flow Analysis - Without Project

Water System Model - Future Cumulative Condition

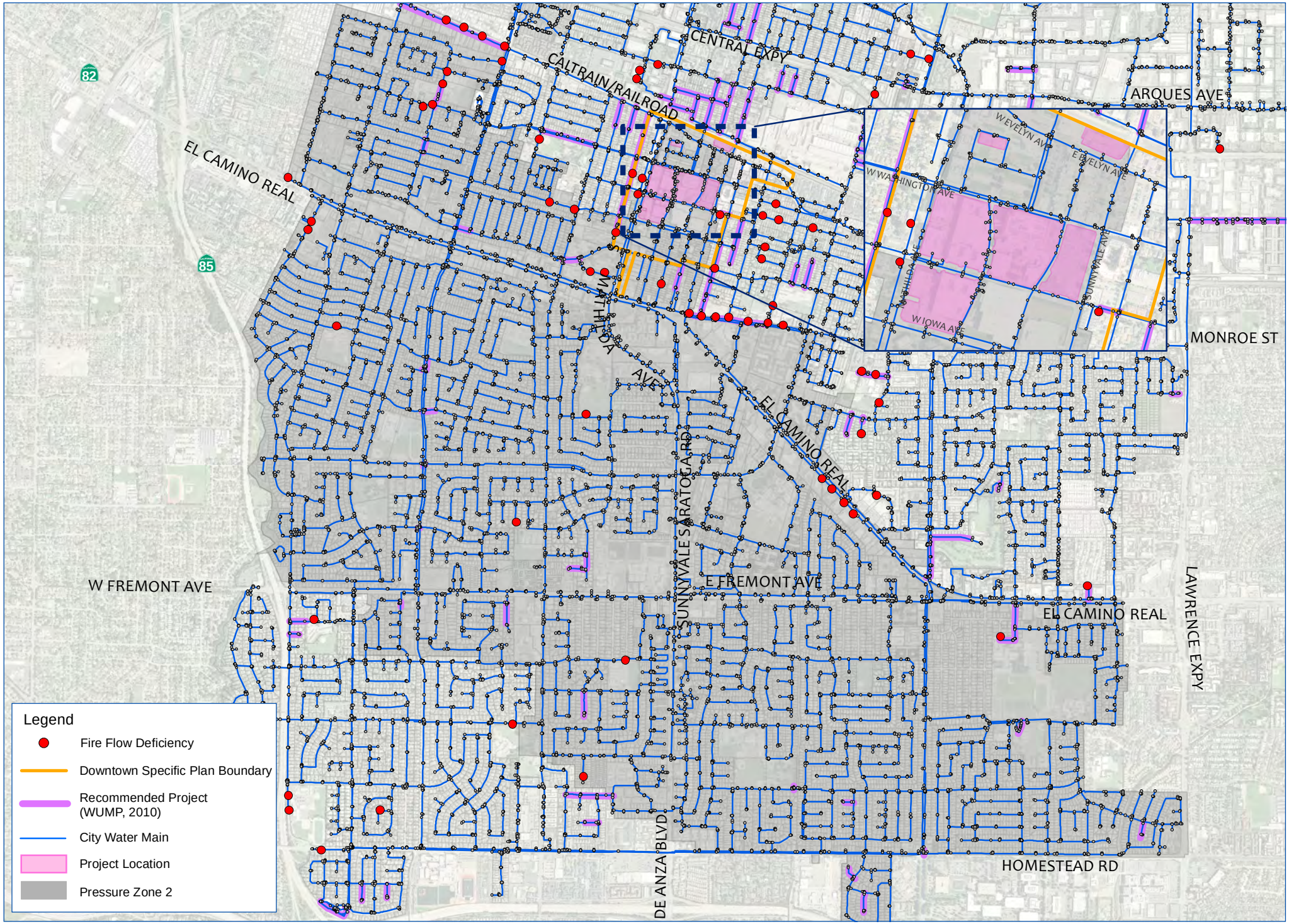

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FIGURE A-9:

Fire Flow Analysis - With Project

Water System Model - Future Cumulative Condition

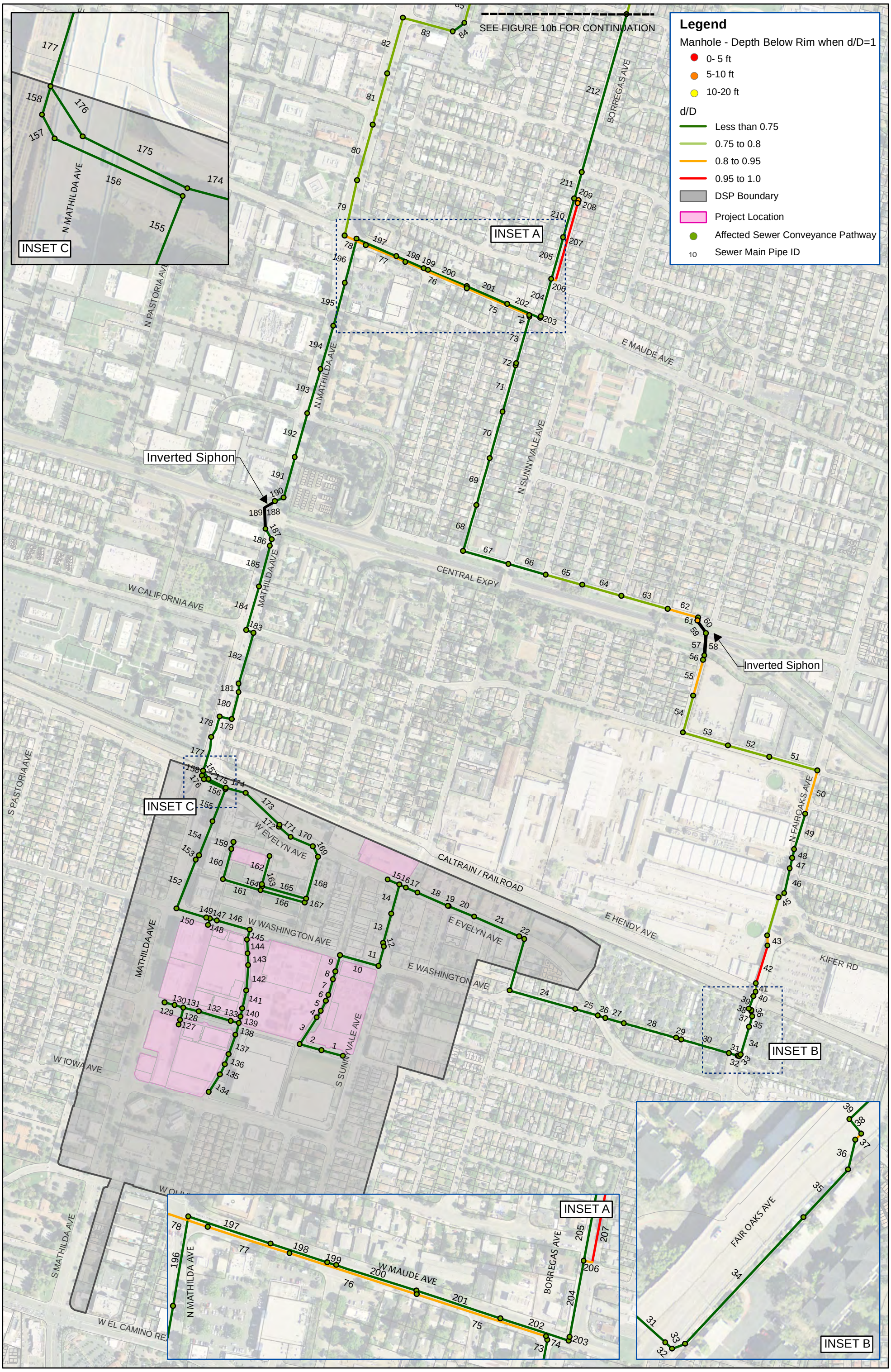

FIGURE A-10a:

Peak Wet Weather Flow - Pre-Project

Sewer System Model - Existing Condition

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Legend

Manhole - Depth Below Rim when d/D=1

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR

W JAVA DR

E JAVA DR

BORREGAS AVE

N MATHILDA AVE

BORDEAUX DR

MOFFETT PARK DR

PERSIAN DR

W WEDDELL DR

E WEDDELL DR

ALMANOR AVE

W AHWANEE AVE

N PASTORIA AVE

MORSE AVE

AHWANEE AVE

N FAIROAKS AVE

237

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SEE FIGURE 10a FOR CONTINUATION

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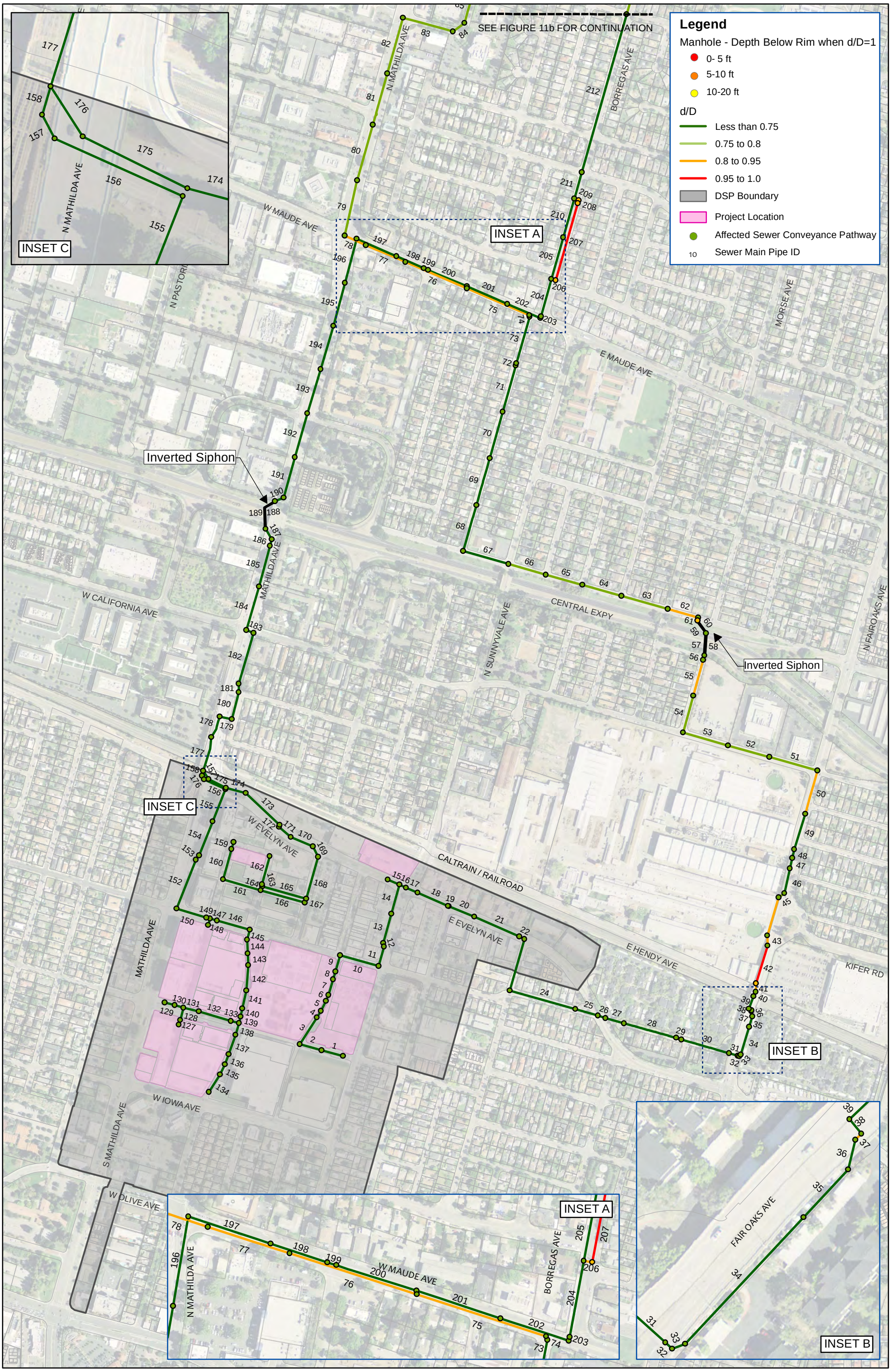
0 300 600 Feet

FIGURE A-10b:

Peak Wet Weather Flow - Pre-Project

Sewer System Model - Existing Condition



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0 295 590 Feet

FIGURE A-11a:

Peak Wet Weather Flow - With Project

Sewer System Model - Existing Condition

Legend

Manhole - Depth Below Rim

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR

BORREGAS AVE

N MATHILDA AVE

BORDEAUX DR

W JAVA DR

E JAVA DR

MOFFETT PARK DR

PERSIAN DR

W WEDDELL DR

E WEDDELL DR

ALMANOR AVE

W AHWANEE AVE

AHWANEE AVE

MORSE AVE

N FAIROAKS AVE

N PASTORIA AVE

237

101

SEE FIGURE 11a FOR CONTINUATION

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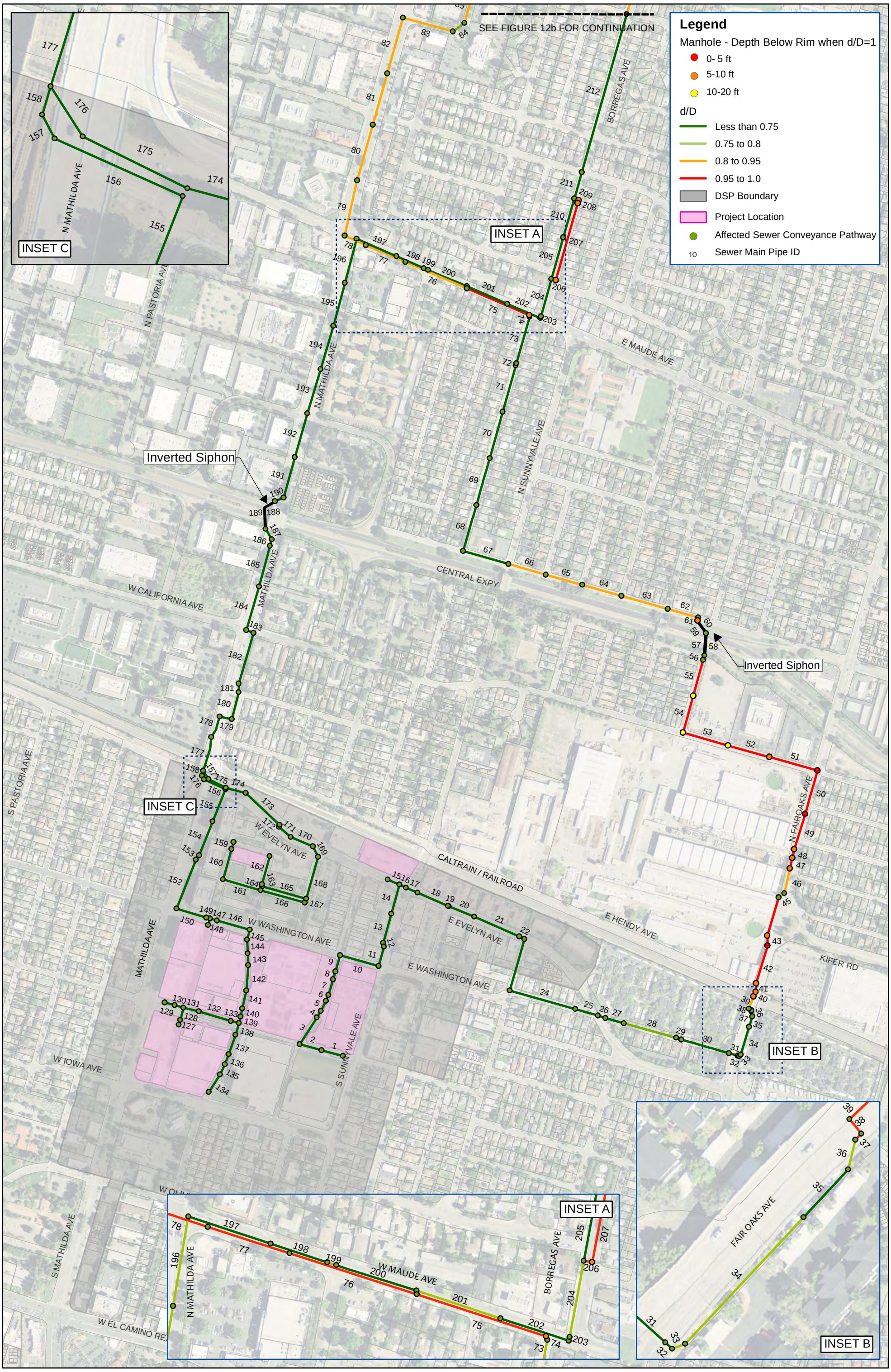
0 300 600 Feet

FIGURE A-11b:

Peak Wet Weather Flow - With Project

Sewer System Model - Existing Condition



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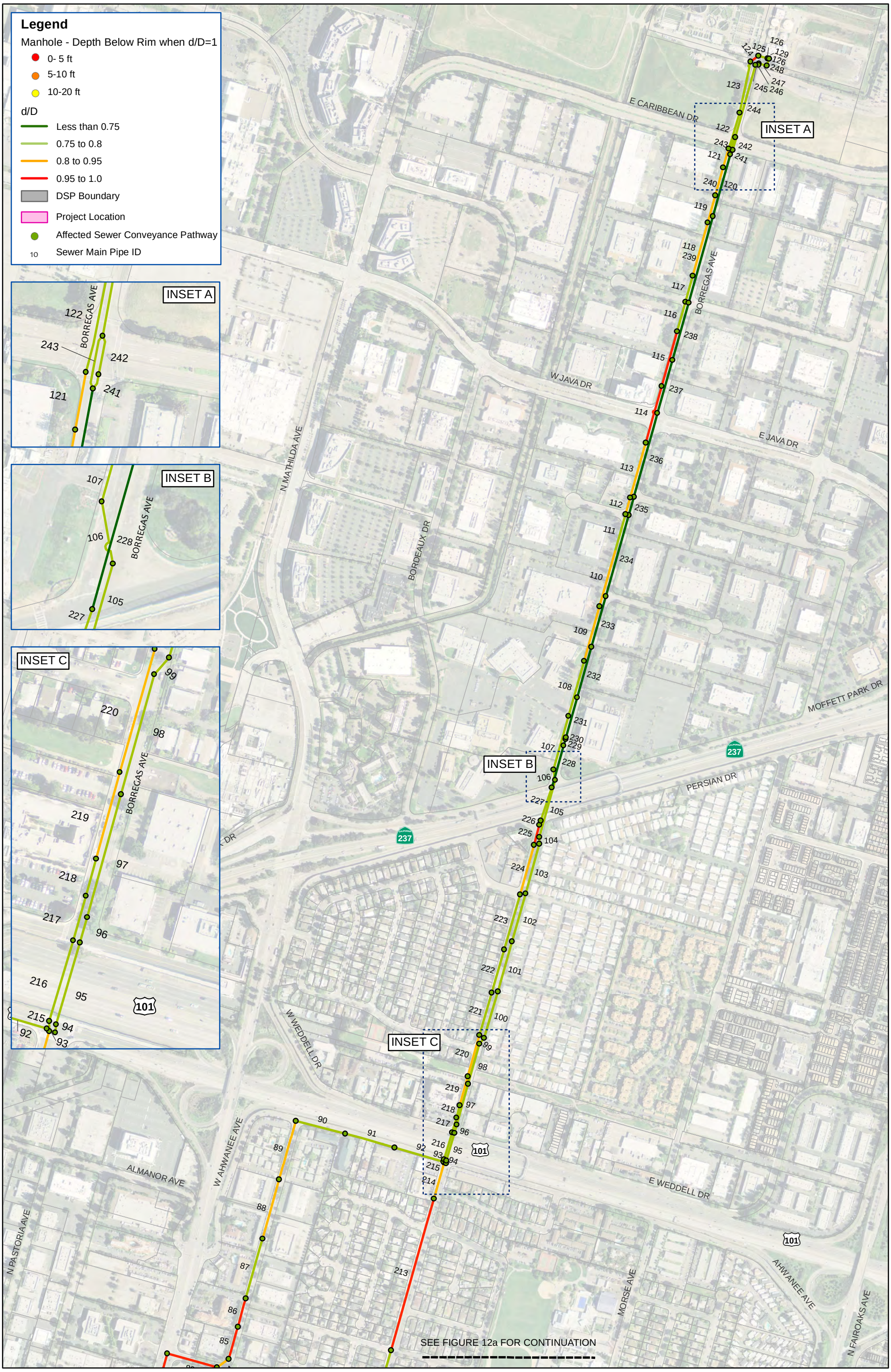
0 300 600 Feet

FIGURE A-12a:

Peak Wet Weather Flow - Pre-Project

Sewer System Model - Future Cumulative Condition



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0 300 600 Feet

FIGURE A-12b:

Peak Wet Weather Flow - Pre-Project

Sewer System Model - Future Cumulative Condition

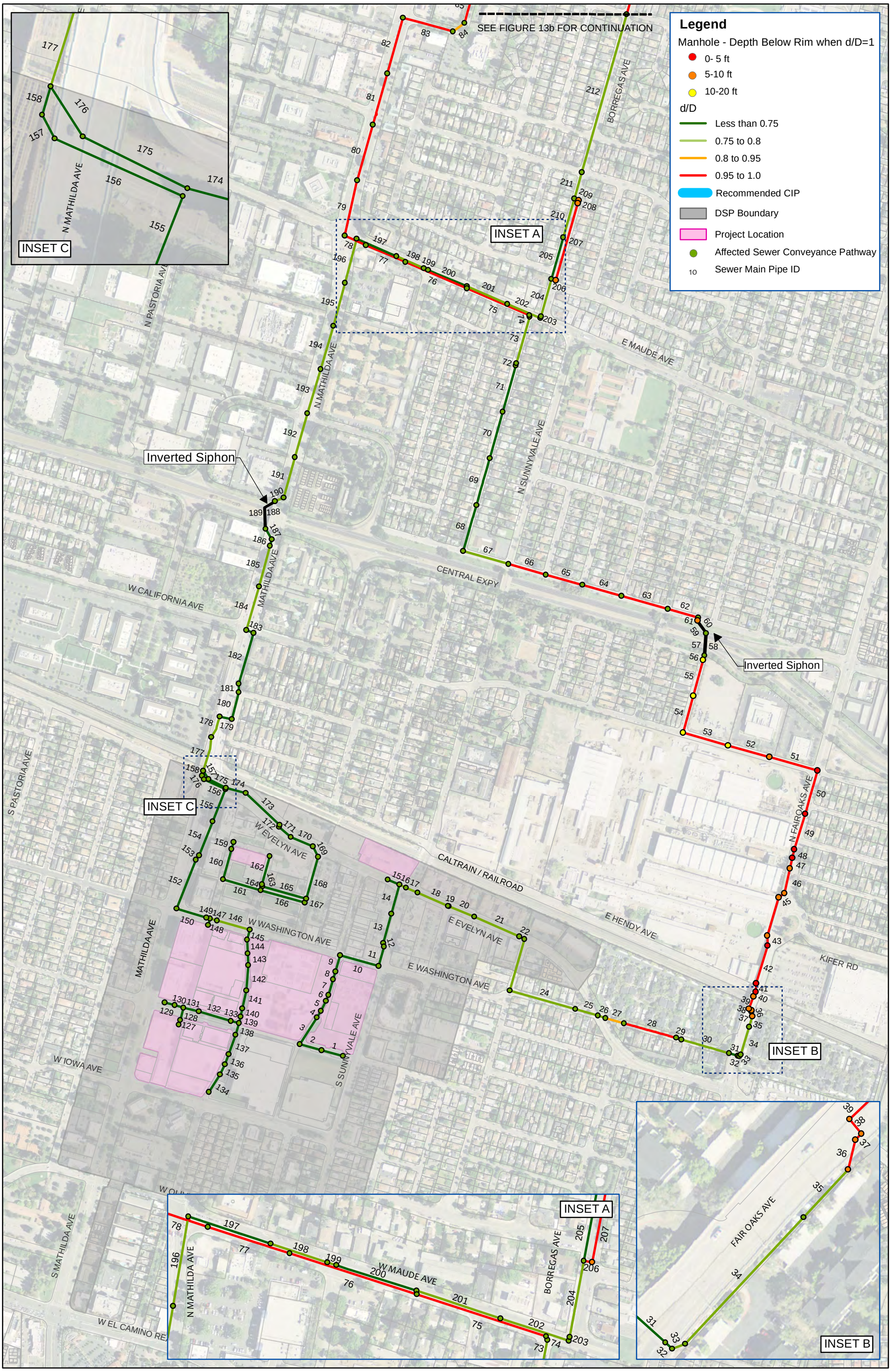

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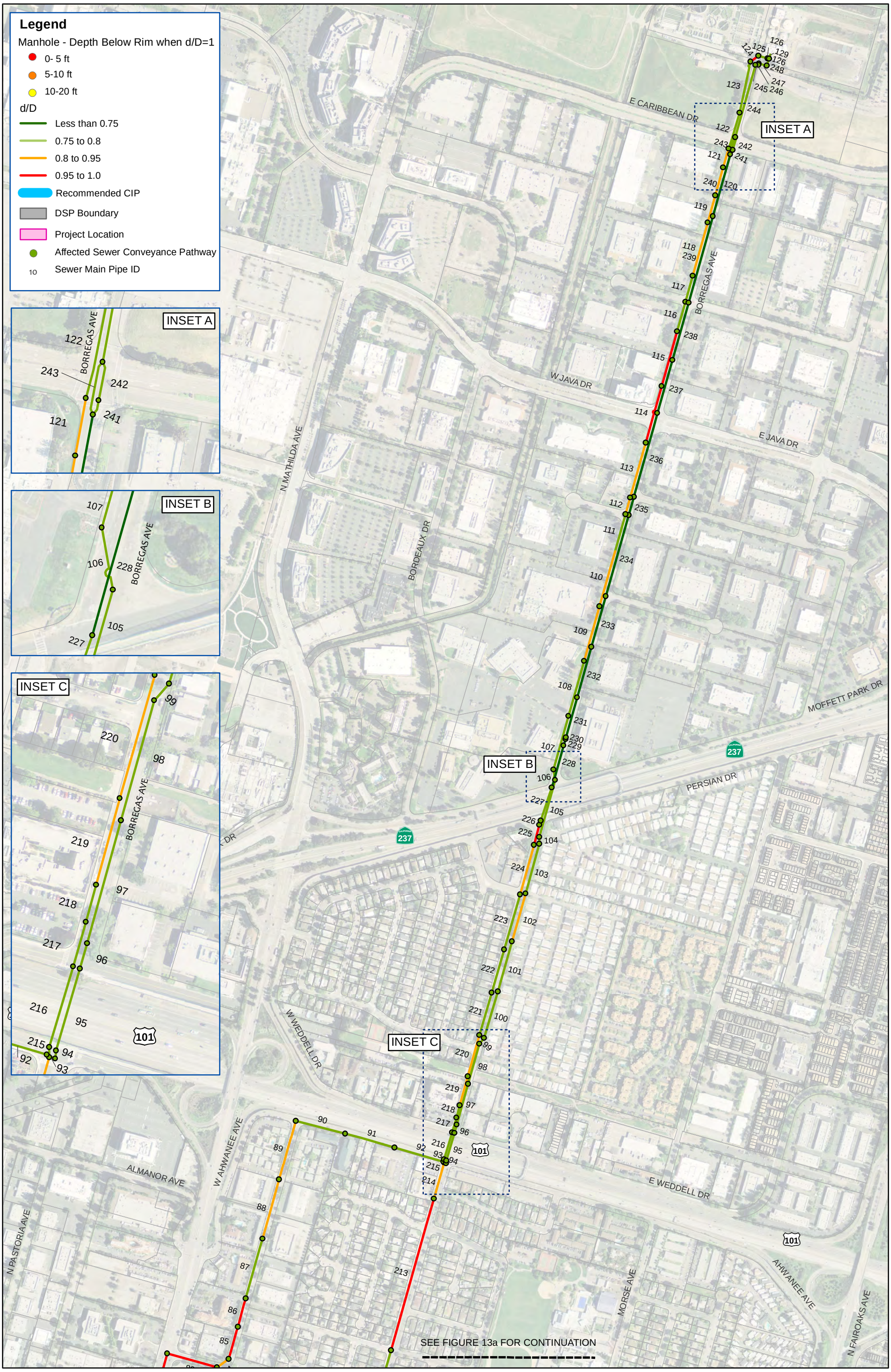
FIGURE A-13a:

Peak Wet Weather Flow - With Project
Sewer System Model - Future Cumulative Condition



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0 300 600 Feet

FIGURE A-13b:

Peak Wet Weather Flow - With Project

Sewer System Model - Future Cumulative Condition

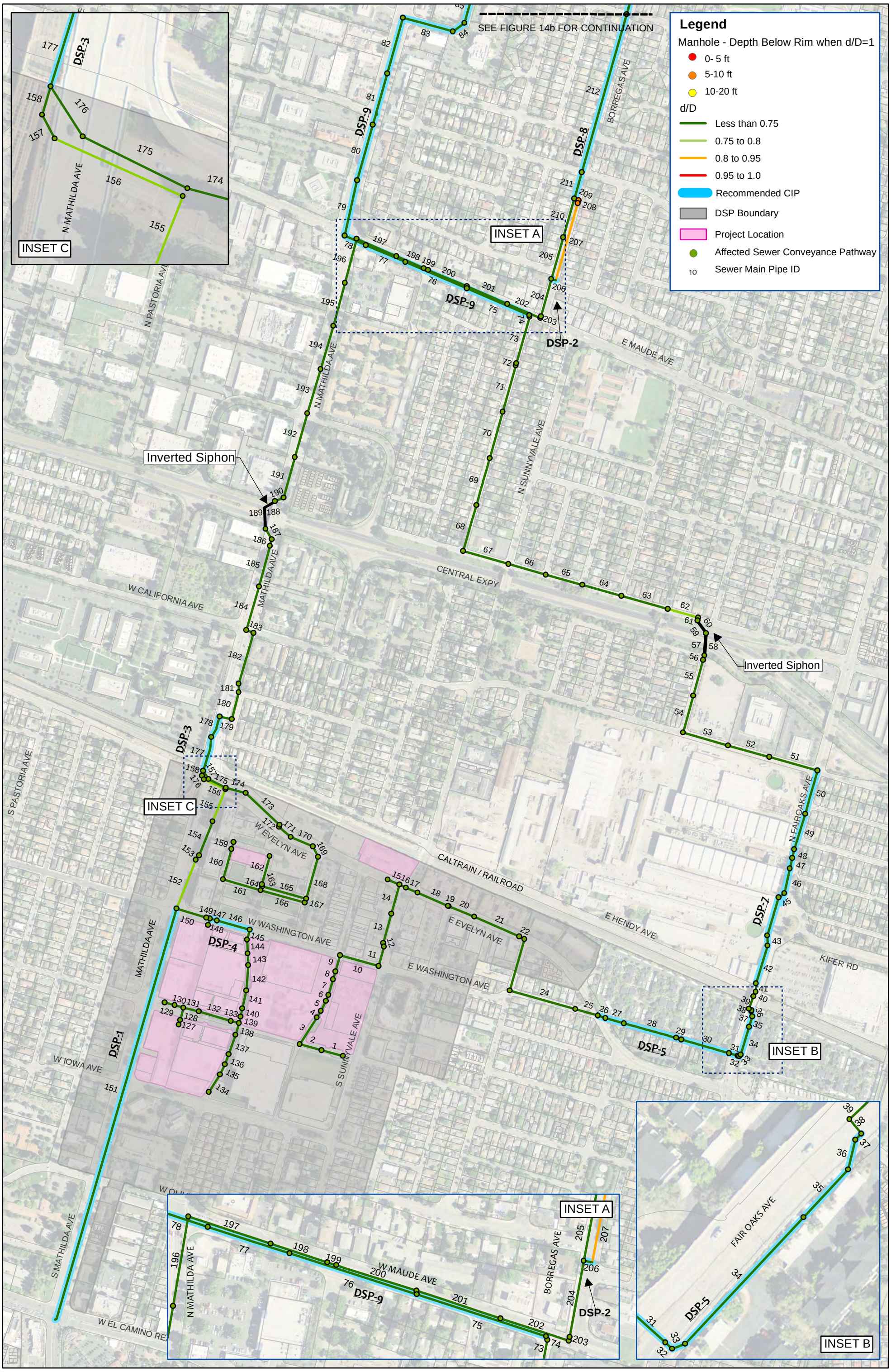

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FIGURE A-14a:

Peak Wet Weather Flow - With Project And All CIPs

Sewer System Model - Future Cumulative Condition

Legend

Manhole - Depth Below Rim when d/D=1

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- Recommended CIP
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR

W JAVA DR

E JAVA DR

MOFFETT PARK DR

PERSIAN DR

BORREGAS AVE

N MATHILDA AVE

BORDEAUX DR

W WEDDELL DR

E WEDDELL DR

W AHWANEE AVE

ALMANOR AVE

N PASTORIA AVE

MORSE AVE

AHWANEE AVE

N FAIROAKS AVE

DSP-6

DSP-8

DSP-9

237

101

SEE FIGURE 14a FOR CONTINUATION

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0 300 600 Feet

FIGURE A-14b: **Peak Wet Weather Flow - With Project And All CIPs**

Sewer System Model - Future Cumulative Condition

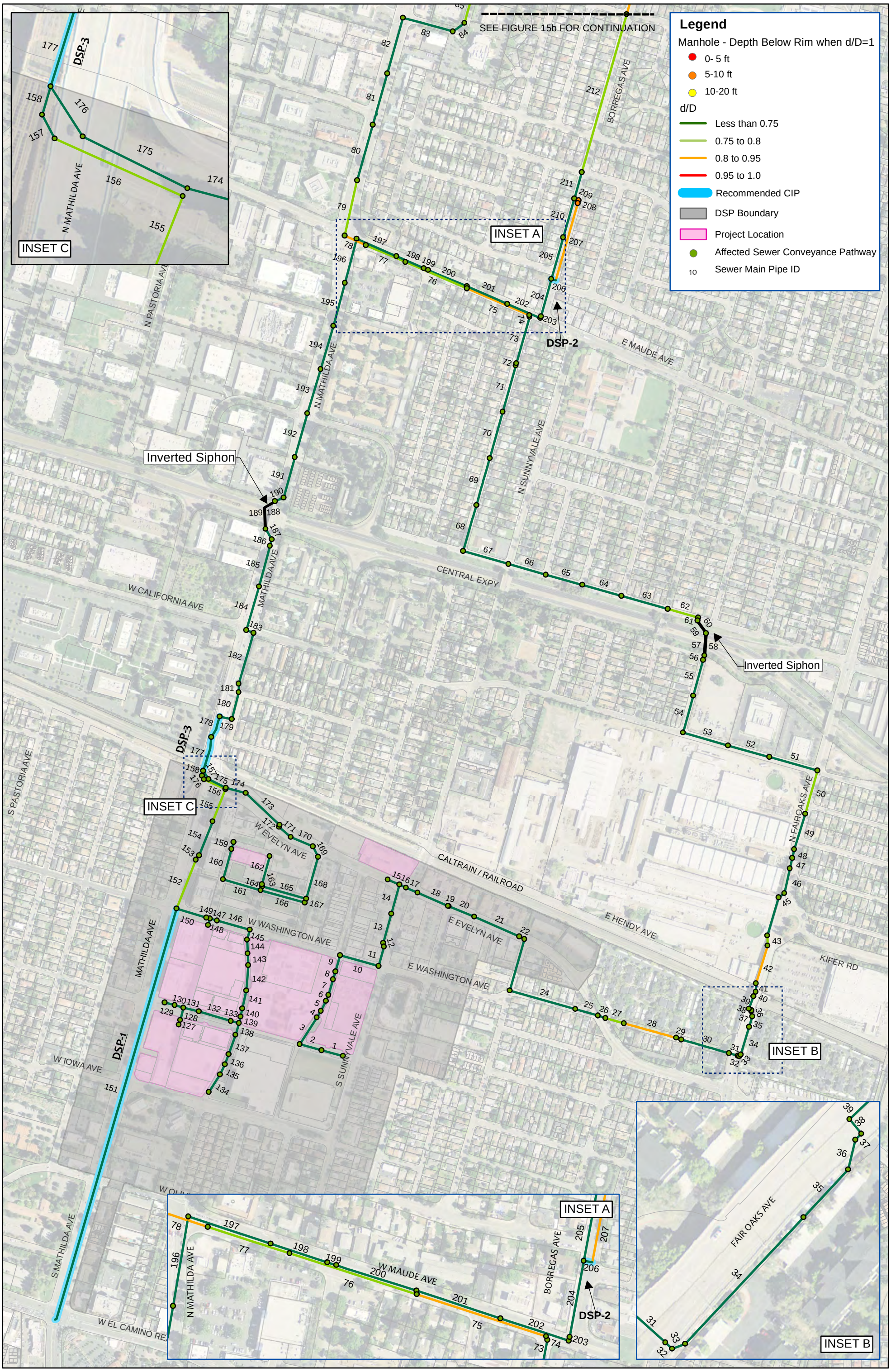

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FIGURE A-15a: **Peak Wet Weather Flow - With Project And 0-5 Year CIPs**
Sewer System Model - Future Cumulative Condition

Legend

Manhole - Depth Below Rim when d/D=1

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- Recommended CIP
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR

W JAVA DR

E JAVA DR

BORREGAS AVE

N MATHILDA AVE

BORDEAUX DR

MOFFETT PARK DR

PERSIAN DR

237

W WEDDELL DR

E WEDDELL DR

ALMANOR AVE

W AHWANEE AVE

N PASTORIA AVE

MORSE AVE

AHWANEE AVE

N FAIROAKS AVE

101

SEE FIGURE 15a FOR CONTINUATION

0 300 600 Feet

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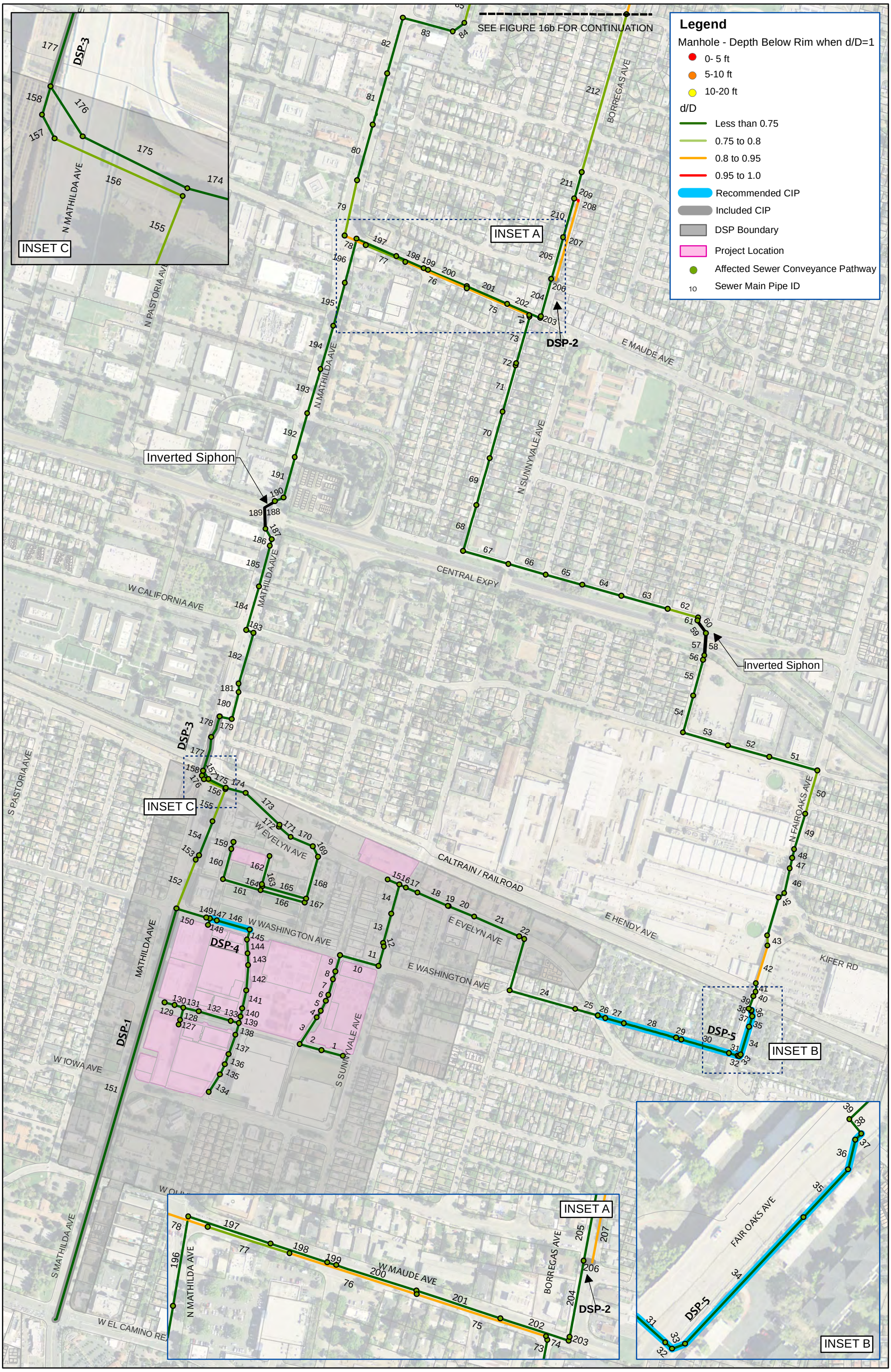
FIGURE A-15b: **Peak Wet Weather Flow - With Project And 0-5 Year CIPs**

Sewer System Model - Future Cumulative Condition



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0 300 600 Feet

FIGURE A-16a: **Peak Wet Weather Flow - With Project And 5-10 Year CIPs**
Sewer System Model - Cumulative Condition

Legend

Manhole - Depth Below Rim when d/D=1

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- Recommended CIP
- Included CIP
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR
W JAVA DR
E JAVA DR
BORREGAS AVE
N MATHILDA AVE
BORDEAUX DR
MOFFETT PARK DR
PERSIAN DR
237
W WEDDELL DR
E WEDDELL DR
ALMANOR AVE
W AHWANEE AVE
N PASTORIA AVE
MORSE AVE
AHWANEE AVE
N FAIROAKS AVE
101
DSP-6

SEE FIGURE 16a FOR CONTINUATION

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0 300 600 Feet

FIGURE A-16b: **Peak Wet Weather Flow - With Project And 5-10 Year CIPs**

Sewer System Model - Future Cumulative Condition

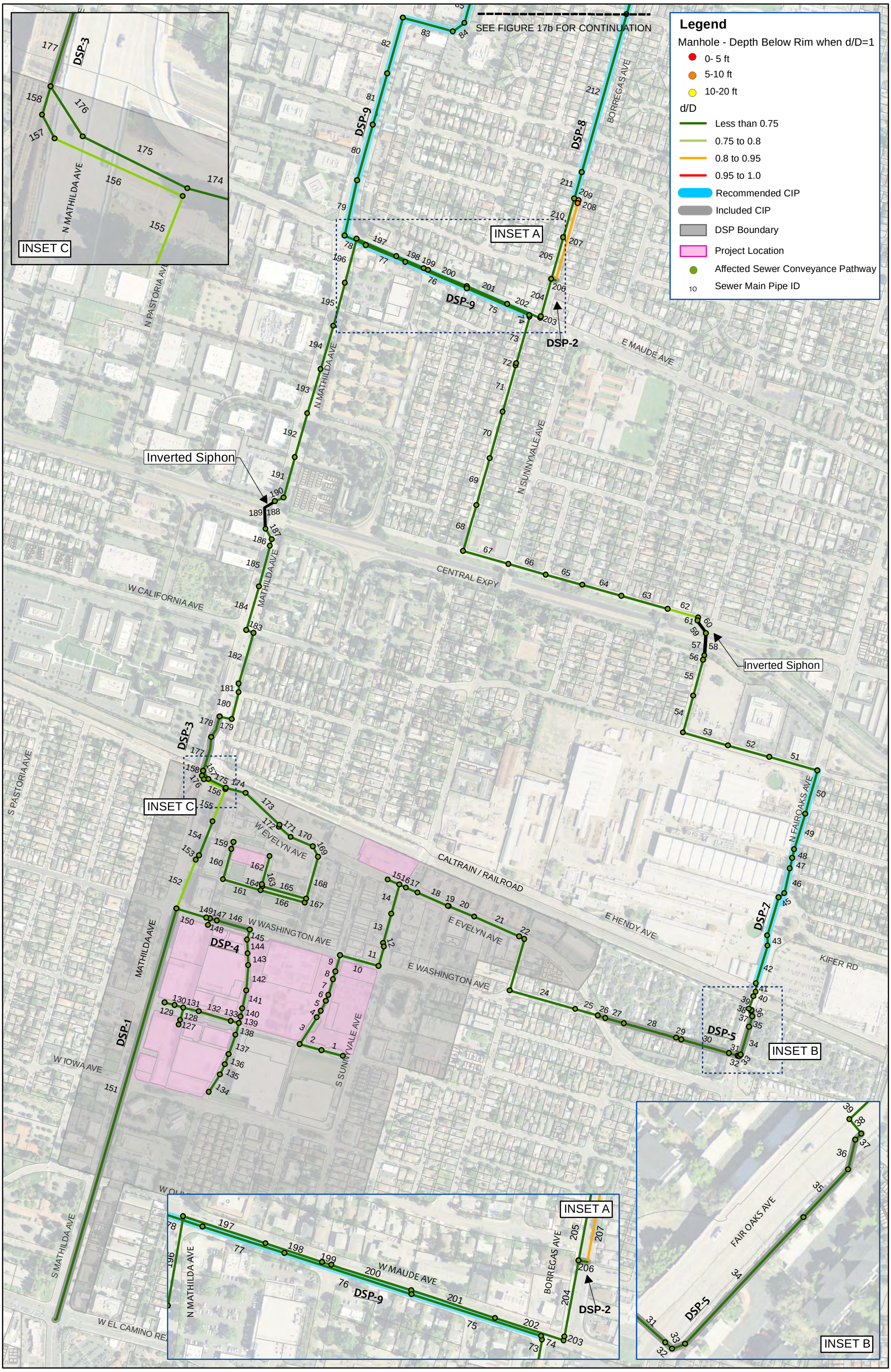

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FIGURE A-17a: **Peak Wet Weather Flow - With Project And 10+ Year CIPs**
Sewer System Model - Future Cumulative Condition

Legend

Manhole - Depth Below Rim when d/D=1

- 0- 5 ft
- 5-10 ft
- 10-20 ft

d/D

- Less than 0.75
- 0.75 to 0.8
- 0.8 to 0.95
- 0.95 to 1.0
- Recommended CIP
- Included CIP
- DSP Boundary
- Project Location
- Affected Sewer Conveyance Pathway
- 10 Sewer Main Pipe ID

INSET A

INSET B

INSET C

E CARIBBEAN DR

W JAVA DR

E JAVA DR

BORREGAS AVE

N MATHILDA AVE

BORDEAUX DR

MOFFETT PARK DR

PERSIAN DR

W WEDDELL DR

E WEDDELL DR

W AHWANEE AVE

ALMANOR AVE

N PASTORIA AVE

MORSE AVE

AHWANEE AVE

N FAIROAKS AVE

DSP-6

DSP-8

DSP-9

237

101

SEE FIGURE 17a FOR CONTINUATION

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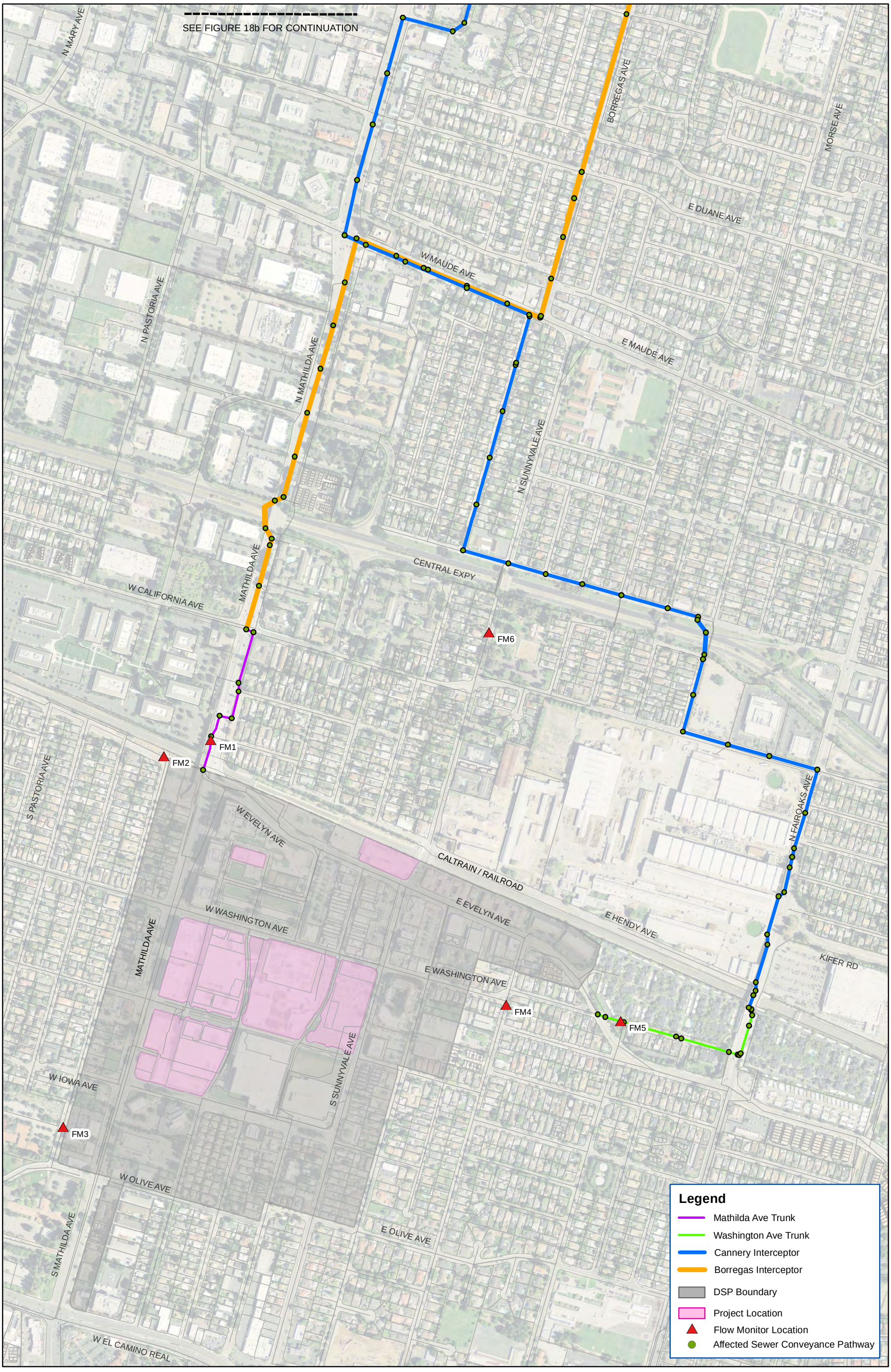
0 300 600 Feet

FIGURE A-17b: **Peak Wet Weather Flow - With Project And 10+ Year CIPs**

Sewer System Model - Future Cumulative Condition



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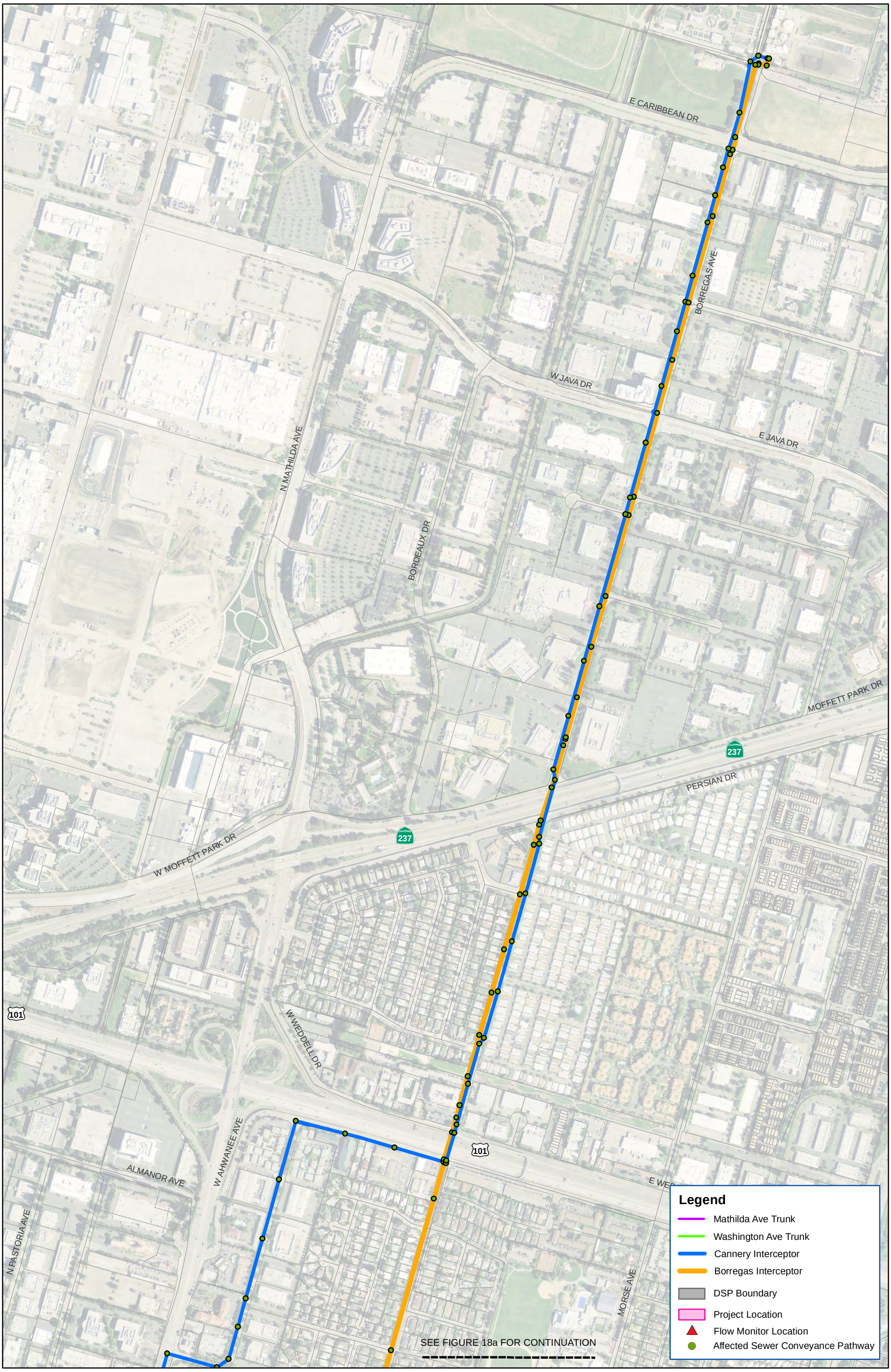
0 300 600 Feet

FIGURE A-18a:

Flow Monitoring Locations And Sewer Interceptors

Sewer System Model



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0 300 600 Feet

FIGURE A-18b: **Flow Monitoring Locations And Sewer Interceptors**

Sewer System Model

APPENDIX B:

Model Results

Table B-1: Existing Condition Model Results

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	McKinley Ave between Murphy Ave and Sunnyvale Ave	1	S3280267-3280268	S328-267	S328-268	10	153.7	0.071	86		0.147	71	
		2	S3280268-3280269	S328-268	S328-269	10	155.4	0.083	83		0.157	69	
	Murphy Ave between Iowa Ave and Washington Ave	3	S3280269-3280270	S328-269	S328-270	12	218.3	0.171	77		0.191	75	
		4	S3280270-3280271	S328-270	S328-271	12	54.1	0.204	73		0.238	68	
		5	S3280271-3280272	S328-271	S328-272	12	76.1	0.184	75		0.225	70	
		6	S3280272-3280273	S328-272	S328-273	12	46.4	0.211	72		0.308	59	
		7	S3280273-3280274	S328-273	S328-274	12	112.2	0.233	69		0.333	56	
		8	S3280274-3280275	S328-274	S328-275	12	55.5	0.295	61		0.406	46	
		9	S3280275-3530273	S328-275	S353-273	12	116.3	0.221	71		0.316	58	
	Washington Ave between Murphy Ave and Sunnyvale Ave	10	S3530273-3290250	S353-273	S329-250	12	276.6	0.218	71		0.312	58	
	Sunnyvale Ave between Washington Ave and Evelyn Ave	11	S3290221-3520204	S329-250	S352-204	12	140.2	0.205	73		0.286	62	
		12	S3520204-3520203	S352-204	S352-203	12	25.4	0.205	73		0.286	62	
		13	S3520203-3520202	S352-203	S352-202	12	209.8	0.206	73		0.283	62	
		14	S3520202-3520223	S352-202	S352-223	12	209.1	0.207	72		0.283	62	
	Evelyn Ave between Sunnyvale Ave and Bayview Ave	15	S3520217-3520223	S352-217	S352-223	14	86.6	0.281	63		0.393	48	
		16	S3520223-3520205	S352-223	S352-205	14	50.3	0.372	50		0.481	36	
		17	S3520205-3520221	S352-205	S352-221	14	87.3	0.386	49		0.492	34	
		18	S3520221-3520213	S352-221	S352-213	14	228.8	0.441	41		0.531	29	
		19	S3520213-3520208	S352-213	S352-208	14	6.7	0.390	48		0.463	38	
		20	S3520208-3520210	S352-208	S352-210	14	190.6	0.361	52		0.441	41	
		21	S3520210-3520216	S352-210	S352-216	14	338.0	0.454	39		0.541	28	
		22	S3520216-3520209	S352-216	S352-209	14	40.2	0.439	41		0.523	30	
	Bayview Ave between Evelyn Ave and Washington Ave	23	S3520209-3290208	S352-209	S329-208	14	371.6	0.400	47		0.477	36	
	Washington Ave between Bayview Ave and Fair Oaks Ave	24	S3290208-3300216	S329-208	S330-216	14	470.4	0.464	38		0.535	29	
		25	S3300216-3300204	S330-216	S330-204	14	162.0	0.422	44		0.483	36	
		26	S3300204-3300202	S330-204	S330-202	14	56.1	0.478	36		0.567	24	
		27	S3300202-3300227	S330-202	S330-227	14	131.6	0.546	27		0.639	15	
		28	S3300227-3300225	S330-227	S330-225	15	374.1	0.598	20		0.681	9	
		29	S3300225-3300213	S330-225	S330-213	15	38.3	0.668	11		0.744	1	
		30	S3300213-3300211	S330-213	S330-211	15	342.9	0.519	31		0.575	23	
		31	S3300211-3300210	S330-211	S330-210	15	62.1	0.321	57		0.352	53	
		32	S3300210-3300209	S330-210	S330-209	15	10.7	0.241	68		0.264	65	
	Fair Oaks Ave south of RR Crossing	33	S3300209-3300228	S330-209	S330-228	10	16.0	0.483	3		0.552	**0**	
		34	S3300228-3310206	S330-228	S331-206	10	199.4	0.492	2		0.562	**0**	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Fair Oaks Ave south of RR Crossing	35	S3310206-3310204	S331-206	S331-204	10	75.4	0.297	41		0.336	33	
		36	S3310204-3310203	S331-204	S331-203	10	35.4	0.621	0		0.649	0	
		37	S3310203-3310207	S331-203	S331-207	12	9.9	0.820	0		0.834	0	
	Fair Oaks Ave at RR Crossing	38	D3310115-3310125	S331-207	D331-115	18	23.4	0.687	8		0.695	7	
		39	D3310115-3310104	D331-115	D331-104	18	91.5	0.582	22		0.593	21	
		40	D3310104-3310103	D331-104	D331-103	18	35.5	0.581	23		0.608	19	
		41	D3310103-3311559	D331-103	D331-1559	18	57.8	0.790	0		0.818	0	6.69
	Fair Oaks Ave north of RR Crossing	42	D3311559-3501554	D331-1559	D350-1554	18	271.5	0.956	0		0.977	0	
		43	D3501554-3500103	D350-1554	D350-103	18	71.7	0.863	0		0.883	0	
		44	D3500103-3500109	D350-103	D350-109	18	273.9	0.799	0		0.814	0	
		45	D3500109-3500110	D350-109	D350-110	18	49.4	0.758	0		0.771	0	
		46	D3500110-3500113	D350-110	D350-113	18	176.0	0.715	5		0.726	3	
		47	D3500113-3500114	D350-113	D350-114	18	73.9	0.715	5		0.726	3	
		48	D3500114-3500115	D350-114	D350-115	18	63.0	0.715	5		0.726	3	
		49	D3500115-3711002	D350-115	S371-210	18	255.0	0.716	5		0.727	3	
		50	S3710210-3710205	S371-210	S371-205	18	312.2	0.816	0		0.830	0	
	California Ave between Fair Oaks Ave and Roosevelt Ave	51	S3710205-3710209	S371-205	S371-209	21	345.8	0.777	0		0.791	0	
		52	S3710209-3700208	S371-209	S370-208	21	296.1	0.767	0		0.780	0	
		53	S3700208-3700206	S370-208	S370-206	21	322.4	0.769	0		0.783	0	
	Roosevelt Ave before Siphon 1	54	S3700206-3700207	S370-206	S370-207	21	263.9	0.777	0		0.794	0	
		55	S3700207-3910219	S370-207	S391-219	21	256.9	0.820	0		0.839	0	
		56	S3910219-3910217	S391-219	S391-217	21	32.1	0.867	0		0.886	0	
	Inverted Siphon 1 at Central Expressway	57	S3910217-3910215	S391-217	S391-215	24	155.0	0.883	-		0.891	-	
		58	S3910217-3910215-2	S391-217	S391-215	24	155.0	0.883	-		0.891	-	
	Inverted Siphon 2 at Central Expressway	59	S3910215-3910211	S391-215	S391-211	24	106.5	1.000	-	8.32	1.000	-	8.29
		60	S3910215-3910211-2	S391-215	S391-211	24	106.5	1.000	-	8.32	1.000	-	8.29
	Central Expressway between Murphy Ave and Roosevelt Ave	61	S3910211-3910210	S391-211	S391-210	24	27.5	0.898	0		0.905	0	
		62	S3910210-3910208	S391-210	S391-208	21	219.0	0.842	0		0.858	0	
		63	S3910208-3910206	S391-208	S391-206	21	331.0	0.771	0		0.785	0	
		64	S3910206-3910204	S391-206	S391-204	21	277.0	0.775	0		0.789	0	
		65	S3910204-3920211	S391-204	S392-211	21	267.0	0.755	0		0.768	0	
		66	S3920211-3920203	S392-211	S392-203	21	276.0	0.748	0.3		0.760	0	
		67	S3920203-3920201	S392-203	S392-201	21	332.0	0.650	13		0.658	12	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Murphy Ave between Central Ave and Maude Ave	68	S3920201-4090214	S392-201	S409-214	27	330.0	0.422	44		0.426	43	
		69	S4090214-4090216	S409-214	S409-216	27	336.4	0.424	43		0.428	43	
		70	S4090216-4090218	S409-216	S409-218	27	335.0	0.420	44		0.425	43	
		71	S4090218-4320226	S409-218	S432-226	27	330.1	0.415	45		0.419	44	
		72	S4320226-4320217	S432-226	S432-217	27	16.0	0.400	47		0.404	46	
		73	S4320217-4320218-2	S432-217	S432-218	27	334.2	0.453	40		0.466	38	
	Maude Ave between Mathilda Ave and Borregas Ave	74	S4320218-4320219	S432-218	S432-219	27	12.0	0.630	16		0.651	13	
		75	S4320219-4320212	S432-219	S432-212	24	470.3	0.832	0		0.854	0	
		76	CDT-47	S432-212	S432-229	24	461.4	0.816	0		0.836	0	
		77	S4320229-4330201	S432-229	S433-201	24	297.3	0.802	0		0.821	0	
		78	S4330201-4330231	S433-201	S433-231	21	131.0	0.848	0		0.868	0	
	Mathilda Ave between Maude Ave and San Aleso Ave	79	S4330231-4480216	S433-231	S448-216	21	391.5	0.770	0		0.786	0	
		80	S4480216-4490205	S448-216	S449-205	21	400.0	0.756	0		0.771	0	
		81	S4490205-4720204	S449-205	S472-204	21	400.0	0.757	0		0.772	0	
		82	S4720204-4720207	S472-204	S472-207	21	400.0	0.756	0		0.770	0	
	San Aleso Ave	83	S4720207-4720209	S472-207	S472-209	21	357.5	0.752	0		0.766	0	
		84	S4720209-4720211	S472-209	S472-211	21	85.4	0.743	1		0.757	0	
		85	S4720211-4721006	S472-211	S472TEE1006	21	231.0	0.768	0		0.783	0	
		86	S4721006-4720212	S472TEE1006	S472-212	21	204.1	0.804	0		0.819	0	
		87	S4720212-4890206	S472-212	S489-206	27	426.5	0.666	11		0.676	10	
		88	S4890206-4890208	S489-206	S489-208	27	422.0	0.720	4		0.733	2	
		89	S4890208-5120205	S489-208	S512-205	27	421.5	0.718	4		0.730	3	
	Ahwanee Ave between San Aleso Ave and Borregas Ave	90	S5120205-4900240	S512-205	S490-240	27	373.4	0.691	8		0.702	6	
		91	S4900240-4900232	S490-240	S490-232	27	352.3	0.661	12		0.671	11	
		92	S4900232-4900206	S490-232	S490-206	27	352.3	0.686	9		0.696	7	
		93	S4900206-4900205	S490-206	S490-205	27	21.5	0.712	5		0.722	4	
	Borregas Ave	94	S4900205-4900202	S490-205	S490-202	27	18.9	0.686	9		0.696	7	
		95	S4900202-4900218	S490-202	S490-218	27	196.8	0.678	10		0.688	8	
		96	S4900218-5110215	S490-218	S511-215	27	60.1	0.666	11		0.676	10	
		97	S5110215-5110213	S511-215	S511-213	27	282.6	0.598	20		0.607	19	
		98	S5110213-5110208	S511-213	S511-208	24	278.0	0.569	24		0.577	23	
		99	S5110208-5110207	S511-208	S511-207	21	42.0	0.657	12		0.668	11	
		100	S5110207-5110206	S511-207	S511-206	21	356.0	0.702	6		0.714	5	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Borregas Ave	101	S5110206-5300205	S511-206	S530-205	21	356.0	0.703	6		0.715	5	
		102	S5300205-5300220	S530-205	S530-220	21	356.0	0.704	6		0.716	5	
		103	S5300220-5500211	S530-220	S550-211	21	356.0	0.697	7		0.708	6	
		104	S5500211-5500210	S550-211	S550-210	21	43.2	0.689	8		0.700	7	
		105	S5500210-5500204	S550-210	S550-204	21	400.0	0.672	10		0.682	9	
		106	S5500204-5500203	S550-204	S550-203	24	75.0	0.640	15		0.650	13	
		107	S5500203-5500220	S550-203	S550-220	24	382.2	0.698	7		0.710	5	
		108	S5500220-5710207	S550-220	S571-207	24	394.0	0.699	7		0.710	5	
		109	S5710207-5710219	S571-207	S571-219	24	394.0	0.735	2		0.748	0	
		110	S5710219-5900204	S571-219	S590-204	24	394.0	0.725	3		0.737	2	
		111	S5900204-5900203	S590-204	S590-203	24	267.4	0.694	7		0.706	6	
		112	S5900202-5900203	S590-203	S590-202	24	117.7	0.713	5		0.725	3	
		113	S5900202-5900218	S590-202	S590-218	24	394.0	0.706	6		0.717	4	
		114	CDT-43	S590-218	S611-205	24	415.2	0.789	**0**		0.802	**0**	
		115	S6110205-6110206	S611-205	S611-206	24	394.0	0.769	**0**		0.782	**0**	
		116	S6110206-6110208	S611-206	S611-208	24	212.6	0.592	21		0.600	20	
		117	S6110208-6110207	S611-208	S611-207	24	187.1	0.625	17		0.635	15	
		118	S6110207-6300205	S611-207	S630-205	24	394.0	0.710	5		0.721	4	
		119	S6300205-6300203	S630-205	S630-203	24	195.1	0.703	6		0.715	5	
		120	S6300203-6300202	S630-203	S630-202	24	199.0	0.689	8		0.700	7	
		121	S6300202-6300210	S630-202	S630-210	24	134.7	0.690	8		0.700	7	
		122	S6300210-6520209	S630-210	S652-209	24	260.4	0.628	16		0.636	15	
		123	CDT-41	S652-209	S652-207	24	368.1	0.553	26		0.561	25	
		124	S6520207-6520202	S652-207	S652-202	24	64.0	0.777	**0**		0.782	**0**	
		125	S6520202-6520211	S652-202	S652-211	48	72.2	0.588	22		0.592	21	
		126	S6520211-6520212	S652-211	S652-212	48	10.0	0.613	18		0.616	18	
Borregas Interceptor	McKinley Ave between Mathilda Ave and Taaffe Ave	127	S3280253-3280252	S328-253	S328-252	8	35.0	0.094	81		0.190	62	
		128	S3280252-3280251	S328-252	S328-251	8	88.8	0.094	81		0.204	59	
		129	S3270252-3280250	S327-252	S328-250	8	72.3	0.151	70		0.220	56	
		130	S3280250-3280251	S328-250	S328-251	8	63.0	0.081	84		0.139	72	
		131	S3280251-3280254	S328-251	S328-254	8	107.6	0.159	68		0.278	44	
		132	S3280254-3280255	S328-254	S328-255	8	231.7	0.136	73		0.237	53	
		133	S3280255-3280256	S328-255	S328-256	8	57.8	0.140	72		0.238	52	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Taaffe St between Iowa St and Washington Ave	134	S3280265-3280264	S328-265	S328-264	8	142.3	0.119	76		0.119	76	
		135	S3280264-3280263	S328-264	S328-263	8	76.6	0.123	75		0.123	75	
		136	S3280263-3280262	S328-263	S328-262	8	75.6	0.143	71		0.212	58	
		137	S3280262-3280261	S328-262	S328-261	8	142.8	0.147	71		0.219	56	
		138	S3280261-3280256	S328-261	S328-256	8	84.6	0.129	74		0.190	62	
		139	S3280256-3280257	S328-256	S328-257	10	45.5	0.156	69		0.250	50	
		140	S3280257-3280258	S328-257	S328-258	10	58.1	0.160	68		0.257	49	
		141	S3280258-3280259	S328-258	S328-259	10	127.0	0.188	62		0.297	41	
		142	S3280259-3280260	S328-259	S328-260	10	175.5	0.158	68		0.318	36	
		143	S3280260-3530270	S328-260	S353-270	10	79.7	0.168	66		0.365	27	
		144	S3530270-3530271	S353-270	S353-271	10	96.1	0.197	61		0.391	22	
		145	S3530271-3530213	S353-271	S353-213	10	71.9	0.164	67		0.381	24	
	Washington Ave between Mathilda Ave and Taaffe Ave	146	S3530213-3530206	S353-213	S353-272	8	234.8	0.257	49		0.539	**0**	
		147	S3530272-3530206	S353-272	S353-206	8	50.7	0.278	44		0.546	**0**	
		148	S3530237-3530206	S353-237	S353-206	8	48.3	0.091	82		0.142	72	
		149	S3530206-3530236	S353-206	S353-236	12	25.5	0.127	83		0.241	68	
		150	S3530236-3530255	S353-236	S353-255	12	216.0	0.133	82		0.248	67	
	Mathilda Ave between Washington Ave and Evelyn Ave	152	S3530255-3530209	S353-255	S353-209	12	363.9	0.214	71		0.315	58	
		153	S3530209-3530208	S353-209	S353-208	12	38.2	0.265	65		0.357	52	
		154	S3530208-3530207	S353-208	S353-207	12	250.7	0.252	66		0.339	55	
		155	S3530207-3680234	S353-207	S368-234	12	240.2	0.253	66		0.338	55	
		156	S3680234-3680223	S368-234	S368-223	12	162.0	0.267	64		0.358	52	
		157	S3680223-3680228	S368-223	S368-228	12	30.7	0.290	61		0.387	48	
		158	S3680228-3680204	S368-228	S368-204	12	34.2	0.330	56		0.428	43	
	Capella Way	159	S3530223-3530224	S353-223	S353-224	8	50.7	0.000	100		0.000	100	
		160	S3530224-3530225	S353-224	S353-225	8	217.0	0.047	91		0.094	81	
		161	S3530225-3530228	S353-225	S353-228	10	271.1	0.106	79		0.176	65	
		162	S3530226-3530256	S353-226	S353-256	10	201.4	0.000	100		0.000	100	
		163	S3530256-3530227	S353-256	S353-227	10	13.3	0.019	96		0.018	96	
		164	S3530228-3530227	S353-227	S353-228	10	29.9	0.054	89		0.067	87	
		165	S3530227-3530253	S353-227	S353-253	10	314.7	0.007	99		0.030	94	
		166	S3530228-3530233	S353-228	S353-233	10	316.0	0.221	56		0.339	32	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Frances Ave between Washington Ave and Evelyn Ave	167	S3530233-3530253	S353-233	S353-253	10	29.1	0.213	57		0.317	37	
		168	S3530253-3530232	S353-253	S353-232	10	300.7	0.205	59		0.325	35	
		169	S3530232-3530231	S353-232	S353-231	10	79.5	0.226	55		0.329	34	
	Evelyn Ave between Mathilda Ave and Frances Ave	170	S3530231-3530234	S353-231	S353-234	10	165.8	0.236	53		0.309	38	
		171	S3530234-3530212	S353-234	S353-212	10	107.4	0.277	45		0.358	28	
		172	S3530212-3530210	S353-212	S353-210	10	15.7	0.315	37		0.380	24	
		173	S3530210-3680206	S353-210	S368-206	12	320.1	0.189	75		0.240	68	
		174	S3680206-3680233	S368-206	S368-233	10	140.8	0.217	57		0.275	45	
		175	S3680233-3680225	S368-233	S368-225	12	134.8	0.194	74		0.242	68	
		176	S3680225-3680204	S368-225	S368-204	12	68.6	0.277	63		0.334	55	
	Mathilda Ave between Evelyn Ave and Maude Ave	177	S3680204-3680216	S368-204	S368-216	12	240.3	0.491	35		0.560	25	
		178	S3680216-3680215	S368-216	S368-215	12	155.0	0.471	37		0.533	29	
		179	S3680215-3680214	S368-215	S368-214	15	86.5	0.384	49		0.433	42	
		180	S3680214-3680211	S368-214	S368-211	15	193.1	0.386	49		0.434	42	
		181	S3680211-3680212	S368-211	S368-212	15	59.2	0.395	47		0.445	41	
		182	S3680212-3930211	S368-212	S393-211	15	364.7	0.367	51		0.411	45	
		183	S3930211-3930209	S393-211	S393-209	15	54.6	0.319	57		0.356	53	
		184	S3930209-3930212	S393-209	S393-212	21	311.0	0.492	34		0.504	33	
		185	S3930212-3930213	S393-212	S393-213	21	293.7	0.487	35		0.498	34	
		186	S3930213-3930214	S393-213	S393-214	21	44.7	0.417	44		0.426	43	
		187	S3930214-3930216	S393-214	S393-216	21	83.1	0.403	46		0.412	45	
	Inverted Siphon at Mathilda Ave	188	CDT-83	S393-216	S408-205	24	237.8	-	-		-	-	
		189	S3930216-4080205	S393-216	S408-205	24	232.5	-	-		-	-	
	Mathilda Ave between Evelyn Ave and Maude Ave	190	S4080205-4080206	S408-205	S408-206	21	69.0	0.504	33		0.516	31	
		191	S4080206-4080209	S408-206	S408-209	21	290.8	0.494	34		0.505	33	
		192	S4080209-4080231	S408-209	S408-231	21	314.0	0.481	36		0.492	34	
		193	S4080231-4330210	S408-231	S433-210	21	320.0	0.481	36		0.492	34	
		194	S4330210-4330208	S433-210	S433-208	21	310.5	0.482	36		0.493	34	
		195	S4330208-4330204	S433-208	S433-204	21	309.1	0.491	35		0.502	33	
		196	S4330204-4330224	S433-204	S433-224	21	313.5	0.543	28		0.555	26	
	Maude Ave between Mathilda Ave and Borregas Ave	197	S4330224-4320202	S433-224	S432-202	27	299.8	0.464	38		0.473	37	
		198	S4320202-4320204	S432-202	S432-204	27	206.1	0.475	37		0.484	35	
		199	S4320204-4320205	S432-204	S432-205	27	32.6	0.482	36		0.492	34	
		200	S4320205-4320213	S432-205	S432-213	27	290.4	0.462	38		0.471	37	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Borregas Ave between Maude Ave and WPCP	201	S4320213-4320220	S432-213	S432-220	27	305.2	0.481	36		0.491	35	
		202	S4320220-4320230	S432-220	S432-230	27	248.8	0.474	37		0.483	36	
		203	S4320230-4320235	S432-230	S432-235	27	12.4	0.481	36		0.487	35	
		204	S4320235-4320228	S432-235	S432-228	27	268.0	0.486	35		0.493	34	
		205	S4320228-4310214	S432-228	S431-214	27	300.7	0.449	40		0.459	39	
		206	S4320228-4320227	S432-228	S432-227	18	30.1	0.816	0		0.829	0	7.88
		207	S4320227-4500212	S432-227	S450-212	16	552.4	1.000	0	6.09	1.000	0	6.06
		208	S4500212-4500211	S450-212	S450-211	16	20.8	1.000	0	5.86	1.000	0	5.84
		209	S4500211-4500210	S450-211	S450-210	16	31.3	0.952	0		0.959	0	
		210	S4310214-4500210	S431-214	S450-210	27	278.2	0.485	35		0.495	34	
		211	S4500210-4500207	S450-210	S450-207	27	187.5	0.518	31		0.526	30	
		212	S4500207-4710213	S450-207	S471-213	27	1135.1	0.647	14		0.661	12	
		213	S4710213-4900224	S471-213	S490-224	27	1086.8	0.770	0		0.787	0	
		214	S4900224-4900207	S490-224	S490-207	27	258.7	0.711	5		0.724	3	
		215	CDT-51	S490-207	S490-201	27	23.4	0.630	16		0.640	15	
		216	S4900201-4900219	S490-201	S490-219	27	193.4	0.635	15		0.646	14	
		217	S4900219-5110214	S490-219	S511-214	27	106.7	0.647	14		0.658	12	
		218	S5110214-5110229	S511-214	S511-229	27	88.6	0.595	21		0.604	19	
		219	S5110229-5110211	S511-229	S511-211	27	206.5	0.727	3		0.741	1	
		220	S5110211-5110209	S511-211	S511-209	27	295.3	0.732	2		0.745	1	
		221	S5110209-5110218	S511-209	S511-218	27	306.6	0.592	21		0.602	20	
		222	S5110218-5300219	S511-218	S530-219	27	310.5	0.593	21		0.603	20	
		223	S5300219-5300202	S530-219	S530-202	27	395.2	0.596	21		0.606	19	
		224	S5300202-5310212	S530-202	S531-212	27	355.6	0.714	5		0.729	3	
		225	S5310212-5500209	S531-212	S550-209	27	355.6	0.805	0		0.820	0	
		226	S5500209-5500207	S550-209	S550-207	27	31.8	0.754	0		0.765	0	
		227	S5500207-5500223	S550-207	S550-223	33	239.6	0.569	24		0.576	23	
		228	S5500223-5500202	S550-223	S550-202	33	301.8	0.361	52		0.366	51	
		229	S5500202-5500201	S550-202	S550-201	33	50.0	0.376	50		0.380	49	
		230	S5500201-5500225	S550-201	S550-225	42	15.0	0.446	41		0.452	40	
		231	S5500225-5710212	S550-225	S571-212	42	286.5	0.432	42		0.437	42	
		232	S5710212-5710211	S571-212	S571-211	42	362.0	0.397	47		0.402	46	
		233	S5710211-5710216	S571-211	S571-216	42	364.9	0.374	50		0.379	49	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-1: Existing Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Borregas Ave between Maude Ave and WPCP	234	S5710216-5900215	S571-216	S590-215	42	581.9	0.378	50		0.382	49	
		235	S5900215-5900216	S590-215	S590-216	42	130.0	0.380	49		0.385	49	
		236	S5900216-5900217	S590-216	S590-217	42	600.9	0.392	48		0.397	47	
		237	S5900217-6110209	S590-217	S611-209	42	380.0	0.384	49		0.389	48	
		238	S6110209-6110210	S611-209	S611-210	42	412.2	0.386	49		0.391	48	
		239	S6110210-6300209	S611-210	S630-209	42	620.0	0.384	49		0.389	48	
		240	S6300209-6290216	S630-209	S629-216	42	444.2	0.373	50		0.377	50	
		241	S6290216-6290218	S629-216	S629-218	33	36.4	0.578	23		0.583	22	
		242	S6290218-6290217	S629-218	S629-217	33	91.0	0.552	26		0.557	26	
		243	S6290216-6290217	S629-216	S629-217	33	127.1	0.460	39		0.466	38	
		244	S6290217-6520225	S629-217	S652-225	42	517.4	0.465	38		0.469	37	
		245	S6520225-6520205	S652-225	S652-205	33	20.7	0.773	0		0.777	0	
		246	S6520205-6520204	S652-205	S652-204	33	10.0	0.789	0		0.793	0	
		247	S6520214-6520204	S652-204	S652-214	39	54.7	0.674	10		0.677	10	
		248	S6520212-6520214	S652-214	S652-212	48	51.1	0.553	26		0.555	26	
	WPCP	249	CDT-39	S652-212	Outfall	48	28.6	0.610	19		0.613	18	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	McKinley Ave between Murphy Ave and Sunnyvale Ave	1	S3280267-3280268	S328-267	S328-268	10	153.7	0.184	63		0.224	55	
		2	S3280268-3280269	S328-268	S328-269	10	155.4	0.210	58		0.235	53	
	Murphy Ave between Iowa Ave and Washington Ave	3	S3280269-3280270	S328-269	S328-270	12	218.3	0.282	62		0.277	63	
		4	S3280270-3280271	S328-270	S328-271	12	54.1	0.331	56		0.332	56	
		5	S3280271-3280272	S328-271	S328-272	12	76.1	0.300	60		0.308	59	
		6	S3280272-3280273	S328-272	S328-273	12	46.4	0.345	54		0.387	48	
		7	S3280273-3280274	S328-273	S328-274	12	112.2	0.372	50		0.415	45	
		8	S3280274-3280275	S328-274	S328-275	12	55.5	0.448	40		0.493	34	
		9	S3280275-3530273	S328-275	S353-273	12	116.3	0.353	53		0.394	47	
	Washington Ave between Murphy Ave and Sunnyvale Ave	10	S3530273-3290250	S353-273	S329-250	12	276.6	0.348	54		0.388	48	
	Sunnyvale Ave between Washington Ave and Evelyn Ave	11	S3290221-3520204	S329-250	S352-204	12	140.2	0.318	58		0.353	53	
		12	S3520204-3520203	S352-204	S352-203	12	25.4	0.318	58		0.354	53	
		13	S3520203-3520202	S352-203	S352-202	12	209.8	0.317	58		0.351	53	
		14	S3520202-3520223	S352-202	S352-223	12	209.1	0.317	58		0.363	52	
	Evelyn Ave between Sunnyvale Ave and Bayview Ave	15	S3520217-3520223	S352-217	S352-223	14	86.6	0.438	42		0.492	34	
		16	S3520223-3520205	S352-223	S352-205	14	50.3	0.527	30		0.579	23	
		17	S3520205-3520221	S352-205	S352-221	14	87.3	0.537	28		0.587	22	
		18	S3520221-3520213	S352-221	S352-213	14	228.8	0.570	24		0.611	19	
		19	S3520213-3520208	S352-213	S352-208	14	6.7	0.495	34		0.528	30	
		20	S3520208-3520210	S352-208	S352-210	14	190.6	0.480	36		0.518	31	
		21	S3520210-3520216	S352-210	S352-216	14	338.0	0.586	22		0.626	17	
		22	S3520216-3520209	S352-216	S352-209	14	40.2	0.566	25		0.605	19	
	Bayview Ave between Evelyn Ave and Washington Ave	23	S3520209-3290208	S352-209	S329-208	14	371.6	0.526	30		0.561	25	
	Washington Ave between Bayview Ave and Fair Oaks Ave	24	S3290208-3300216	S329-208	S330-216	14	470.4	0.595	21		0.629	16	
		25	S3300216-3300204	S330-216	S330-204	14	162.0	0.560	25		0.603	20	
	Washington Ave between Evelyn Ave and Fair Oaks Ave, South of RR Crossing **DSP-5**	26	S3300204-3300202	S330-204	S330-202	14/18	56.1	0.666	11		0.719/0.442	4/41	
		27	S3300202-3300227	S330-202	S330-227	14/18	131.6	0.742	1		0.794/0.500	0/33	
		28	S3300227-3300225	S330-227	S330-225	15/18	374.1	0.768	0		0.809/0.573	0/24	
		29	S3300225-3300213	S330-225	S330-213	15/18	38.3	0.821	0		0.856/0.626	0/17	
		30	S3300213-3300211	S330-213	S330-211	15/18	342.9	0.631	16		0.655/0.497	13/34	
		31	S3300211-3300210	S330-211	S330-210	15/18	62.1	0.383	49		0.397/0.315	47/58	
		32	S3300210-3300209	S330-210	S330-209	15/18	10.7	0.289	61		0.300/0.227	60/70	
		33	S3300209-3300228	S330-209	S330-228	10/18	16.0	0.629	0		0.670/0.262	0/65	
		34	S3300228-3310206	S330-228	S331-206	10/18	199.4	0.640	0		0.681/0.266	0/65	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*
[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project / With CIPs		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Washington Ave between Evelyn Ave and Fair Oaks, South of RR Crossing **DSP-5**	35	S3310206-3310204	S331-206	S331-204	10/18	75.4	0.374	25		0.690/0.182	0/76	6.15/-
		36	S3310204-3310203	S331-204	S331-203	10/18	35.4	0.692	0		1.00/0.327	0/56	5.45/-
		37	S3310203-3310207	S331-203	S331-207	12/18	9.9	0.986	0		1.00/0.496	0/34	5.35/-
	Fair Oaks Ave at RR Crossing	38	D3310115-3310125	S331-207	D331-115	18	23.4	0.810	0		1.00/0.639	0/15	5.39/-
		39	D3310115-3310104	D331-115	D331-104	18	91.5	0.861	0	6.25	1.00/0.539	0/28	5.31/-
		40	D3310104-3310103	D331-104	D331-103	18	35.5	1.000	0	5.47	1.00/0.536	0/29	4.55/-
		41	D3310103-3311559	D331-103	D331-1559	18	57.8	1.000	0	5.67	1.00/0.622	0/17	4.75/-
	Fair Oaks between North of RR Crossing and California Ave **DSP-7**	42	D3311559-3501554	D331-1559	D350-1554	18/21	271.5	1.000	0	4.91	1.00/0.603	0/20	4.05/-
		43	D3501554-3500103	D350-1554	D350-103	18/21	71.7	1.000	0	6.45	1.00/0.582	0/22	5.60/-
		44	D3500103-3500109	D350-103	D350-109	18/21	273.9	0.991	0		1.00/0.575	0/23	5.58/-
		45	D3500109-3500110	D350-109	D350-110	18/21	49.4	0.930	0		1.00/0.555	0/26	5.84/-
		46	D3500110-3500113	D350-110	D350-113	18/21	176.0	0.939	0	5.67	1.00/0.515	0/31	5.17/-
		47	D3500113-3500114	D350-113	D350-114	18/21	73.9	1.000	0	5.16	1.00/0.513	0/32	4.68/-
		48	D3500114-3500115	D350-114	D350-115	18/21	63.0	1.000	0	5.15	1.00/0.513	0/32	4.66/-
		49	D3500115-3711002	D350-115	S371-210	18/21	255.0	1.000	0	4.85	1.00/0.513	0/32	4.64/-
		50	S3710210-3710205	S371-210	S371-205	18/21	312.2	1.000	0	4.06	1.00/0.619	0/17	3.82/-
	California Ave between Fair Oaks and Roosevelt Ave	51	S3710205-3710209	S371-205	S371-209	21	345.8	1.000	0	7.20	1.00/0.719	0/4	6.99/-
		52	S3710209-3700208	S371-209	S370-208	21	296.1	1.000	0	10.17	1.00/0.710	0/5	10.02/-
		53	S3700208-3700206	S370-208	S370-206	21	322.4	1.000	0	16.86	1.00/0.711	0/5	16.74/-
	Roosevelt Ave before Siphon 1	54	S3700206-3700207	S370-206	S370-207	21	263.9	1.000	0	13.97	1.00/0.714	0/5	13.88/-
		55	S3700207-3910219	S370-207	S391-219	21	256.9	0.997	0		1.00/0.746	0/1	11.90/-
		56	S3910219-3910217	S391-219	S391-217	21	32.1	0.994	0		1.00/0.788	0/0	
	Inverted Siphon 1 at Central Expressway	57	S3910217-3910215	S391-217	S391-215	24	155.0	0.934	-		0.946	-	
		58	S3910217-3910215-2	S391-217	S391-215	24	155.0	0.934	-		0.946	-	
	Inverted Siphon 2 at Central Expressway	59	S3910215-3910211	S391-215	S391-211	24	106.5	1.000	-	8.14	1.000	-	8.09/-
		60	S3910215-3910211-2	S391-215	S391-211	24	106.5	1.000	-	8.14	1.000	-	8.09/-
	Central Expressway between Murphy Ave and Roosevelt Ave	61	S3910211-3910210	S391-211	S391-210	24	27.5	0.947	0		0.959/0.844	0/0	
		62	S3910210-3910208	S391-210	S391-208	21	219.0	0.933	0		0.943/0.777	0/0	
		63	S3910208-3910206	S391-208	S391-206	21	331.0	0.860	0		0.879/0.714	0/5	
		64	S3910206-3910204	S391-206	S391-204	21	277.0	0.859	0		0.876/0.718	0/4	
		65	S3910204-3920211	S391-204	S392-211	21	267.0	0.831	0		0.845/0.702	0/6	
		66	S3920211-3920203	S392-211	S392-203	21	276.0	0.820	0		0.833/0.697	0/7	
		67	S3920203-3920201	S392-203	S392-201	21	332.0	0.701	7		0.710/0.610	5/19	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Murphy Ave between Central Expressway and Maude Ave	68	S3920201-4090214	S392-201	S409-214	27	330.0	0.445	41		0.449	40	
		69	S4090214-4090216	S409-214	S409-216	27	336.4	0.448	40		0.451	40	
		70	S4090216-4090218	S409-216	S409-218	27	335.0	0.444	41		0.447	40	
		71	S4090218-4320226	S409-218	S432-226	27	330.1	0.438	42		0.441	41	
		72	S4320226-4320217	S432-226	S432-217	27	16.0	0.422	44		0.424	43	
		73	S4320217-4320218-2	S432-217	S432-218	27	334.2	0.585	22		0.591	21	
	Maude Ave between Mathilda Ave and Borregas Ave	74	S4320218-4320219	S432-218	S432-219	27	12.0	0.805	0	6.53	0.808/0.537	0/28	5.15/-
	Maude Ave between Mathilda Ave and Borregas Ave **DSP-9**	75	S4320219-4320212	S432-219	S432-212	24/27	470.3	0.956	0		0.958/0.639	0/15	
		76	CDT-47	S432-212	S432-229	24/27	461.4	0.899	0		0.903/0.628	0/16	
		77	S4320229-4330201	S432-229	S433-201	24/27	297.3	0.877	0		0.879/0.589	0/21	
		78	S4330201-4330231	S433-201	S433-231	21/27	131.0	0.923	0		0.924/0.544	0/27	
	Mathilda Ave between Maude Ave and San Aleso Ave **DSP-9**	79	S4330231-4480216	S433-231	S448-216	21/24	391.5	0.828	0		0.829/0.587	0/22	
		80	S4480216-4490205	S448-216	S449-205	21/24	400.0	0.810	0		0.811/0.580	0/23	
		81	S4490205-4720204	S449-205	S472-204	21/24	400.0	0.811	0		0.813/0.581	0/23	
		82	S4720204-4720207	S472-204	S472-207	21/24	400.0	0.810	0		0.811/0.580	0/23	
		83	S4720207-4720209	S472-207	S472-209	21/24	357.5	0.805	0		0.806/0.578	0/23	
		84	S4720209-4720211	S472-209	S472-211	21/24	85.4	0.794	0		0.796/0.573	0/24	
		85	S4720211-4721006	S472-211	S472TEE1006	21/24	231.0	0.826	0		0.829/0.587	0/22	
		86	S4721006-4720212	S472TEE1006	S472-212	21/24	204.1	0.859	0		0.861/0.654	0/13	
	San Aleso Ave	87	S4720212-4890206	S472-212	S489-206	27	426.5	0.705	6		0.707/0.660	6/12	
		88	S4890206-4890208	S489-206	S489-208	27	422.0	0.764	0		0.766/0.714	0/5	
		89	S4890208-5120205	S489-208	S512-205	27	421.5	0.760	0		0.762/0.712	0/5	
	Ahwanee Ave between San Aleso Ave and Borregas Ave	90	S5120205-4900240	S512-205	S490-240	27	373.4	0.730	3		0.732	2	
		91	S4900240-4900232	S490-240	S490-232	27	352.3	0.700	7		0.701	7	
		92	S4900232-4900206	S490-232	S490-206	27	352.3	0.725	3		0.726	3	
		93	S4900206-4900205	S490-206	S490-205	27	21.5	0.749	0		0.750	0	
	Borregas Ave	94	S4900205-4900202	S490-205	S490-202	27	18.9	0.724	3		0.725	3	
		95	S4900202-4900218	S490-202	S490-218	27	196.8	0.714	5		0.715	5	
		96	S4900218-5110215	S490-218	S511-215	27	60.1	0.700	7		0.701	7	
		97	S5110215-5110213	S511-215	S511-213	27	282.6	0.629	16		0.630	16	
		98	S5110213-5110208	S511-213	S511-208	24	278.0	0.601	20		0.602	20	
		99	S5110208-5110207	S511-208	S511-207	21	42.0	0.699	7		0.700	7	
		100	S5110207-5110206	S511-207	S511-206	21	356.0	0.747	0		0.748	0	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Cannery Interceptor	Borregas Ave	101	S5110206-5300205	S511-206	S530-205	21	356.0	0.748	0		0.749/0.697	0/7	
		102	S5300205-5300220	S530-205	S530-220	21	356.0	0.750	0		0.751/0.698	0/7	
		103	S5300220-5500211	S530-220	S550-211	21	356.0	0.741	1		0.742/0.690	1/8	
		104	S5500211-5500210	S550-211	S550-210	21	43.2	0.732	2		0.734/0.683	2/9	
		105	S5500210-5500204	S550-210	S550-204	21	400.0	0.713	5		0.714/0.666	5/11	
		106	S5500204-5500203	S550-204	S550-203	24	75.0	0.680	9		0.681/0.635	9/15	
		107	S5500203-5500220	S550-203	S550-220	24	382.2	0.744	1		0.745/0.692	1/8	
		108	S5500220-5710207	S550-220	S571-207	24	394.0	0.745	1		0.746/0.693	1/8	
		109	S5710207-5710219	S571-207	S571-219	24	394.0	0.786	0		0.788/0.729	0/3	
		110	S5710219-5900204	S571-219	S590-204	24	394.0	0.775	0		0.776/0.718	0/4	
		111	S5900204-5900203	S590-204	S590-203	24	267.4	0.741	1		0.742/0.688	1/8	
		112	S5900202-5900203	S590-203	S590-202	24	117.7	0.762	0		0.763/0.707	0/6	
		113	S5900202-5900218	S590-202	S590-218	24	394.0	0.753	0		0.754/0.700	0/7	
		114	CDT-43	S590-218	S611-205	24	415.2	0.844	0		0.845/0.781	0/0	
		115	S6110205-6110206	S611-205	S611-206	24	394.0	0.821	0		0.822/0.763	0/0	
		116	S6110206-6110208	S611-206	S611-208	24	212.6	0.624	17		0.625/0.588	17/22	
		117	S6110208-6110207	S611-208	S611-207	24	187.1	0.663	12		0.664/0.620	11/17	
		118	S6110207-6300205	S611-207	S630-205	24	394.0	0.759	0		0.761/0.705	0/6	
		119	S6300205-6300203	S630-205	S630-203	24	195.1	0.762	0		0.763/0.709	0/5	
		120	S6300203-6300202	S630-203	S630-202	24	199.0	0.753	0		0.754/0.703	0/6	
		121	S6300202-6300210	S630-202	S630-210	24	134.7	0.752	0		0.753/0.703	0/6	
		122	S6300210-6520209	S630-210	S652-209	24	260.4	0.679	9		0.680/0.639	9/15	
		123	CDT-41	S652-209	S652-207	24	368.1	0.650	13		0.651/0.632	13/16	
		124	S6520207-6520202	S652-207	S652-202	24	64.0	0.855	0		0.856/0.852	0/0	
		125	S6520202-6520211	S652-202	S652-211	48	72.2	0.642	14		0.642/0.642	14/14	
		126	S6520211-6520212	S652-211	S652-212	48	10.0	0.666	11		0.667/0.667	11/11	
Borregas Interceptor	McKinley Ave between Mathilda Ave and Taaffe St	127	S3280253-3280252	S328-253	S328-252	8	35.0	0.100	80		0.162	68	
		128	S3280252-3280251	S328-252	S328-251	8	88.8	0.102	80		0.157	69	
		129	S3270252-3280250	S327-252	S328-250	8	72.3	0.158	68		0.158	68	
		130	S3280250-3280251	S328-250	S328-251	8	63.0	0.086	83		0.087	83	
		131	S3280251-3280254	S328-251	S328-254	8	107.6	0.170	66		0.217	57	
		132	S3280254-3280255	S328-254	S328-255	8	231.7	0.145	71		0.185	63	
		133	S3280255-3280256	S328-255	S328-256	8	57.8	0.158	68		0.208	58	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Taaffe St between Iowa St and Washington Ave	134	S3280265-3280264	S328-265	S328-264	8	142.3	0.246	51		0.246	51	
		135	S3280264-3280263	S328-264	S328-263	8	76.6	0.253	49		0.253	49	
		136	S3280263-3280262	S328-263	S328-262	8	75.6	0.245	51		0.278	44	
		137	S3280262-3280261	S328-262	S328-261	8	142.8	0.254	49		0.288	42	
		138	S3280261-3280256	S328-261	S328-256	8	84.6	0.219	56		0.248	50	
		139	S3280256-3280257	S328-256	S328-257	10	45.5	0.219	56		0.263	47	
		140	S3280257-3280258	S328-257	S328-258	10	58.1	0.223	55		0.273	45	
		141	S3280258-3280259	S328-258	S328-259	10	127.0	0.261	48		0.312	38	
		142	S3280259-3280260	S328-259	S328-260	10	175.5	0.222	56		0.317	37	
		143	S3280260-3530270	S328-260	S353-270	10	79.7	0.245	51		0.363	27	
		144	S3530270-3530271	S353-270	S353-271	10	96.1	0.274	45		0.389	22	
		145	S3530271-3530213	S353-271	S353-213	10	71.9	0.244	51		0.379	24	
	Washington Ave between Mathilda Ave and Taaffe St **DSP-4**	146	S3530213-3530206	S353-213	S353-272	8/12	234.8	0.363	27		0.537/0.298	0/60	
		147	S3530272-3530206	S353-272	S353-206	8/12	50.7	0.382	24		0.544/0.311	0/59	
	Washington Ave between Mathilda Ave and Taaffe St	148	S3530237-3530206	S353-237	S353-206	8	48.3	0.097	81		0.097	81	
		149	S3530206-3530236	S353-206	S353-236	12	25.5	0.169	77		0.233	69	
		150	S3530236-3530255	S353-236	S353-255	12	216.0	0.176	77		0.239	68	
	Mathilda Ave between ECR and Washington Ave - **DSP-1**	151	CDT-95	S287-202	S353-255	12	2962.9	-	-		0.639	15	
	Mathilda Ave between Washington Ave and Evelyn Ave	152	S3530255-3530209	S353-255	S353-209	12	363.9	0.256	66		0.311	59	
		153	S3530209-3530208	S353-209	S353-208	12	38.2	0.312	58		0.362	52	
		154	S3530208-3530207	S353-208	S353-207	12	250.7	0.305	59		0.350	53	
		155	S3530207-3680234	S353-207	S368-234	12	240.2	0.304	59		0.349	53	
		156	S3680234-3680223	S368-234	S368-223	12	162.0	0.322	57		0.370	51	
		157	S3680223-3680228	S368-223	S368-228	12	30.7	0.348	54		0.401	47	
		158	S3680228-3680204	S368-228	S368-204	12	34.2	0.390	48		0.441	41	
	Capella Way	159	S3530223-3530224	S353-223	S353-224	8	50.7	0.000	100		0.000	100	
		160	S3530224-3530225	S353-224	S353-225	8	217.0	0.088	82		0.097	81	
		161	S3530225-3530228	S353-225	S353-228	10	271.1	0.168	66		0.181	64	
		162	S3530226-3530256	S353-226	S353-256	10	201.4	0.000	100		0.000	100	
		163	S3530256-3530227	S353-256	S353-227	10	13.3	0.017	97		0.017	97	
		164	S3530228-3530227	S353-227	S353-228	10	29.9	0.064	87		0.077	85	
		165	S3530227-3530253	S353-227	S353-253	10	314.7	0.028	94		0.040	92	
		166	S3530228-3530233	S353-228	S353-233	10	316.0	0.326	35		0.348	30	

** For PWWF Existing Condition, deficiency is based on existing pipe diameter. For PWWF Future Cumulative Condition with CIPs, deficiency is based on CIP pipe diameter.*

[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Frances Ave between Washington Ave and Evelyn Ave	167	S3530233-3530253	S353-233	S353-253	10	29.1	0.306	35		0.348	30	
		168	S3530253-3530232	S353-253	S353-232	10	300.7	0.313	39		0.325	35	
		169	S3530232-3530231	S353-232	S353-231	10	79.5	0.321	37		0.338	32	
	Evelyn Ave between Mathilda Ave and Frances Ave	170	S3530231-3530234	S353-231	S353-234	10	165.8	0.327	36		0.344	31	
		171	S3530234-3530212	S353-234	S353-212	10	107.4	0.407	35		0.348	30	
		172	S3530212-3530210	S353-212	S353-210	10	15.7	0.419	19		0.426	15	
		173	S3530210-3680206	S353-210	S368-206	12	320.1	0.270	16		0.433	13	
		174	S3680206-3680233	S368-206	S368-233	10	140.8	0.309	64		0.282	62	
		175	S3680233-3680225	S368-233	S368-225	12	134.8	0.269	38		0.324	35	
		176	S3680225-3680204	S368-225	S368-204	12	68.6	0.348	64		0.281	63	
	Mathilda Ave between Evelyn Ave and California Ave - **DSP-3**	177	S3680204-3680216	S368-204	S368-216	12/15	240.3	0.563	54		0.373/0.606	50/19	
		178	S3680216-3680215	S368-216	S368-215	12/15	155.0	0.536	25		0.598/0.620	20/17	
	Mathilda Ave between Evelyn Ave and Maude Ave	179	S3680215-3680214	S368-215	S368-214	15	86.5	0.435	29		0.567	24	
		180	S3680214-3680211	S368-214	S368-211	15	193.1	0.437	42		0.459	39	
		181	S3680211-3680212	S368-211	S368-212	15	59.2	0.447	42		0.461	39	
		182	S3680212-3930211	S368-212	S393-211	15	364.7	0.413	40		0.472	37	
		183	S3930211-3930209	S393-211	S393-209	15	54.6	0.357	45		0.435	42	
		184	S3930209-3930212	S393-209	S393-212	21	311.0	0.519	52		0.375	50	
		185	S3930212-3930213	S393-212	S393-213	21	293.7	0.513	31		0.525	30	
		186	S3930213-3930214	S393-213	S393-214	21	44.7	0.438	32		0.519	31	
	Inverted Siphon at Mathilda Ave	187	S3930214-3930216	S393-214	S393-216	21	83.1	-	-		-	-	
		188	CDT-83	S393-216	S408-205	24	237.8	-	-		-	-	
	Mathilda Ave between Evelyn Ave and Maude Ave	189	S3930216-4080205	S393-216	S408-205	24	232.5	0.435	42		0.440	41	
		190	S4080205-4080206	S408-205	S408-206	21	69.0	0.532	42		0.440	41	
		191	S4080206-4080209	S408-206	S408-209	21	290.8	0.521	29		0.538	28	
		192	S4080209-4080231	S408-209	S408-231	21	314.0	0.507	31		0.527	30	
		193	S4080231-4330210	S408-231	S433-210	21	320.0	0.507	32		0.512	32	
		194	S4330210-4330208	S433-210	S433-208	21	310.5	0.508	32		0.512	32	
		195	S4330208-4330204	S433-208	S433-204	21	309.1	0.517	32		0.513	32	
		196	S4330204-4330224	S433-204	S433-224	21	313.5	0.571	31		0.523	30	
	Maude Ave between Mathilda Ave and Borregas Ave	197	S4330224-4320202	S433-224	S432-202	27	299.8	0.487	24		0.577	23	
		198	S4320202-4320204	S432-202	S432-204	27	206.1	0.499	35		0.492	34	
		199	S4320204-4320205	S432-204	S432-205	27	32.6	0.506	39		0.504	33	
		200	S4320205-4320213	S432-205	S432-213	27	290.4	0.485	37		0.511	32	

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[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria

[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Maude Ave between Mathilda Ave and Borregas Ave	201	S4320213-4320220	S432-213	S432-220	27	305.2	0.505	33		0.509	32	
		202	S4320220-4320230	S432-220	S432-230	27	248.8	0.497	34		0.501	33	
		203	S4320230-4320235	S432-230	S432-235	27	12.4	0.530	29		0.532	29	
	Borregas Ave between Maude Ave and WPCP	204	S4320235-4320228	S432-235	S432-228	27	268.0	0.519	31		0.521	31	
		205	S4320228-4310214	S432-228	S431-214	27	300.7	0.480	36		0.482	36	
	Borregas Ave at Arbor Ave - **DSP-2 (Close Pipe)**	206	S4320228-4320227	S432-228	S432-227	18/Close Pipe	30.1	0.849	0	7.693	0.850/-	0/-	7.740/-
	Borregas Ave between Maude Ave and WPCP	207	S4320227-4500212	S432-227	S450-212	16	552.4	1.000	0	6.009	1.00/0.803	0/0	6.016/6.23
		208	S4500212-4500211	S450-212	S450-211	16	20.8	1.000	0	5.801	1.00/1.00	0/0	5.794/5.93
		209	S4500211-4500210	S450-211	S450-210	16	31.3	0.980	0		0.983/0.969	0/0	
		210	S4310214-4500210	S431-214	S450-210	27	278.2	0.520	31		0.524/0.559	30/25	
	Borregas Ave Duane Ave and Weddell Dr **DSP-8**	211	S4500210-4500207	S450-210	S450-207	27/30	187.5	0.549	27		0.553/0.484	26/35	
		212	S4500207-4710213	S450-207	S471-213	27/30	1135.1	0.703	6		0.713/0.592	5/21	
		213	S4710213-4900224	S471-213	S490-224	27/30	1086.8	0.839	0		0.850/0.699	0/7	
		214	S4900224-4900207	S490-224	S490-207	27/30	258.7	0.758	0		0.764/0.651	0/13	
		215	CDT-51	S490-207	S490-201	27/30	23.4	0.667	11		0.672/0.581	10/23	
		216	S4900201-4900219	S490-201	S490-219	27/30	193.4	0.676	10		0.682/0.589	9/21	
		217	S4900219-5110214	S490-219	S511-214	27/30	106.7	0.690	8		0.697/0.604	7/19	
		218	S5110214-5110229	S511-214	S511-229	27/30	88.6	0.636	15		0.643/0.556	14/26	
	Borregas Ave between Weddell Dr and CA-237 **DSP-6**	219	S5110229-5110211	S511-229	S511-211	27/30	206.5	0.782	0		0.792/0.658	0/12	
		220	S5110211-5110209	S511-211	S511-209	27/30	295.3	0.783	0		0.790/0.661	0/12	
		221	S5110209-5110218	S511-209	S511-218	27/30	306.6	0.628	16		0.633/0.547	16/27	
		222	S5110218-5300219	S511-218	S530-219	27/30	310.5	0.628	16		0.634/0.548	15/27	
		223	S5300219-5300202	S530-219	S530-202	27/30	395.2	0.632	16		0.637/0.550	15/27	
		224	S5300202-5310212	S530-202	S531-212	27/30	355.6	0.770	0		0.778/0.650	0/13	
		225	S5310212-5500209	S531-212	S550-209	27/30	355.6	0.863	0		0.871/0.751	0/0	
		226	S5500209-5500207	S550-209	S550-207	27/30	31.8	0.794	0		0.799/0.736	0/2	
	Borregas Ave between Maude Ave and WPCP	227	S5500207-5500223	S550-207	S550-223	33	239.6	0.596	21		0.600	20	
		228	S5500223-5500202	S550-223	S550-202	33	301.8	0.377	50		0.379	49	
		229	S5500202-5500201	S550-202	S550-201	33	50.0	0.394	47		0.397	47	
		230	S5500201-5500225	S550-201	S550-225	42	15.0	0.470	37		0.472	37	
		231	S5500225-5710212	S550-225	S571-212	42	286.5	0.455	39		0.458	39	
		232	S5710212-5710211	S571-212	S571-211	42	362.0	0.420	44		0.422	44	
		233	S5710211-5710216	S571-211	S571-216	42	364.9	0.398	47		0.400	47	

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[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0

Table B-2: Future Cumulative Condition Model Results (continued)

Sewer Interceptor	Segment Description	Segment Figure ID	Sewer Main ID	Upstream MH	Downstream MH	Model Diameter (in)	Length (ft)	Pre-Project			Post-Project		
								d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]	d/D	Pipe Capacity Remaining[1] (% d/D)	Depth below Downstream MH Rim[2]
Borregas Interceptor	Borregas Ave between Maude Ave and WPCP	234	S5710216-5900215	S571-216	S590-215	42	581.9	0.406	46		0.408	46	
		235	S5900215-5900216	S590-215	S590-216	42	130.0	0.413	45		0.415	45	
		236	S5900216-5900217	S590-216	S590-217	42	600.9	0.435	42		0.438	42	
		237	S5900217-6110209	S590-217	S611-209	42	380.0	0.432	42		0.434	42	
		238	S6110209-6110210	S611-209	S611-210	42	412.2	0.436	42		0.438	42	
		239	S6110210-6300209	S611-210	S630-209	42	620.0	0.435	42		0.437	42	
		240	S6300209-6290216	S630-209	S629-216	42	444.2	0.421	44		0.423	44	
		241	S6290216-6290218	S629-216	S629-218	33	36.4	0.641	15		0.643	14	
		242	S6290218-6290217	S629-218	S629-217	33	91.0	0.611	19		0.613	18	
		243	S6290216-6290217	S629-216	S629-217	33	127.1	0.521	31		0.524	30	
		244	S6290217-6520225	S629-217	S652-225	42	517.4	0.532	29		0.526	30	
		245	S6520225-6520205	S652-225	S652-205	33	20.7	0.893	**0**		0.864	**0**	
		246	S6520205-6520204	S652-205	S652-204	33	10.0	0.898	**0**		0.876	**0**	
		247	S6520214-6520204	S652-204	S652-214	39	54.7	0.745	1		0.743	1	
		248	S6520212-6520214	S652-214	S652-212	48	51.1	0.605	19		0.605	19	
	WPCP	249	CDT-39	S652-212	Outfall	48	28.6	0.662	12		0.663	12	

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[1]Pipe capacity remaining is calculated by dividing the difference between the d/D City performance criteria based on pipe diameter and the d/D for the pipe by the d/D City performance criteria
[2]Depth given only when pipe d/D at downstream manhole is equal to 1.0