FINAL REPORT

South Main Planning Area Utilities Engineering Report

PREPARED FOR

City of Redwood City

April 2020

WEST YOST ASSOCIATES

South Main Planning Area
Utilities Engineering Report

Prepared for

City of Redwood

Project No. 047-60-19-23

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SOUTH MAIN PLANNING AREA UTILITIES ENGINEERING REPORT

1.0 INTRODUCTION

The City of Redwood City (City) is preparing the Greystar V Project (Project), which is also known as the City's South Main Planning Area redevelopment project. The Project site includes 18 parcels in five planning areas and comprises 8.3 acres bounded by El Camino Real to the south, Elm Street to the west, Caltrain to the north, and Cedar/Chestnut Streets to the East. Figure 1-1 shows a location map for the Project area.

The Project will provide detailed recommendations for the South Main Planning Area. Figure 1-2 shows the existing land use within the Project area. Figure 1-3 shows the proposed land use within the Project area. Buildout of the Project will include mixed-use residential and office development across multiple blocks.

The purpose of this Engineering Report is to:

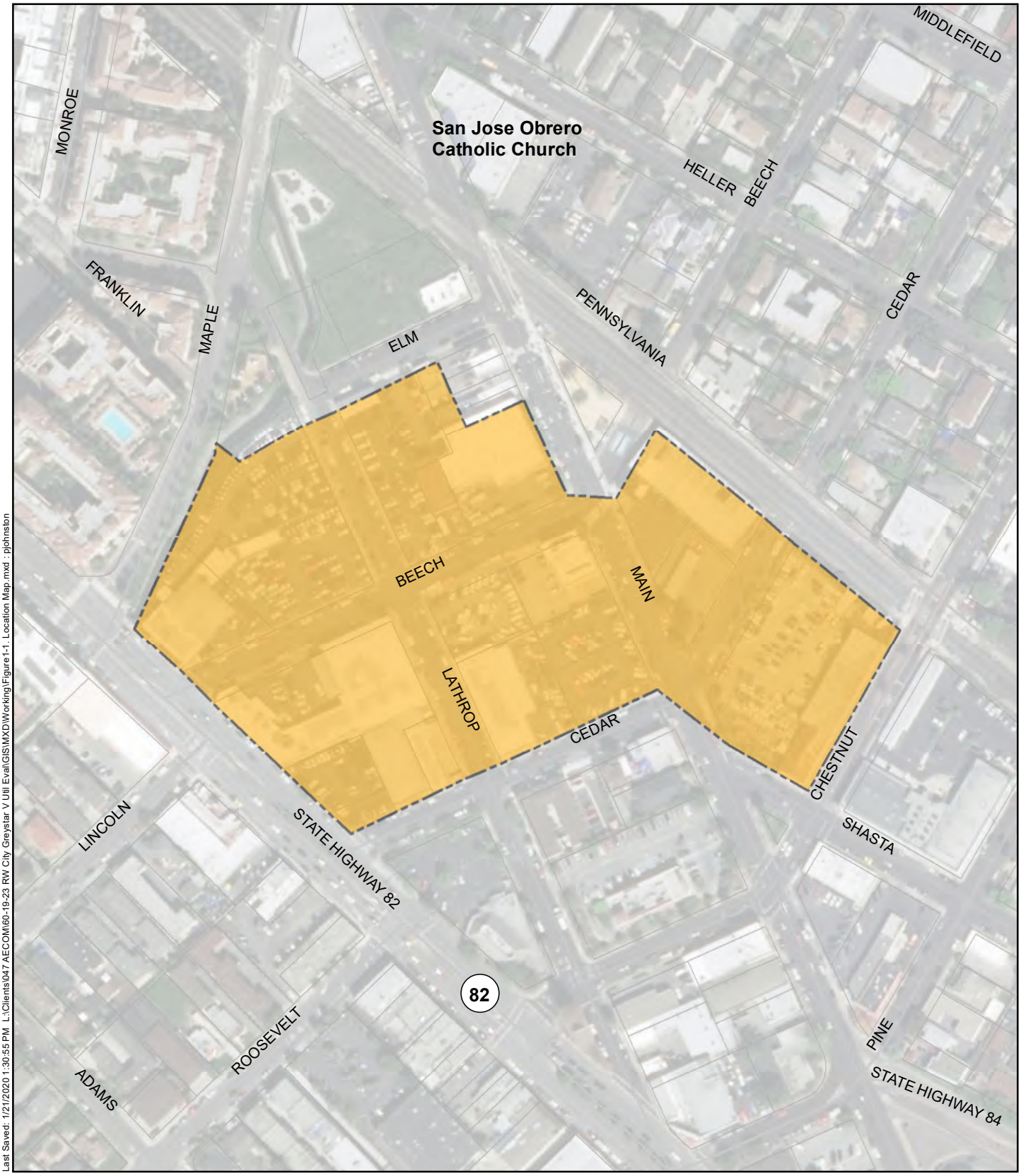
- Review locations and sizing of potable and recycled water, sewer, and storm utilities, in accordance with the City Engineering Standards to identify impacts of the proposed Project on each of the utility systems; and,
- Identify improvements required to mitigate any potential impacts.

Following this Introduction section, the report is organized into the following sections:

- **Section 2**: Potable Water System Analysis
- **Section 3**: Recycled Water System Analysis
- **Section 4**: Sewer System Analysis
- **Section 5**: Storm Drain System Analysis

Each of the sections provides descriptions of the following:

- Existing infrastructure
- Existing conditions based on current demands or loads
- Hydraulic model used for the evaluation
- Evaluation criteria
- Results of the analysis
- Recommended infrastructure sizes



Last Saved: 1/21/2020 1:30:55 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure1-1. Location Map.mxd : pjohnston

Project Boundary

Parcels

N

0 100 200

Scale in Feet

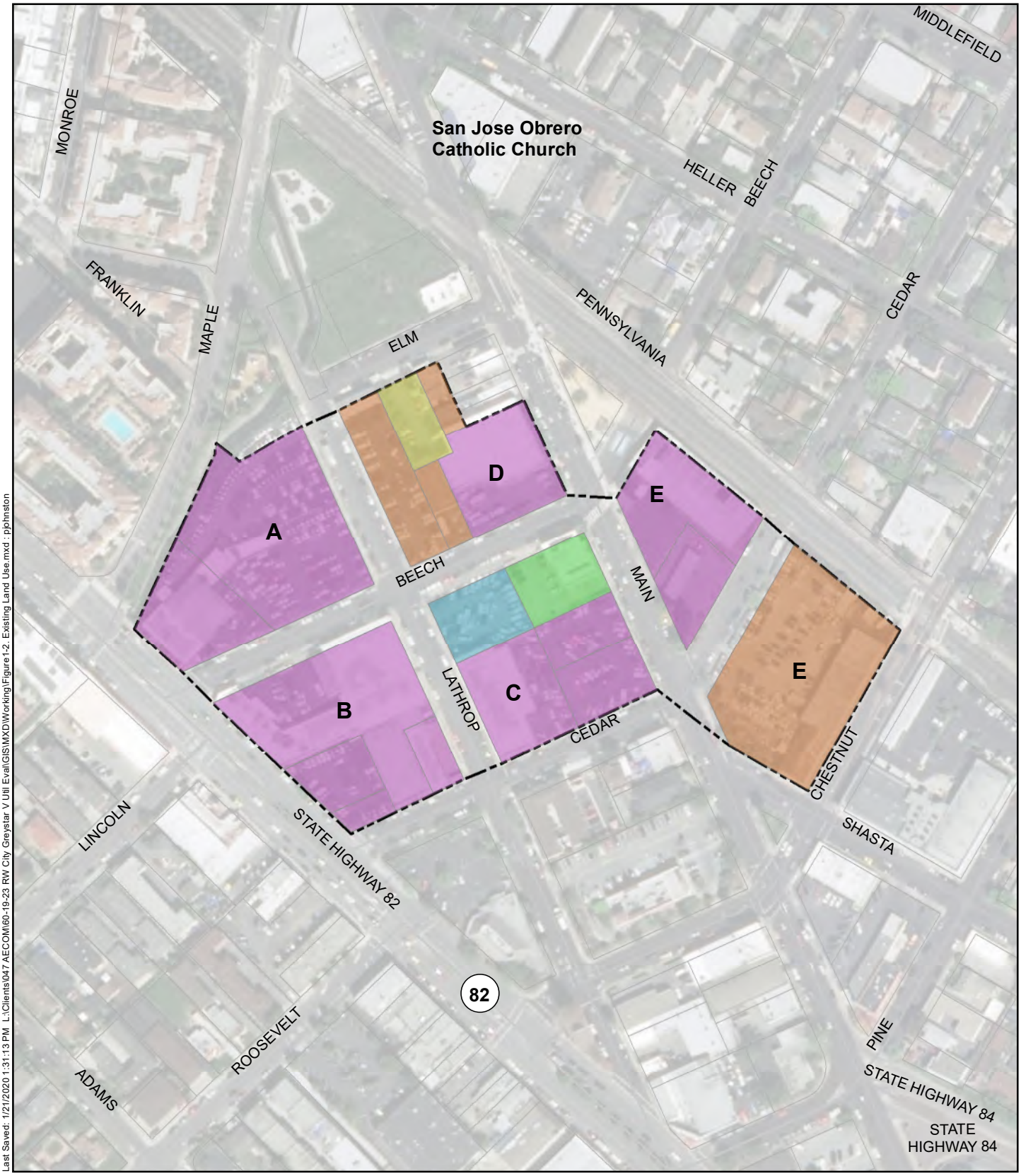
Redwood City California founded 1867

WEST YOST ASSOCIATES

Figure 1-1

Location Map

City of Redwood City
South Main Utility Evaluation



Last Saved: 1/21/2020 1:31:13 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure1-2. Existing Land Use.mxd ; pjohnston

Project Boundary
Streets
Parcels

Existing Land Use

- Residential
- Retail
- Commercial
- Parking
- Vacant

N

0 100 200

Scale in Feet

Redwood City California Founded 1867

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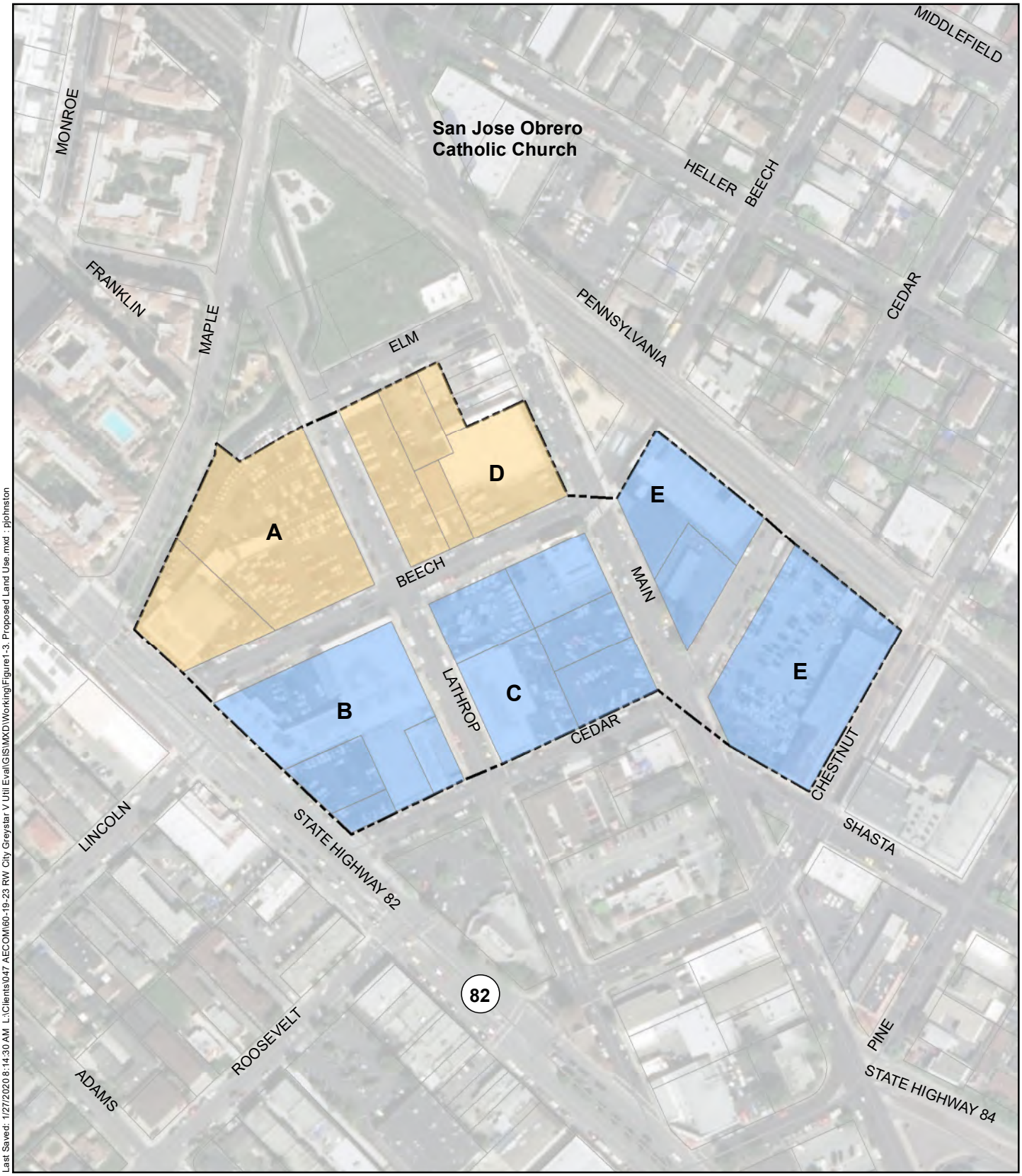
Figure 1-2

Existing Land Use

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.



Last Saved: 1/27/2020 8:14:30 AM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure1-3. Proposed Land Use.mxd : pjohnston

Project Boundary
Streets
Parcels

Proposed Land Use
Office
Residential

N

0 100 200
Scale in Feet

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Figure 1-3

Proposed Land Use

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.

2.0 POTABLE WATER SYSTEM ANALYSIS

The potable water system analysis summarizes required infrastructure, based on the results of a hydraulic analysis of pre-Project conditions and of proposed Project conditions. A hydraulic model developed for the City's 2011 Water System Master Plan (WMP) was used to evaluate existing and proposed conditions.

An analysis was conducted to evaluate pressures for normal operating conditions under Peak Hour Demand (PHD) for three different scenarios listed below:

- Existing system infrastructure and existing demands;
- Existing system with proposed developer infrastructure improvements, per the Preliminary Utility Summary, which is included in this report's Appendix A, with existing demands and buildout demands for the Project area estimated located in Appendix A as Attachment Q, and;
- Existing system with proposed developer infrastructure improvements, with buildout system demands from the 2011 WMP (base on Urban Water Management Plan and General Plan data) and buildout demands for the Project area estimated using Attachment Q, (located in Appendix A).

An analysis was conducted for two fire-flow scenarios:

- Existing system with proposed developer infrastructure improvements, with existing demands and buildout demands for the Project area, representing near-term development, and;
- Existing system with proposed developer infrastructure improvements, with buildout system demands and buildout demands for the Project area, representing 2030 conditions.

These evaluations were performed to determine whether the developer's proposed improvements to the potable water system to support the Project area are sufficient or additional improvements are needed.

2.1 Existing Potable Water System

This section describes the existing infrastructure and demands in the Project area. Refer to Figure 1-1 for a visual representation of the system described in the sections below.

2.1.1 Existing System Description

Potable water is supplied to the Project area from the Main City Pressure Zone. The Main City Pressure Zone is supplied by several turnout connections to the San Francisco Public Utility Commission's (SFPUC's) Regional Water System, located south of the Project area.

The Main City Pressure Zone has three existing storage reservoirs, with a total of 11.75 million gallons (MG) of storage, and a usable storage volume of just under nine MG. The reservoirs serve the pressure zone by gravity and are located on the southwest side of the pressure zone, approximately two miles from the Project area.

Figure 2-1 shows the existing potable water pipelines in the Project area. The Project area is currently served by an existing 10-inch diameter cast iron pipeline (CIP) (1935) that is located along Chestnut Street and an existing 8-inch diameter CIP (1969, 1956, 1967) along Lathrop. In addition, there is an 8-inch asbestos cement pipeline (ACP) (1983) located along Main Street. Lastly, there is a 4-inch diameter CIP (1918) located on Elm Street and 6-inch diameter CIPs along Beech Street (1956) and Cedar Street (1908).

2.1.2 Existing Model Demands

Historical water demands for the Project area were included in the potable water hydraulic model developed for the 2011 Water System Master Plan. Average day demand (ADD) was based on ADD developed for the WSMP but scaled to match recent ADD values provided by the City. Maximum day (MDD) and peak hour demands (PHD) were calculated using the following peaking factors from the 2011 WSMP:

- Maximum Day Demand = [Average Day Demand] x 2.0
- Peak Hour Demand = [Average Day Demand] x 3.2

Demand nodes corresponding to the five planning areas of the Greystar 5 development were identified in the model and the demands were summed. These demands are presented in Table 2-1.

As part of the Preliminary Utility Summary provided by the City, existing demands produced by the existing parcels in the Project site were estimated using the City's standard Attachment Q. Attachment Q is used to calculate both interior and irrigation demands using unit demand generation values. The calculations of the existing demands were compared to the existing demands found in the model, which are both presented in Table 2-1. Demands estimated using Attachment Q are much greater than the existing demands that are in the model. As a result, two existing scenarios had to be analyzed; an existing scenario with the model existing demands, and an existing scenario with demands adjusted to match the Attachment Q, located in Appendix A, estimated demands. The results of these scenarios, as well as the results of the Project scenario, are discussed in Sections 2.4 and 2.5.

Table 2-1. Project Area Existing Potable Water Demands

Planning Area	Model Existing ADD, gpd	Attachment Q, Estimated Existing ADD, gpd
A	274	9,120
B	850	28,020
C	101	12,810
D	720	7,140
E[(a)]	7,963	18,900
Total	**9,907**	**75,990**

(a) Elevated demands for Planning Area E are due to a self-serve car wash.

2.2 Hydraulic Model Calibration

The hydraulic model of the potable water system was developed using the Innovyze InfoWater software which runs within ArcGIS. The model transforms information about the physical water system into a mathematical model that solves for flows and pressures in the system, based on specified supply and demand conditions. The model was developed for the City as part of the City's 2011 Water System Master Plan.

The hydraulic model was calibrated in the Project area using hydrant test data provided by the City for tests performed on December 6, 2019. The City conducted three hydrant tests in the vicinity of the proposed Project. The hydrant tests were performed at the hydrants located at the intersections of Elm Street at Lathrop Street, Main Street at Beech Street and Buckeye Street at Shasta Street. For all three of the hydrant tests, pressures were measured at an observation hydrant located at Beech Street and Lathrop Street.

Table 2-2 compares the field pressures and model simulated pressures for the field flow tests. Field test data were used to compare modeled pressures with field pressure. The model used the existing average day demand scenario to represent test conditions.

West Yost reviewed C-factors within the planning area, and made no adjustments, since the assigned C-factors are reasonable for the pipeline materials and age.

The C-factors that are assigned to the existing pipelines within the project area are listed as follows:

- C-factor of 100 for the existing 6-inch diameter cast iron pipeline installed in 1956 along Beech Street.
- C-factor of 120 for the existing 8-inch diameter cast iron pipeline installed in 1967 along Lathrop Street.
- C-factor of 130 for the existing 8-inch diameter asbestos cement pipeline installed in 1983 along Main Street.
- C-factor of 65 for the existing 4-inch diameter cast iron pipeline installed in 1918 along Elm Street.
- C-factor of 65 for the existing 6-inch diameter cast iron pipeline installed in 1908 along Cedar Street.

As noted above, the current C-factors assigned to the existing pipelines are reasonable based on the pipeline materials and age.

Table 2-2. Field and Model Simulated Hydrant Flow Test Comparison

Hydrant Flow Test	Location	Field Hydrant Flow, gpm	Field Pressure, psi			Model Simulated Pressure, psi			Comparison of Differential Pressure, psi
			Static	Residual	Differential Pressure, psi	Static	Residual	Differential Pressure, psi	
Hydrant Flow Test 1	Hydrant at Elm/Lathrop	839	66	43	23	68	44	24	
Observed Hydrant Test 1	Beech/Lathrop		68	67	1	67	66	1	0
Hydrant Flow Test 2	Hydrant at Main/Beech	1169	68	62	6	67	63	4	
Observed Hydrant Test 2	Beech/Lathrop		68	66	2	67	66	1	1
Hydrant Flow Test 3	Hydrant at Buckeye/Shasta	1314	68	61	7	66	63	3	
Observed Hydrant Test 3	Beech/Lathrop		68	68	0	67	66	1	-1

2.3 Analysis Criteria

Pipelines within the Project area were sized to meet pipeline velocity, pipeline headloss, and system pressure criteria developed from the Water System Master Plan and from the City's design and construction standards. These criteria are summarized below.

Pipeline Sizing Criteria

- Maximum Velocity (under normal conditions) = four feet per second (fps)
- Maximum Headloss (under normal conditions) = four ft per 1,000 ft of pipe
- Maximum Velocity (under fire flow conditions) = seven fps
- Maximum Headloss (under fire flow conditions) = 10 ft per 1,000 ft of pipe
- Minimum Pipeline Diameter = 8-inch

System Pressure Criteria

- Maximum Allowable Pressure = 120 pounds per square inch (psi)
- Minimum Service Pressure under Normal Conditions = 35 psi
- Minimum Service Pressure under Fire Flow Conditions = 20 psi

2.4 Analysis of Proposed Project

The proposed Project is broken down into five planning areas. The Preliminary Utility Summary presents proposed land use within the planning areas, from which proposed project demands have been calculated. Additionally, the Preliminary Utility Summary presents proposed improvements to the infrastructure within the Project area.

2.4.1 Proposed Developer Improvements

Figure 2-2 shows potable water system improvements proposed by the developer. A City ordinance requires the replacement of existing water mains less than six inches in diameter along the Project's frontage. This includes replacing the four-inch diameter main along Elm Street with a six-inch diameter water line from Lathrop to Main Street. Additionally, due to the abandonment of Cedar Street between Main Street and the Caltrain right of way and its respective water main, a new looped connection located along Pennsylvania Avenue will be provided.

To evaluate the proposed water system infrastructure, three scenarios were evaluated for regular operating conditions and two scenarios were evaluated for fire flow conditions.

Figures of the proposed system are included in the Preliminary Utility Summary.

2.4.2 Proposed Project Demands

Table 2-3 summarizes pre-Project and Project average day demands estimated for the Project planning areas using Attachment Q, located in Appendix A. Estimates were provided by Talus Engineering in the Preliminary Utility Summary completed October 21, 2019.

Table 2-3. Pre-Project and Project Potable Water Demands		
Planning Area	Attachment Q Estimated Pre-Pojrect ADD, gpd	Attachment Q, Estimated Project ADD, gpd
A	9,120	26,425
B	28,020	24,873
C	12,810	8,072
D	7,140	12,494
E	18,900	13,466
Total	**75,990**	**84,330**

The estimated pre-Project demand and Project demand calculated using Attachment Q, located in Appendix A are very similar, even though the proposed planning areas will include higher intensity development than the existing parcels. This is because Redwood City enacted City Ordinance No. 2335 which requires the use of recycled water for landscape irrigation and building plumbing. The proposed buildings will be constructed to provide dual plumbing that will include a separate system for toilets, urinals, trap primers, and landscape irrigation. The existing development uses potable water for all those services, and the proposed Project will use recycled water, effectively decreasing the potable water demand. Due to this, the total increase in estimated potable water demand from the existing to future scenarios is 8,340 gpm, just under 10 percent of the proposed Project demand. The proposed recycled water demands are discussed further in Section 3.0.

Proposed MDD and PHD were calculated based on the peaking factors from the 2011 Water System Master Plan and presented in Section 2.3. The MDD and PHD for buildout of the Project are estimated to be approximately 119 and 190 gpm, respectively, based on an ADD of 59 gpm. The ADD, MDD and PHD are presented in Table 2-4.

Table 2-4. Proposed Greystar V Project Potable Water Demands			
Planning Area	ADD, gpm	MDD, gpm	PHD, gpm
A	18	37	59
B	17	35	55
C	6	11	18
D	9	18	29
E	9	18	29
Totals	**59**	**119**	**190**

2.4.3 Proposed Fire Flow Requirements

The fire flow requirement was provided by the City in the Preliminary Utility Summary prepared in October of 2019 by Talus Engineering. The fire flow requirement provided for the proposed site was considered for the largest proposed building. Fire Service Requirements per the California Fire Code (CFC) are as follows:

Building Type I

- Max. Building Area = 142,058 square feet (from architect)
- Fire Flow = 6,000 gpm per CFC Table B105.1

  3,000 gpm (with 50 percent reduction for sprinklers) plus 500 gpm for sprinkler demand.

2.4.4 Evaluation Scenarios

Three scenarios were evaluated under regular, non-fire flow operations:

- Existing system infrastructure and existing demands;
- Existing system with proposed developer infrastructure improvements with existing demands and buildout demands for the Project area estimated using Attachment Q, and;
- Existing system with proposed developer infrastructure improvements, with buildout system demands and buildout demands for the Project area estimated using Attachment Q. located in Appendix A.

Each one of these operational scenarios were evaluated under average day demand (ADD), maximum day demand (MDD), and peak hour demand (PHD) creating 12 total non-fire flow scenarios.

Two fire flow scenarios were evaluated:

- Existing system with proposed developer infrastructure improvements, with existing demands and buildout demands for the Project area, representing near-term development, and;
- Existing system with proposed developer infrastructure improvements, with buildout system demands and buildout demands for the Project area, representing 2030 conditions.

The figures displaying the results for the PHD and the fire flow scenarios are included in Appendix B.

2.4.5 Normal Operations Results

Under existing system peak hour condition, the hydraulic model results indicate that the pressures under peak hour demand conditions within the Project area range from 60-65 psi.

Under existing system peak hour conditions with proposed buildout demands for the Project area, the hydraulic model results indicate that the pressures under peak hour demand conditions within the Project area range from 60-65 psi.

Under buildout system peak hour condition with proposed buildout demands for the Project area, the hydraulic model results indicate that the peak hour demand pressures within the Project area range from 60-64 psi.

Under all three of the PHD scenarios the minimum system normal operating pressure requirement of 35 psi is met.

2.4.6 Maximum Day Plus Fire Flow Evaluations Results

To simulate near-term conditions, West Yost used the hydraulic model to simulate fire flow availability while flowing hydrants under existing system maximum day demand and Project buildout maximum day conditions while maintaining 20 psi residual pressure and a maximum pipeline velocity of seven feet per second in proposed pipelines. Existing pipelines were not subject to any velocity criterion.

To simulate buildout conditions, the hydraulic model was used to simulate fire flow availability while flowing hydrants under buildout system maximum day demand and Project buildout maximum day demand conditions while maintaining 20 psi residual pressure and a maximum pipeline velocity of seven feet per second in proposed pipelines. Improvement projects recommended in the 2011 WSMP were not included.

The system was analyzed with the improvements as proposed. The analysis indicated insufficient fire flow capacity at many of the hydrants adjacent to the project area. The system was then analyzed after increasing the diameter of several of the improvements from eight inches to ten inches. The improvements that were increased from eight inches to ten inches include El Camino Real between Maple Street and Cedar Street, Lathrop Street between Elm Street and Cedar Street, and Beech Street between El Camino Real and Lathrop Street. With the increases in diameter, the system was found to have sufficient fire flow capacity. Table 2-5 summarizes the simulated fire flow availability at the hydrant locations that serve each planning area of the project area for the near-term scenario with the increased pipeline diameters. Table 2-6 summarizes the simulated fire flow availability at the hydrant locations that serve each planning area of the project area under buildout demand conditions with the increased pipeline diameters.

For the planning areas within the Project area, there are multiple adjacent hydrants, several of which are included in Tables 2-5 and 2-6. While the model results indicate that not all hydrants within the project area can meet the fire flow requirements, each planning area has at least one hydrant adjacent to it that can meet the fire flow requirements. Therefore, the model results indicate that the potable water system can provide adequate fire flow to all planning areas within the Project area with the recommended increases in diameter for some of the improvements.

The City indicated that the setting of the El Camino Real pressure reducing valve (PRV) is such that it rarely provides supply into the system. However, the model indicates that with the provided setting for this PRV it would provide supply into the system under fire flow conditions. To determine the effect of the El Camino Real PRV the model was used to analyze the system both with and without the El Camino Real PRV allowed to provide supply into the system. The model indicates that the El Camino Real PRV has minimal effect on the ability of the system to meet the fire flow requirements.

Table 2-5. Summary of Fire Flow Availability for Near-Term MDD + Fire Flow Conditions[a]

Planning Area	Model Junction	Available Design Fire Flow, gpm	Hydrant Pressure at Design Flow, psi
A, B	WY_G5_J5	3,236	63
A, B, C, D	WY_G5_J4	3,663	62
C, D, E	J-MAIN-26586	3,478	48
C	WY_G5_J8	605	20
A, D	WY_G5_2	3,582	63
D	WY_G5_J3	2,526	58
C, D, E	J-MAIN-26588	4,946	37
C, D, E	J-MAIN-26584	3,485	48

(a) Existing System Maximum Day Demands Plus Buildout Demand for Project Area, with a maximum velocity of 7 feet per second in all new pipelines.

Table 2-6. Summary of Fire Flow Availability for Buildout MDD + Fire Flow Conditions[a]

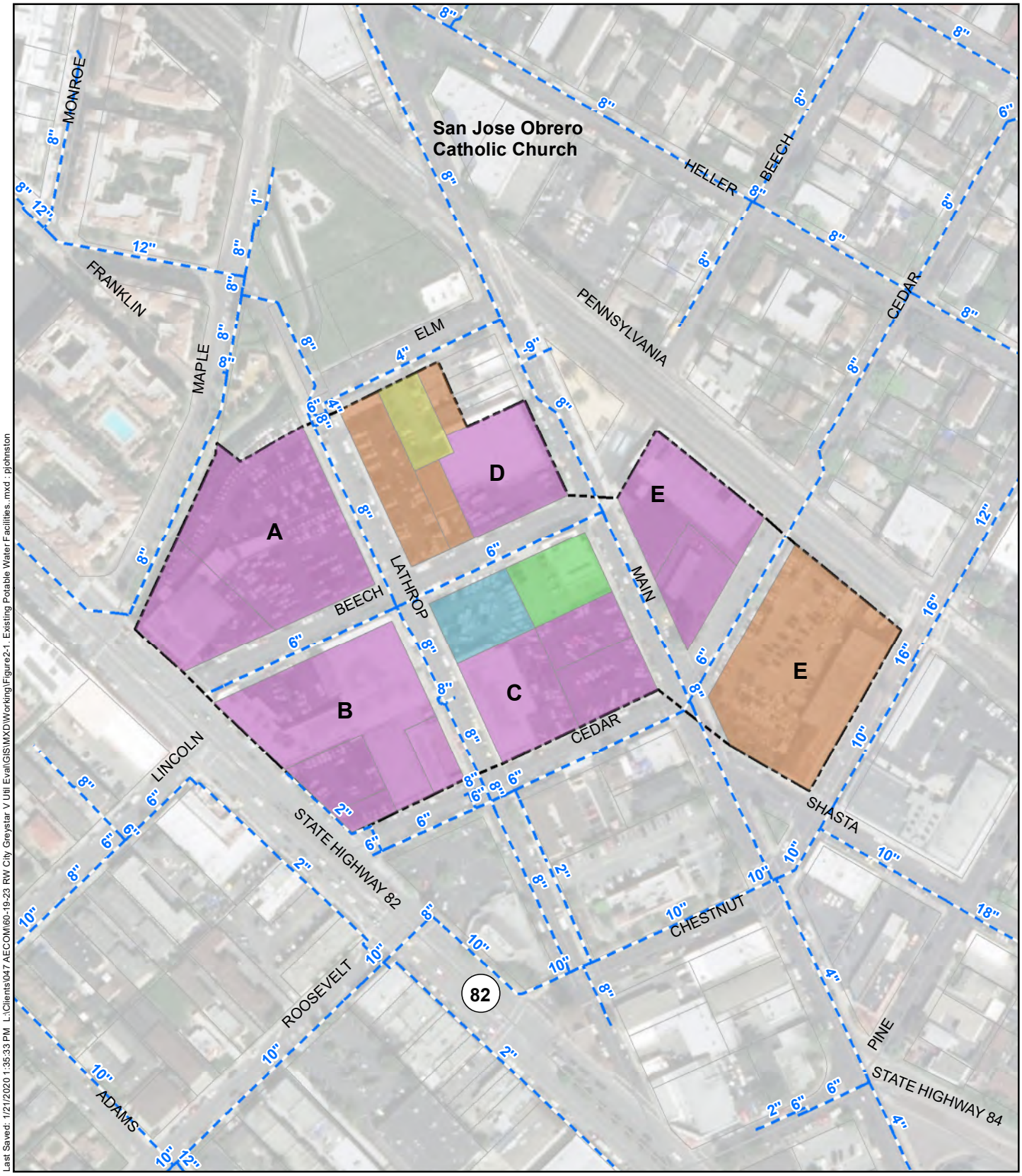
Planning Area	Model Junction	Available Design Fire Flow, gpm	Hydrant Pressure at Design Flow, psi
A, B	WY_G5_J5	3,214	62
A, B, C, D	WY_G5_J4	3,689	60
C, D, E	J-MAIN-26586	3,464	47
C	WY_G5_J8	600	20
A, D	WY_G5_2	3,489	62
D	WY_G5_J3	2,525	57
C, D, E	J-MAIN-26588	4,942	35
C, D, E	J-MAIN-26584	3,465	47

(a) 2030 System Maximum Day Demands Plus Buildout Demand for Project Area, with a maximum velocity of 7 feet per second in all new pipelines.

2.5 Summary of Potable Water System Improvements

With the recommended increases in diameter for some of the proposed water system improvements in the Preliminary Utility Summary, the water system will meet all analysis criteria. It recommended to increase the diameter from eight inches to ten inches for the improvements in El Camino Real between Maple Street and Cedar Street, Lathrop Street between Elm Street and Cedar Street, and Beech Street between El Camino Real and Lathrop Street.

An additional recommended adjustment to the improvements proposed in the Preliminary Utility Summary is that the proposed replacement pipeline on Elm Street between Lathrop Street and Main Street be installed as an eight-inch pipeline rather than the proposed six-inch pipeline, as the minimum pipeline diameter for the City is eight inches.



Last Saved: 1/21/2020 1:35:33 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure2-1 Existing Potable Water Facilities_mxd : pjohnston

8" Existing Potable Water Pipe

Project Boundary

Streets

Parcels

Existing Land Use

- Residential
- Retail
- Commercial
- Parking
- Vacant

N

0 100 200

Scale in Feet

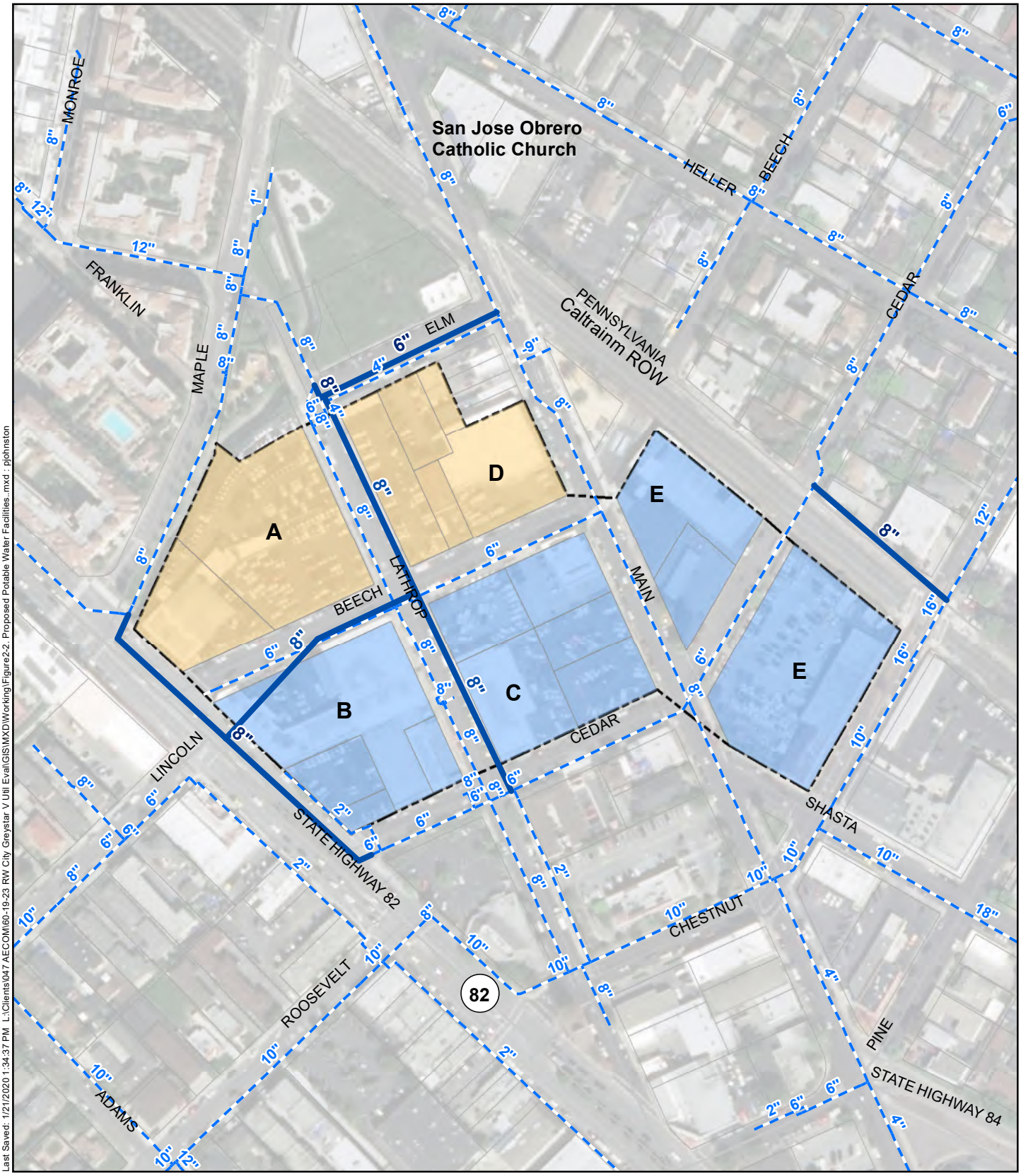
WEST YOST ASSOCIATES

Figure 2-1

Existing Potable Water Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.



Last Saved: 1/21/2020 1:34:37 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure2-2. Proposed Potable Water Facilities..mxd : pjohnston

8" Proposed Potable Water Pipe

8" Existing Potable Water Pipe

Project Boundary

Streets

Parcels

Future Land Use

Office

Residential

N

0 100 200

Scale in Feet

WEST YOST ASSOCIATES

Figure 2-2

Proposed Potable Water Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed

3.0 RECYCLED WATER SYSTEM ANALYSIS

This section summarizes the results of a hydraulic analysis of the recycled water system with future system demands and the Project built out. While City Ordinance No. 2335 requires that recycled water be used for landscape irrigation and building plumbing, recycled water service has not yet been extended to the Project area.

A hydraulic model developed for evaluation of future recycled water facilities was used for the analysis. The recycled system hydraulic model was used to evaluate operating pressures under peak hour demand conditions. This evaluation was performed to determine the proposed improvements to the recycled water system to support the Project Area.

3.1 Existing Recycled Water System

3.1.1 Existing System Description

Recycled water will be supplied to the Project area from the Silicon Valley Clean Water (SVCW) treatment plant in Redwood Shores via an existing 24-inch diameter pipeline that currently ends at the intersection of Marshall Street and Main Street.

3.1.2 Existing Recycled Water Use

There is currently no existing recycled water use in the Project area.

3.2 Hydraulic Model

Preliminary studies by greywater specialists indicate that recycled water demand serving indoor uses could be approximated as 25 percent of the typical potable water indoor residential use and 80 percent of the typical potable water indoor office and retail use. The irrigation demands are not included in these ratios and are considered to be 100 percent recycled. The total recycled water demand is estimated to be 65,507 gpd and is summarized in Table 3-1.

Table 3-1 Recycled Water Demands

Planning Area	Water Demand (gpd)	Potable Indoor (gpd)	Recycled Indoor (gpd)	Recycled Irrigation (gpd)	Recycled Water Total (gpd)
A	36,485	25,362	10,038	1,085	11,123
B	37,285	21,795	13,679	1,811	15,490
C	22,189	4,248	16,994	947	17,941
D	33,747	24,660	8,220	867	9,087
E	37,354	25,488	9,948	1,918	11,866
Total	**167,060**	**101,553**	**58,879**	**6,628**	**65,507**

The City provided a hydraulic model updated by Kennedy/Jenks Consultants in 2015 for a future planning scenario in which average annual recycled water use is estimated to be 3,238 acre-feet/year. The City recently updated the model to include recent changes in development, including many new recycled water customers in the downtown area of Redwood

City. The model includes existing recycled water facilities and customers as well as future recycled water facilities and customers in Seaport and downtown Redwood City. This model scenario was used as a starting point to evaluate recycled water facilities pipeline sizing for the Project area, and to evaluate pressures in the recycled water system at buildout of the future phases.

The project demand for the Project area was updated in the model to include recycled water demand at buildout of the Project area based on a worst-case peak hour demand for each proposed planning area within the Project area.

3.3 Analysis Criteria

Pipelines within the Project area were sized to meet pipeline velocity, pipeline headloss, and system pressure criteria. These criteria are:

Pipeline Criteria

- Maximum Velocity = 5 feet per second (fps)
- Maximum Headloss = 1 psi per 5,000 ft of pipe (or 2.3 ft / 5,000 ft of pipe, or 0.5 ft / 1,000 ft)

Pressure Criteria

- Maximum Allowable Pressure = 100 pounds per square inch (psi)
- Minimum Service Pressure = 55 psi, preferred, 45 psi, minimum

3.4 Analysis of Proposed Development

3.4.1 Proposed Development Demands

The land use within the Project area is shown on Figure 3-1. The City provided proposed recycled water demand for each development area within the Specific Plan area based on indoor and outdoor uses. The proposed recycled water alignments for the Project area are shown on Figure 3-2. The future project demand in the model was updated to reflect estimated recycled water demand for the proposed Project. Projected project model demands are based on a Peak Hour Demand (PHD) and were calculated based on the following criteria:

- Peak Hour Demand (gpm) = [Average Daily Irrigation Demand (gpm) x 10]
- Peak Hour Demand (gpm) = [Average Daily Interior Residential Demand (gpm) x 8]
- Peak Hour Demand (gpm) = [Average Daily Interior Commercial Demand (gpm) x 2]

The modeled PHD is estimated to be approximately 880 gpm, which includes both irrigation and interior demands.

3.4.2 Proposed Recycled Water Facilities

A new recycled water transmission main is required to serve recycled water to the Project area. The planned route for the transmission main is shown on Figures 3-1 and 3-2. The existing system ends at the intersection of Marshall Street and Walnut Street. The new transmission main would extend

south along Walnut Street to the Project area. Two proposed alignment options are shown on Figure 3-2. After current and projected recycled water demands for the downtown area were added to the hydraulic model, the modeling results indicate that the new transmission main must be a 24-inch pipeline to meet the City's maximum headloss criterion.

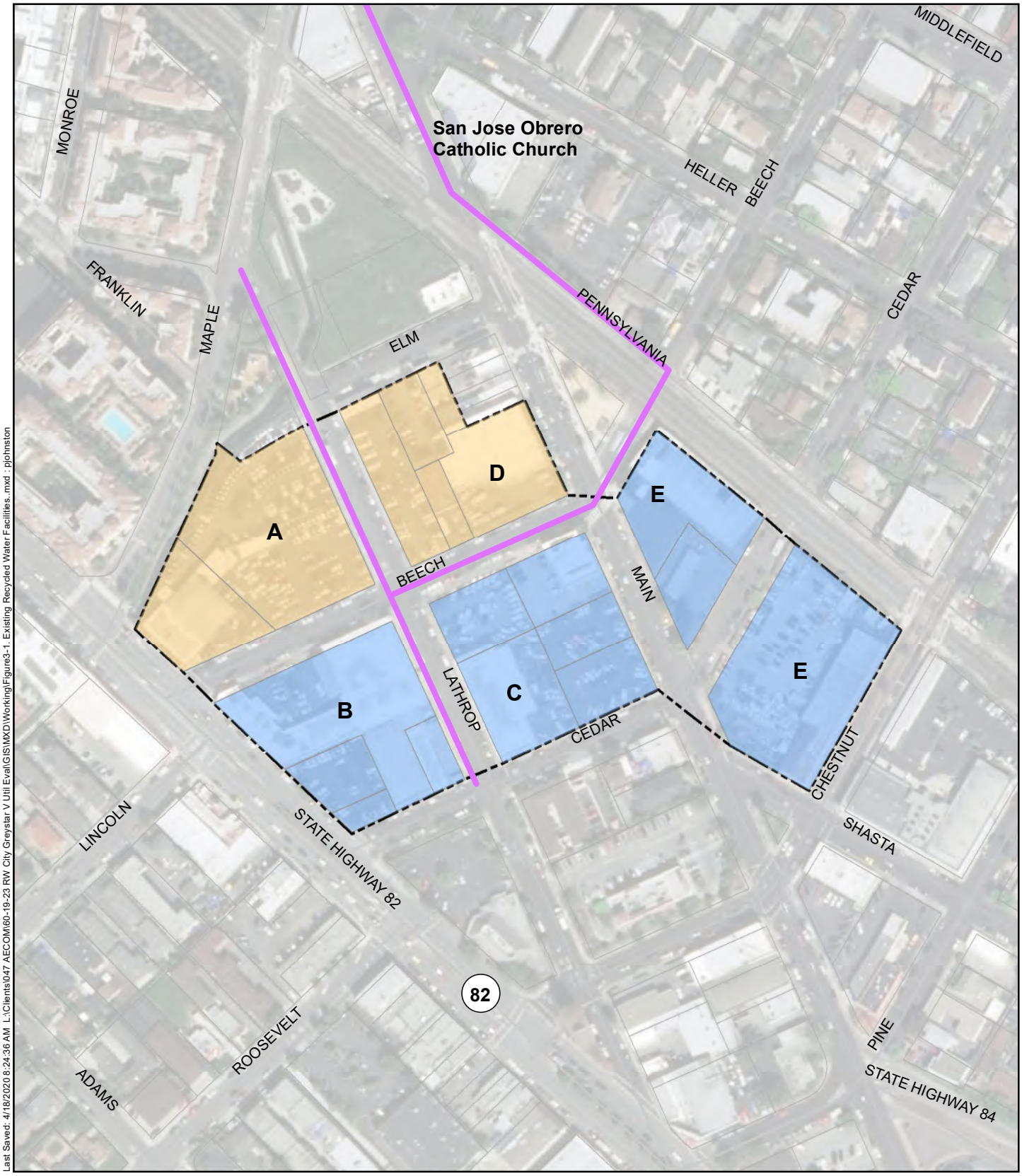
Two new pipelines are required to serve recycled water within the Project area. These pipelines are shown on Figures 3-1 and 3-2. Each pipeline was sized using the City's maximum headloss criterion. The pipeline along Cedar Street must be a 10-inch diameter pipeline that would tie into the 24-inch diameter recycled water main in Main Street. The pipeline along Beech Street must be a 14-inch diameter pipeline that would tie into the 24-inch diameter recycled water main in Main Street.

Figure 3-3 shows the buildout plan for the recycled water system that has been adjusted to accommodate recent changes in development in the downtown area.

3.5 Summary of Recycled Water System Improvements

The following new recycled water pipelines are needed for the Project area, with some variation between the two options:

- 220 feet of new 10-inch diameter pipeline to serve Cedar Street;
- 450 feet of new 14-inch diameter pipeline to serve Beech Street;
- 3,200 feet of new 24-inch diameter pipeline to connect the Project area to the existing recycled water system.



Planned Recycled Water Pipe
Project Boundary
Streets
Parcels

Land Use
Office
Residential

N

0 100 200
Scale in Feet

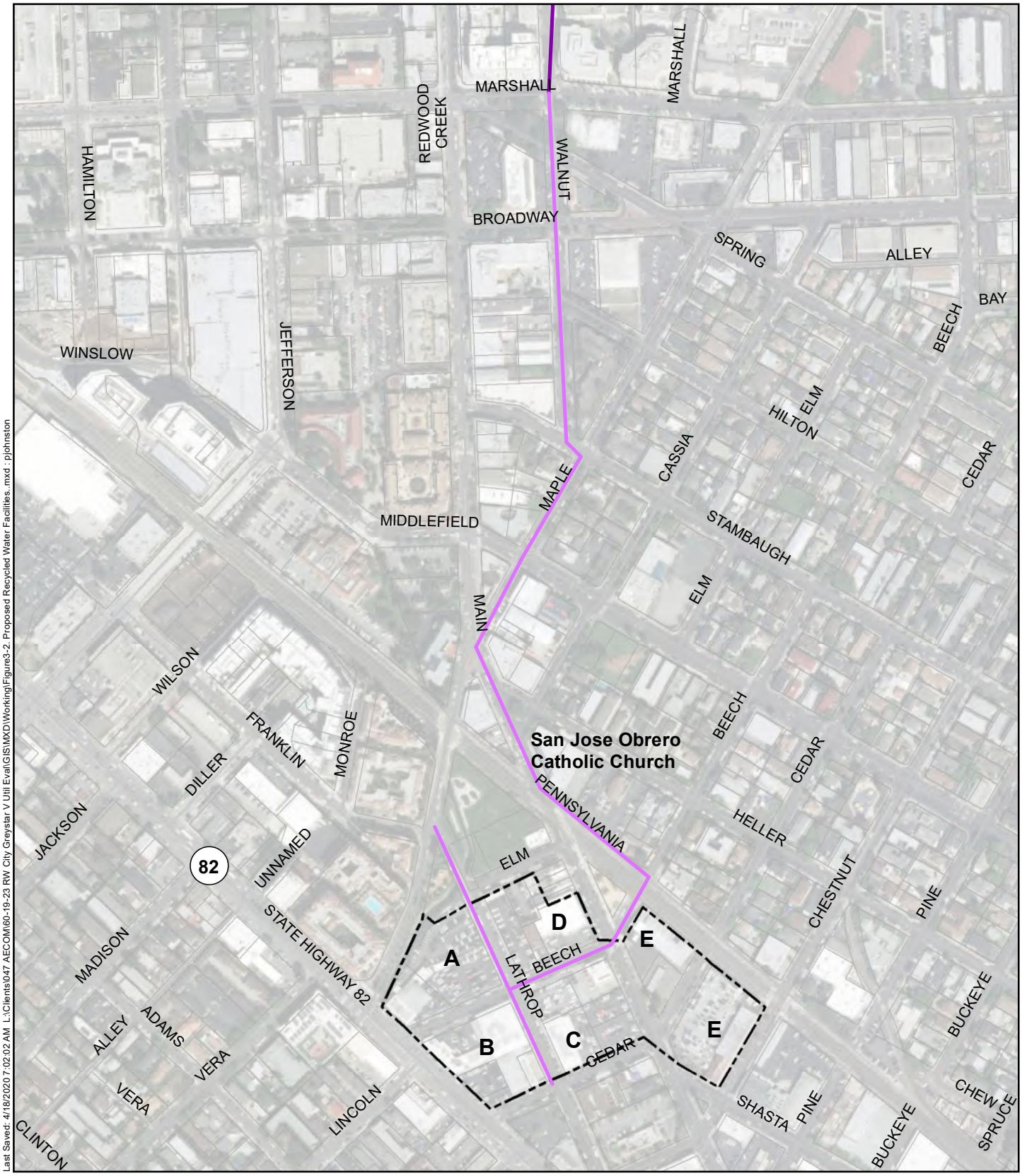
WEST YOST ASSOCIATES

Figure 3-1

Landuse and Planned Recycled Water Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.



Last Saved: 4/18/2020 7:02:02 AM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure3-2. Proposed Recycled Water Facilities..mxd : pjohnston

Existing Recycled Water Pipe
New Recycled Water Pipe
Project Boundary
Parcels

N

0 200 400
Scale in Feet

Redwood City California Founded 1867

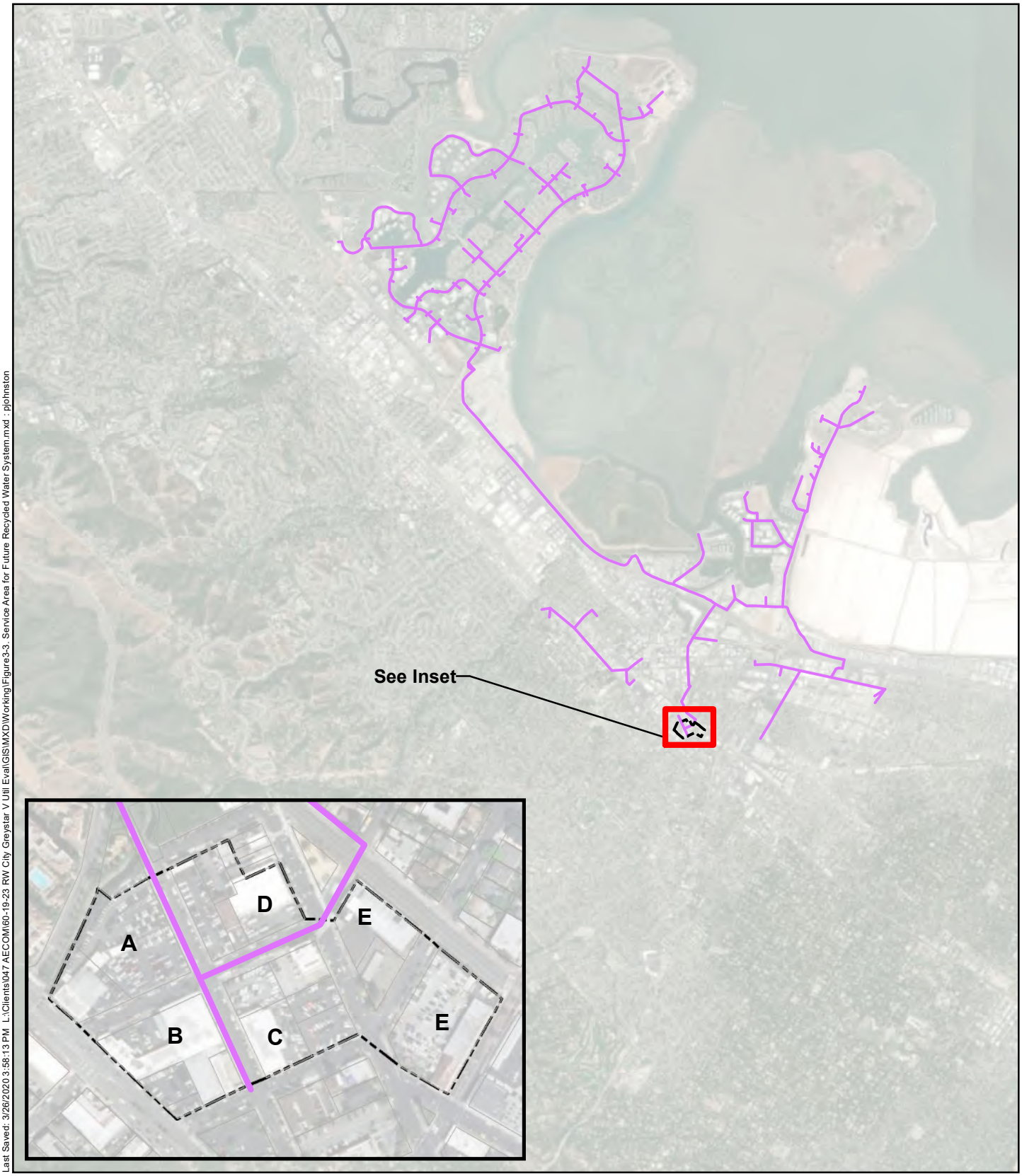
WEST YOST ASSOCIATES

Figure 3-2

Planned Recycled Water Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.



Last Saved: 3/26/2020 3:58:13 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure3-3. Service Area for Future Recycled Water System.mxd : pjohnston

Recycled Water Pipe

Project Boundary

N

0 2,500 5,000

Scale in Feet

WEST YOST ASSOCIATES

Figure 3-3

Service Area for Future Recycled Water System

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.

4.0 SEWER SYSTEM ANALYSIS

This section summarizes the results of a hydraulic analysis of both existing and future flow conditions, with and without the proposed Project.

A hydraulic model developed for the 2008 Sewer System Master Plan (SSMP) was used to evaluate both existing and future conditions. The sewer system hydraulic model was used to evaluate sewer capacity under Peak Wet Weather Flow (PWWF) conditions.

The analysis was conducted for four scenarios:

- Existing system flows with existing level of development;
- Existing system flows with buildout of the Project area (near-term development);
- Buildout system with flow projections for Project area based on original land uses; and
- Buildout system flows with buildout of the Project area based on proposed land uses.

These evaluations were performed to determine proposed improvements to the sewer collection system to support the Project area.

4.1 Existing Sewer System

4.1.1 Existing System Description

The City's sewer collection system consists of gravity mains, force mains, and pump stations. Most of the City's sewer flows are directed to the Maple Street Pump Station, and are then transmitted to and treated in the Silicon Valley Clean Water (SVCW) Wastewater Treatment Plant in Redwood Shores, and eventually further treated and delivered to the City's recycled water system or discharged into the San Francisco Bay. SVCW's 10-year capital improvement plan calls for the construction of a new pipeline and reconstruction/replacement of regional SVCW pump stations. SVCW's new 48-inch diameter force main will connect the San Carlos and Maple Street pump stations.

Figure 4-1 shows the existing sanitary sewer system in the vicinity of the Project area. The existing sewer system within the Project area consists of a 10-inch Vitrified Clay Pipe (VCP) sewer main along Maple Street, 8-inch VCP sewer mains along El Camino Real, Main Street and Caltrain, a 6-inch VCP sewer main along Lathrop Street that connects with a 10-inch VCP sewer main in Maple Street and 12-inch PVC and 16-inch VCP sewer mains along the south side of El Camino Real. Additionally, two bypass trunks exist that extend across Caltrain at the north end of Beech Street, which consist of 27- and 18-inch VCP mains in Beech Street and Main Street, respectively. All of the sewer mains ultimately transport flow northerly and discharge at the treatment facility in Redwood Shores.

4.1.2 Existing and Future Sewer Flows

The City has a standard method of estimating sewer flows by assuming 95 percent of the water demand estimated for a parcel. These calculations are completed using the City's "Attachment L" located in Appendix A. Existing and future average dry weather sewer flows (ADWF) were estimated for the

Project areas using attachment L, provided by Talus Engineering in the Preliminary Utility Summary dated October 21, 2019.

Table 4-1. Existing and Future Average Dry Weather Flows in Project Area

Planning Area	Existing ADWF, gpd	Future ADWF, gpd	Net Increase, gpd
A	8,664	33,630	24,966
B	26,619	33,700	7,081
C	11,571	20,180	8,609
D	6,783	31,236	24,453
E	17,955	33,664	15,709
Total	**71,592**	**152,410**	**80,818**

The future flows provided by Talus are presented in Table 4-1. Comparison between the existing flows and the proposed flows shows that the proposed development more than doubles the sanitary sewer flow from the Project area.

4.2 Hydraulic Model

The hydraulic model of the City's sanitary sewer system was developed in the InfoWorks CS software for the City's 2008 Sewer Master Plan. InfoWorks CS is a fully dynamic open channel modeling platform distributed by Innovyze. The hydraulic model was updated and re-calibrated by West Yost in 2013 as part of the 2013 Sewer Master Plan Update.

The hydraulic model is a skeletonized model that contains the collection system's gravity main interceptors. It was not developed to assess the capacity of the city's small diameter gravity main collectors, and the model includes only a few gravity mains less than 10-inches in diameter where required for connectivity. The hydraulic model was updated as follows in the Project Area for this analysis:

- The Project Area originally contained two subcatchments for flow loading. Subcatchments were re-drawn to correspond to the proposed development areas summarized in Table 4-1, so that the flow from each proposed development area can be loaded in an individual subcatchment. The RTK[1] method was used to develop estimates of rain-dependent infiltration and inflow (RDII) and develop peak wet weather flows. Wet weather RTK factors were not changed for the re-drawn subcatchments and are consistent with wet weather basin C11 as described in the 2013 Sewer Master Plan Update.

[1] West Yost used the RTK method to calculate RDII inputs to the City's hydraulic model. The RTK method generates hydrographs from each subcatchment that represent estimated flows during and immediately after rainfall events caused by potential seepage of water into the collection system. The RTK method generates a series of three triangular hydrographs that represent short-term, medium-term, and long-term rainfall response. The RTK parameters are: (1) R is the area of the graph representing the portion of rainfall falling on a subcatchment that enters the sewer collection system. (2) T is the time from the onset of rainfall to the peak of the triangle. (3) K is the ratio of the "time to recession" to the "time to peak" of the hydrograph.

- The hydraulic model did not include any of the collection system in the Seaport/Pacific Shores area north of the Maple Street PS. The collection system in this area consists primarily of small diameter gravity main collectors that flow to small pump stations that discharge directly to the SVCW force main system, and therefore this infrastructure was not considered to be part of the trunk system in either the 2008 Master Plan or the 2013 Master Plan Update.
- Scenarios in the model were updated to include flows from previously constructed or projects on Bair Island and 333 Main Street and planned projects at 353 Main Street and 557 East Bayshore Road.

4.3 Analysis Criteria

The following criteria were used as part of this analysis.

4.3.1 Flow Development

Project Area sanitary sewer flows were developed as follows:

- For the Project Area, Base Wastewater Flow (BWF) projections were calculated from water demand projections using Attachment L. located in Appendix A.
- Peak Dry Weather Flow (PDWF) is the maximum value generated by the ADWF and the diurnal curve applied to the flow
- Peak Wet Weather Flow (PWWF) = PDWF plus Rainfall-Dependent Infiltration/Inflow (RDI/I)
- RDI/I is calculated in the hydraulic model and has been calibrated to multiple storms
- RDI/I is based upon calibrated RTK values in combination with a design storm
- Consistent with the 2013 Sewer Master Plan Update, the design storm is a nested 10-year 24-hour storm, timed for peak-to-peak conditions.

4.3.2 Pipeline Sizing

The following criteria were used for sizing gravity mains:

- Minimum Gravity Main Pipeline Size = eight-inch diameter
- Gravity mains were determined to have sufficient capacity when wastewater flows did not cause the flow to exceed three-fourths (¾) full at peak flow condition, or d/D = 0.75 where d is depth of flow and D is diameter of the sewer pipe. This criterion is based on Volume 3, Part VI of the City's Engineering Standards
- A design storm establishes the volume and distribution of rainfall that the collection system will experience during a single rainfall event. A synthetic design storm with a 10-year recurrence interval and 24-hour duration, as provided through the National Oceanographic and Atmospheric Administration rainfall atlas and distributed using the Soil Conservation Service Type 1 distribution, was used for the Peak Wet Weather Flow (PWWF) analysis. The 10-year, 24-hour design storm criterion is

consistent with criteria in use by SVCW for planning future pumping, conveyance, and wet weather storage improvements.

- Manhole surcharging limited to within five feet of the manhole rim during PWWF

4.3.3 Pump Station Sizing

Pump Station Firm Capacity is defined as the capacity of the pump station with the largest pump out of service. Pump Station Firm Capacity shall be greater than or equal to the PWWF at the pump station.

4.4 Analysis of Proposed Development

4.4.1 Proposed Sewer System Facilities

In order to evaluate the sanitary sewer infrastructure for the Project area, the estimated sewer flows for the proposed development area were loaded into the collection system model. The flows from the proposed development are assigned to subcatchments M_1730 and M_1740 within the hydraulic model. These subcatchments are then assigned to a trunk main to the west of the proposed development, with M_1730 assigned to manhole 916 and M_1740 assigned to manhole 1672. Manholes 916 and 1672 are along a 10-inch trunk main along Maple Street. After the flows from the development enter the trunk main along Maple Street, the flows continue north along Maple Street, north along Main Street, east along Bradford Street and then north along Walnut Street to the Maple Street Pump Station.

When proposed and existing infrastructure are evaluated using existing flows plus flows from the previously constructed or planned projects for the remainder of the City, existing infrastructure relevant to the study area is found to have capacity deficiencies for PWWF along Maple Street, Main Street, Bradford Street and Walnut Street in certain sections of trunk main. When the flows for the proposed Project are added to system, the extents of the capacity deficiencies are greater, with more sections of trunk main showing capacity deficiencies for PWWF. The results from the evaluation using the hydraulic model are presented in Tables 4-2 and 4-3. The sections of trunk main highlighted in Table 4-3 are those that do not meet the evaluation criteria for d/D <0.75.

Table 4-2. Peak Wet Weather Flow (PWWF) Results, MGD								
					Existing		Future	
Pipe ID	Upstream Node ID	Downstream Node ID	Diameter (in)	Pipe Full Capacity (mgd)	2013 Master Plan Update plus Developments	With Project (Greystar)	2013 Master Plan Update plus Developments	With Project (Greystar)
Greystar Project Pipelines								
918.1	918	910	10	0.75	0.52	0.52	0.52	0.52
910.1	910	917	10	0.85	0.66	0.66	0.66	0.66
917.1	917	916	10	0.78	0.66	0.66	0.66	0.66
916.1	916	1674	10	0.73	0.68	0.77	0.69	0.77
1674.1	1674	7	10	0.72	0.68	0.77	0.69	0.77
7.1	7	1673	10	0.73	0.68	0.77	0.69	0.77
1673.1	1673	1672	10	0.77	0.68	0.77	0.69	0.77
1672.1	1672	2677	10	1.27	0.80	0.99	0.81	1.00
2677.1	2677	2678	10	0.91	0.80	0.99	0.81	1.00
2678.1	2678	2673	10	1.15	0.91	1.10	0.92	1.11
2673.1	2673	2715	12	5.70	0.96	1.15	0.99	1.18
2715.1	2715	2716	12	1.87	0.97	1.17	1.02	1.25
2716.1	2716	2706	12	1.94	0.97	1.17	1.02	1.24
2706.2	2706	2705	12	2.40	1.00	1.18	1.03	1.30
2705.1	2705	4234	27	7.86	9.25	9.47	10.15	10.38
4234.1	4234	2970	27	9.32	9.56	9.90	9.91	10.29
2970.2	2970	2972	27	6.52	9.56	9.90	9.90	10.29
2972.1	2972	4220	27	7.29	10.91	11.26	11.32	11.70
4220.1	4220	2976	48	-39.83	25.41	26.05	26.57	27.25
2976.1	2976	2977	48	180.78	25.41	26.05	26.57	27.25
2977.1	2977	2978	48	33.62	37.82	38.64	39.51	40.34
2978.1	2978	2981	48	28.00	37.82	38.64	39.51	40.34
2981.1	2981	6429	48	30.40	37.82	38.64	39.51	40.34
6429.2	6429	6180	60	70.02	23.21	23.71	24.30	24.80
6180.1	6180	6184	48	118.82	38.16	38.98	39.96	40.79
6184.1	6184	5905	48	149.74	38.16	38.98	39.96	40.79

Table 4-3. PWWF Maximum d/D Results

					Existing		Future	
Pipe ID	Upstream Node ID	Downstream Node ID	Diameter (in)	Length (ft)	2013 Master Plan Update plus Developments	With Project (Greystar)	2013 Master Plan Update plus Developments	With Project (Greystar)
Greystar Project Pipelines								
918.1	918	910	10	90	0.670	0.670	0.671	0.672
910.1	910	917	10	325	0.720	0.810	0.720	0.820
917.1	917	916	10	245	0.790	1.000	0.790	1.000
916.1	916	1674	10	75	0.790	2.000	0.790	2.000
1674.1	1674	7	10	115	0.780	2.000	0.790	2.000
7.1	7	1673	10	114	0.780	0.940	0.780	0.950
1673.1	1673	1672	10	286	0.730	0.860	0.740	0.870
1672.1	1672	2677	10	259	0.740	1.000	0.750	1.000
2677.1	2677	2678	10	353	0.730	2.000	0.740	2.000
2678.1	2678	2673	10	525	0.680	0.820	0.690	0.860
2673.1	2673	2715	12	6	0.420	0.490	0.440	0.530
2715.1	2715	2716	12	354	0.510	0.820	0.740	1.000
2716.1	2716	2706	12	350	1.000	1.000	1.000	1.000
2706.2	2706	2705	12	37	1.000	1.000	1.000	1.000
2705.1	2705	4234	27	305	2.000	2.000	2.000	2.000
4234.1	4234	2970	27	360	2.000	2.000	2.000	2.000
2970.2	2970	2972	27	236	2.000	2.000	2.000	2.000
2972.1	2972	4220	27	128	2.000	2.000	2.000	2.000
4220.1	4220	2976	48	11	0.800	0.820	0.850	0.870
2976.1	2976	2977	48	17	0.920	0.950	0.970	0.990
2977.1	2977	2978	48	130	0.920	0.940	0.960	0.980
2978.1	2978	2981	48	440	0.880	0.900	0.920	0.940
2981.1	2981	6429	48	429	0.760	0.770	0.780	0.790
6429.2	6429	6180	60	358	0.380	0.390	0.390	0.400
6180.1	6180	6184	48	93	0.410	0.410	0.420	0.420
6184.1	6184	5905	48	53	0.360	0.360	0.370	0.370

Note: A d/D ratio of 1.0 represents backwater conditions, indicating a downstream capacity deficiency. A d/D ratio of 2.0 represents surcharge conditions, indicating a capacity deficiency.

In addition to evaluating existing flows plus flows from the previously constructed or planned projects for the remainder of the City to determine immediate infrastructure recommendations, the proposed Project area flows were modeled in combination with buildout flows for the remainder of the City to determine long-term infrastructure needs. The results for evaluating the system under buildout flows are similar to the results for the evaluation under existing flows, except that the extents of the capacity deficiencies are greater, with one additional section of trunk main showing a capacity deficiency. Similarly, when the flows from the proposed Project are added to the system, the extents of the capacity deficiencies are greater with one additional section of trunk main showing a capacity deficiency.

4.5 Condition Assessment

Several sanitary sewer gravity mains in the Project area were identified by the City at the outset of the project as requiring condition assessment by closed-circuit television (CCTV) inspection and subsequent condition assessment. Selected mains had not undergone inspection as part of the City's routine maintenance program and included approximately 2,322 feet of gravity main in the following locations: Maple Street between El Camino Real and Middlefield Road (1,525 linear feet); Elm Street between Lathrop Street and Main Street (225 linear feet); and along the railroad right-of-way between Elm Street and Cedar Street (572 linear feet)

4.5.1 CCTV Inspection and Condition Assessment Methodology

National Plant Services, Inc. (NPS) performed CCTV pipeline inspections using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) assessment and scoring system. NASSCO's PACP was established in 2002 to provide standardization and consistency to evaluation of underground infrastructure and is the industry standard in pipeline condition assessment. PACP provides a standard system to code pipeline defects associated with both Structural and Operation & Maintenance (O&M) categories. Defect codes are assigned grades to capture the severity of the observed defect. Grades range from 1 to 5 with 5 being the most significant and indicative of poor condition. Structural defects are categorized for pipe integrity and include defects such as sags, fractures, holes, other damage, and joint issues. O&M defects are categorized for service integrity and include observations of roots and other foreign debris, and infiltration. The PACP "Quick Rating" is a shorthand way of expressing the number of occurrences for the two highest severity defect grades, and thus provides a quick reference for evaluating the structural and O&M condition of each pipe.

Using the CCTV inspection results, condition assessment was performed by reviewing the inspection log files, spot checking the PACP grade 5 defects, identifying any PACP grade 3, 4, or 5 defects, and identifying mitigation measures for each defect.

4.5.2 CCTV Inspection Results

Prior to inspection, mains were cleaned by hydro-jetting. Many mains required heavy cleaning to remove grease buildup and debris. After cleaning, CCTV inspection was completed for Maple Street between El Camino Real and Middlefield Road for approximately 1,511 linear feet of 10-inch VCP. The 16-inch segment in Maple Street was identified as 10-inch in the inspection. Inspection in

Elm Street between Lathrop Street and Main Street was not completed as the gravity mains were 4-inch diameter or smaller and could not be inspected with a conventional CCTV crawler. Inspection in the Caltrain right-of-way between Main Street and Cedar Street was removed from the scope of work as the Caltrain permit could not be obtained in time.

4.5.3 Condition Assessment Results

A summary of the inspection results and recommendations for each pipe segment including the PACP Structural and O&M Quick Ratings is shown in Table 4-4.

Table 4-4. CCTV Results and Recommendations – Maple Street from El Camino Real to Middlefield Road

US to DS MH	PACP O&M Quick Rating	PACP Structural Quick Rating	Condition and Defect Summary	Recommendation
1187 to 1179	2C00	2400	88-feet of 10" VCP (identified as 16" in GIS); Minor deposits (grease and settled sediment)	Regular cleaning
1179 to 1186	4131	3B2F	327-feet of 10" VCP; Several Grade 3 structural sags; Grade 3 lining failure/bulges; Minor deposits (attached grease); Grade 3 roots at MH1186	Regular cleaning; Remove roots and grout with a root inhibitor additive; Monitor changes to lining and repair as needed
1186 to 1185	2L00	3121	256-feet of 10" VCP: Grade 3 lining failure/bulge; Minor deposits (attached grease)	Regular cleaning
1185 to 1852	5141	0000	72-feet of 10" VCP; Grade 5 deposits (attached grease)	Regular cleaning
1852 to 1851	3126	3923	227-feet of 10" Clay tile; 90-degree bend in pipe; Grade 3 structural sag; Grade 3 lining failure/blister	Regular cleaning; Monitor changes to lining and repair as needed
1851 to 1850	2D00	322B	285-feet of 10" VCP; Two Grade 3 lining failures; Broken service tap; Minor deposits (attached grease);	Regular cleaning; Monitor changes to lining and repair as needed
1850 to 2646	4121	3A22	256-feet of 10" VCP; Several Grade 3 and Grade 2 structural sags; Camera underwater due to sag; Minor deposits (attached grease)	Regular cleaning

In general, CCTV inspections indicate that the sewer gravity mains are in serviceable condition, with no grade 4 or 5 severity structural defects. Significant effort was spent cleaning the mains, and even then, notable grease and other deposits remained during inspection.

O&M recommendations include regular cleaning of the gravity mains. Structural repair recommendations include monitoring changes to the conditions of the lining and repairs as needed. It is also recommended for one gravity main section (10-inch VCP, manhole 1179 to manhole 1186) that root removal is performed, following by grouting of the joints with a root inhibitor additive.

See Appendix C for the detailed CCTV inspection reports.

4.6 Summary of Sewer System Improvements

The sanitary sewer system improvements required for the Project area, as well as the allocation of these improvements to proposed development areas within the Project, are summarized below.

The proposed Project sewer improvements include replacing the existing 27-inch trunk main on Beech Street with a 33-inch trunk main along a different alignment, as shown on Figure 4-2. The Project also proposes to realign Beech Street itself. The upsizing of the trunk main corresponds with the recommendation for CIP project P12 in the 2013 Sewer Master Plan Update Technical Memorandum (SMPU). Therefore, this proposed sewer improvement project is appropriate.

The increased flows from the Project affect trunk mains along Maple Street, Main Street, Bradford Street and Walnut Street that are included in the SMPU as capital improvement program (CIP) projects P11, P10 and P13. The trunk mains along Maple Street and Main Street are included in CIP project P11. The trunk mains along Bradford Street and along Walnut Street south of Veterans Boulevard are included in CIP project P10. The trunk mains along Walnut Street north of Veterans Boulevard are included in CIP project P13. The CIP projects are shown on Figure 4-3.

CIP project P11 consists of upsizing 10-inch and 12-inch trunk mains to 15-inch trunk mains. CIP project P10 consists of upsizing 27-inch trunk mains to 33-inch trunk mains in the area affected by the Project flows. CIP project P13 consists of upsizing 48-inch trunk mains to 54-inch trunk mains.

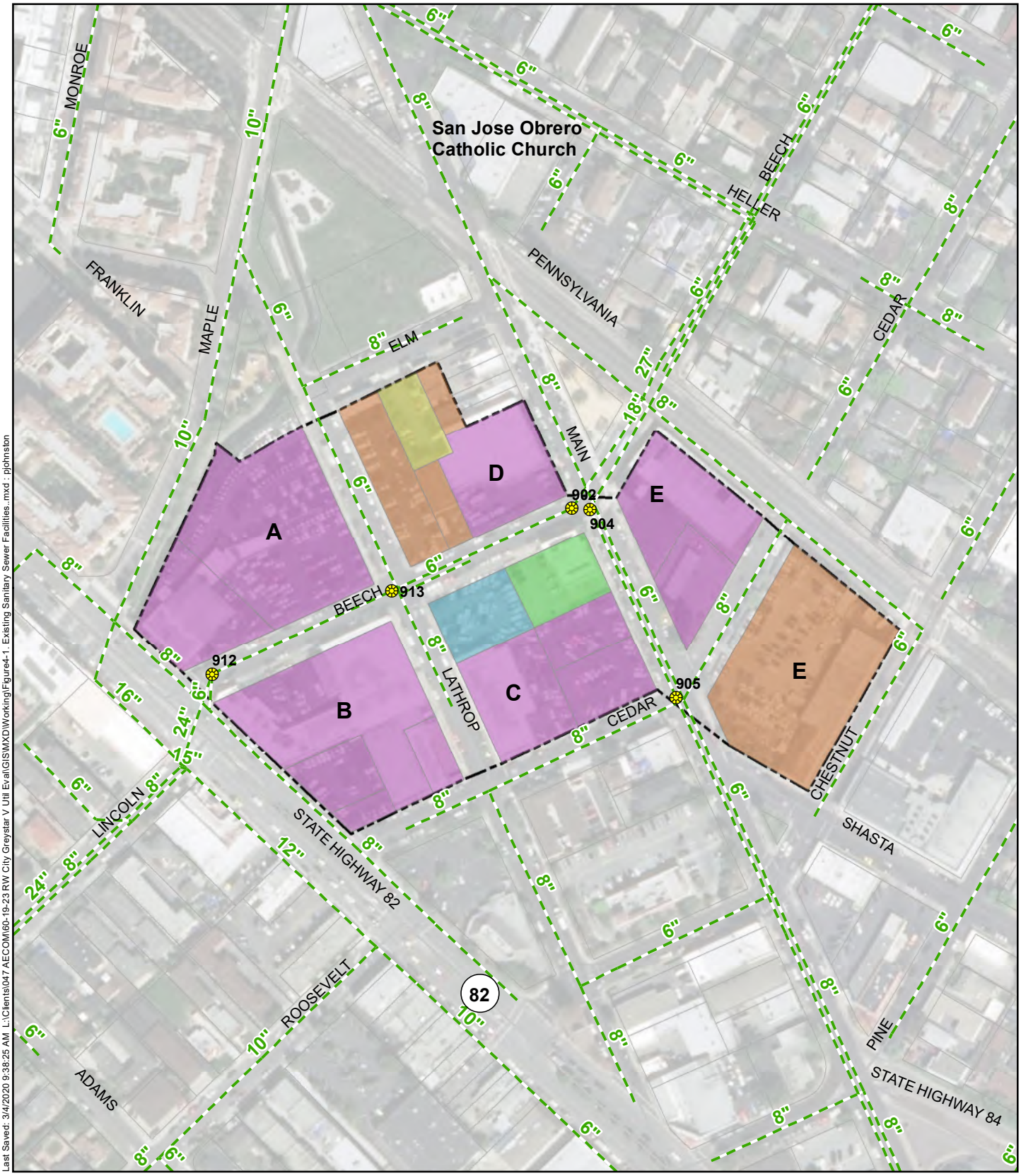
The system was analyzed after incorporating the upsized trunk mains for CIP projects P11, P10 and P13. The results for the buildout scenario with the proposed Project flows are presented in Table 4-5 and indicate that with the CIP projects, the system will have sufficient capacity to eliminate surcharging during PWWF conditions. However, there are five sections of trunk main along projects P11, P10 and P13 for which the d/D ratio will not meet the criterion of $d/D<0.75$. The exceedance of the criterion is small and may be acceptable to the City. As the City is currently updating its Sewer Master Plan, it is recommended that the City review the buildout flow projections that are currently being developed for the Sewer Master Plan Update to determine if buildout flows for these three CIP projects have increased or decreased. This will allow the City to determine if the recommended diameters for CIP projects P11, P10 and P13 need to be increased to accommodate the proposed flows from the Project.

Figures are included in Appendix D that show the extent of the surcharging for each of the scenarios included in Tables 4-2, 4-3 and 4-5. The gravity mains that show the most surcharging in the scenarios analyzed are the 27-inch gravity mains that are upsized in CIP project P10, which consists of upsizing approximately 1,000 feet of 27-inch gravity main with 33-inch gravity main. Surcharging in the 27-inch gravity mains is less than two feet above the crown of the gravity main, and the surcharging is more than 10 feet from the ground surface in all of the scenarios analyzed. There are some gravity mains within the boundaries of CIP project P11 that show surcharging, but the surcharging is relatively minimal and is less than one foot in the scenarios analyzed. However, the gravity mains within CIP project P11 are relatively shallow, with the gravity mains within three feet of the ground surface in a few locations. Therefore, it is recommended that the City consider implementing CIP project P10 and at least portions of CIP project P11 after verifying the proposed diameters through its update of the Sewer Master Plan.

Table 4-5. CIP Projects and PWWF Maximum d/D Results

							Existing		CIP		CIP with Project 10 Upsized	
Pipe ID	Upstream Node ID	Downstream Node ID	Street Name	Existing Diameter (in)	Length (ft)	Proposed CIP Project	Existing Diameter (in)	Future Without Project (d/D)	Proposed Diameter in CIP (in)	Future With Project (d/D)	Proposed Diameter (in)	Future With Project (d/D)
Greystar Project Pipelines												
918.1	918	910	Maple	10	90	11	10	0.671	15	0.354	15	0.350
910.1	910	917	Maple	10	325	11	10	0.720	15	0.370	15	0.370
917.1	917	916	Maple	10	245	11	10	0.790	15	0.420	15	0.390
916.1	916	1674	Maple	10	75	11	10	0.790	15	0.420	15	0.390
1674.1	1674	7	Maple	10	115	11	10	0.790	15	0.420	15	0.390
7.1	7	1673	Maple	10	114	11	10	0.780	15	0.420	15	0.390
1673.1	1673	1672	Maple	10	286	11	10	0.740	15	0.410	15	0.380
1672.1	1672	2677	Main	10	259	11	10	0.750	15	0.430	15	0.380
2677.1	2677	2678	Main	10	353	11	10	0.740	15	0.430	15	0.380
2678.1	2678	2673	Main	10	525	11	10	0.690	15	0.400	15	0.360
2673.1	2673	2715	Main	12	6	11	12	0.440	15	0.350	15	0.310
2715.1	2715	2716	Main	12	354	11	12	0.740	15	0.420	15	0.380
2716.1	2716	2706	Main	12	350	11	12	1.000	15	0.560	15	0.410
2706.2	2706	2705	Main	12	37	11	12	1.000	15	0.820	15	0.640
2705.1	2705	4234	Bradford	27	305	10	27	2.000	33	0.800	36	0.660
4234.1	4234	2970	Walnut	27	360	10	27	2.000	33	0.810	36	0.700
2970.2	2970	2972	Walnut	27	236	10	27	2.000	33	0.810	36	0.700
2972.1	2972	4220	Walnut	27	128	10	27	2.000	33	0.730	33	0.710
4220.1	4220	2976	Walnut	48	11		48	0.850	48	0.710	48	0.700
2976.1	2976	2977	Walnut	48	17		48	0.970	48	0.830	48	0.820
2977.1	2977	2978	Walnut	48	130	13	48	0.960	54	0.740	54	0.730
2978.1	2978	2981	Walnut	48	440	13	48	0.920	54	0.730	54	0.720
2981.1	2981	6429	Walnut	48	429	13	48	0.780	54	0.650	54	0.640
6429.2	6429	2997	Walnut	60	16	13	48	0.610	54	0.540	48	0.630
6180.1	2997	6180	Walnut	48	351	13	48	0.610	54	0.540	48	0.620

Note: A d/D ratio of 1.0 represents backwater conditions, indicating a downstream capacity deficiency. A d/D ratio of 2.0 represents surcharge conditions, indicating a capacity deficiency.



Last Saved: 3/4/2020 9:38:25 AM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure4-1. Existing Sanitary Sewer Facilities_mxd : pjohnston

8" Existing Gravity Main

Manhole

Project Boundary

Streets

Parcels

Existing Land Use

Residential

Retail

Commercial

Parking

Vacant

N

0 100 200

Scale in Feet

WEST YOST ASSOCIATES

Figure 4-1

Existing Sanitary Sewer Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.

Last Saved: 3/4/2020 11:48:35 AM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure4-2. Proposed Sanitary Sewer Facilities..mxd : pjohnston

8" Proposed Sewer

8" Existing Gravity Main

Manhole

Project Boundary

Streets

Future Land Use

Office

Residential

N

0 100 200

Scale in Feet

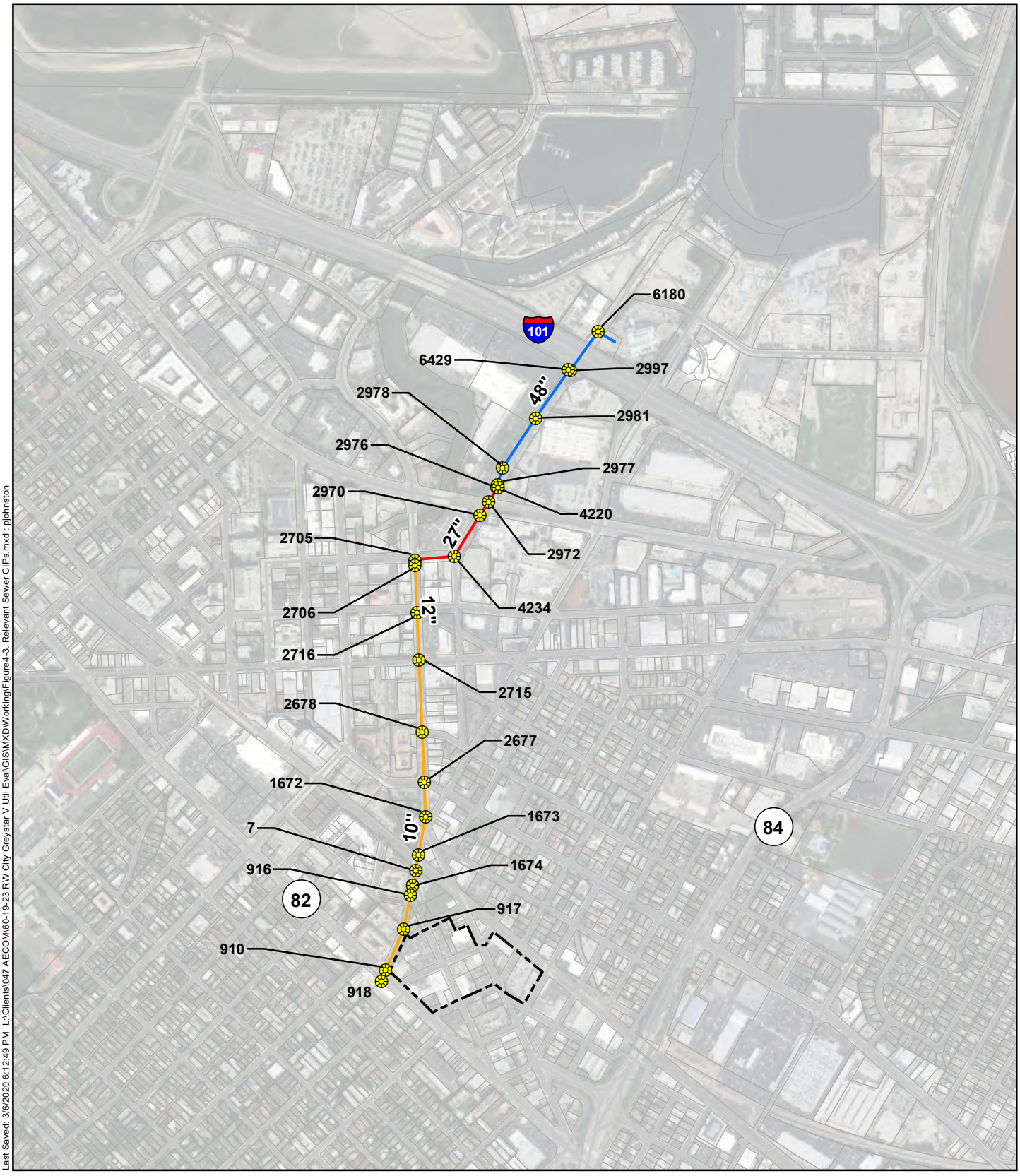
WEST YOST ASSOCIATES

Figure 4-2

Proposed Sanitary Sewer Facilities

City of Redwood City
South Main Utility Evaluation

Note: Planning Areas A, B, C, D and E are displayed.



Last Saved: 3/6/2020 6:12:49 PM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Working\Figure4-3. Relevant Sewer CIPs.mxd : pjohnston

P10
P11
P13
Manhole
Project Boundary
Streets
Parcels

N

0 500 1,000
Scale in Feet

Redwood City California founded 1867

WEST YOST ASSOCIATES

Figure 4-3

Relevant Sewer CIPs

City of Redwood City
South Main Utility Evaluation

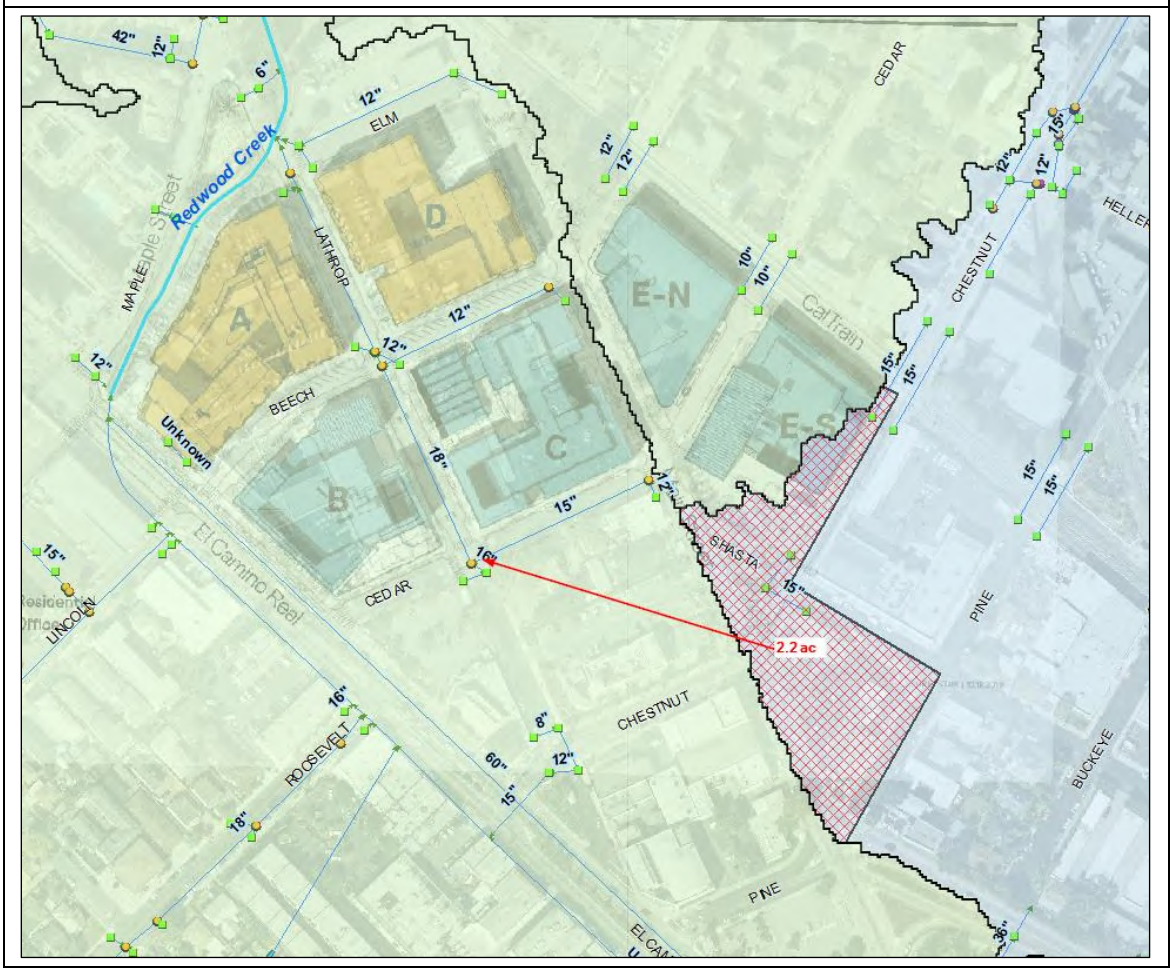
5.0 HYDRAULIC EVALUATION OF EXISTING AND PROPOSED STORM DRAIN SYSTEMS

This section discusses the hydraulic analysis of the storm drain system for the existing condition (prior to Project development) and proposed condition (post Project development) for the 10-year, 30-year, and 100-year frequency design storms. The analysis reflected changes to land use and assessed the performance of the proposed storm drain system improvements.

5.1 Existing Condition Model

The Project area covers watersheds that have previously been evaluated in two different storm drain models. Review of the Project area indicated there was no need to combine the Eastern Low-Lying Area (ELLA) Drainage Master Plan (DMP) and ELLA Modification models to accomplish the goals of this analysis. The small portion of watershed included in the Broadway drainage system (ELLA Modification model) to be redirected toward the Redwood Creek drainage system (ELLA DMP model) as part of the Project is only 2.2 acres in size. Any impact to the Broadway system will be beneficial (reduced flows and lower water surface elevations) and impacts to the Redwood Creek system can be assessed using only the ELLA DMP model. The Redwood Creek sub-watersheds (green), Broadway sub-watersheds (blue), and the portion of Broadway watershed to be redirected toward the Redwood Creek system (hatched red) are shown in Figure 5-1.

Figure 5-1. Redirected Portion of Broadway Watershed to Redwood Watershed

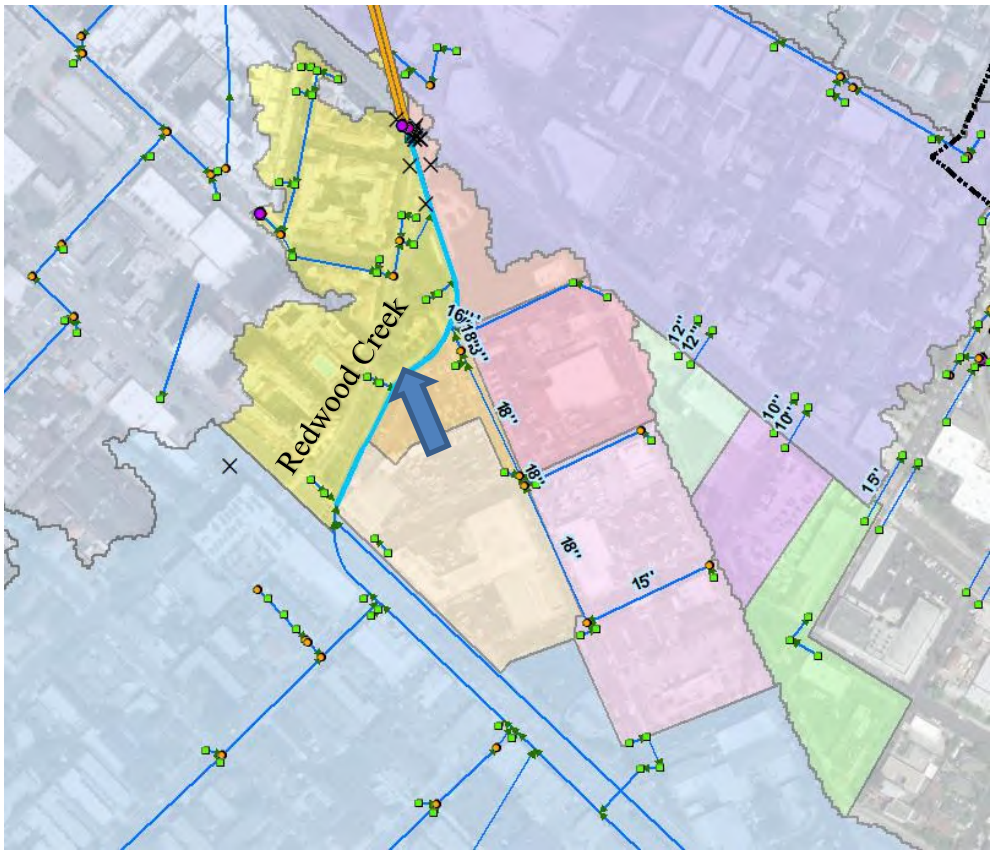


The existing condition Project model was based on the existing condition ELLA DMP model and had refinements to focus on the Project area. The refinements included subdividing existing watersheds, adding the local onsite drainage system and high density 2D representation of the development area. All model features outside the vicinity of the Project area in the existing condition Project model are the same as the ELLA DMP model. The following sub-sections describe only the components of the existing condition ELLA DMP model that were refined and incorporated in the existing condition Project model.

5.1.1 Existing Pipe Network

The existing pipe network in Figure 5-2 of the Project area consists of 15-inch to 18-inch diameter gravity mains that drain North towards Redwood Creek, as illustrated in below. These pipes were added to the ELLA DMP model to assess the local on-site drainage characteristics.

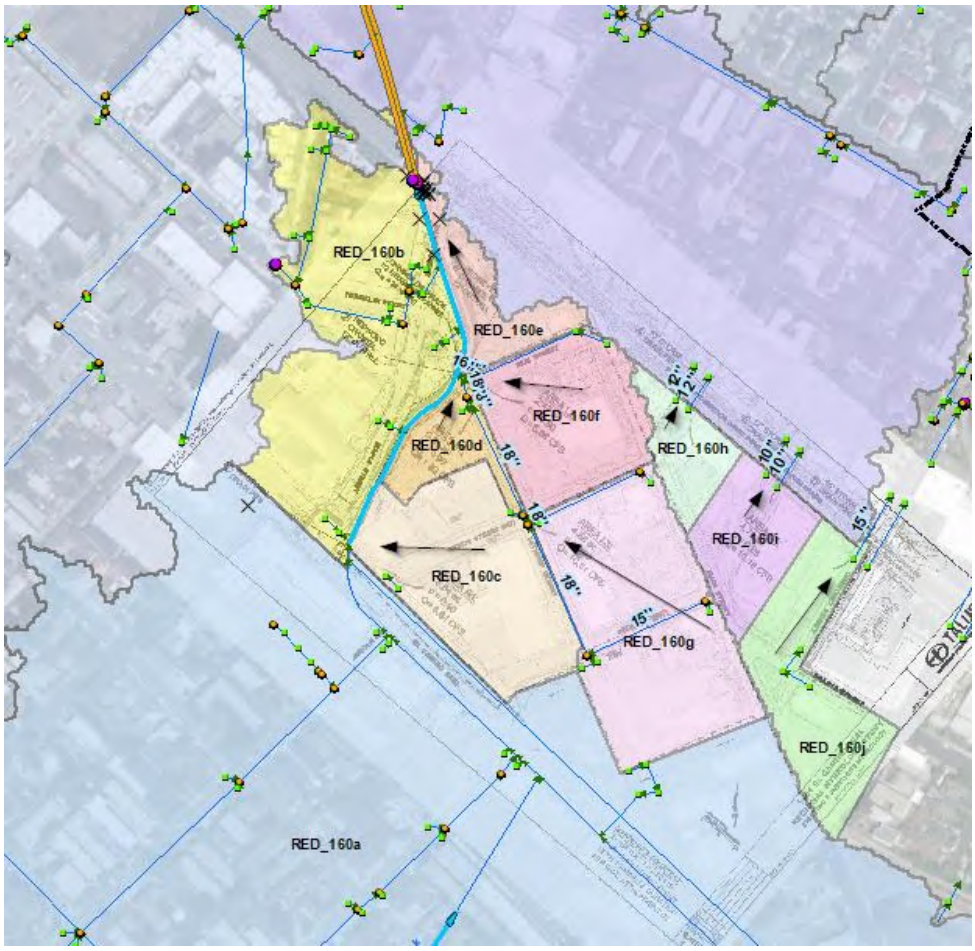
Figure 5-2. Existing Pipe Network



5.1.2 Existing Watersheds

The existing watersheds in the ELLA DMP model were refined to reflect the local drainage pattern around the Project area. This involved sub-dividing the large upland watershed designated in the ELLA DMP model as ID: RED_160. As shown in Figure 5-3, the upper portion of watershed RED_160 was cut along El Camino Real creating sub-watershed RED_160a. The general Project area was cut along the Redwood Creek and in between Cedar and Chestnut Streets creating sub-watersheds RED_160c through RED_160j, which reflect the detailed existing drainage conditions at this location. The remaining portion of RED_160 (yellow) was cut along Redwood Creek creating sub-watershed RED_160b. All other watersheds are unchanged in the existing condition.

Figure 5-3. Existing Watershed Refinement



The land use and soil datasets were unchanged and reflected the existing condition as defined in the ELLA DMP model. Only the newly subdivided watersheds from RED_160 have updated Snyder runoff transformation parameters. All hydrologic methods were consistent with the ELLA DMP model.

Table 5-1 presents the subdivided watershed's (RED_160a – RED_160j) Snyder runoff parameters for the existing condition Project model.

Table 5-2. Existing Sub-Watershed Snyder Parameters

Identifier	Area (ac)	Lag Time (mins)	Peaking Factor	Percent Impervious	Percent Soil A	Percent Soil B	Percent Soil C	Percent Soil D
RED_160a	3354.8	40	0.5	20.4	0.1	30.1	44.8	4.6
RED_160b	6.5	5	0.5	85	-	-	-	15
RED_160c	3.5	5	0.5	85	-	-	-	15
RED_160d	1	5	0.5	85	-	-	-	15
RED_160e	1.2	5	0.5	90	-	-	-	10
RED_160f	2.6	5	0.5	85	-	-	-	15
RED_160g	4.6	5	0.5	85	-	-	-	15
RED_160h	1	5	0.5	85	-	-	-	15
RED_160i	1.5	5	0.5	85	-	-	-	15
RED_160j	2.5	5	0.5	85	-	-	-	15

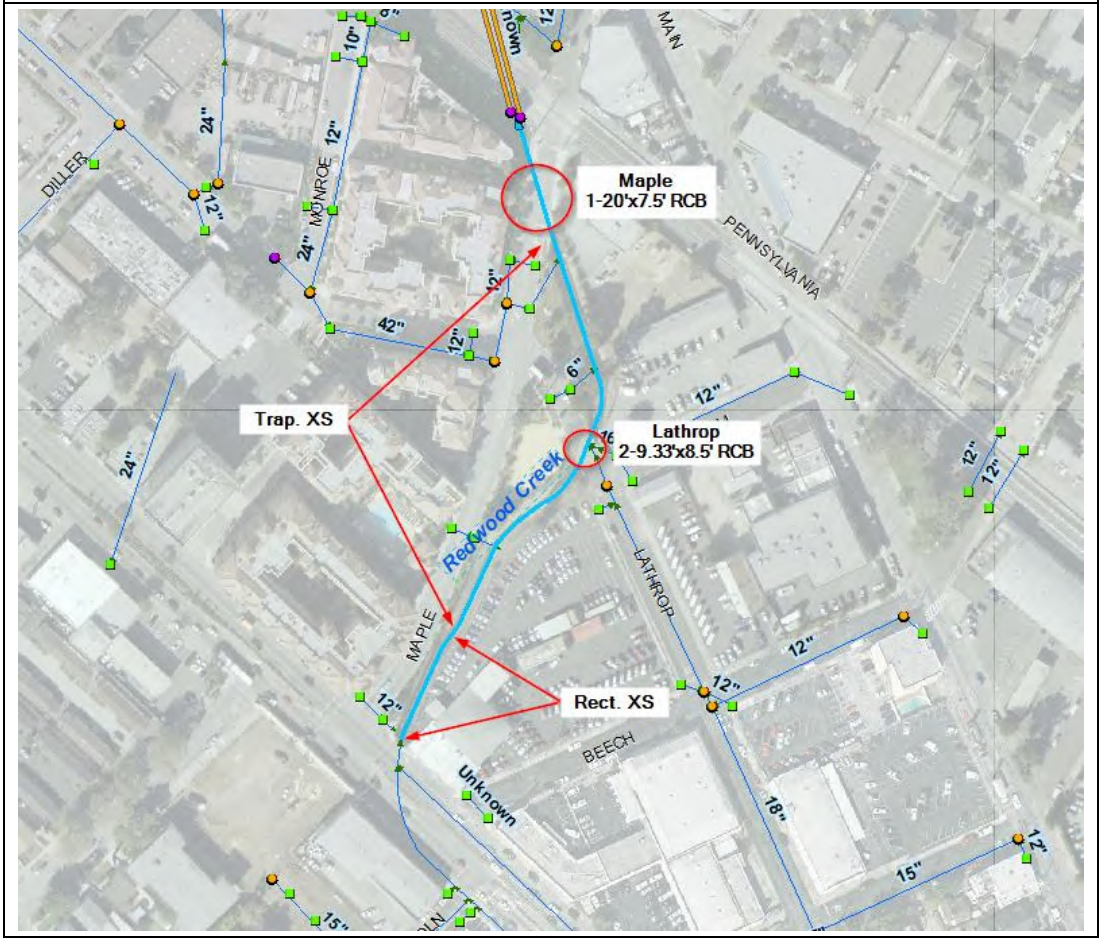
The sub-watersheds RED_160c through RED_160_j were assigned imperviousness values consistent with the ELLA DMP study based on the existing land use dataset which are designated as Commercial (85 impervious) and Multiuse (90 percent impervious) for this location.

The flow hydrograph from upper portion of the RED_160 was injected to the model where the 15-foot by seven foot by five foot Reinforced Culvert Box (RCB) along El Camino Real daylights into open channel. The flow hydrograph from the general Project area was injected to Redwood Creek where the Lathrop Street drainage system outfalls. And the remaining portion of RED_160 was injected along the reach of Redwood Creek channel downstream of Lathrop Street.

5.1.3 Existing Open Channel System

The open channel reach of Redwood Creek from El Camino Real to Maple Street was refined to more accurately define channel section geometry, account for headlosses at culvert crossings along the reach, and allow for lateral spill to the overbank. The open channel reach contains two street crossings, at Lathrop Street (two 9.33-foot by 8.5-foot RBC) and at Maple Street (one 20-foot by 7.5-foot RCB) per as-built drawing M-166 (01732.tif) dated 1967. The channel cross section varies from rectangular and trapezoid cross-sections per M-166. The culvert locations and channel cross-section shape extents are shown in Figure 5-4.

Figure 5-4. Existing Open Channel Refinement



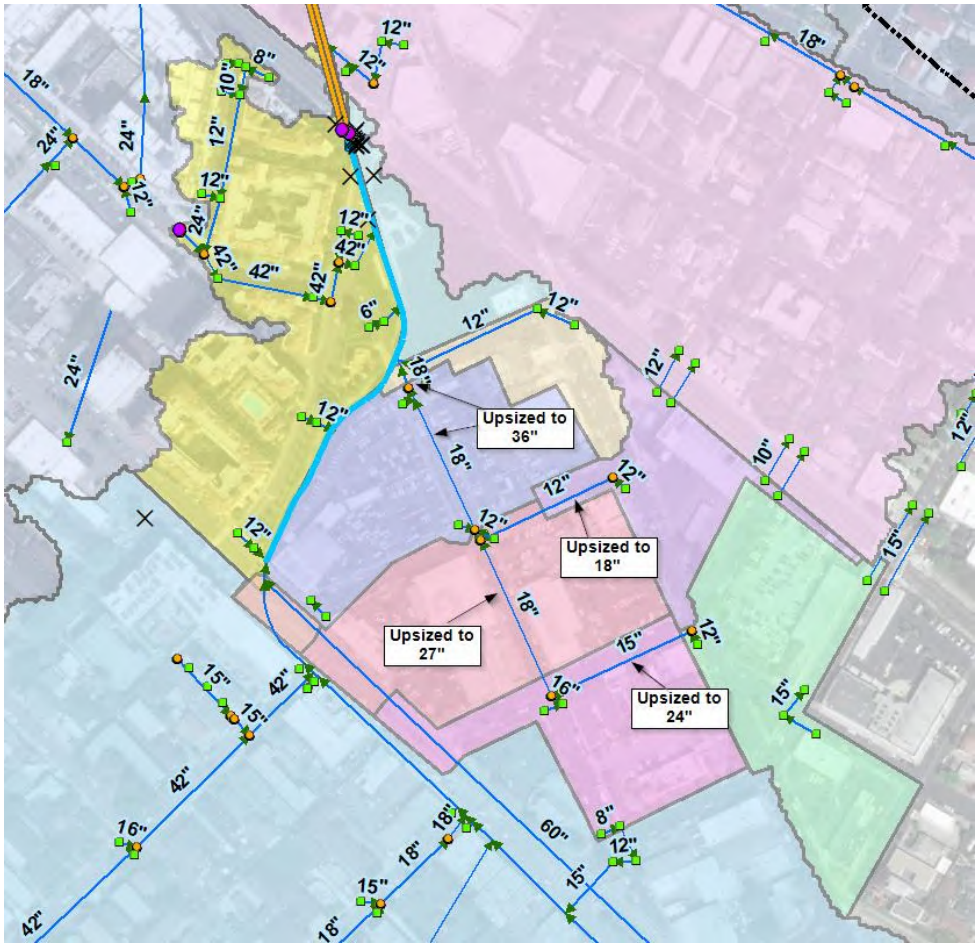
5.2 Proposed Condition Model

The proposed (developed) condition Project model is based on the existing condition Project model discussed in Section 5.1 and has refinements for the improvements in the Project area. All model features outside the vicinity of the Project area in the proposed condition Project model are the same as the existing condition Project model. The following sub-sections describe only the refined components of the existing condition Project model now incorporated in the proposed condition Project model.

5.2.1 Proposed Pipe Network

The proposed condition involves the improvement of the local drainage system by upsizing gravity mains, as shown in Figure 5-5.

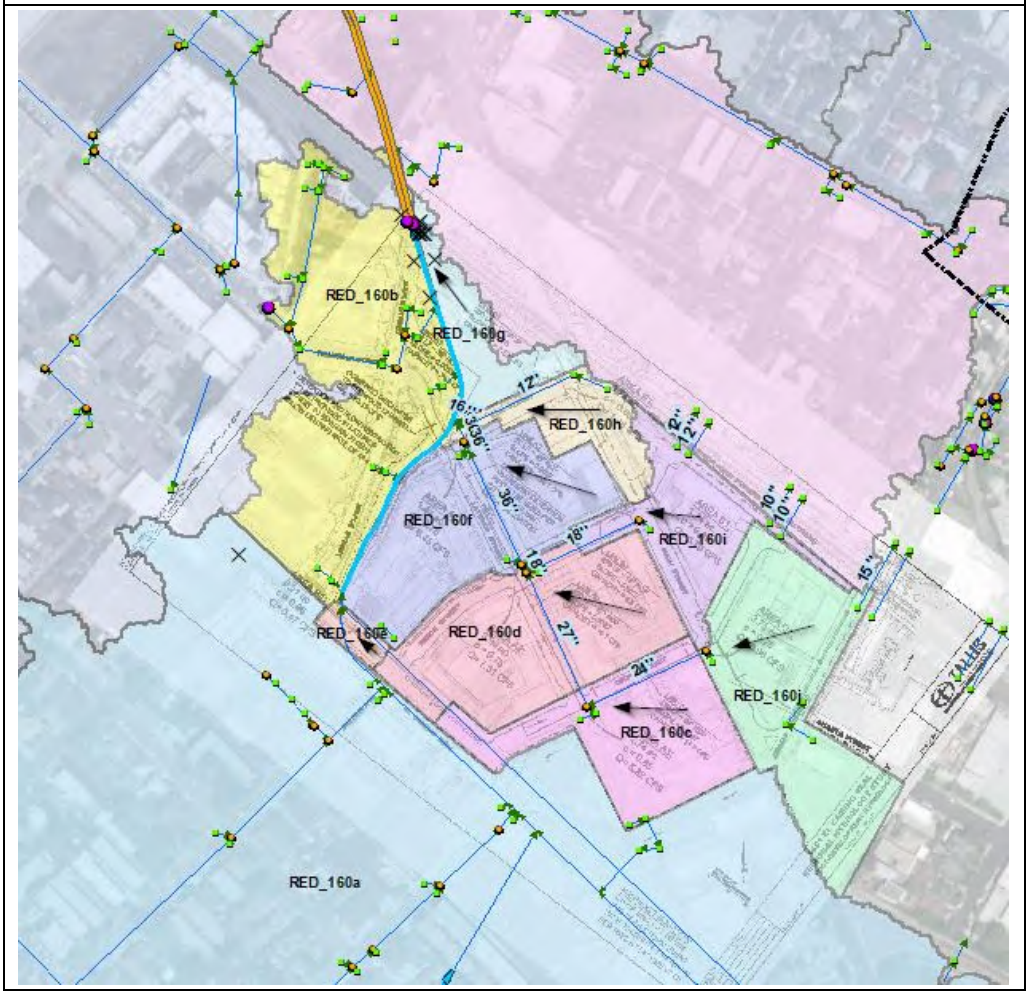
Figure 5-5. Proposed Pipe Network Improvements



5.2.2 Proposed Watersheds

The proposed watershed refinement process was similar to the process for refinement of existing watersheds. RED_160 was divided into RED_160a through RED_160j to reflect the proposed drainage systems watersheds as shown in Figure 5-6. Note, in the proposed condition RED_160h, RED_160i and RED_160j now drain towards Redwood Creek rather than toward the siphons along the Caltrain corridor.

Figure 5-6. Proposed Condition Watershed Refinement



The PROJECT sub-watershed (RED_160a-j) Snyder runoff parameters for the proposed condition model are presented in Table 5-2.

Table 5-3 Proposed Condition Watershed Parameters

Identifier	Area (ac)	Lag Time (mins)	Peaking Factor	Percent Impervious	Percent Soil A	Percent Soil B	Percent Soil C	Percent Soil D
RED_160a	3354.8	40	0.5	20.4	0.1	30.1	44.8	4.6
RED_160b	6.5	5	0.5	85	-	-	-	15
RED_160c	2.8	5	0.5	85	-	-	-	15
RED_160d	3.9	5	0.5	85	-	-	-	15
RED_160e	0.3	5	0.5	85	-	-	-	15
RED_160f	3.6	5	0.5	80	-	-	-	20
RED_160g	1.2	5	0.5	90	-	-	-	10
RED_160h	1.2	5	0.5	80	-	-	-	20
RED_160i	1.9	5	0.5	85	-	-	-	15
RED_160j	3.9	5	0.5	85	-	-	-	15

The sub-watersheds in RED_160c-RED_160j were assigned imperviousness values per the proposed land use map provided by the developer. The proposed condition designates the northern parcels land use as residential, and the southern and eastern parcels as office space, which translates to Apartments (80 percent impervious), and Commercial (85 percent impervious), respectively. Sub-watershed RED_160g remains as it did in the existing condition as Multiuse (90 percent impervious).

One considerable difference between the existing and proposed condition Project models is that the three eastern sub-watersheds (RED_160h, RED_160i and RED_160j) drain into the upsized 18" and 24" gravity mains instead of towards the siphons at the Caltrain railroad tracks.

5.2.3 Open Channel System

There are no changes to the open channel system in the existing and proposed Project models.

5.3 Model Results

The existing and proposed condition models were quality checked for numerically stability and validity. Model results for gravity mains, Redwood Creek open channel, and overland floodplains are discussed below.

5.3.1 Gravity Main Results

The existing condition model gravity main peak flows are shown in Table 5-3. The values in Table 5-3 correspond the mains labeled in Figure 5-7.

Figure 5-7. Existing Condition Gravity Main Result Locations

Table 5-3. Existing Condition Gravity Main Peak Flow

Street	ID	Existing Diameter (in)	Existing 10-yr Flow (cfs)	Existing 30-yr Flow (cfs)	Existing 100-yr Flow (cfs)
Lathrop	L1	18	7	9	12
Lathrop	L2	18	7	9	12
Lathrop	L3	18	6	7	10
Lathrop	L4	18	6	7	10
Lathrop	L5	18	4	4	5
Elm	E1	16	4	6	9
Cedar	C1	15	3	4	4

The proposed condition model gravity main peak flows are shown in Table 5-4. The values in 5-4 correspond the mains labeled in Figure 5-8.

Figure 5-8. Proposed Condition Gravity Main Result Locations

Table 5-4. Proposed Condition Gravity Main Peak Flow

Street	Identifier	Proposed Diameter (in)	Proposed 10-yr Flow (cfs)	Proposed 30-yr Flow (cfs)	Proposed 100-yr Flow (cfs)
Lathrop	L1	36	21	27	40
Lathrop	L2	36	16	21	28
Lathrop	L3	36	16	21	25
Lathrop	L4	27	11	15	18
Lathrop	L5	27	9	12	14
Elm	E1	16	3	6	9
Elm	E2	12	2	2	3
Beech	B1	18	2	3	4
Cedar	C1	25	5	7	8

The existing gravity mains meet the 30-year level of service criteria established by Redwood City. The proposed gravity mains exceed the criteria and have a 100-year level of service.

However, it should be noted that in both the existing and proposed condition models, high water levels in Redwood Creek during the 100-year design storm event cause backflow into the local storm gravity mains. Installation of flap gates on the new gravity main outfalls at Lathrop Street are highly recommended for the proposed condition to eliminate backflow and limit flooding. Without flap gates, the 100-year design storm is expected to surcharge into the street and result in similar floodplains in the existing and proposed condition.

5.3.2 Open Channel Results

The existing and proposed condition model peak flows in Redwood Creek at the downstream face of the Lathrop culvert crossing for the 10-year, 30-year, and 100-year design storm events are presented in Table 5-5. There is no significant change in channel flow in the vicinity of the development between existing and proposed conditions; flow further downstream in the system is almost identical.

Table 5-5. Open Channel Peak Flow

Design Storm Event	Existing Condition Peak Channel Flow (cfs)	Proposed Condition Peak Channel Flow (cfs)
100-year	1,530	1,540
30-year	1,090	1,090
10-year	650	650

In the existing and proposed condition models for the 100-year design storm event, spill from the right bank of Redwood Creek occurs due to high water levels. In the proposed condition model, the channel water level peaks at approximately 17 to 18 feet NAVD88 for about 1hr duration. The channel peak stage occurs approximately 30 minutes later than the peak onsite runoff.

5.3.3 Floodplain Results

The existing condition and proposed condition model floodplains for the are shown in Figure 5-9 through Figure 5-14. The floodplains for the 10-year and 30-year design storms are minimal in the development area because the system capacity is adequate. In the 100-year design event flooding is expected due to channel spill and the peak flood elevation is approximately 17-18 feet NAVD88.

Figure 5-9. Existing 10-Year Floodplain

Figure 5-10. Proposed 10-Year Floodplain

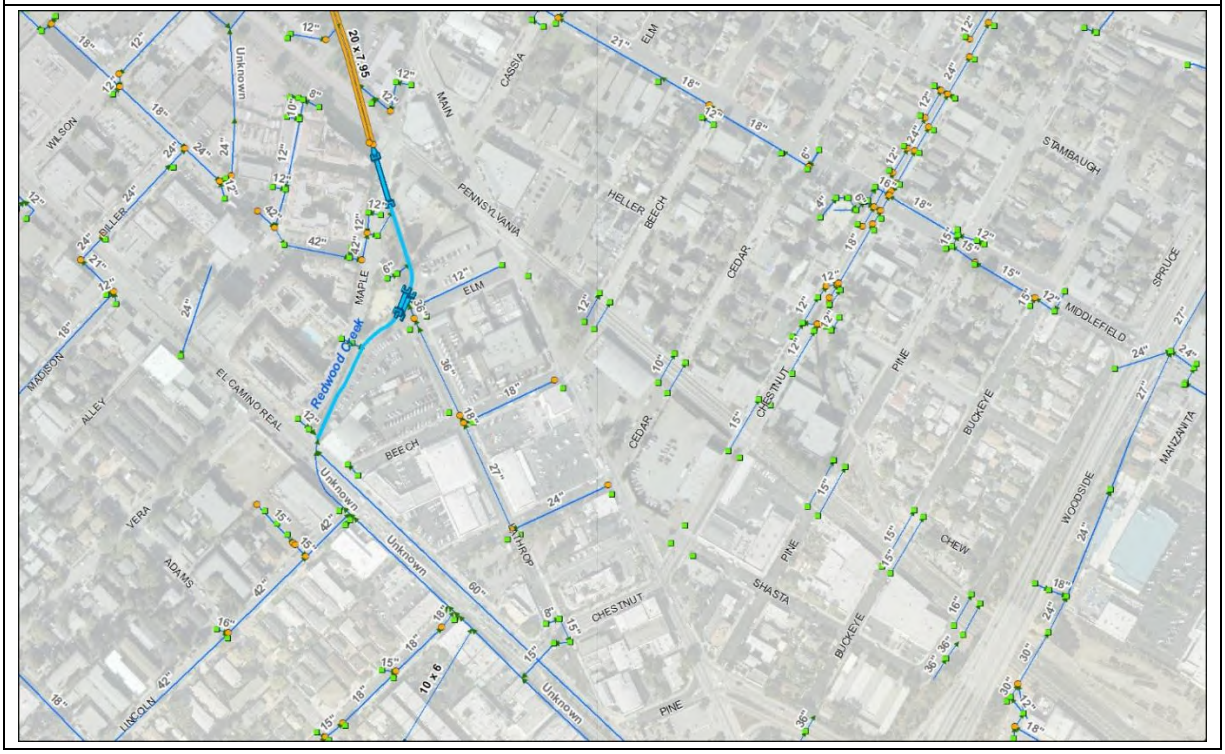


Figure 5-11. Existing 30-Year Floodplain

Figure 5-12. Proposed 30-Year Floodplain

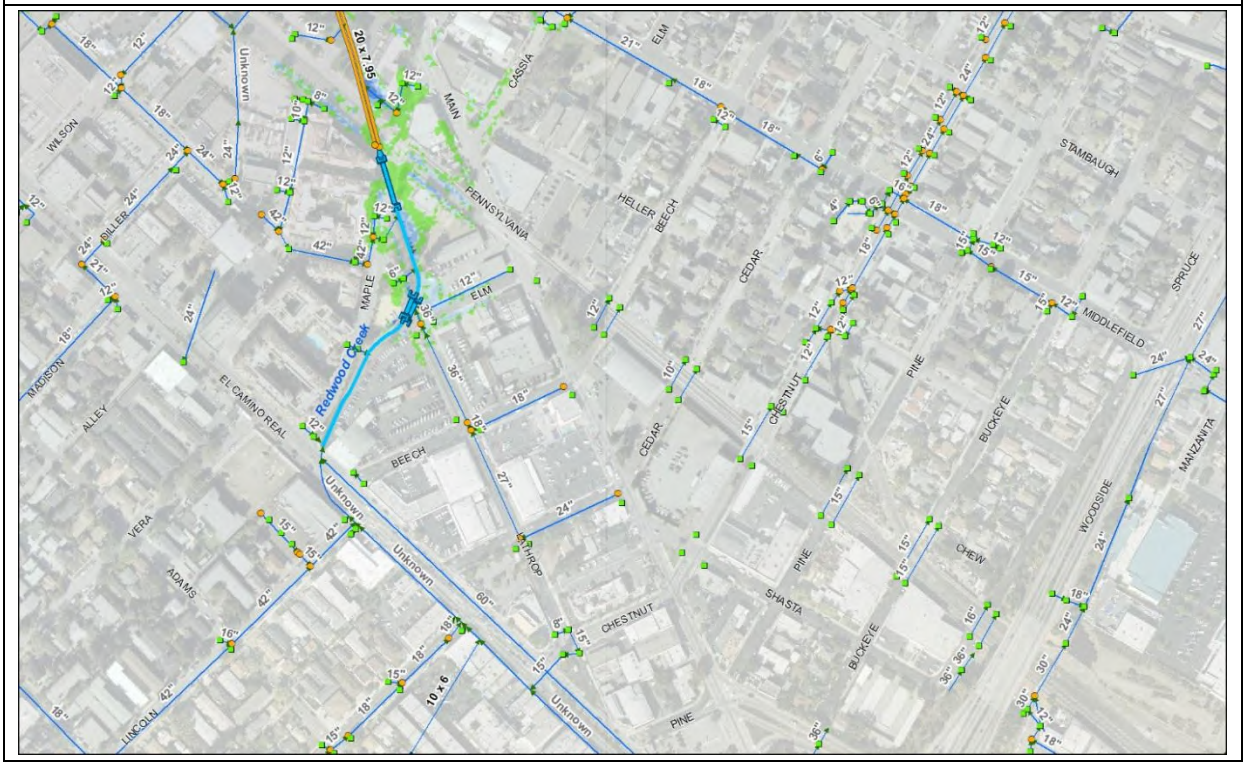


Figure 5-13. Existing 100-Year Floodplain

Figure 5-14. Proposed 100-Year Floodplain

5.3.4 Conclusions

The proposed development infrastructure capacity meets Redwood City drainage criteria. No significant changes are observed in Redwood Creek due to the proposed development. The re-direction of Planning Area E in the developed condition (to drain towards Redwood Creek rather than overland towards the Caltrain siphons) results in reduced floodplains in all design storm events analyzed. The 100-year event results in high water levels in Redwood Creek and it is recommended that flap gates be installed on the new outlet gravity mains at Lathrop Street crossing.

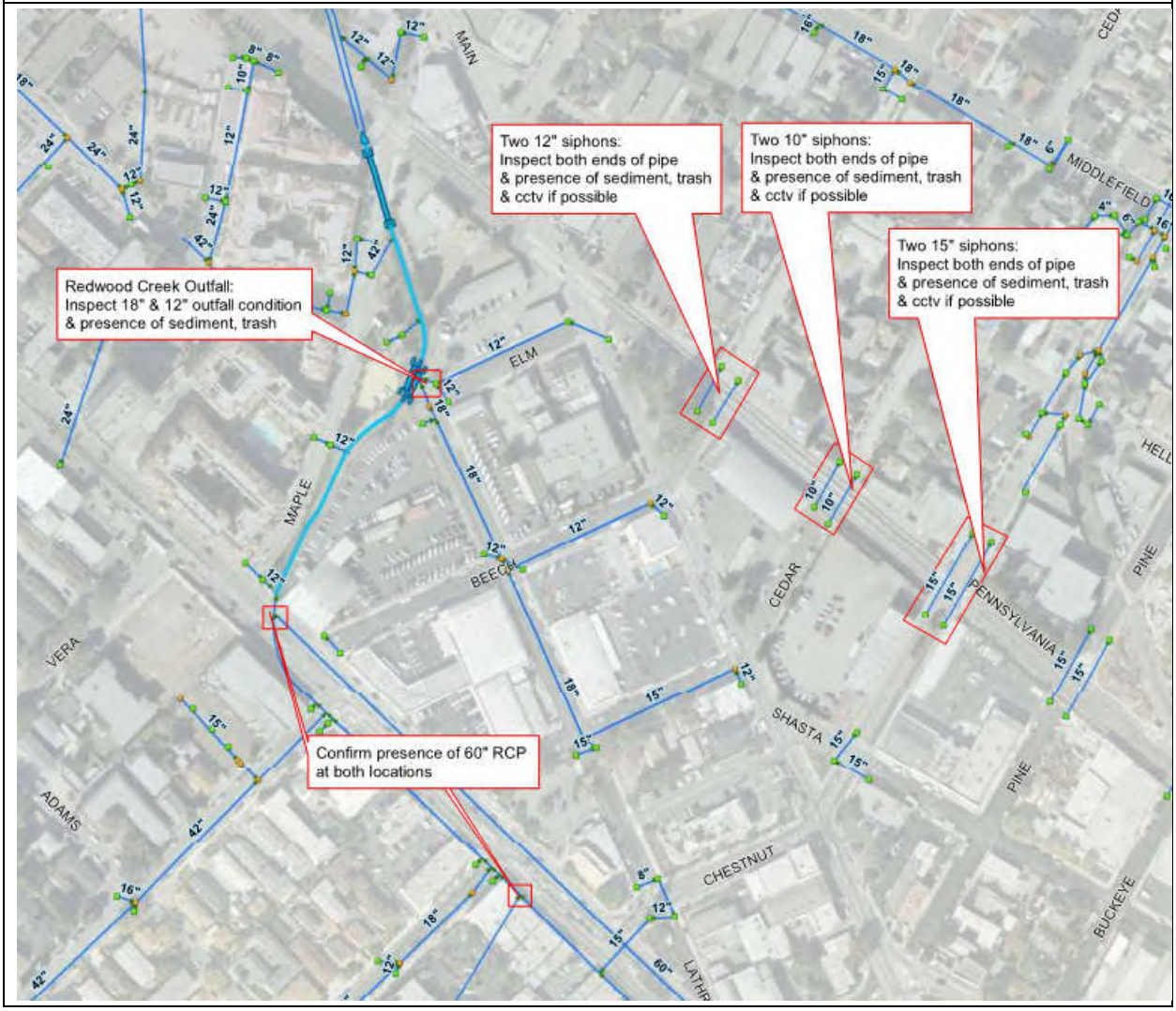
5.4 Condition Assessment

CCTV condition assessments and inspections were performed by National Plant Services, Inc. (NPS) for the stormwater conduits. NPS operators performed NASSCO PACP inspections and completed hydro-cleaning prior to inspections by jetting and a vacuum truck. The complete technical memo and inspections report prepared by NPS is available in Appendix C.

Approximately 700 feet of stormwater conduit was selected for CCTV and inspection. The locations are listed below and shown in Figure 5-15.

- (2) Siphons at Beech Street and Pennsylvania Avenue/Caltrain ROW: approximately 174 LF of 12-inch CMP.
- (2) Siphons at Cedar Street and Pennsylvania Avenue/Caltrain ROW: approximately 189 LF of 10-inch CMP.
- (2) Siphons at Chestnut Street and Pennsylvania Avenue /Caltrain ROW: approximately 332 LF of 15-inch RCP.
- (2) Outfalls to Redwood Creek at Lathrop Street: approximately 26 LF of 16-inch RCP and 43 LF of 16-inch RCP gravity mains.
- Confirm presence of 60-inch RCP gravity main at two locations:
  - El Camino Real between Maple Street and Beech Street
  - El Camino Real, south of Roosevelt Avenue (in front of 1708 and 1710 El Camino Real)

Figure 5-15. CCTV and Inspection Locations



NPS was able to perform inspections for almost all locations. A summary of their work performed for stormwater conduits is presented in Table 5-6.

Table 5-6. NPS Summary of Work Performed	
Description	Status as of 3/23/2020
Two (2) Siphons at Beech Street and Pennsylvania Avenue/Caltrain ROW: approximately 174 LF of 12-inch CMP	Able to camera the majority of both siphons
Two (2) Siphons at Cedar Street and Pennsylvania Avenue/Caltrain ROW: approximately 189 LF of 10-inch CMP	Unable to camera with repeated visits/attempts with mini crawler due to access being blocked by cars or activity, and due to being full of water from rains.
Two (2) Siphons at Chestnut Street and Pennsylvania Avenue /Caltrain ROW: approximately 332 LF of 15-inch RCP	Able to camera the majority of both siphons
Two (2) Outfalls to Redwood Creek at Lathrop Street: approximately 26 LF of 16-inch RCP and 43 LF of 16-inch RCP gravity mains	Able to camera the pipes from the outfalls to the upstream drainage inlet
Confirm presence of 60-inch RCP gravity main at two locations	Presence confirmed at both locations (walked box culvert at each end to locate tie-in of 60" to the box culvert).

NPS performed PACP coding using Wincan VX PACP Version 6 software. The PACP quick score ratings for structural, operations and maintenance and the overall pipe rating were assigned for each pipe segment.

The CCTV and inspections found that the conduits are in serviceable condition. Recommendations are provided for both operations and maintenance (O&M), and structural deficiencies. For O&M deficiencies, NPS recommends performing routine cleaning of the conduit segments by jetting. For structural deficiencies, NPS found that some of the 10” and 12” conduit (syphons) under the Caltrans ROW are experiencing corrosion and should be monitored overtime with corrective actions taken if needed. NPS also found that one of the 10” Caltrans conduits has a joint offset deficiency that should be repaired with CIPP or replaced, and one 12” conduits has a hole that should be repaired with CIPP lining. The 15” Caltrans conduits and conduits that outfall to Redwood Creek were found to be in good condition. The presence of the larger 60” conduits on El Camino Real were confirmed at both locations inspected.

See Appendix C for complete results and recommendations by NPS for each inspected conduit.

5.5 Infrastructure Capacity by Planning Area

The infrastructure capacities serving the Project Planning Areas are presented in Table 5-7. The table corresponds to the Project Planning Areas shown in Figure 5-16. The infrastructure capacity (gravity main full flow capacity) provided for the parcel should not exceed the design values in Table 5-7. If parcel areas are sub-divided in the future, allowable discharge (runoff) form the sub-divided areas should be proportioned based on area and not exceed the provided infrastructure capacity when combined. This information shall be used in future evaluations by the City to determine impact fees associated with development of the Project area.

Figure 5-16. Project Planning Areas

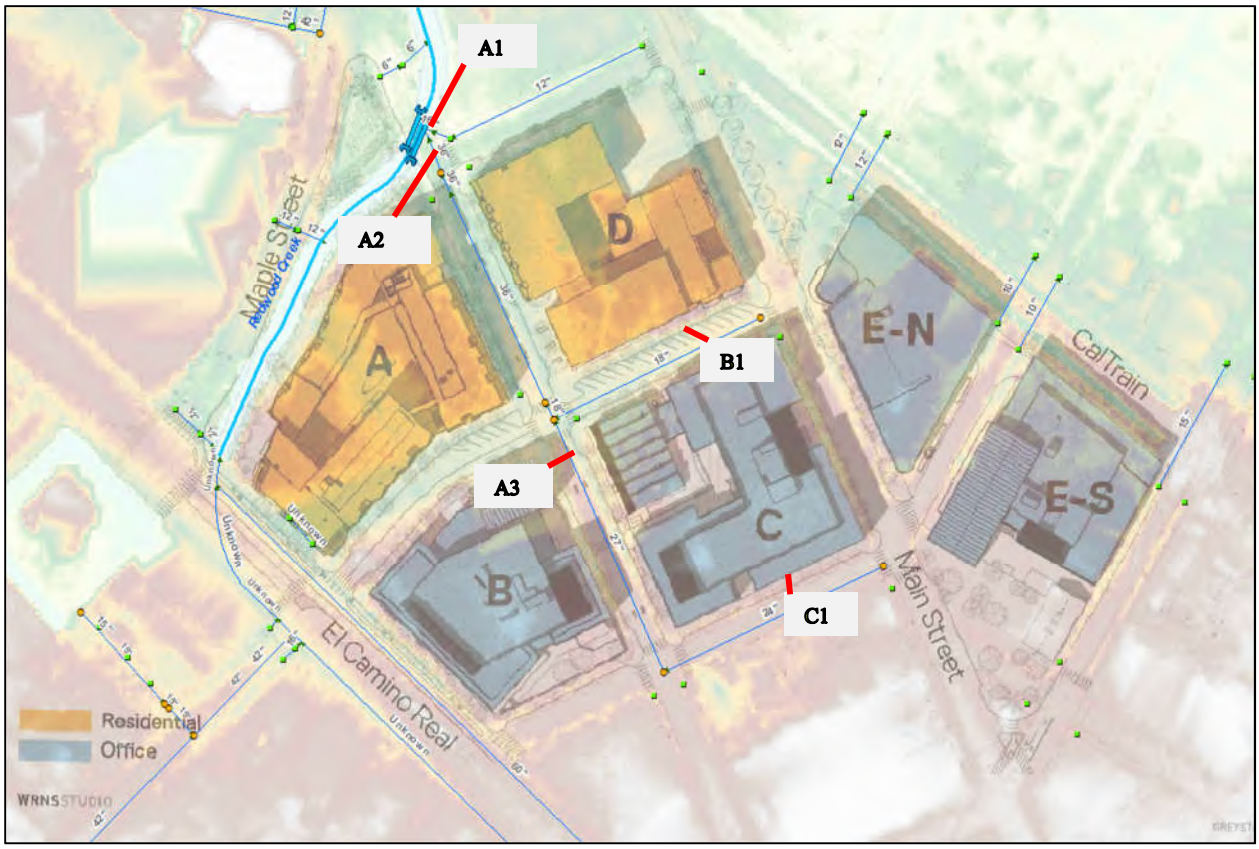


Table 5-7. Instructure Capacity Per Planning Area

Planning Areas	Gravity Main ID Serving Planning Area	Gravity Main Diameter Serving Planning Area	Gravity Main Full Flow Capacity (cfs)
A	Line A2	36” RCP	35
B	Line A3	27” RCP	16
C	Line A3	27” RCP	16
D	Line A1	36” RCP	38
E-N	Line B1	18” RCP	6
E-S	Line C1	24” RCP	12

APPENDIX A
Preliminary Utility Summary

Preliminary Utility Summary

1601 El Camino Real
Redwood City, California, 94063

October 21, 2019

PREPARED FOR:

Greystar GP II, LLC
450 Sansome Street, Suite 500
San Francisco, CA 94111

PREPARED BY:

TALUS | ENGINEERING
811 San Ramon Valley Blvd, #201
Danville, California 94526
Ph: (415) 948-0440
Job No.: 18190

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- RWC Standards Attachment L - Sewage Generation Projection Worksheet (Existing)
- RWC Standards Attachment L - Sewage Generation Projection Worksheet (Proposed)
- CFC Fire Table B105.1
- Fire Flow Test Results
- Region Hydrology Exhibit (Existing)
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- SWMP Exhibit – Post-Development (Sheet C-109)
- Hydrology and C.3 Sizing Tables (Parcels A – E)
- Special Projects Worksheet (Entire Project)
- RWC C.3 Checklist (Attachment R1)
- RWC Standards Attachment G – IDF Curves
- RWC Standards Attachment O – Post-Development Storm Water Storage
- Flood Insurance Rate Map (Community Panel #06081C0301F Apr 5, 2019)
- Redwood City Utility GIS Maps

OVERVIEW

Talus has performed preliminary utility design of the proposed redevelopment of the South Main Planning Area located at in Redwood City, San Mateo County, California. The project site includes 18 parcels (APN's 053-181-07, 08, 09, 10 & 11; 053-182-02 & 04; 053-183-01 & 02; 053-184-02, 03, 04 & 05; 053-185-04, 05, 06 & 07; 053-186-01) and comprises approximately 8.3 acres. The properties are approximately bound by El Camino Real to the south, Elm Street to the west, Caltrain to the north and Cedar/Chestnut Streets to the east. The preliminary development program includes mixed-use residential and office development across multiple blocks with infrastructure repair and replacement for roadways adjacent to the project sites. This report is based on discussions with the client and City staff and based on experience with similar projects in Redwood City.

SECTION 1 DOMESTIC WATER

1.1 Existing Water System

Water service in the area is provided by the City of Redwood City. Existing public water mains are available along all City streets fronting of the project including a 10" main in Chestnut street, 8" mains in Lathrop and Main Streets, 6" mains in Beech and Cedar Streets, and a 4" main in Elm Street.

1.2 Existing and Proposed Water Demand

The total future domestic water demand was based on the conceptual development program provided by the architect, including 501 residential units and 567,601 sf of commercial (office & retail) space. Existing demands are calculated based on existing building floor area and use on each property. The anticipated project water demand is calculated using Attachment Q of the Redwood City Design Standards; the results are summarized as follows:

Parcel	Existing Water Demand (gpd)	Future Water Demand (gpd)	Net Water Demand Increase (gpd)
A	9,120	36,485	27,365
B	28,020	37,285	9,265
C	12,810	22,189	9,379
D	7,140	33,747	26,607
E	18,900	37,354	18,454
Total	**75,990**	**167,060**	**91,070**

1.3 Offsite Water Improvements

City ordinance requires that a developer must replace any existing water mains less than 6" along the project's frontage. The existing 4" main in Elm Street will be replaced from Lathrop Street to Main Street with a new 8" water line. Although currently included in the scope of work for the proposed development, the adjacent project at 1180 Main Street is required by City code to install this improvement if approved earlier. Due to

the abandonment of Cedar Street between Main Street and Caltrain right of way, including the removal of the existing water main, a new looped connection in Pennsylvania Avenue is provided.

1.4 Recycled Water

City Ordinance No. 2335 requires the use of recycled water for landscape irrigation and building plumbing. The proposed buildings will be conditioned to provide dual plumbing that will include a separate system for water closets, urinals, trap primers, and landscaping irrigation. The proposed project includes routing of a recycled water pipe to serve all buildings within the development with a future off-site connection to the City's existing system. Preliminary plans show routing of the system through Beech Street and across Caltrain. Routing of the off-site system to the ultimate connection point to the existing system will be negotiated with the City and their consultants. The recycled water pipe size is anticipated to be 6". However, the City recycled water model report by their third-party consultant will give final recommendations to the pipe size.

Based on preliminary studies by greywater specialists, a preliminary estimate of recycled water demand was provided with a ratio of 27% recycled for residential use and 62% recycled for office and retail use (Child Care excluded). Irrigation demands are not included in these ratios and are considered 100% recycled.

Parcel	Water Demand	Potable	Non-potable	Irrigation	Total Recycled
A	36,485	26,425	8,975	1,085	10,060
B	37,285	24,873	10,601	1,811	12,412
C	22,189	8,072	13,170	947	14,117
D	33,747	12,494	20,386	867	21,253
E	37,354	13,466	21,970	1,918	23,888
Total	**167,060**	**85,330**	**75,102**	**6,628**	**81,730**

- Child Care is excluded from non-potable uses.

Project Recycled Water Demand = 81,730 gpd

SECTION 2 FIRE SERVICE

2.1 Fire Code Requirements

Talus has considered fire flow requirements for the largest proposed building, and Fire Service Requirements per the California Fire Code (CFC) are as follows:

- Building Type: Type I
- Max. Building Area = 142,058 square feet (from architect)
- Fire Flow = 4,250 gpm per CFC Table B105.1
  = 2,125 gpm (with 50% reduction for sprinklers)

The City has performed a fire flow test in the project vicinity that shows a flow rate of 2,871 gpm with a residual pressure of 20 psi. This flow rate is sufficient to comply with fire code requirements. Additional modeling of new water line installations will be provided by the City's consultant, including full build out of the proposed development.

2.2 Fire Access

Fire Code requires fire truck access to be a maximum of 150 feet from all faces of the building. Fire access to all sides of the proposed buildings is provided from public streets fronting the projects, with the exception of Parcels A and E. Parcel A will provide a manual exterior wet standpipe along the pedestrian corridor along the Redwood Channel as well as in the interior courtyard for use by the fire department. Parcel E provides a 26-foot wide emergency access road along the existing Cedar Street alignment, with a hammerhead turnaround at the Caltrain right of way.

SECTION 3 SANITARY SEWER

3.1 Existing Sewer Facilities

Sanitary sewer service to the project site is provided by the City of Redwood City. The existing sewer system serving the project area include a 10" sewer main in El Camino Real, 8" sewer in Main Street, and an 8" main running through Caltrain adjacent to the project's northerly boundary. An existing 6" sewer main is located in Lathrop Street heading northerly to the 10" main in Maple Street. Two bypass trunk mains run through the project area including an existing 24" main in Beech Street and an 18" main through Main Street. Both trunk mains extend across Caltrain right of way at the termination of Beech Street. All sewer pipes drain generally to the north and are ultimately treated at the treatment facility in Redwood Shores.

3.2 Sanitary Sewer Demand

The total estimated sanitary sewer demand is based on the preliminary development program provided by the architect, including 501 residential units and 567,601 sf of commercial (office & retail) space. The sewer demand is calculated using the Redwood City Engineering Design Standards Attachment L (attached). The results are summarized as follows:

Parcel	Existing Sewer Demand (gpd)	Future Sewer Demand (gpd)	Net Sewer Demand Increase (gpd)
A	8,664	33,630	24,966
B	26,619	33,700	7,081
C	11,571	20,180	8,609
D	6,783	31,236	24,453
E	17,955	33,664	15,709
Total	**71,592**	**152,410**	**80,818**

Peak flow was found to occur during business hours due to the large amount of office use. Peak flows by Parcel are summarized as follows:

Parcel A:	Avg. Daily Demand = 33,630 gpd;	Peak Flow = 112.5 gpm
Parcel B:	Avg. Daily Demand = 33,700 gpd;	Peak Flow = 117.0 gpm
Parcel C:	Avg. Daily Demand = 20,180 gpd;	Peak Flow = 70.1 gpm
Parcel D:	Avg. Daily Demand = 31,236 gpd;	Peak Flow = 108.5 gpm
Parcel E:	Avg. Daily Demand = 33,664 gpd;	Peak Flow = 116.9 gpm
Total:	**Avg. Daily Demand = 152,410 gpd;**	**Peak Flow = 398.3 gpm***

* Refer to table below for peak flow (398.3 gpm / 1.07 cfs during business hours)

Peak Flow	Bus. Hrs	Off-Hrs	Max.(gpm)	Max. (cfs)	Receiving Pipe Size	% Capacity Use
Parcels A & B	168.0	159.3	168.0	**0.45**	**10”**	**45%**
Parcels C & D	103.5	136.5	136.5	**0.37**	**8”**	**67%**
Parcel E	116.9	46.8	116.9	**0.31**	**18”**	**6%**
Total	**398.3***	342.5	**398.3***	**1.07**	**-**	**-**

3.3 Sanitary Sewer Improvements

This report assumes that capacities are available in the proposed sewer mains to serve the development. During environmental review of the project, additional studies will be performed including system investigations and flow studies of the existing sewer facilities as well as a City-wide sewer system model by the City’s consultant. At that time a more intensive study will be prepared to identify alternative routing considerations.

The proposed project is designed to split building sewage to the City’s existing system including the 10” main in El Camino Real (Parcels A & B), 8” main In Main Street (Parcels C & D) and the 18” trunk main in Beech Street (Parcel E). Based on the proposed sewer service connections, the project’s impact to the existing system is provided herein as a percent capture of the receiving pipes capacity with a percent full ratio of d/D = 75%.

A preliminary estimate of peak flow rates and receiving pipe capacities are provided as follows:

Pipe Capacity	
18” @ 0.25% (d/D = 0.75)	4.79 cfs
10" @ 0.25% (d/D = 0.75)	1.00 cfs
8" @ 0.25% (d/D = 0.75)	0.55 cfs

3.4 Sanitary Sewer CIP Fee

The City has implemented a Sanitary Sewer CIP program that requires developers to contribute their fair share cost towards the planned sewer improvements serving their properties. The City has allowed for developers to mitigate their impacts to the CIP projects through in-lieu payments for system upgrades. The fees are based on sanitary sewer line remediation costs to reduce rainfall dependent inflow and infiltration (RDI/I) in an amount equal to the additional sewage generated by the project. This reduction would

result in a net-zero impact to the City's system.

CIP Fee Calculation

The City has established a fee based on the total increased project flow divided by 37.6 times $300. The project demand of 152,410 gpd is offset by the existing demand of 71,592 gpd, for a net increase of 80,818 gpd.

Increased Average Daily Sewage Flow from Project = 80,818 gpd
Project CIP Fair Share Cost = 80,818 / 37.6 x $300 = **$ 644,824**

3.5 Project 11 / Additional CIP Impacts

The sanitary sewer CIP fee above will provide the developer's fair share portion of the existing planned CIP improvements. However, the planned CIP improvements were modeled in anticipation of scattered development throughout the City and may not account for concentrated development in one area. The City's Sewer Model Study will identify whether additional impacts not covered by the CIP are triggered by the proposed development and give recommendations for additional off-site sewer improvements that may be required for this project.

3.6 Beech Street Sewer Upgrade

The existing 27" trunk main in Beech Street serving upstream development is undersized to handle the peak wet weather flows directed through the project site. As a condition of approval, the developer is requested to upsize the trunk main to 36" or larger depending on the findings of a third-party review of the City's master sewer system infrastructure. Relocation of the trunk main alignment will be required for both the relocation of Beech Street between Lathrop and El Camino Real, as well as to maintain continuous operation of the system during construction.

SECTION 4 STORM DRAINAGE

4.1 Existing Site Drainage

The majority of the project site runoff drains generally by surface flow to the street gutters along parcel frontages where it is collected into a public storm drain system. The storm drain system drains to an existing 18" diameter concrete pipe in Lathrop Street, draining north to the Redwood Channel just north of Elm Street. The portion of the project to the east of Main Street drains towards the Caltrain right of way, where it drains through shallow pipes ranging from 10" to 15" in diameter crossing the Caltrain tracks.

4.2 Proposed Site Drainage

Project drainage from each parcel will be collected through the building's plumbing and directed to the existing public storm drain system after adequate treatment and detention requirements have been met. Due to inadequate infrastructure serving Parcel E, the entire project site will be directed to a central storm drain system in Lathrop Street, discharging to the Redwood Channel. Regulatory permitting will be required through USACE, CA DFW and CA RWQCB as noted on the project plans. Existing Caltrain bubbler pipes are not taken into consideration with project hydrology design. They are shown to remain at the request of the City as overland release in case of system failure or surcharge.

4.3 Regional Hydrology Impacts

A preliminary hydrology study of the existing and proposed drainage volumes is provided (exhibits attached) showing the impacts of the proposed development for the 100-year storm event (i=2.50). Existing runoff from the project area is currently split between the Redwood Channel and the shallow syphon storm drain lines at Caltrain. Existing hydrology is split between the two at rates of 26.3 cfs to the Redwood Channel and 10.2 cfs to Caltrain.

Since existing site conditions are largely impervious, the proposed development does not account for a net increase in storm water runoff, especially when accounting for on-site detention requirements listed below. However, the redirection of stormwater from Caltrain to the Redwood Channel will create a net increase of 5.9 cfs to the Redwood Channel.

Due to the concentration of project runoff through Lathrop Street towards the Redwood Channel, the existing storm drain system will be upsized to handle the larger flows. During environmental review of the project, a more detailed study will be provided that includes the design hydraulic grade in the Redwood Channel and accounts for any in-line detention that may be required to offset the diversion of project runoff at Parcel E.

4.4 On-site Storm Water Detention

Due to the increase in impervious surfaces and the City's higher drainage coefficient for roof areas, peak flows discharging from the site will be increased by the proposed project. Detention of storm waters will be required to mitigate any adverse impacts to the existing system. The City's design standards require that the proposed 30-year storm event be compared to the existing 10-year event, which increases the detention requirement. On-site detention for the proposed development will be provided in detention vaults or underground pipes placed on the individual parcels.

4.5 Storm Water Treatment

The proposed development qualifies as a Special Project based on Appendix J Section J.4 of the MRP, category C: Transit Oriented Development. Depending on parcel design, non-LID treatment credits are available in the range of 55% to 75%. For each site, a portion of the building roof will drain to LID flow-through treatment planters, with the remainder of the site handled through non-LID media filter devices. Treatment sizing calculations are or included in this report.

4.6 Flood Protection - FEMA

Based on the Flood Insurance Rate Map (FIRM# 06081C0301E dated April 5, 2019) project site is situated in Flood Zone X, identified as areas less than 0.2 percent chance flood. No processing with FEMA will be required for development on the site.

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl A - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= 9,120 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

_____ sqft X 3.5 cuft of water /sqft of landscape per year = _____ **CUFT/YR**

To convert to GPD:

_____ cuft/yr X 7.48 gal/cuft X 1 yr/365 days = _____ **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 9,120 **GPD Projected**

Section E Calculation Summary

Retail : 90 ft x 450 gpd / 25 ft = 1,620 gpd

Service: 10 bays x 750 gpd = 7,500 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl B - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3: = 28,020 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

_____ sqft X 3.5 cuft of water /sqft of landscape per year = _____ **CUFT/YR**

To convert to GPD:

_____ cuft/yr X 7.48 gal/cuft X 1 yr/365 days = _____ **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 28,020 **GPD Projected**

Section E Calculation Summary

Retail : 140 ft x 450 gpd / 25 ft = 2,520 gpd

Service: 34 bays x 750 gpd = 25,500 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl C - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   24 Units X 2.2 Persons = 53 Persons

53 Persons X 60* GPD = 3,180 **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3: = 9,000 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

_____ sqft X 3.5 cuft of water /sqft of landscape per year = _____ **CUFT/YR**

To convert to GPD:

_____ cuft/yr X 7.48 gal/cuft X 1 yr/365 days = _____ **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 12,810 **GPD Projected**

Section E Calculation Summary

Service: 12 bays x 750 gpd = 9,000 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl D - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3: = 7,140 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

_____ sqft X 3.5 cuft of water /sqft of landscape per year = _____ **CUFT/YR**

To convert to GPD:

_____ cuft/yr X 7.48 gal/cuft X 1 yr/365 days = _____ **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 7,140 **GPD Projected**

Section E Calculation Summary
Manufacturing: 12,600 sf / 200 sf/pp = 63 pp x 30 gpd = 1,890 gpd
Service: 7 bays x 750 gpd = 5,250 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl E - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3: = 18,900 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

_____ sqft X 3.5 cuft of water /sqft of landscape per year = _____ **CUFT/YR**

To convert to GPD:

_____ cuft/yr X 7.48 gal/cuft X 1 yr/365 days = _____ **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 18,900 **GPD Projected**

Section E Calculation Summary for BAWSCA Agencies " ,

Health Club: 13,800 sf / 50 sf/pp = 276 pp x 25 gpd = 6,900 gpd

Service: 16 bays x 750 gpd = 12,000 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl A - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   252 Units X 2.2 Persons = 554 Persons

554 Persons X 60* GPD = 33,240 **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= 2,160 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

15,132 sqft X 3.5 cuft of water /sqft of landscape per year = 52,962 **CUFT/YR**

To convert to GPD:

52,962 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 1,085 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 36,485 **GPD Projected**

Section E Calculation Summary

Retail : 120 ft x 450 gpd / 25 ft = 2,160 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl B - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

109,379 sqft X 0.13 gpd/sqft = 14,219 **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3: = 21,255 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

25,251 sqft X 3.5 cuft of water /sqft of landscape per year = 88,379 **CUFT/YR**

To convert to GPD:

88,379 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 1,811 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 37,285 **GPD Projected**

Section E Calculation Summary

Retail : 160 ft x 450 gpd / 25 ft = 2,880 gpd

Child Care: 8,563 sf / 35 sf/pp = 245 pp x 75 gpd = 18,375 gpd

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl C - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

163,402 sqft X 0.13 gpd/sqft = 21,242 **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= _____ **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

13,202 sqft X 3.5 cuft of water /sqft of landscape per year = 46,207 **CUFT/YR**

To convert to GPD:

46,207 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 947 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 22,189 **GPD Projected**

* From SFPUC Demand Study by URS, " Projected Water Usage for BAWSCA Agencies " , Tech Memo of August 2006.

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl D - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   249 Units X 2.2 Persons = 548 Persons

548 Persons X 60* GPD = 32,880 **GPD Projected**

B. OFFICE/COMMERCIAL

_____ sqft X 0.13 gpd/sqft = _____ **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= _____ **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

12,091 sqft X 3.5 cuft of water /sqft of landscape per year = 42,319 **CUFT/YR**

To convert to GPD:

42,319 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 867 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 33,747 **GPD Projected**

* From SFPUC Demand Study by URS, " Projected Water Usage for BAWSCA Agencies " , Tech Memo of August 2006.

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl E - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Single Family (1-7 Units/Acre)
   _____ Units X 2.8 Persons = _____ Persons
2. Multi - Family (8-20 Units/Acre)
   _____ Units X 2.5 Persons = _____ Persons
3. High - Density (21+ Units/Acre)
   _____ Units X 2.2 Persons = _____ Persons

_____ Persons X 60* GPD = _____ **GPD Projected**

B. OFFICE/COMMERCIAL

257,356 sqft X 0.13 gpd/sqft = 33,456 **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= 1,980 **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

26,746 sqft X 3.5 cuft of water /sqft of landscape per year = 93,611 **CUFT/YR**

To convert to GPD:

93,611 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 1,918 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 37,354 **GPD Projected**

Section E Calculation Summary

Retail : 110 ft x 450 gpd / 25 ft = 1,980 gpd

ATTACHMENT Q (2 of 3)

WATER DEMAND PROJECTION WORKSHEET
OCCUPANT LOADS

JOB TITLE _____ CAL. BY _____
JOB NUMBER _____ CHKD. BY _____
JOB LOCATION _____ DATE _____

DESIGNED USE OF THE FACILITY	OCCUPANT LOAD OF FLOOR AREA
A. SCHOOL/CLASSROOM	20 sqft/person
B. HEALTH CLUB	50 sqft/person/shift (3 shifts per day)
C. MANUFACTURING AREAS	200 sqft/person
D. NURSERIES (DAY-CARE)	35 sqft/person
E. STORAGE FACILITIES	300 sqft/person

ATTACHMENT Q (3 of 3)

WATER DEMAND PROJECTION WORKSHEET
UNIT LOADS

JOB TITLE _____ CAL. BY _____
JOB NUMBER _____ CHKD. BY _____
JOB LOCATION _____ DATE _____

TYPE OF ESTABLISHMENT	VOLUME OF CONSUMPTION/DAY
Assembly Halls	2 gal per seat
Bowling Alley	75 gal per lane
Churches	7 gal per seat
Dance Halls	2 gal per person
General Hospitals	0.27 gal per sqft
Health Clubs	25 gal per person
Laundries	400 gal per machine
Manufacturing (excluding industrial usage)	30 gal per person/shift
Motels with bath, toilet and kitchen wastes	170 gal per room
Nursing homes/Daycare	75 gal per person
Medical Offices (other than hospitals)	0.18 gal per sqft
Research and Development	0.21 gal per sqft
Schools	35 gal per person
Service Station	750 gal per bay
Storage facilities	1 gal per person
Stores (Retail type)	450 gal per 25 ft frontage
(Food -- non-restaurant type)	900 gal per 25 ft frontage
Trailer parks or tourist camps (with built-in bath)	50 gal per person

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl A - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 9,120 x 0.95 = 8,664 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 8,664 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 30.1 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 12.0 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl B - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 28,020 x 0.95 = 26,619 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 26,619 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 92.4 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 37.0 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl C - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

3,180 GPD_W X 0.95 = 3,021 **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 9,000 x 0.95 = 8,550 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 11,571 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 33.9 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 22.4 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl D - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 7,140 x 0.95 = 6,783 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 6,783 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 23.6 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 9.4 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl E - Existing
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 09/20/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

3,711 GPD_W X 0.95 = 3,525 **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 18,900 x 0.95 = 17,955 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 17,955 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 62.3 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 24.9 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl A - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

33,240 GPD_W X 0.95 = 31,578 **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 2,160 x 0.95 = 2,052 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 33,630 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 51.0 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 112.5 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl B - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

14,219 GPD_W X 0.95 = 13,508 **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 21,255 x 0.95 = 20,192 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 33,700 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 117.0 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 46.8 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl C - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

21,242 GPD_W X 0.95 = 20,180 **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= _____ **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 20,180 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 70.1 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 28.0 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl D - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

32,880 GPD_W X 0.95 = 31,236 **GPD_S**

B. OFFICE/COMMERCIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= _____ **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 31,236 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 43.4 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 108.50 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE 1601 ECR - Pcl E - Future
JOB NUMBER 18190
JOB LOCATION Redwood City, CA

CAL. BY EM
CHKD. BY EM
DATE 10/21/2019

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

_____ GPD_W X 0.95 = _____ **GPD_S**

B. OFFICE/COMMERCIAL

33,456 GPD_W X 0.95 = 31,783 **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= 1,980 x 0.95 = 1,881 **GPD_S**

F. INFILTRATION

1. PVC pipe: _____ miles X 100 GPD X _____ diameter (in.) = _____ **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 31,783 GPD (SUM OF A - F)

H. PEAK HOURLY FLOW* FOR PUMPING STATIONS

1. Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 116.9 **GPM**
2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 46.8 **GPM**

* Peak hourly flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

EXISTING SEWER MAIN TO BE REMOVED UPON COMPLETION OF NEW 33" TRUNK MAIN.

PENINSULA CORRIDOR JOINT POWERS BOARD (CALTRAIN)

EXISTING SS MAIN IN CALTRAIN RIGHT OF WAY TO BE ABANDONED IN PLACE.

MAIN STREET

MAPLE STREET

ELM STREET

FRANKLIN STREET

PARCEL D SERVICE POC

PARCEL E (N) SERVICE POC

PARCEL E (S) SERVICE POC

CHESTNUT STREET

CEDAR STREET SEWER MAIN TO BE REMOVED.

EXISTING 6" SS MAIN TO BE REMOVED.

BEECH STREET

PARCEL C SERVICE POC

SHASTA STREET

CONNECT CEDAR STREET SEWER TO 18" TRUNK MAIN.

UPGRADE BYPASS TRUNK MAIN FROM 27" TO 33" MIN. DIA PIPE. FINAL SIZE TO BE RECOMMENDED BY CITY'S CONSULTANT.

LATHROP STREET

CEDAR STREET

DIVERT CHESTNUT / SHASTA SEWER TO 6" DIA. SEWER IN MAIN STREET.

MAPLE STREET

PARCEL A SERVICE POC

EXISTING SEWER MAIN TO BE REMOVED UPON COMPLETION OF NEW 33" TRUNK MAIN.

PARCEL B SERVICE POC

EL CAMINO REAL

LINCOLN AVE

GRAPHIC SCALE

0 100 200

TALUS
ENGINEERING | PLANNING | DEVELOPMENT

SOUTH MAIN PLANNING AREA CIVIL UTILITY IMPROVEMENTS SEWER SYSTEM UPGRADES

SAN MATEO COUNTY CALIFORNIA

REDWOOD CITY

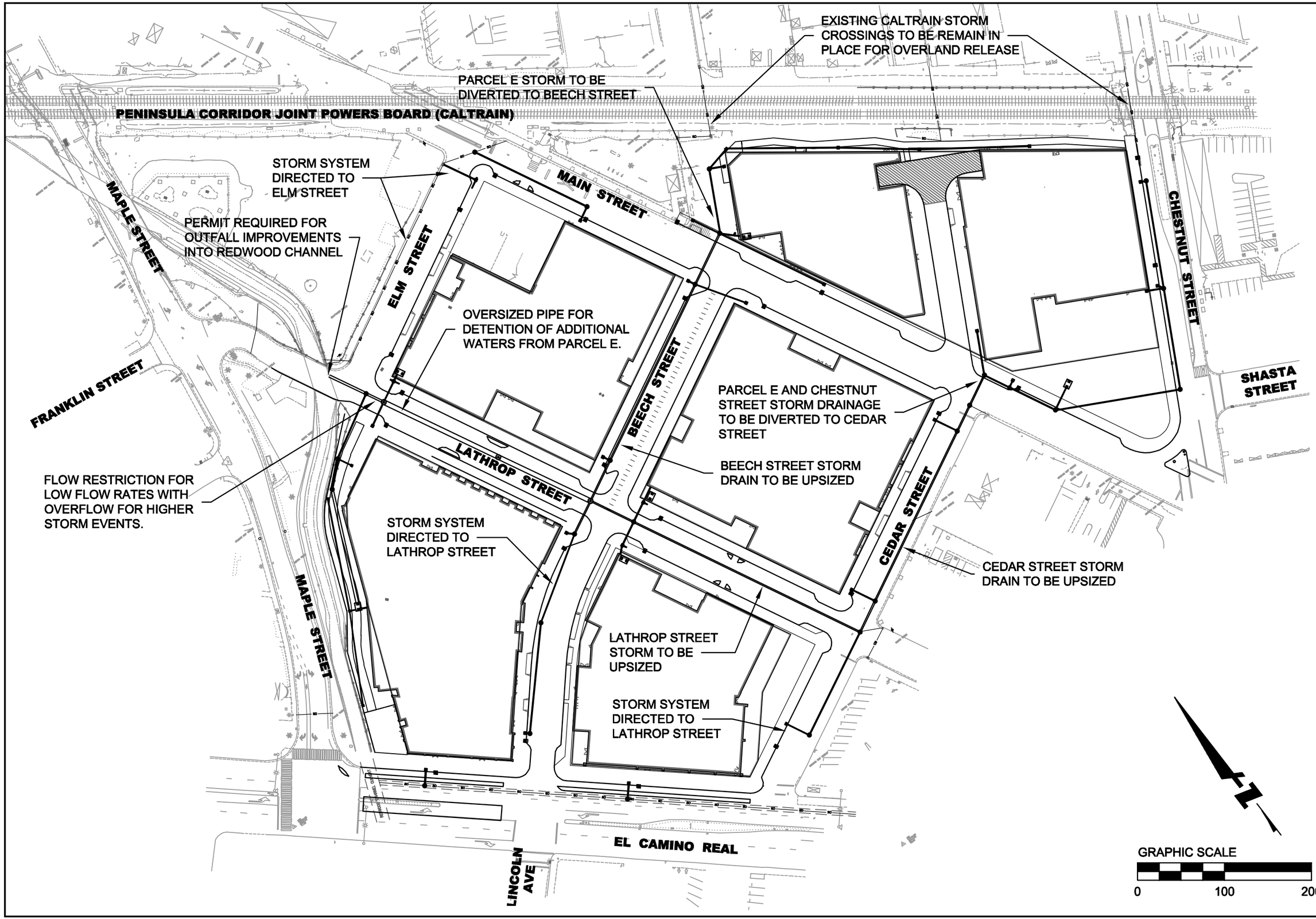
Revisions	No.

Date	05/31/19
Scale	1" = 100'
Job No.	18190

Drawing Number:

SEWER 1 OF 3

DRAWING NAME: E:\p18190\EXHIBITS\Utility Exhibits\19_0531 Utility_Upgrades(SS).dwg
PLOT DATE: 05-24-19 PLOTTED BY: Easton



DRAWING NAME: E:\p18190\EXHIBITS\Utility Exhibits\19_0531 Utility_Upgrades(SD).dwg
PLOT DATE: 05-24-19 PLOTTED BY: Easton

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SOUTH MAIN PLANNING AREA CIVIL UTILITY IMPROVEMENTS STORM SYSTEM UPGRADES

SAN MATEO COUNTY, CALIFORNIA

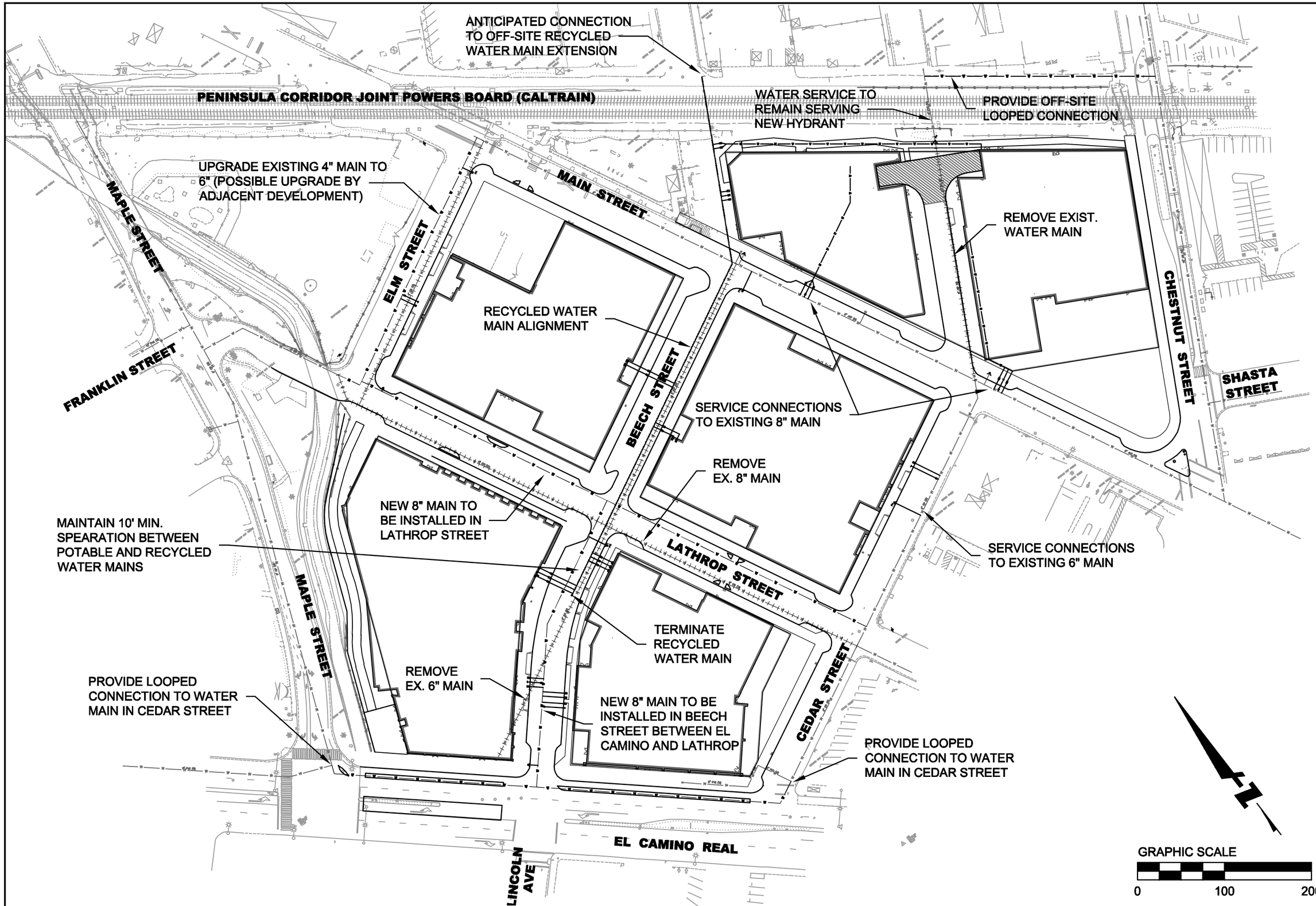
REDWOOD CITY

Revisions	No.

Date	05/31/19
Scale	1" = 100'
Job No.	18190

Drawing Number:

STORM 2 OF 3



DRAWING NAME: E:\p18190\EXHIBITS\Utility Exhibits\19_0531 Utility_Upgrades(W).dwg
PLOT DATE: 05-24-19 PLOTTED BY: Easton

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SOUTH MAIN PLANNING AREA
CIVIL UTILITY IMPROVEMENTS
WATER SYSTEM UPGRADES

SAN MATEO COUNTY
CALIFORNIA

REDWOOD CITY

Revisions		
No.		

Date	05/31/19
Scale	1" = 100'
Job No.	18190

Drawing Number:

WATER

3 OF 3

APPENDIX B
Model Results

Parcel D

Parcel E

Parcel A

Parcel C

Parcel B

Last Saved: 11/25/2019 4:52:13 PM L:\Clients\047 AECOM\60x19-23 RW City Greystar V Util Eval\GIS\MXD\WaterModel Results\FigA1 Ex-PHD.mxd pjohnston

Symbology

- Parcels
- Planning Area A
- Planning Area B
- Planning Area C
- Planning Area D
- Planning Area E

Pipe Pressure

- Less than 45 psi
- 45 psi - 50 psi
- 50 psi - 55 psi
- 55 psi - 65 psi
- Greater than 65 psi

Pipe Velocity

- 0 fps - 4 fps
- 4 fps - 7 fps
- Greater than 7 fps

0 62.5 125

Scale in Feet

WEST YOST ASSOCIATES

Figure A-1

Existing Peak Hour Demand Existing Infrastructure

Redwood City
Greystar V Utility Evaluation

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Symbology

- Parcels
- Planning Area A
- Planning Area B
- Planning Area C
- Planning Area D
- Planning Area E

Junction Pressure

- Less than 45 psi
- 45 psi - 50 psi
- 50 psi - 55 psi
- 55 psi - 65 psi
- Greater than 65 psi

Pipe Velocity

- 0 fps - 4 fps
- 4 fps - 7 fps
- Greater than 7 fps

0 62.5 125

Scale in Feet

WEST YOST ASSOCIATES

Figure A-2

Existing Plus Project Peak Hour Demand Proposed Infrastructure

Redwood City
Greystar V Utility Evaluation

Last Saved: 11/22/2019 11:26:11 AM L:\Clients\047 AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\WaterModel Results\Fig A3_G5_FU_PHD.mxd pjohnston

Symbology

- Parcels
- Planning Area A
- Planning Area B
- Planning Area C
- Planning Area D
- Planning Area E

Junction Pressure

- Less than 45 psi
- 45 psi - 50 psi
- 50 psi - 55 psi
- 55 psi - 65 psi
- Greater than 65 psi

Pipe Velocity

- 0 fps - 4 fps
- 4 fps - 7 fps
- Greater than 7 fps

0 62.5 125

Scale in Feet

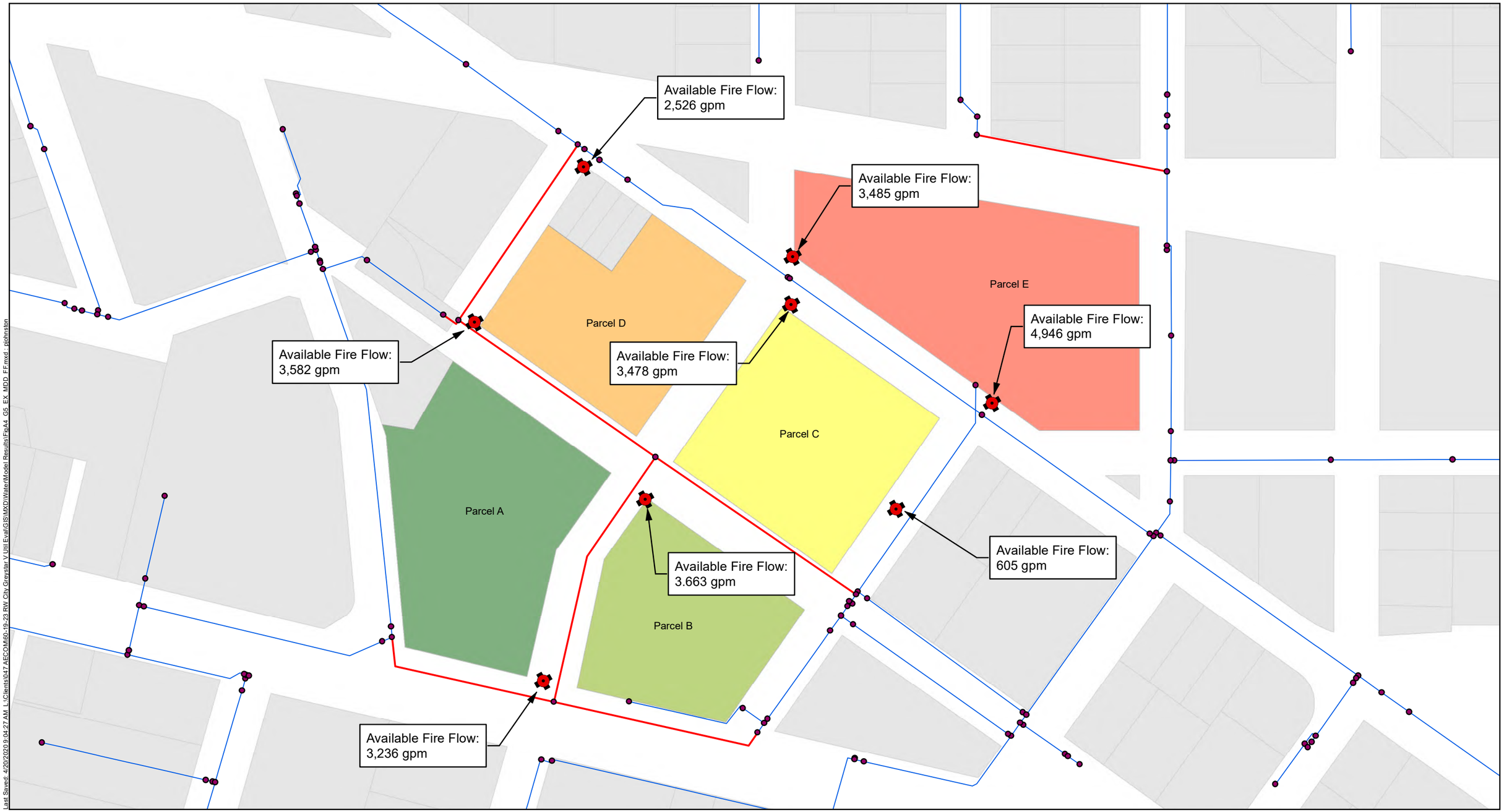
Redwood City California founded 1867

WEST YOST ASSOCIATES

Figure A-3

Future Plus Project
Peak Hour Demand
Proposed Infrastructure

Redwood City
Greystar V Utility Evaluation



Symbology

- Parcels
- Planning Area A
- Planning Area B
- Planning Area C
- Planning Area D
- Planning Area E
- Proposed Fire Hydrant
- junction
- Proposed Water Main
- Existing Water Main

Note: Results shown incorporate a maximum velocity criterion of 7 feet per second

0 62.5 125
Scale in Feet

WEST YOST ASSOCIATES

Figure A-4

Existing Plus Project MDD + Fire Flow Proposed Infrastructure

Redwood City
Greystar V Utility Evaluation

Last Saved: 4/20/2020 9:16:14 AM L:\Clients\047.AECOM\60-19-23 RW City Greystar V Util Eval\GIS\MXD\Water\Model Results\FireA5_G5_FU_MDD_FF.mxd - plohmsten

Symbology

- Other Parcels
- Planning Area A
- Planning Area B
- Planning Area C
- Planning Area D
- Planning Area E
- Proposed Fire Hydrant
- Proposed Water Main
- Existing Water Main

Note: Results shown incorporate a maximum velocity criterion of 7 feet per second

0 62.5 125
Scale in Feet

WEST YOST ASSOCIATES

Figure A-5

Future Plus Project
MDD + Fire Flow
Proposed Infrastructure

Redwood City
Greystar V Utility Evaluation

APPENDIX C
CCTV Inspection

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Cleaning and CCTV Inspection Services for Redwood City and Greystar GP II LLC

DATE: April 6th, 2020

PREPARED BY:

Michelle D. Beason, PE

Regional Manager

National Plant Services, Inc.

www.nationalplant.com

mbeason@nationalplant.com

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CCTV Inspection and Equipment

Greystar GP II LLC contracted National Plant Services, Inc. (NPS) to perform Hydro cleaning and Closed-Circuit Television Video (CCTV) inspections for some sewer and storm pipe segments owned by Redwood City.

CCTV inspection involves a process of inserting remotely controlled robotic CCTV cameras into the pipes through existing manholes. High resolution videos of the inspections are recorded during these inspections.

NPS conducted inspections totaling approximately 1,932.11 LF of pipe with diameters between 10" and 15".

Table 1 below shows a summary of the pipe information for the completed inspections.

Table 1: Showing the summary information of pipes inspected.

Diameter	VCP	CAST IRON	CONC	CLAY TILE	RCP	total	Length
10	7		2	2		11	1620.32
12		4				4	198.89
15			0		2	2	112.9
TOTAL						17	1932.11

CCTV Truck and Camera Equipment

The Closed-Circuit Television Video (CCTV) equipment is contained in a compact Mercedes Sprinter van, powered by a generator. The generator is fully enclosed and designed for quiet operation.

The CCTV camera and tractors are conventional pan-tilt-zoom cameras. NPS Operators performed NASSCO PACP-certified inspections of all sewer pipes in the scope of work.

For hydro cleaning, NPS used the Jetting and Vacuum truck to ensure the pipe segments were cleaned and ready for CCTV inspections.

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Original Scope of Work

Sanitary Sewer: approximately 2,322 LF of 8-inch, 10-inch, and 16-inch diameter sanitary sewer gravity mains highlighted in Attachment A and detailed as:

- Elm Street, from Lathrop Street to Main Street: approximately 225 LF of 8-inch main
- Caltrain ROW, from Main Street to Cedar Street: approximately 572 LF of 8-inch main
- Maple Street, from El Camino Real to Middlefield Road: approximately 1,435 LF of 10-inch and 90 LF of 16-inch main

Storm Sewer: approximately 695 LF 10-inch, 12-inch, 15-inch siphons; and 69 LF of 16-inch outfalls, highlighted in Attachment B and detailed as:

- (2) Siphons at Beech Street and Pennsylvania Avenue/Caltrain ROW: approximately 174 LF of 12-inch CMP.
- (2) Siphons at Cedar Street and Pennsylvania Avenue/Caltrain ROW: approximately 189 LF of 10-inch CMP.
- (2) Siphons at Chestnut Street and Pennsylvania Avenue /Caltrain ROW: approximately 332 LF of 15-inch RCP.
- (2) Outfalls to Redwood Creek at Lathrop Street: approximately 26 LF of 16-inch RCP and 43 LF of 16-inch RCP gravity mains.
- Confirm presence of 60-inch RCP gravity main at two locations:
    - El Camino Real between Maple Street and Beech Street
    - El Camino Real, south of Roosevelt Avenue (in front of 1708 and 1710 El Camino Real)

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Summary of Inspection Results

Generally, the CCTV inspections for Redwood City was a success. NPS inspected most of the line segments in the scope provided above.

NPS performed PACP coding using Wincan VX PACP Version 6 software. The PACP quick score ratings for structural, operations and maintenance and the overall pipe rating were assigned for each pipe segment.

A summary table with all inspection results can be found in Appendix A.

The table below gives the details for work performed.

Description	Status as of 3/23/2020
Elm Street, from Lathrop Street to Main Street: approximately 225 LF of 8-inch main	Incomplete - mains located in field are 4" or smaller. Can't access with convential CCTV crawler, to long of stretch to use push camera
Caltrain ROW, from Main Street to Cedar Street: approximately 572 LF of 8-inch main	Removed from scope for now
Maple Street, from El Camino Real to Middlefield Road: approximately 1,435 LF of 10-inch and 90 LF of 16-inch main	Performed additional cleaning to remove heavy grease, dewatered, and completed CCTV. Appears to have either a very shallow/minor siphon, or a major sag for a portion of the line
(2) Siphons at Beech Street and Pennsylvania Avenue/Caltrain ROW: approximately 174 LF of 12-inch CMP	Able to camera the majority of both siphons
(2) Siphons at Cedar Street and Pennsylvania Avenue/Caltrain ROW: approximately 189 LF of 10-inch CMP	Unable to cameara with repeated visits/attempts with mini crawler due to access being blocked by cars or activty, and due to being full of water from rains.
(2) Siphons at Chestnut Street and Pennsylvania Avenue /Caltrain ROW: approximately 332 LF of 15-inch RCP	Able to camera the majority of both siphons
(2) Outfalls to Redwood Creek at Lathrop Street: approximately 26 LF of 16-inch RCP and 43 LF of 16-inch RCP gravity mains	Able to camera the pipes from the outfalls to the upstream drainage inlet
Confirm presence of 60-inch RCP gravity main at two locations	Presence confirmed at both locations (walked box culvert at each end to locate tie-in of 60" to the box culvert).

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Sample report generated for each inspection. The PACP Scoring in Appendix C shows the PACP coding for all lines inspected.

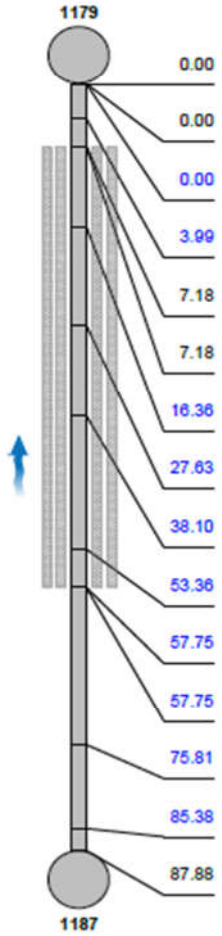
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		Dry	R.DION N.P.S	U-816-07005058	1187-1179
Year laid:	Pre-cleaning:	Direction: Upstream	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	REDWOOD CITY	Drainage Area:		Upstream MH:	1187
Street:	MAPLE STREET	Media Label:		Up Rim to Invert:	0.0
Location Code:	Light highway	Flow Control:	Not Controlled	Downstream MH:	1179
Location Details:		Sheet Number:		Down Rim to Invert:	0.0
Pipe shape:	Circular	Sewer Use:	Sanitary	Total gallons used:	0.0
Pipe size:	10 "	Sewer Category:	SEC	Joints passed:	0
Pipe material:	Vitrified Clay Pipe	Purpose:	Routine Assessment	Joints failed:	0
Lining Method:		Owner:			

Additional Info:



1:664 Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1179	00:00:26	1	
0.00		MWL	Water Level, 10% of the vertical dimension	00:00:39	2	
0.00		DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:00:43	3	M2
3.99		DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:01:32	4, 5	M2
7.18	S01	DAGS	Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Start	00:01:59	6, 7	
7.18	S02	DAGS	Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Start	00:02:03	8, 9	
16.36		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:03:44	10, 11	S2
27.63		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:04:32	12, 13	S2
38.10		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:05:13	14, 15	S2
53.36		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:06:09	16, 17	S2
57.75	F01	DAGS	Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Finish	00:06:33	18, 19	M2
57.75	F02	DAGS	Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Finish	00:06:36	20, 21	M2
75.81		DSF	Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock	00:07:42	22, 23	M2
85.38		DSF	Deposits Settled Fine, 5% of cross sectional area from 5 o'clock to 7 o'clock	00:08:23	24, 25	M2
87.88		AMH	Manhole / 1187	00:08:50	26	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
2400	2C00	8.0	48.0	56.0	2.0	2.0	2.0

REDWOOD CITY SEWER AND STORM CCTV [Greystar] // Page: 1

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Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	MAPLE STREET	2/21/2020	1187-1179	1

1, 00:00:26, 0.00ft
Manhole / 1179

2, 00:00:39, 0.00ft
Water Level, 10% of the vertical dimension

3, 00:00:43, 0.00ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock

4, 00:01:32, 3.99ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock

Page 2

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Defect Summary and Recommendations

The most common defects found were deposits and sags.

Appendix A summarizes the condition codes observed, along with the structural quick, O&M quick, and overall PACP scores for each segment. A © after a code indicates a continuous defect. A defect with a "(Code) x 2, etc." indicates the number of incidences of a defect.

Field inspections identified the following types of defects:

Operational & Maintenance Defects: deposits attached grease, deposits attached encrustation, deposits of silt and gravel, roots, etc.

Structural Defects: hole, joint offset, lining defects, and surface damage.

The PACP Version 6 Code Guide (including Code definitions) is included in Appendix D. The PACP codes that were observed were as follows:

Deposits – DAE/DAGS/DAZ/DSF/DSGV/DSC

Most of the pipes had deposits. These pipes should be cleaned to restore full capacity of these segments, and to avoid further accumulation of debris.

Sags – MWLS

Line segments with sags and high water levels should be cleaned more frequently to prevent buildup that could cause an overflow.

Surface Damage -SCP

A few of the pipe segments showed surface damage. These issues should be monitored to see if this condition worsens, and rehabilitation planned, if required.

Hole - H

One of the pipe segments has a hole. This can be fixed through a CIPP point repair.

Lining features -LFB/LFOC/LFUC

Some pipe segments were CIPP lined and exhibited lining issues. These conditions should be monitored to ensure the condition does not worsen, and repairs planned as needed.

Roots – RMC

One segment had visible roots at one joint. Root foaming may stop the forward progress of roots for 2-3 years, or the use of injection grout with root inhibitor can also be used. Alternatively, CIPP point repairs can be performed for a more permanent fix.

Joint - JOL

The defect at the joint can be fixed through a CIPP point repair.

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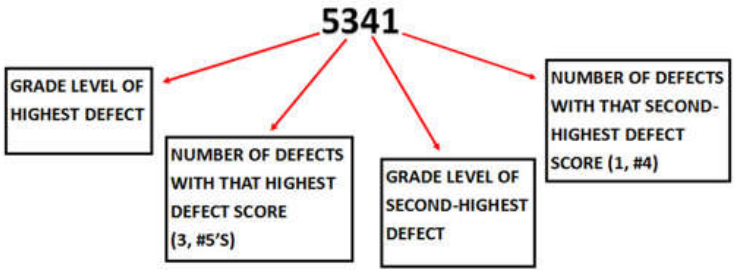
Recommendations/Conclusions

The pipelines inspected are in serviceable condition. From the results found, recommendations for repair and maintenance were made for these pipe segments. These recommendations can be found in the last two columns of the summary spreadsheet in Appendix A, and are also summarized in this report. The Owner must make the final determination on the rehabilitation and maintenance schedule and methods to be used based on available budget and City-wide project prioritizations. These inspections results should be considered a guide to do so.

PACP Quick Scores and the Overall Pipe Rating were used to prioritize the extent of the PACP defects observed. The PACP defect scores are rolled up to indicate the overall condition of a pipe segment. The most severe codes are a grade 5, and lines with no defects are given a grade 0.

The quick scores indicate the two highest defect scores encountered in a line segment, and the number of each. There is a quick score for Structural Defects, and then one for O&M Defects. Both are listed in Appendix A, and summarized from the scoring report per Appendix D.

PACP SCORE OF '5341'



Overall, the pipes segments are in a good working condition. Most of the pipe segments had debris codes including settled deposits, grease, and encrustation.

For lines with deposits, sags, and high-water levels, it is recommended that these lines are cleaned on a regular basis to prevent further buildup and possible overflows.

Some rehabilitation and repair items are recommended in Appendix A.

A Note About Estimating Remaining Useful Life:

Estimating remaining useful life is a process that considers initial life expectancy of the sewer pipelines and then assesses the current deterioration state and factors that contribute to failure. Accurate remaining useful life forecasting is based on regular monitoring and assessment of pipelines over time.

These project results should be considered as a baseline assessment, since this was the first time these assets have been inspected. Only with regular inspections and tracking over time can we determine any changes in corrosion measurements and defects, deterioration factors such as H2S or

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customer discharges, and increased or decreased maintenance practices. That allows us to accurately estimate the rate of degeneration and therefore life expectancy, of a particular sewer or stormwater pipeline.

Re-inspection Strategy:

All buried sewer pipelines, regardless of size, should be assigned re-inspection frequencies that are set and adjusted from time-to-time based on their changing conditions. Setting inspection cycles will allow the City to schedule these activities to determine when RUL is approaching a benchmark that triggers a maintenance, rehabilitation, or replacement activity. For large-diameter pipelines, targeted rehabilitation is preferred due to the cost of replacement or rehabilitation. Preventative maintenance combined with a risk-based asset management plan also allows the City to select additional inspection tools and refine RUL estimates.

Appendix A – Summary Table of Inspections and Assessments

Appendix B – CCTV Videos (To Be Delivered)

Appendix C – PACP Scoring Report

Appendix D – PACP Defect Code Guide

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APPENDIX A

Summary of Inspections and Assessments (Excel Spreadsheet)

Date	Upstream Manhole	Downsteam Manhole	Street	Actual Diameter	Actual Material	LENGTH INSPECTED	NOTES	STRUCTURAL QUICK	O&M QUICK	OVERALL PACP SCORE	PACP SCORE 1	PACP SCORE 2	PACP SCORE 3	PACP SCORE 4	PACP SCORE 5	PACP SCORE 6	PACP SCORE 7	PACP SCORE 8	PACP SCORE 9	MAINTENANCE RECOMMENDATIONS	REPAIR RECOMMENDATIONS
2/21/2020	1186	1185	Maple street	10	VCP	255.75		3121	2L00	2	DAZ	DAGSx2	DAZ©	DAGS©x3	LFBU	MWLS				CLEAN LINE SEGMENT	MONITOR CHANGES TO LINING CONDITION AND REPAIR AS NEEDED.
2/21/2020	1179	1186	Maple street	10	VCP	326.57	Manhole has roots in channel	3B2F	4131	2.2	DAZX2	DAGSX3	DAZ©	DAGS©x3	MWLSX6	MWLS ©X4	LFBUX5	MCU	RMC	CLEAN LINE SEGMENT. REMOVE ROOTS	MONITOR CHANGES TO LINING CONDITION AND REPAIR AS NEEDED.REMOVE ROOTS AND GROUT WITH ROOT INHIBITOR ADDITIVE
2/21/2020	1187	1179	Maple street	10	VCP	87.88		2400	2C00	2	DAGSX 2	DAGS©X2	MWLSX 4	DSFX2						CLEAN LINE SEGMENT	
2/21/2020	1185	1852	Maple street	10	VCP	56.95	MSA/ Survey abandoned. Reverse was performed. The	0000	5141	3.7	DAGSX 3	MSA GREASE 50%								CLEAN LINE SEGMENT	
2/24/2020	1851	1850	Maple street	10	VCP	284.87		322B	2D00	2	TFD	DAZ©	LFOC	MWLS	LFUC	MWLS ©				CLEAN LINE SEGMENT	MONITOR CHANGES TO LINING CONDITION AND REPAIR AS NEEDED.
2/24/2020	1850	2646	Maple street	10	VCP	256.25	MCU/ Camera under water	3A22	4121	2.2	DAZ©	MWLSX3	MWLS ©	MCU						CLEAN LINE SEGMENT	
2/26/2020	H6	H7	Chestnut street	10	CONC	53.06	MMC/Corrugated metal pipe. MSA/Survey	2100	2111	1.7	DAGS	MSC/8"/10"	MMC - CORR METAL	LD	JOL	MSA - DUE TO JOL				CLEAN LINE SEGMENT	POINT REPAIR TO FIX JOINT OFFSET.
2/26/2020	H4	H5	Chestnut street	10	Cast Iron	18.75	MSA/Survey abandoned. Reverse performed	3100	3124	2.3	DAE	DAE©	DSC	SCP	MSA - DSC 25%					CLEAN LINE SEGMENT	MONITOR FOR INCREASED CORROSION AND TAKE CORRECTIVE ACTION AS NEEDED.
2/26/2020	F163	F164	Beech street	12	Cast Iron	39.6	MSA/Survey abandoned/OBR	5131	2111	2.8	SCP	H	LD	DSF	MSA - OBR					CLEAN LINE SEGMENT/REMOVE OBSTACLE	POINT REPAIR TO FIX HOLE. MONITOR SURFACE CORROSION AND TAKE ACTION AS NEEDED.
2/26/2020	H4_Reverse	H5_Reverse	Chestnut street	10/12	Cast Iron/Clay tile	59.35	MSA/ Survey abandoned. Size change to 12	0000	3121	2.5	DSGV	MMC/Clay pipe/cast iron/CHANGE TO 12"	MSA							CLEAN LINE SEGMENT	
2/26/2020	H6_Reverse	H7_Reverse	Chestnut street	10	CONC	52.37	MSA/Size change	0000	2100	2	DSF	MSC/6"/8"	MSA							CLEAN LINE SEGMENT	
2/26/2020	F165	F166	Beech street	12	Cast Iron	81.19		3B00	1100	2.9	SCP©	LD									MONITOR FOR INCREASED CORROSION AND TAKE CORRECTIVE ACTION AS NEEDED.
2/26/2020	F101	Redwood	Redwood	15	RCP	25.53		0000	0000	0											
2/26/2020	F102	Redwood	Redwood	15	RCP	34.31		0000	0000	0											
3/20/2020	1185-post	1852	Maple street	10	VCP	72.81	Post cleaning	0000	412B	2.1	DAZ	MGO - POST CLEANING INSPECTION	DAGSX 3	DAGS©						CLEAN LINE SEGMENT	
3/23/2020	1852_Reverse	1851_Reverse	Maple street	10	Clay tile	90.93	MSA/survey abandoned. 90 degree alignment	3823	5126	2.6	MWM	LFB©	MWLS ©	DAGS©	MSA - 90 DEGREE ALIGN					CLEAN LINE SEGMENT	MONITOR CHANGES TO LINING CONDITION AND REPAIR AS NEEDED.
3/23/2020	1852	1851	Maple street	10	Clay tile	135.94	MGO/MH 63. MSA/ Survey abandoned/90 bend. Reverse performed	3100	3100	3	DAGS	MWLS	MGO	MSA - 90 DEGREE BEND						CLEAN LINE SEGMENT	
					Total	**1932.11**															

STRUCTURAL ITEMS ARE SHADED IN PINK

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APPENDIX B

CCTV Videos

Delivered Separately

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APPENDIX C

PACP Scoring Report

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Section Profile

Project
REDWOOD CITY SEWER AND STORM CCTV [Greystar]

2/21/2020

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
1	1187	1179	2/21/2020	MAPLE STREET		Vitrified Clay Pipe	87.88	87.88
2	1179	1186	2/21/2020	MAPLE STREET		Vitrified Clay Pipe	326.57	326.57
3	1186	1185	2/21/2020	MAPLE STREET		Vitrified Clay Pipe	255.75	255.75
4	1185	1852	2/21/2020	MAPLE STREET		Vitrified Clay Pipe	56.95	56.95
5	1851	1850	2/24/2020	MAPLE STREET		Vitrified Clay Pipe	284.87	284.87
6	1850	2646	2/24/2020	MAPLE STREET		Vitrified Clay Pipe	256.25	256.25
7	H4	H5	2/26/2020	CHESTNUT ST		Cast Iron	59.35	59.35
7	H4	H5	2/26/2020	CHESTNUT ST		Cast Iron	59.35	**18.75**
8	H6	H7	2/26/2020	CHESTNUT ST		Concrete Pipe (non-reinforced)	53.06	53.06
8	H6	H7	2/26/2020	CHESTNUT ST		Concrete Pipe (non-reinforced)	53.06	**52.37**
13	1852	1851	3/23/2020	MAPLE ST		Clay Tile (not vitrified clay)	135.94	**90.93**
13	1852	1851	3/23/2020	MAPLE ST		Clay Tile (not vitrified clay)	135.94	135.94
15	1185-POST	1852	3/20/2020	MAPLE STREET		Vitrified Clay Pipe	72.81	72.81

13 x Circular 10 = 1589.43 Total Length (1589.43 Length Surveyed)

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
9	F163	F164	2/26/2020	BEECH ST		Cast Iron	39.60	39.60
10	F165	F166	2/26/2020	BEECH ST		Cast Iron	81.19	81.19

2 x Circular 12 = 120.79 Total Length (120.79 Length Surveyed)

Nr.	Upstream MH	Downstream MH	Date	Street	Media Label	Material	Total Length	Length Surveyed
11	F101	REDWOOD CREEK OUT FALL #1	2/26/2020	REDWOOD CREEK		Reinforced Concrete Pipe	25.53	25.53
12	F102	REDWOOD CREEK OUT FALL #2	2/26/2020	REDWOOD CREEK		Reinforced Concrete Pipe	34.31	34.31

2 x Circular 15 = 59.85 Total Length (59.85 Length Surveyed)

Total: 17 = 1770.07 Total Length (1770.07 Length Surveyed)

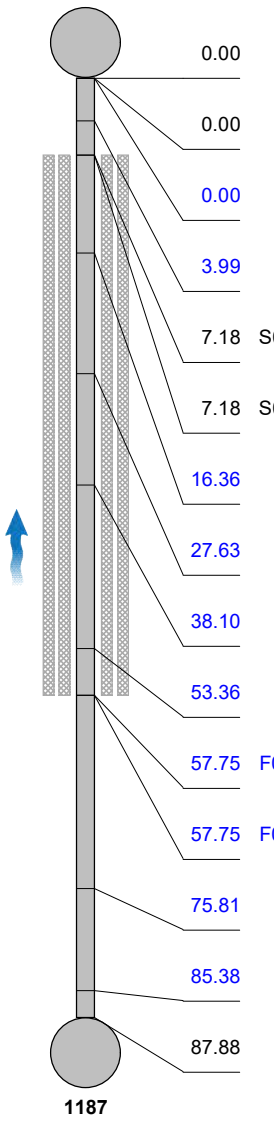
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1187-1179**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1187**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Light highway**	Flow Control:	**Not Controlled**	Downstream MH:	**1179**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1179	00:00:26	1	
0.00		MWL	Water Level, 10% of the vertical dimension	00:00:39	2	
0.00		DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:00:43	3	M2
3.99		DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:01:32	4, 5	M2
7.18	S01	DAGS	Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Start	00:01:59	6, 7	
7.18	S02	DAGS	Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Start	00:02:03	8, 9	
16.36		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:03:44	10, 11	S2
27.63		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:04:32	12, 13	S2
38.10		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:05:13	14, 15	S2
53.36		MWLS	Water Level, Sag in pipe, 15% of the vertical dimension	00:06:09	16, 17	S2
57.75	F01	DAGS	Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Finish	00:06:33	18, 19	M2
57.75	F02	DAGS	Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Finish	00:06:36	20, 21	M2
75.81		DSF	Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock	00:07:42	22, 23	M2
85.38		DSF	Deposits Settled Fine, 5% of cross sectional area from 5 o'clock to 7 o'clock	00:08:23	24, 25	M2
87.88		AMH	Manhole / 1187	00:08:50	26	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
2400	2C00	8.0	48.0	56.0	2.0	2.0	2.0

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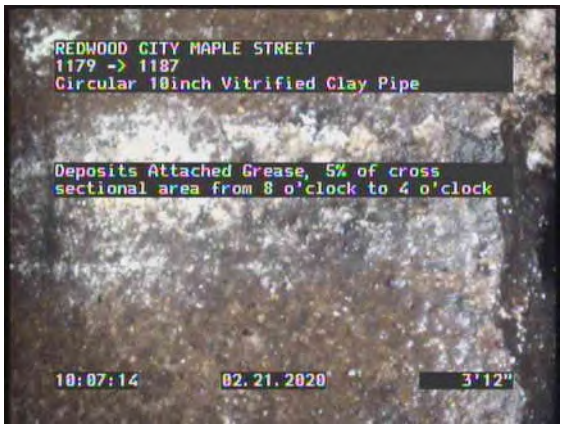
Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

1, 00:00:26, 0.00ft
Manhole / 1179

2, 00:00:39, 0.00ft
Water Level, 10% of the vertical dimension

3, 00:00:43, 0.00ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock



4, 00:01:32, 3.99ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock

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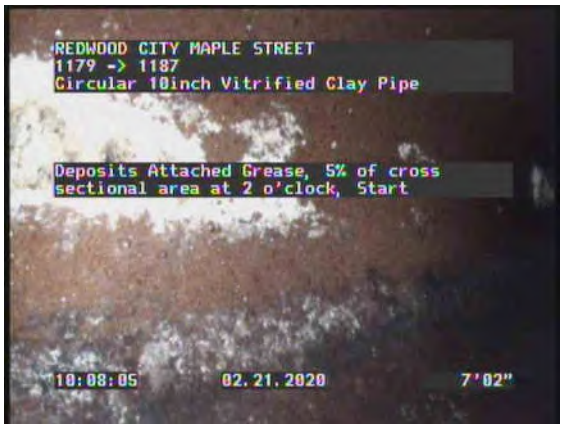
Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

5, 00:01:32, 3.99ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock

6, 00:01:59, 7.18ft
Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Start

7, 00:01:59, 7.18ft
Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Start



8, 00:02:03, 7.18ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Start

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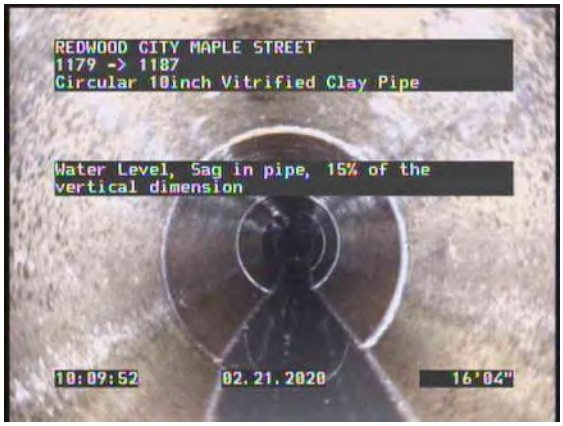
Section Pictures - 2/21/2020 - 1187-1179

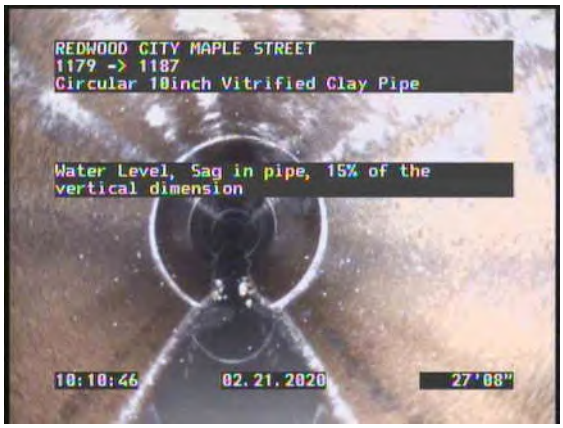
City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

9, 00:02:03, 7.18ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Start



10, 00:03:44, 16.36ft
Water Level, Sag in pipe, 15% of the vertical dimension

11, 00:03:44, 16.36ft
Water Level, Sag in pipe, 15% of the vertical dimension



12, 00:04:32, 27.63ft
Water Level, Sag in pipe, 15% of the vertical dimension

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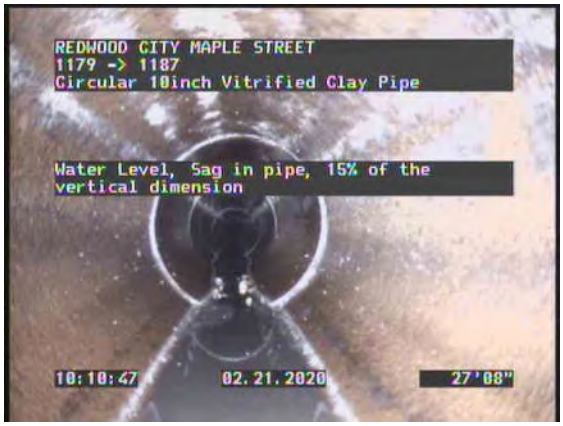
Section Pictures - 2/21/2020 - 1187-1179

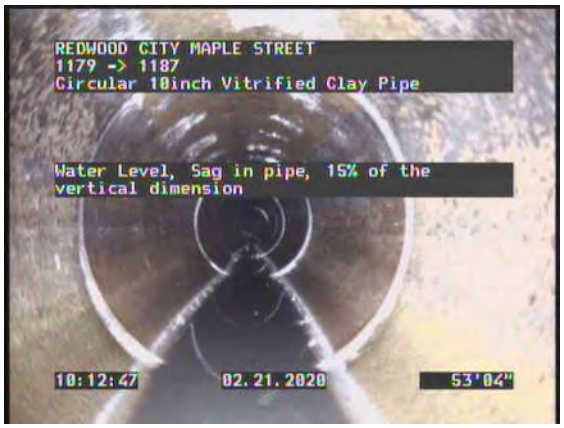
City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**



13, 00:04:32, 27.63ft
Water Level, Sag in pipe, 15% of the vertical dimension

14, 00:05:13, 38.10ft
Water Level, Sag in pipe, 15% of the vertical dimension

15, 00:05:13, 38.10ft
Water Level, Sag in pipe, 15% of the vertical dimension



16, 00:06:09, 53.36ft
Water Level, Sag in pipe, 15% of the vertical dimension

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Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

17, 00:06:09, 53.36ft
Water Level, Sag in pipe, 15% of the vertical dimension

18, 00:06:33, 57.75ft
Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Finish

19, 00:06:33, 57.75ft
Deposits Attached Grease, 5% of cross sectional area at 10 o'clock, Finish

20, 00:06:36, 57.75ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Finish

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Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

21, 00:06:36, 57.75ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock, Finish

22, 00:07:42, 75.81ft
Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock

23, 00:07:42, 75.81ft
Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock

24, 00:08:23, 85.38ft
Deposits Settled Fine, 5% of cross sectional area from 5 o'clock to 7 o'clock

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Section Pictures - 2/21/2020 - 1187-1179

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1187-1179**	**1**

25, 00:08:23, 85.38ft
Deposits Settled Fine, 5% of cross sectional area from 5 o'clock to 7 o'clock

26, 00:08:50, 87.88ft
Manhole / 1187

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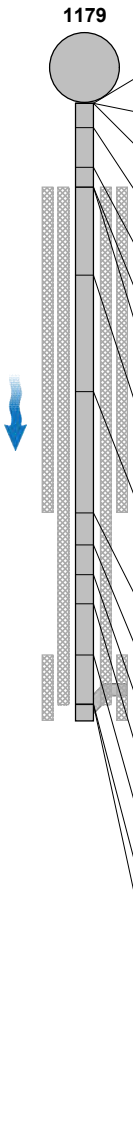
Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1179-1186**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1179**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Light highway**	Flow Control:	**Not Controlled**	Downstream MH:	**1186**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:	**Cured in Place**	Owner:			

Additional Info:



Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1179	00:00:30	1, 2	
0.00		MWL	Water Level, 15% of the vertical dimension	00:00:45	3	
0.00		DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:00:49	4	M2
3.99		DAZ	Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock	00:02:25	5, 6	M2
10.47		DAGS	Deposits Attached Grease, 5% of cross sectional area at 11 o'clock	00:03:05	7, 8	M2
13.67	S01	DAZ	Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Start	00:03:33	9, 10	
13.67	S02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / WONDERS	00:03:43	11, 12	
27.93		MWLS	Water Level, Sag in pipe, 20% of the vertical dimension	00:04:41	13, 14	S2
46.88		MWLS	Water Level, Sag in pipe, 25% of the vertical dimension	00:05:49	15	S2
66.53	F01	DAZ	Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Finish	00:07:34	16, 17	M2
71.82		MWLS	Water Level, Sag in pipe, 25% of the vertical dimension	00:07:59	18, 19	S2
76.60		MWLS	Water Level, Sag in pipe, 35% of the vertical dimension	00:08:22	20, 21	S3
81.39		MWLS	Water Level, Sag in pipe, 45% of the vertical dimension	00:08:52	22, 23	S3
89.67	S03	MWLS	Water Level, Sag in pipe, 40% of the vertical dimension, Start	00:09:24	24	
97.55		TFA	Tap Factory Made Active at 9 o'clock, 6inch dim	00:09:50	25	
97.75	F02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / WONDERS	00:10:09	26, 27	M2

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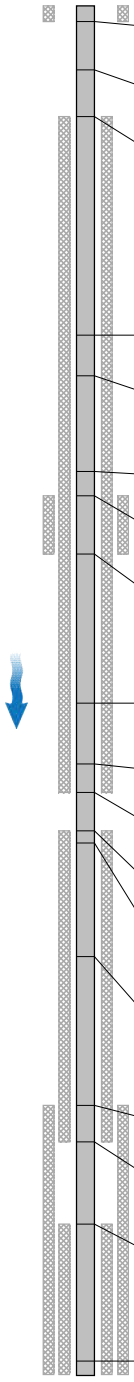
Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1179-1186**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

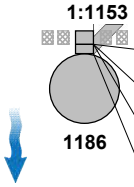


1:1153 Distance		Code	Observation	Counter	Photo	Grade
103.04	F03	MWLS	Water Level, Sag in pipe, 40% of the vertical dimension, Finish	00:10:27	28, 29	S3
110.82		MWLS	Water Level, Sag in pipe, 25% of the vertical dimension	00:10:53	30, 31	S2
118.40	S04	MWLS	Water Level, Sag in pipe, 25% of the vertical dimension, Start	00:11:24	32, 33	
153.91		DAGS	Deposits Attached Grease, 5% of cross sectional area at 1 o'clock	00:13:22	34, 35	M2
160.49		DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock	00:14:00	36, 37	M2
176.05		LFBU	Lining Failure Bulges at 3 o'clock	00:14:52	38, 39	S3
180.04	S05	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / DEFECT WONDERS	00:15:21	40, 41	
189.52	F05	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / DEFECT WONDERS	00:16:05	42, 43	M2
213.65		LFBU	Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch	00:17:25	44, 45	S3
223.63		LFBU	Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch	00:18:25	46, 47	S3
228.22	F04	MWLS	Water Level, Sag in pipe, 25% of the vertical dimension, Finish	00:18:58	48, 49	S2
234.40	S06	MWLS	Water Level, Sag in pipe, 25% of the vertical dimension, Start	00:19:20	50, 51	
236.40		LFBU	Lining Failure Bulges from 9 o'clock to 3 o'clock	00:19:45	52, 53	S3
254.85		LFBU	Lining Failure Bulges from 11 o'clock to 1 o'clock, within 8 inch	00:21:06	54, 55	S3
279.09	S07	MWLS	Water Level, Sag in pipe, 35% of the vertical dimension, Start	00:22:16	56	
284.97	F06	MWLS	Water Level, Sag in pipe, 25% of the vertical dimension, Finish	00:22:41	57	S2
298.34	S08	DAGS	Deposits Attached Grease, 5% of cross sectional area from 9 o'clock to 3 o'clock, Start / DEFECT WONDERS	00:23:33	58	
320.58		MCU	Camera Underwater	00:26:01	59	M4

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1179-1186**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
		Downstream			



Distance		Code	Observation	Counter	Photo	Grade
325.17	F07	MWLS	Water Level, Sag in pipe, 50% of the vertical dimension, Finish	00:26:36	60	S3
325.17	F08	DAGS	Deposits Attached Grease, 5% of cross sectional area from 9 o'clock to 3 o'clock, Finish / DEFECT WONDERS	00:26:40	61	M2
325.17		RMC	Roots Medium Connection from 8 o'clock to 4 o'clock, 15% lost / AT MANHOLE	00:26:48	62	M3
326.57		AMH	Manhole / 1186 MANHOLE HAS ROOTS IN THE CHANNEL	00:27:13	63	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3B2F	4131	129.0	87.0	216.0	2.3	2.1	2.2

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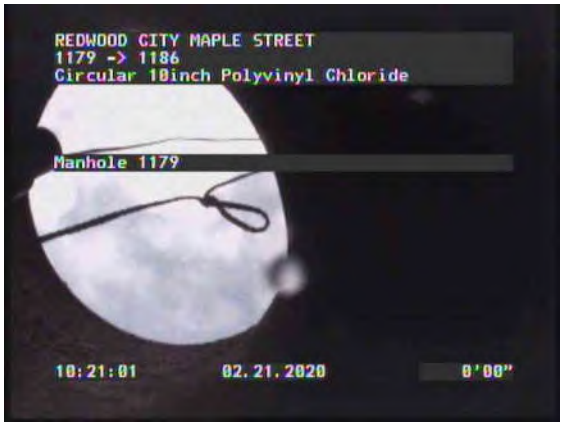
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**



1, 00:00:30, 0.00ft
Manhole / 1179

2, 00:00:30, 0.00ft
Manhole / 1179

3, 00:00:45, 0.00ft
Water Level, 15% of the vertical dimension

4, 00:00:49, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock

WinCan

Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

5, 00:02:25, 3.99ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock

6, 00:02:25, 3.99ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock

7, 00:03:05, 10.47ft
Deposits Attached Grease, 5% of cross sectional area at 11 o'clock

8, 00:03:05, 10.47ft
Deposits Attached Grease, 5% of cross sectional area at 11 o'clock

WinCan

Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

9, 00:03:33, 13.67ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Start

10, 00:03:33, 13.67ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Start

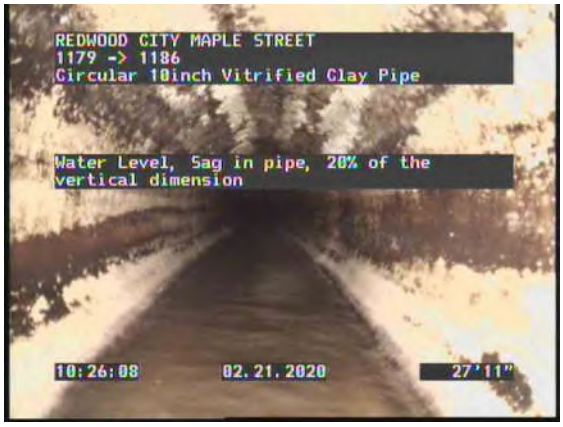
11, 00:03:43, 13.67ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / WONDERS

12, 00:03:43, 13.67ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / WONDERS

WinCan

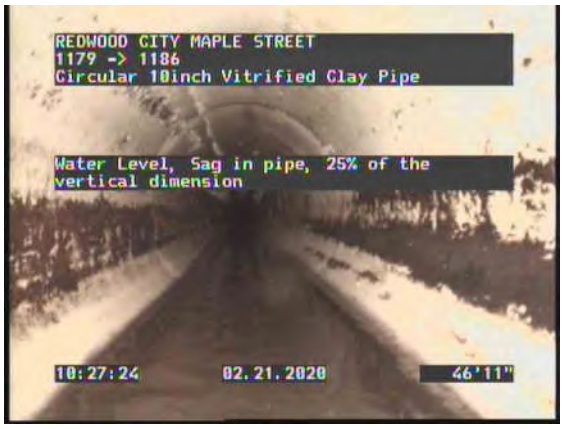
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

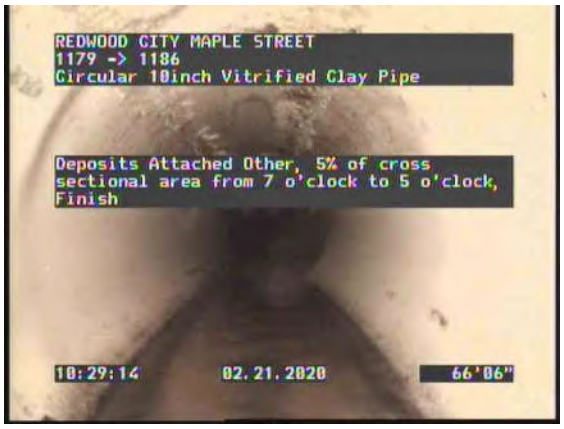


13, 00:04:41, 27.93ft
Water Level, Sag in pipe, 20% of the vertical dimension

14, 00:04:41, 27.93ft
Water Level, Sag in pipe, 20% of the vertical dimension



15, 00:05:49, 46.88ft
Water Level, Sag in pipe, 25% of the vertical dimension



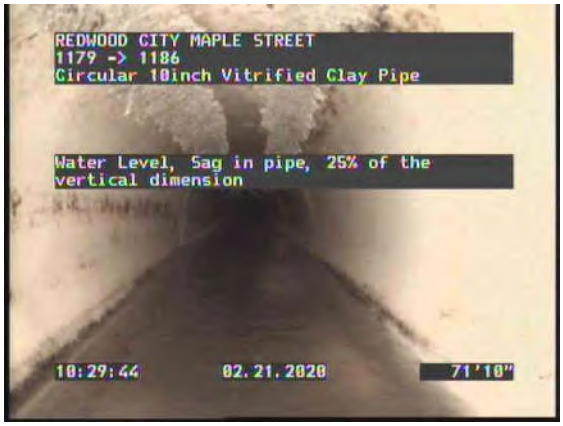
16, 00:07:34, 66.53ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Finish

WinCan

Section Pictures - 2/21/2020 - 1179-1186

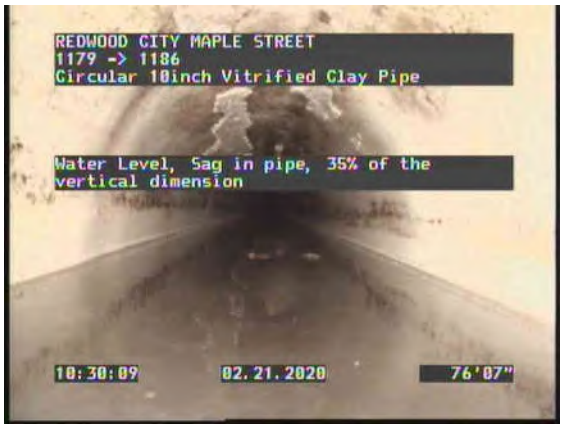
City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

17, 00:07:34, 66.53ft
Deposits Attached Other, 5% of cross sectional area from 7 o'clock to 5 o'clock, Finish



18, 00:07:59, 71.82ft
Water Level, Sag in pipe, 25% of the vertical dimension

19, 00:07:59, 71.82ft
Water Level, Sag in pipe, 25% of the vertical dimension



20, 00:08:22, 76.60ft
Water Level, Sag in pipe, 35% of the vertical dimension

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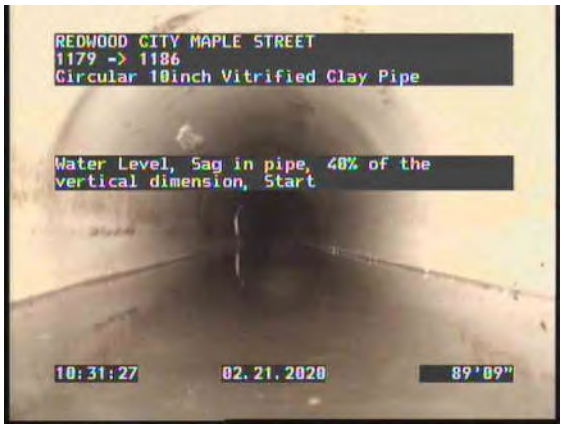
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

21, 00:08:22, 76.60ft
Water Level, Sag in pipe, 35% of the vertical dimension

22, 00:08:52, 81.39ft
Water Level, Sag in pipe, 45% of the vertical dimension

23, 00:08:52, 81.39ft
Water Level, Sag in pipe, 45% of the vertical dimension



24, 00:09:24, 89.67ft
Water Level, Sag in pipe, 40% of the vertical dimension, Start

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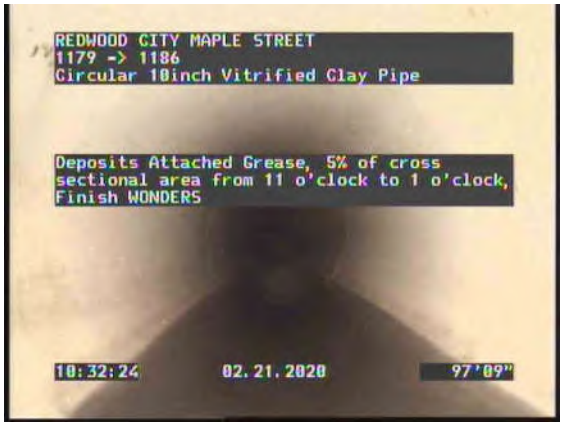
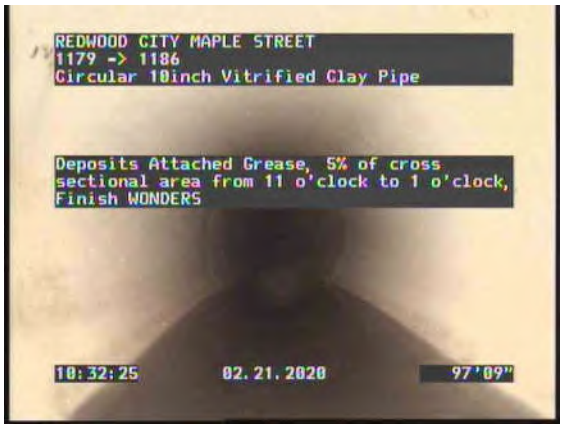
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

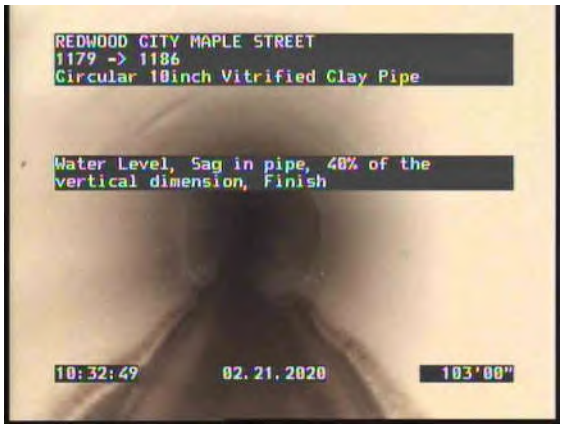
25, 00:09:50, 97.55ft
Tap Factory Made Active at 9 o'clock, 6inch dim



26, 00:10:09, 97.75ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / WONDERS



27, 00:10:09, 97.75ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / WONDERS



28, 00:10:27, 103.04ft
Water Level, Sag in pipe, 40% of the vertical dimension, Finish

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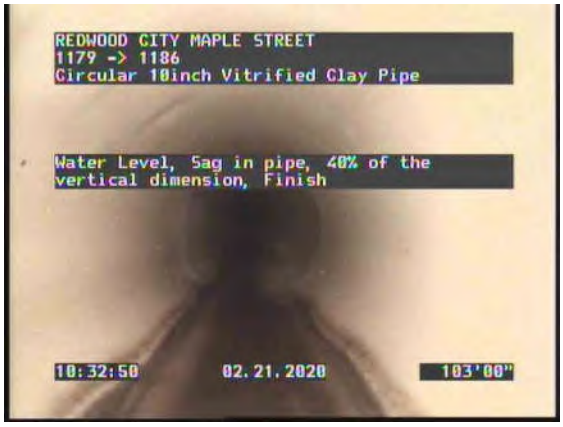
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**



29, 00:10:27, 103.04ft
Water Level, Sag in pipe, 40% of the vertical dimension, Finish

30, 00:10:53, 110.82ft
Water Level, Sag in pipe, 25% of the vertical dimension

31, 00:10:53, 110.82ft
Water Level, Sag in pipe, 25% of the vertical dimension

32, 00:11:24, 118.40ft
Water Level, Sag in pipe, 25% of the vertical dimension, Start

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Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

33, 00:11:24, 118.40ft
Water Level, Sag in pipe, 25% of the vertical dimension, Start

34, 00:13:22, 153.91ft
Deposits Attached Grease, 5% of cross sectional area at 1 o'clock

35, 00:13:22, 153.91ft
Deposits Attached Grease, 5% of cross sectional area at 1 o'clock

36, 00:14:00, 160.49ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock

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Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

37, 00:14:00, 160.49ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock

38, 00:14:52, 176.05ft
Lining Failure Bulges at 3 o'clock

39, 00:14:52, 176.05ft
Lining Failure Bulges at 3 o'clock

40, 00:15:21, 180.04ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / DEFECT WONDERS

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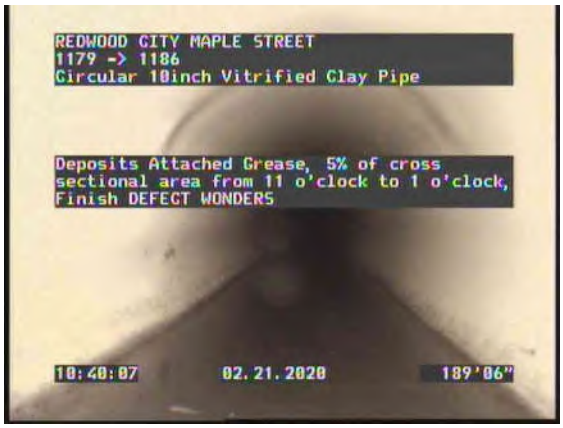
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

41, 00:15:21, 180.04ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Start / DEFECT WONDERS

42, 00:16:05, 189.52ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / DEFECT WONDERS



43, 00:16:05, 189.52ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, Finish / DEFECT WONDERS

44, 00:17:25, 213.65ft
Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch

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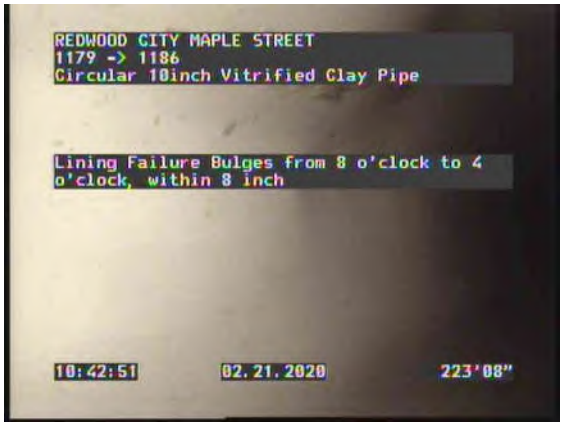
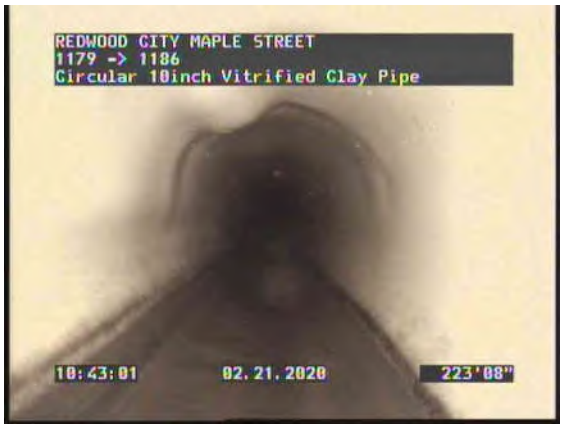
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

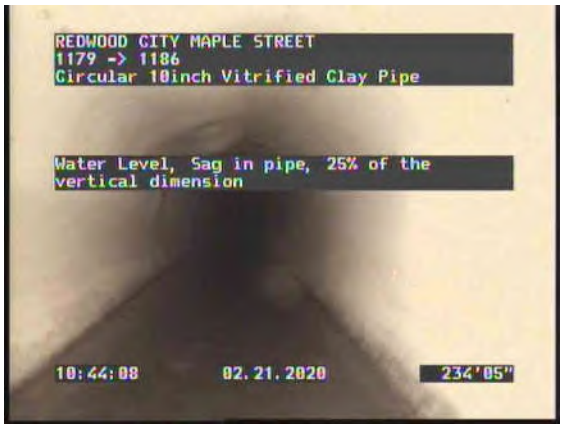
45, 00:17:25, 213.65ft
Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch



46, 00:18:25, 223.63ft
Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch



47, 00:18:25, 223.63ft
Lining Failure Bulges from 8 o'clock to 4 o'clock, within 8 inch



48, 00:18:58, 228.22ft
Water Level, Sag in pipe, 25% of the vertical dimension, Finish

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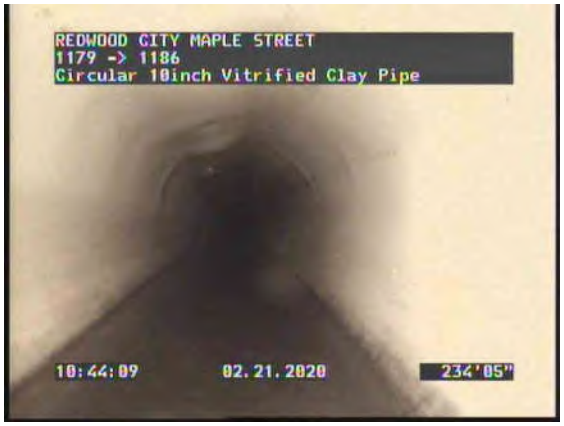
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

49, 00:18:58, 228.22ft
Water Level, Sag in pipe, 25% of the vertical dimension, Finish



50, 00:19:20, 234.40ft
Water Level, Sag in pipe, 25% of the vertical dimension, Start

51, 00:19:20, 234.40ft
Water Level, Sag in pipe, 25% of the vertical dimension, Start

52, 00:19:45, 236.40ft
Lining Failure Bulges from 9 o'clock to 3 o'clock

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Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

53, 00:19:45, 236.40ft
Lining Failure Bulges from 9 o'clock to 3 o'clock

54, 00:21:06, 254.85ft
Lining Failure Bulges from 11 o'clock to 1 o'clock, within 8 inch

55, 00:21:06, 254.85ft
Lining Failure Bulges from 11 o'clock to 1 o'clock, within 8 inch

56, 00:22:16, 279.09ft
Water Level, Sag in pipe, 35% of the vertical dimension, Start

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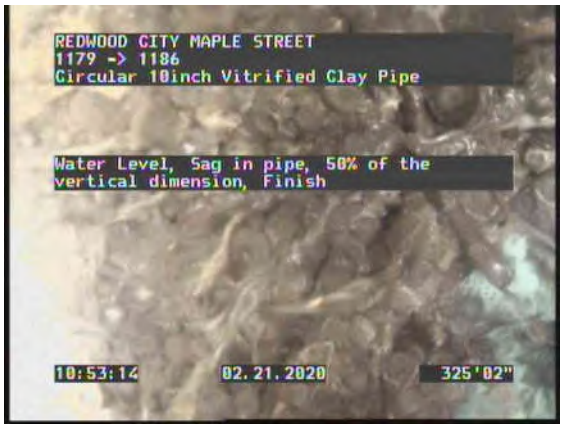
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**

57, 00:22:41, 284.97ft
Water Level, Sag in pipe, 25% of the vertical dimension, Finish

58, 00:23:33, 298.34ft
Deposits Attached Grease, 5% of cross sectional area from 9 o'clock to 3 o'clock, Start / DEFECT WONDERS

59, 00:26:01, 320.58ft
Camera Underwater



60, 00:26:36, 325.17ft
Water Level, Sag in pipe, 50% of the vertical dimension, Finish

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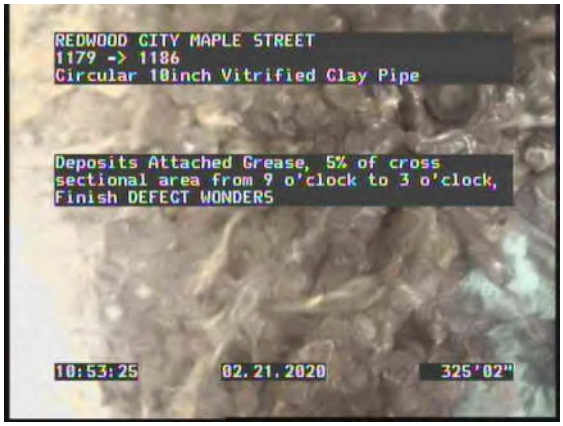
Section Pictures - 2/21/2020 - 1179-1186

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1179-1186**	**2**



61, 00:26:40, 325.17ft
Deposits Attached Grease, 5% of cross sectional area from 9 o'clock to 3 o'clock, Finish / DEFECT WONDERS

62, 00:26:48, 325.17ft
Roots Medium Connection from 8 o'clock to 4 o'clock, 15% lost / AT MANHOLE

63, 00:27:13, 326.57ft
Manhole / 1186
MANHOLE HAS ROOTS IN THE CHANNEL

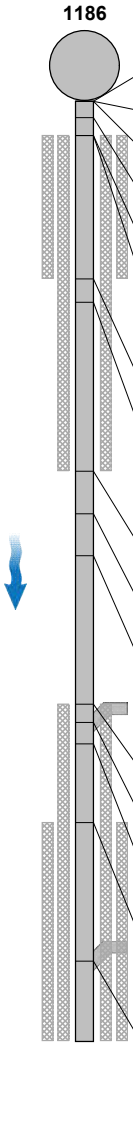
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1186-1185**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1186**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Light highway**	Flow Control:	**Not Controlled**	Downstream MH:	**1185**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:	**Cured in Place**	Owner:			

Additional Info:



Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1186	00:00:38	1	
0.00		MWL	Water Level, 20% of the vertical dimension	00:02:04	2	
0.00		DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:02:11	3	M2
3.59		DAGS	Deposits Attached Grease, 10% of cross sectional area from 10 o'clock to 2 o'clock	00:03:32	4, 5	M2
7.38	S01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start	00:03:59	6, 7	
7.38	S02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start	00:04:01	8, 9	
37.70	F01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish	00:05:48	10, 11	M2
42.79		LFBU	Lining Failure Bulges from 7 o'clock to 8 o'clock, within 8 inch	00:06:13	12, 13	S3
78.60	F02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Finish	00:08:29	14, 15	M2
87.58		DAGS	Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock	00:09:10	16, 17	M2
96.45		MWL	Water Level, 25% of the vertical dimension / MWLS	00:09:58	18, 19	
128.07	S03	DAGS	Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start / WONDERS	00:11:59	20, 21	
131.96		TF	Tap Factory Made at 9 o'clock, 6inch dim	00:12:31	22	
136.45		MWL	Water Level, 35% of the vertical dimension	00:13:19	23	
153.21	S04	DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS	00:17:45	24, 25	
182.53		TFB	Tap Factory Made Abandoned at 10 o'clock, 6inch dim	00:18:54	26, 27	

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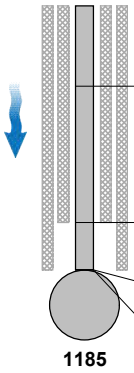
Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1186-1185**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:



Distance		Code	Observation	Counter	Photo	Grade
216.65		MWLS	Water Level, Sag in pipe, 30% of the vertical dimension	00:20:11	28, 29	S2
245.67	F03	DAGS	Deposits Attached Grease, 10% of cross sectional area from 8 o'clock to 4 o'clock, Finish / WONDERS	00:21:38	30	M2
255.75	F04	DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / WONDERS	00:22:45	31, 32	M2
255.75		AMH	Manhole / 1185	00:22:48	33	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3121	2L00	5.0	136.0	141.0	2.5	2.0	2.0

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Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

1, 00:00:38, 0.00ft
Manhole / 1186

2, 00:02:04, 0.00ft
Water Level, 20% of the vertical dimension

3, 00:02:11, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock

4, 00:03:32, 3.59ft
Deposits Attached Grease, 10% of cross sectional area from 10 o'clock to 2 o'clock

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Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

5, 00:03:32, 3.59ft
Deposits Attached Grease, 10% of cross sectional area from 10 o'clock to 2 o'clock

6, 00:03:59, 7.38ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start

7, 00:03:59, 7.38ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start

8, 00:04:01, 7.38ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start

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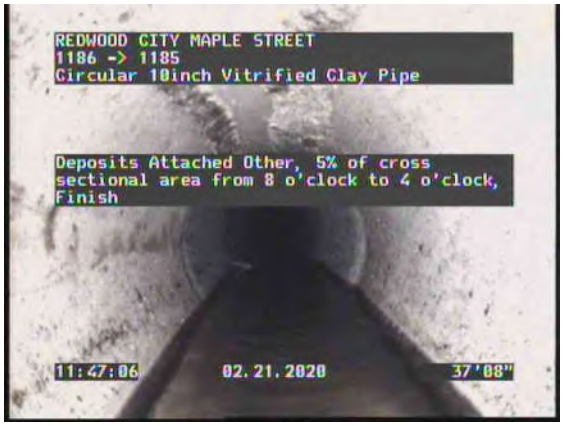
Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

9, 00:04:01, 7.38ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start



10, 00:05:48, 37.70ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish

11, 00:05:48, 37.70ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish

12, 00:06:13, 42.79ft
Lining Failure Bulges from 7 o'clock to 8 o'clock, within 8 inch

WinCan

Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

13, 00:06:13, 42.79ft
Lining Failure Bulges from 7 o'clock to 8 o'clock, within 8 inch

14, 00:08:29, 78.60ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Finish

15, 00:08:29, 78.60ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Finish

16, 00:09:10, 87.58ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock

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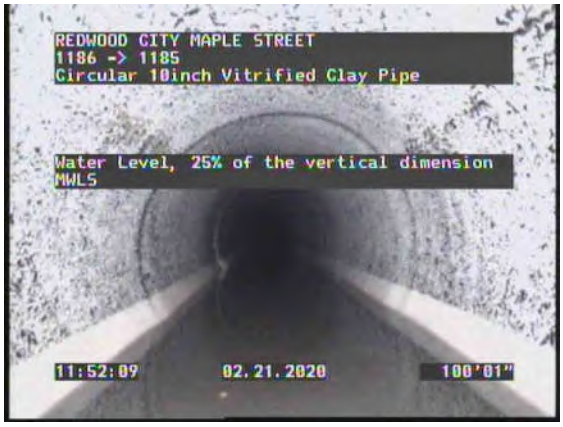
Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

17, 00:09:10, 87.58ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock



18, 00:09:58, 96.45ft
Water Level, 25% of the vertical dimension / MWLS

19, 00:09:58, 96.45ft
Water Level, 25% of the vertical dimension / MWLS

20, 00:11:59, 128.07ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start / WONDERS

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Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

21, 00:11:59, 128.07ft
Deposits Attached Grease, 5% of cross sectional area from 10 o'clock to 2 o'clock, Start / WONDERS

22, 00:12:31, 131.96ft
Tap Factory Made at 9 o'clock, 6inch dim

23, 00:13:19, 136.45ft
Water Level, 35% of the vertical dimension

24, 00:17:45, 153.21ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS

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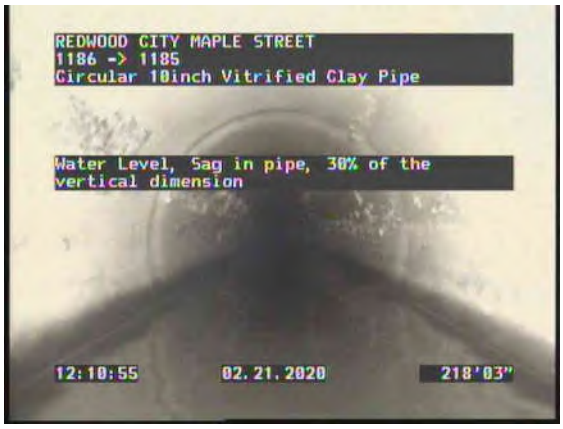
Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

25, 00:17:45, 153.21ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS

26, 00:18:54, 182.53ft
Tap Factory Made Abandoned at 10 o'clock, 6inch dim

27, 00:18:54, 182.53ft
Tap Factory Made Abandoned at 10 o'clock, 6inch dim



28, 00:20:11, 216.65ft
Water Level, Sag in pipe, 30% of the vertical dimension

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Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

29, 00:20:11, 216.65ft
Water Level, Sag in pipe, 30% of the vertical dimension

30, 00:21:38, 245.67ft
Deposits Attached Grease, 10% of cross sectional area from 8 o'clock to 4 o'clock, Finish / WONDERS

31, 00:22:45, 255.75ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / WONDERS

32, 00:22:45, 255.75ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / WONDERS

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Section Pictures - 2/21/2020 - 1186-1185

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1186-1185**	**3**

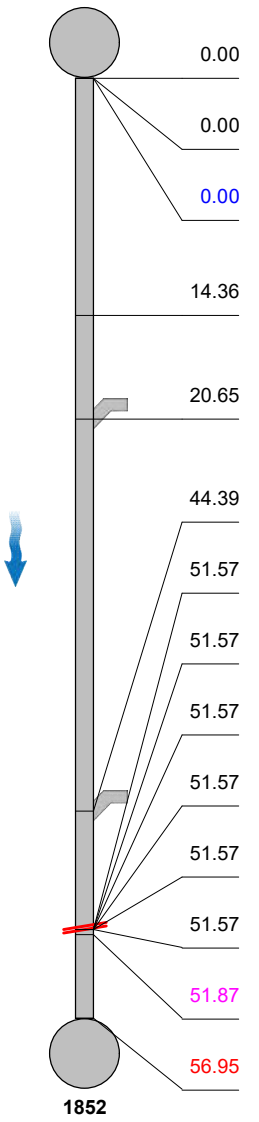
33, 00:22:48, 255.75ft
Manhole / 1185

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/21/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1185-1852**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:			Upstream MH:	**1185**	
Street:	**MAPLE STREET**	Media Label:			Up Rim to Invert:	**0.0**	
Location Code:	**Light highway**	Flow Control:			Downstream MH:	**1852**	
Location Details:		Sheet Number:			Down Rim to Invert:	**0.0**	
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**		Total gallons used:	**0.0**	
Pipe size:	**10 "**	Sewer Category:	**SEC**		Joints passed:	**0**	
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**		Joints failed:	**0**	
Lining Method:	**Cured in Place**	Owner:					
Additional Info:							



1:430 Distance	Code	Observation	Counter	Photo	Grade
0.00	AMH	Manhole / 1185	00:00:21	1	
0.00	MWL	Water Level, 20% of the vertical dimension	00:00:36	2	
0.00	DAGS	Deposits Attached Grease, 10% of cross sectional area from 8 o'clock to 4 o'clock / DEFECT WONDERS	00:00:38	3	M2
14.36	MWL	Water Level, 40% of the vertical dimension	00:01:28	4	
20.65	TF	Tap Factory Made at 10 o'clock, 6inch dim	00:01:45	5, 6	
44.39	TFC	Tap Factory Made Capped at 9 o'clock, 6inch dim	00:02:40	7	
51.57	C	Remark: ***** Combined *****			
51.57	C	Remark: Inspection from the other side			
51.57	C	Remark: Uninspected Length: 0.0			
51.57	C	Remark: Inspection from the other side			
51.57	C	Remark: ***** Combined *****			
51.57	MSA	Survey Abandoned / GREASE 50%	00:06:02	8, 9	
51.87	DAGS	Deposits Attached Grease, 25% of cross sectional area at 9 o'clock	00:03:13	10, 11	M4
56.95	DAGS	Deposits Attached Grease, 50% of cross sectional area from 9 o'clock to 3 o'clock	00:04:14	12, 13	M5

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	5141	0.0	11.0	11.0	0.0	3.7	3.7

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Section Pictures - 2/21/2020 - 1185-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1185-1852**	**4**

1, 00:00:21, 0.00ft
Manhole / 1185

2, 00:00:36, 0.00ft
Water Level, 20% of the vertical dimension

3, 00:00:38, 0.00ft
Deposits Attached Grease, 10% of cross sectional area from 8 o'clock to 4 o'clock / DEFECT WONDERS

4, 00:01:28, 14.36ft
Water Level, 40% of the vertical dimension

WinCan

Section Pictures - 2/21/2020 - 1185-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1185-1852**	**4**

5, 00:01:45, 20.65ft
Tap Factory Made at 10 o'clock, 6inch dim

6, 00:01:45, 20.65ft
Tap Factory Made at 10 o'clock, 6inch dim

7, 00:02:40, 44.39ft
Tap Factory Made Capped at 9 o'clock, 6inch dim

8, 00:06:02, 51.57ft
Survey Abandoned / GREASE 50%

WinCan

Section Pictures - 2/21/2020 - 1185-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1185-1852**	**4**

9, 00:06:02, 51.57ft
Survey Abandoned / GREASE 50%

10, 00:03:13, 51.87ft
Deposits Attached Grease, 25% of cross sectional area at 9 o'clock

11, 00:03:13, 51.87ft
Deposits Attached Grease, 25% of cross sectional area at 9 o'clock

12, 00:04:14, 56.95ft
Deposits Attached Grease, 50% of cross sectional area from 9 o'clock to 3 o'clock

WinCan

Section Pictures - 2/21/2020 - 1185-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/21/2020**	**1185-1852**	**4**

13, 00:04:14, 56.95ft
Deposits Attached Grease, 50% of cross sectional area from 9 o'clock to 3 o'clock

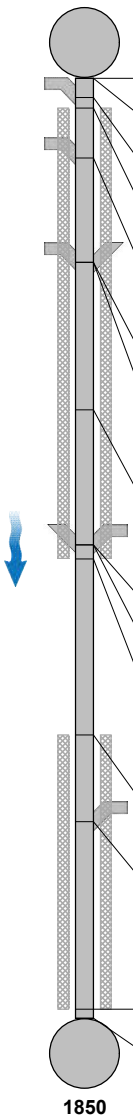
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/24/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1851-1850**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1851**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Light highway**	Flow Control:		Downstream MH:	**1850**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:	**Cured in Place**	Owner:			

Additional Info:



1:2150 Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1851	00:00:28	1, 2	
0.00		MWL	Water Level, 25% of the vertical dimension	00:00:43	3	
5.89		TFD	Tap Factory Made Defective at 3 o'clock, 6inch dim / BROKEN	00:01:21	4	M2
9.18	S01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS	00:02:00	5, 6	
24.24		TFB	Tap Factory Made Abandoned at 3 o'clock, 6inch dim	00:02:54	7	
55.76		TF	Tap Factory Made at 3 o'clock, 6inch dim	00:04:34	8	
55.76		LFOC	Lining Failure Overcut Connection from 7 o'clock to 10 o'clock	00:04:42	9, 10	S3
100.44		MWLS	Water Level, Sag in pipe, 30% of the vertical dimension	00:07:07	11	S2
141.34		LFUC	Lining Failure Undercut Connection from 2 o'clock to 5 o'clock	00:09:40	12, 13	S3
141.34		TFA	Tap Factory Made Active at 10 o'clock, 6inch dim	00:09:28	14	
145.63	F01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / DEFECT WONDERS	00:10:41	15, 16	M2
198.89	S02	MWLS	Water Level, Sag in pipe, 30% of the vertical dimension, Start / DEFECT WONDERS	00:12:44	17	
225.22		TFA	Tap Factory Made Active at 10 o'clock, 4inch dim	00:14:04	18	
281.98	F02	MWLS	Water Level, Sag in pipe, 30% of the vertical dimension, Finish / DEFECT WONDERS	00:17:25	19, 20	S2
284.87		AMH	Manhole / 1850	00:18:05	21	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
322B	2D00	42.0	56.0	98.0	2.1	2.0	2.0

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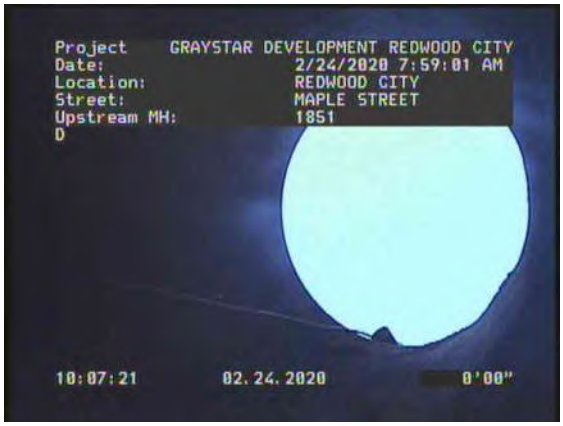
Section Pictures - 2/24/2020 - 1851-1850

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**



1, 00:00:28, 0.00ft
Manhole / 1851

2, 00:00:28, 0.00ft
Manhole / 1851

3, 00:00:43, 0.00ft
Water Level, 25% of the vertical dimension

4, 00:01:21, 5.89ft
Tap Factory Made Defective at 3 o'clock, 6inch dim / BROKEN

WinCan

Section Pictures - 2/24/2020 - 1851-1850

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**

5, 00:02:00, 9.18ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS

6, 00:02:00, 9.18ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / WONDERS

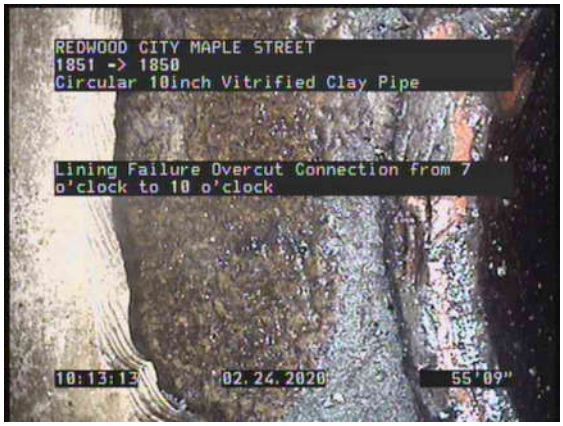
7, 00:02:54, 24.24ft
Tap Factory Made Abandoned at 3 o'clock, 6inch dim

8, 00:04:34, 55.76ft
Tap Factory Made at 3 o'clock, 6inch dim

WinCan

Section Pictures - 2/24/2020 - 1851-1850

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**



9, 00:04:42, 55.76ft
Lining Failure Overcut Connection from 7 o'clock to 10 o'clock

10, 00:04:42, 55.76ft
Lining Failure Overcut Connection from 7 o'clock to 10 o'clock

11, 00:07:07, 100.44ft
Water Level, Sag in pipe, 30% of the vertical dimension

12, 00:09:40, 141.34ft
Lining Failure Undercut Connection from 2 o'clock to 5 o'clock

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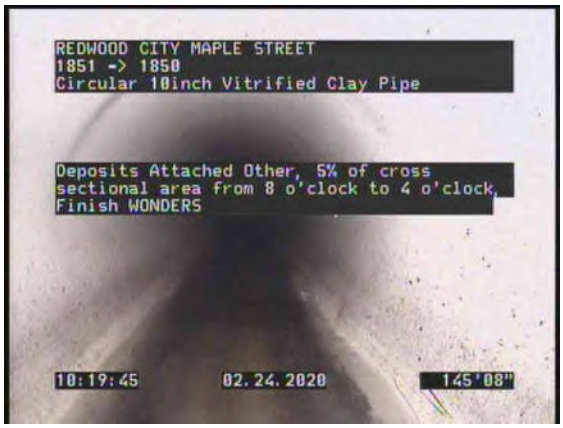
Section Pictures - 2/24/2020 - 1851-1850

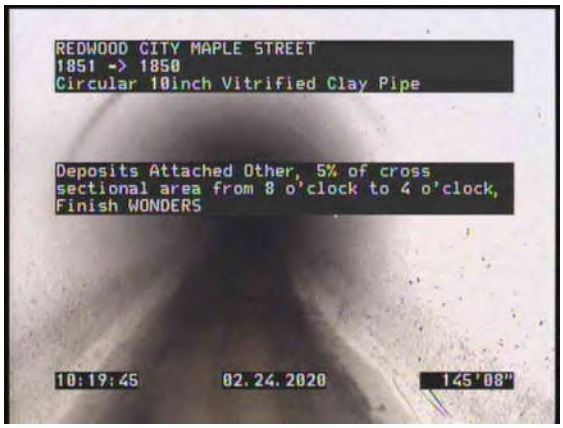
City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**

13, 00:09:40, 141.34ft
Lining Failure Undercut Connection from 2 o'clock to 5 o'clock

14, 00:09:28, 141.34ft
Tap Factory Made Active at 10 o'clock, 6inch dim



15, 00:10:41, 145.63ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / DEFECT WONDERS

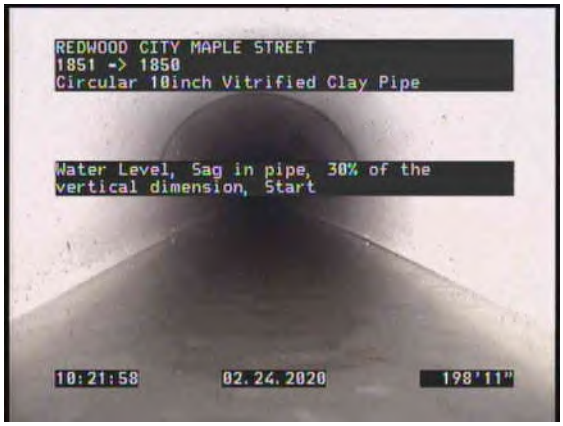


16, 00:10:41, 145.63ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / DEFECT WONDERS

WinCan

Section Pictures - 2/24/2020 - 1851-1850

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**



17, 00:12:44, 198.89ft
Water Level, Sag in pipe, 30% of the vertical dimension, Start / DEFECT WONDERS

18, 00:14:04, 225.22ft
Tap Factory Made Active at 10 o'clock, 4inch dim

19, 00:17:25, 281.98ft
Water Level, Sag in pipe, 30% of the vertical dimension, Finish / DEFECT WONDERS

20, 00:17:25, 281.98ft
Water Level, Sag in pipe, 30% of the vertical dimension, Finish / DEFECT WONDERS

WinCan

Section Pictures - 2/24/2020 - 1851-1850

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1851-1850**	**5**

21, 00:18:05, 284.87ft
Manhole / 1850

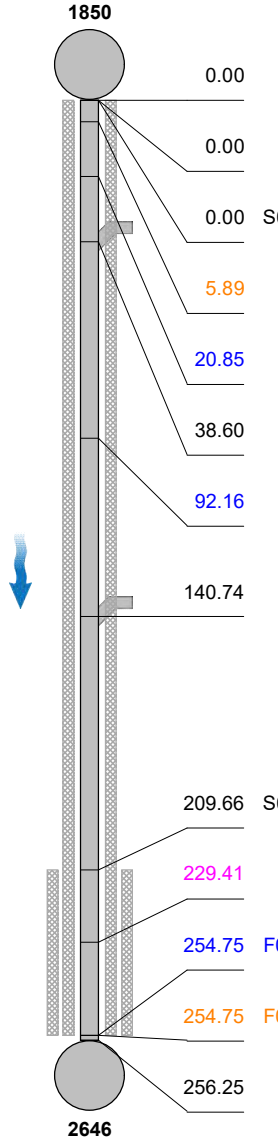
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/24/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1850-2646**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1850**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Light highway**	Flow Control:	**Not Controlled**	Downstream MH:	**2646**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Sanitary**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



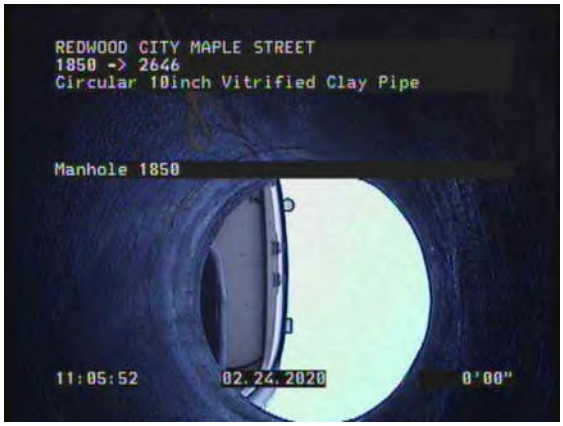
Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1850	00:00:23	1	
0.00		MWL	Water Level, 20% of the vertical dimension	00:00:46	2	
0.00	S01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / STAINING	00:00:49	3, 4	
5.89		MWLS	Water Level, Sag in pipe, 35% of the vertical dimension	00:01:19	5, 6	S3
20.85		MWLS	Water Level, Sag in pipe, 30% of the vertical dimension	00:02:07	7, 8	S2
38.60		TF	Tap Factory Made at 10 o'clock, 4inch dim / GREASE	00:03:02	9	
92.16		MWLS	Water Level, Sag in pipe, 30% of the vertical dimension	00:05:40	10, 11	S2
140.74		TF	Tap Factory Made at 9 o'clock, 6inch dim	00:08:01	12	
209.66	S02	MWLS	Water Level, Sag in pipe, 35% of the vertical dimension, Start	00:12:13	13, 14	
229.41		MCU	Camera Underwater	00:13:23	15	M4
254.75	F01	DAZ	Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / STAINING	00:14:55	16	M2
254.75	F02	MWLS	Water Level, Sag in pipe, 35% of the vertical dimension, Finish	00:14:59	17	S3
256.25		AMH	Manhole / 2646	00:15:17	18	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3A22	412I	34.0	106.0	140.0	2.8	2.0	2.2

WinCan

Section Pictures - 2/24/2020 - 1850-2646

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1850-2646**	**6**



1, 00:00:23, 0.00ft
Manhole / 1850

2, 00:00:46, 0.00ft
Water Level, 20% of the vertical dimension

3, 00:00:49, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / STAINING

4, 00:00:49, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start / STAINING

WinCan

Section Pictures - 2/24/2020 - 1850-2646

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1850-2646**	**6**

5, 00:01:19, 5.89ft
Water Level, Sag in pipe, 35% of the vertical dimension

6, 00:01:19, 5.89ft
Water Level, Sag in pipe, 35% of the vertical dimension

7, 00:02:07, 20.85ft
Water Level, Sag in pipe, 30% of the vertical dimension

8, 00:02:07, 20.85ft
Water Level, Sag in pipe, 30% of the vertical dimension

WinCan

Section Pictures - 2/24/2020 - 1850-2646

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1850-2646**	**6**

9, 00:03:02, 38.60ft
Tap Factory Made at 10 o'clock, 4inch dim / GREASE

10, 00:05:40, 92.16ft
Water Level, Sag in pipe, 30% of the vertical dimension

11, 00:05:40, 92.16ft
Water Level, Sag in pipe, 30% of the vertical dimension

12, 00:08:01, 140.74ft
Tap Factory Made at 9 o'clock, 6inch dim

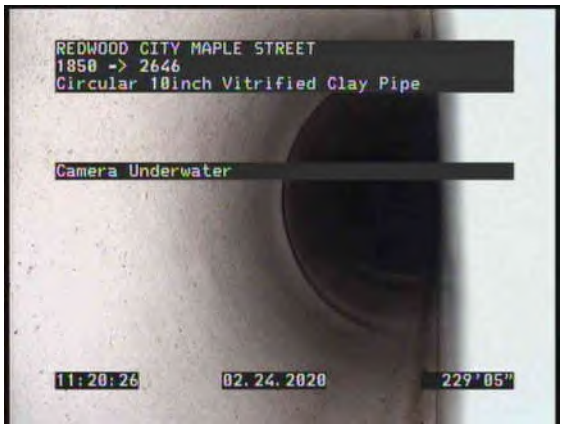
WinCan

Section Pictures - 2/24/2020 - 1850-2646

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1850-2646**	**6**

13, 00:12:13, 209.66ft
Water Level, Sag in pipe, 35% of the vertical dimension, Start

14, 00:12:13, 209.66ft
Water Level, Sag in pipe, 35% of the vertical dimension, Start



15, 00:13:23, 229.41ft
Camera Underwater

16, 00:14:55, 254.75ft
Deposits Attached Other, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish / STAINING

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Section Pictures - 2/24/2020 - 1850-2646

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**2/24/2020**	**1850-2646**	**6**

17, 00:14:59, 254.75ft
Water Level, Sag in pipe, 35% of the vertical dimension, Finish

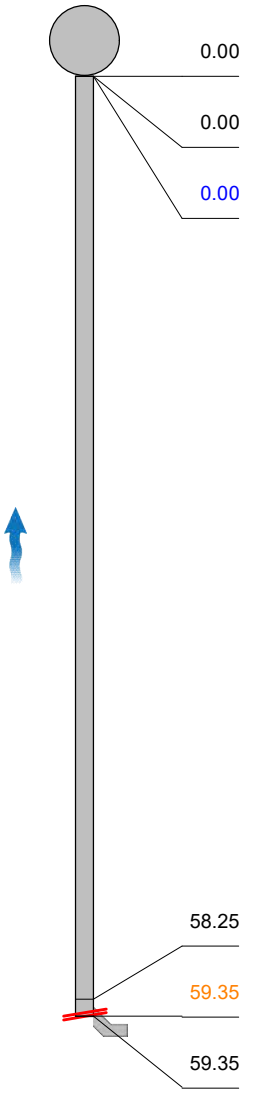
18, 00:15:17, 256.25ft
Manhole / 2646

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**H4-H5**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:	**BAISN H**	Upstream MH:	**H4**
Street:	**CHESTNUT ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Sidewalk**	Flow Control:	**Not Controlled**	Downstream MH:	**H5**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Cast Iron**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:448 Distance	Code	Observation	Counter	Photo	Grade
0.00	ACB	Catch Basin / H-5	00:00:32	1, 2	
0.00	MWL	Water Level, 15% of the vertical dimension	00:01:04	3, 4	
0.00	DSGV	Deposits Settled Gravel, 5% of cross sectional area from 5 o'clock to 7 o'clock	00:01:25	5, 6	M2
58.25	MMC	Material Change, Cast iron / CP TO CAST IRON 12 INCH	00:03:50	7, 8	
59.35	TFI	Tap Factory Made Intruding at 9 o'clock, 6inch dim, 3inch intrusion	00:04:19	9	M3
59.35	MSA	Survey Abandoned / SIZE CHANGE TO 12	00:05:13	10, 11	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	3121	0.0	5.0	5.0	0.0	2.5	2.5

WinCan

Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**

1, 00:00:32, 0.00ft
Catch Basin / H-5

2, 00:00:32, 0.00ft
Catch Basin / H-5

3, 00:01:04, 0.00ft
Water Level, 15% of the vertical dimension

4, 00:01:04, 0.00ft
Water Level, 15% of the vertical dimension

WinCan

Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**

5, 00:01:25, 0.00ft
Deposits Settled Gravel, 5% of cross sectional area from 5 o'clock to 7 o'clock

6, 00:01:25, 0.00ft
Deposits Settled Gravel, 5% of cross sectional area from 5 o'clock to 7 o'clock

7, 00:03:50, 58.25ft
Material Change, Cast iron / CP TO CAST IRON 12 INCH

8, 00:03:50, 58.25ft
Material Change, Cast iron / CP TO CAST IRON 12 INCH

WinCan

Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**

9, 00:04:19, 59.35ft
Tap Factory Made Intruding at 9 o'clock, 6inch dim, 3inch intrusion

10, 00:05:13, 59.35ft
Survey Abandoned / SIZE CHANGE TO 12

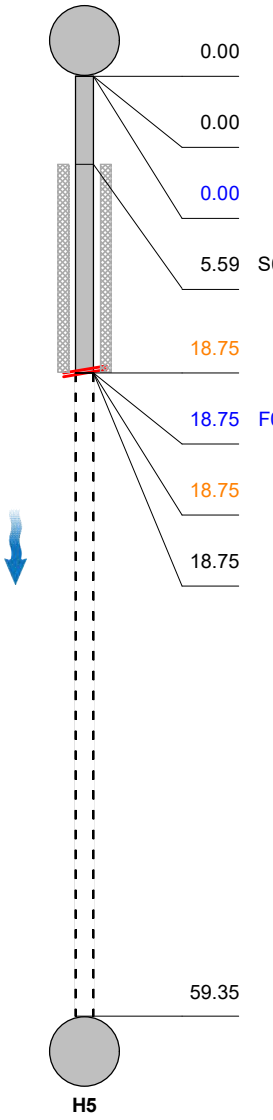
11, 00:05:13, 59.35ft
Survey Abandoned / SIZE CHANGE TO 12

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**H4-H5**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:	**BAISN H**	Upstream MH:	**H4**
Street:	**CHESTNUT ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Sidewalk**	Flow Control:	**Not Controlled**	Downstream MH:	**H5**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Cast Iron**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:448 Distance		Code	Observation	Counter	Photo	Grade
0.00		ACB	Catch Basin / H-4	00:00:25	1	
0.00		MWL	Water Level, 15% of the vertical dimension	00:00:47	2	
0.00		DAE	Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock	00:01:06	3, 4	M2
5.59	S01	DAE	Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start	00:01:36	5, 6	
18.75		DSC	Deposits Settled Compacted, 15% of cross sectional area from 4 o'clock to 8 o'clock	00:02:45	7	M3
18.75	F01	DAE	Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish	00:03:06	8	M2
18.75		SCP	Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock	00:03:14	9, 10	S3
18.75		MSA	Survey Abandoned / DSC 25 %	00:03:34	11, 12	
59.35			End of pipe			

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3100	3124	3.0	11.0	14.0	3.0	2.2	2.3

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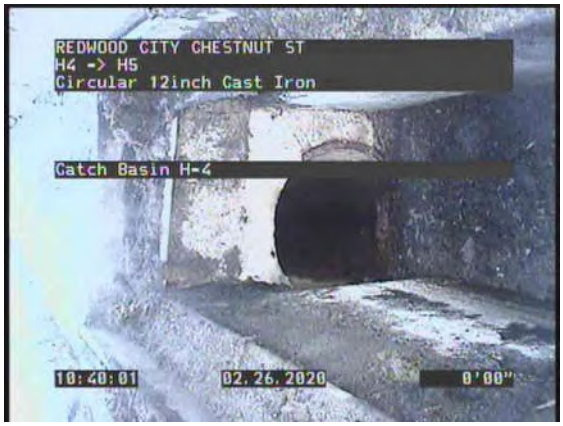
Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**



1, 00:00:25, 0.00ft
Catch Basin / H-4

2, 00:00:47, 0.00ft
Water Level, 15% of the vertical dimension

3, 00:01:06, 0.00ft
Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock

4, 00:01:06, 0.00ft
Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock

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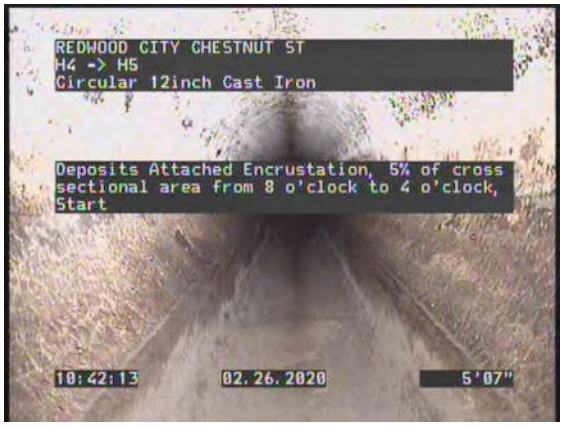
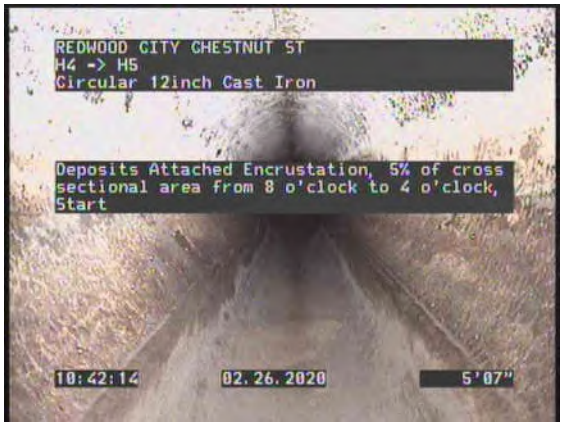
Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**

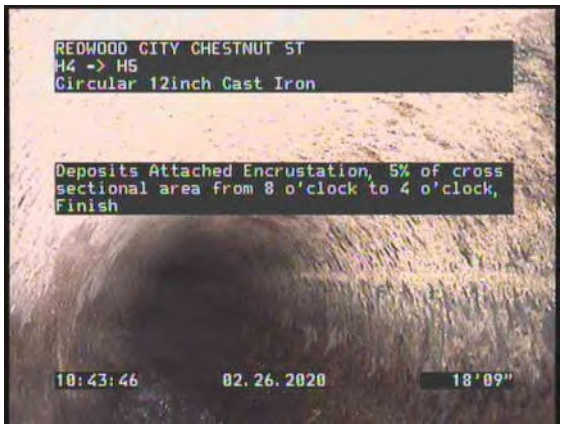


5, 00:01:36, 5.59ft
Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start



6, 00:01:36, 5.59ft
Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start

7, 00:02:45, 18.75ft
Deposits Settled Compacted, 15% of cross sectional area from 4 o'clock to 8 o'clock

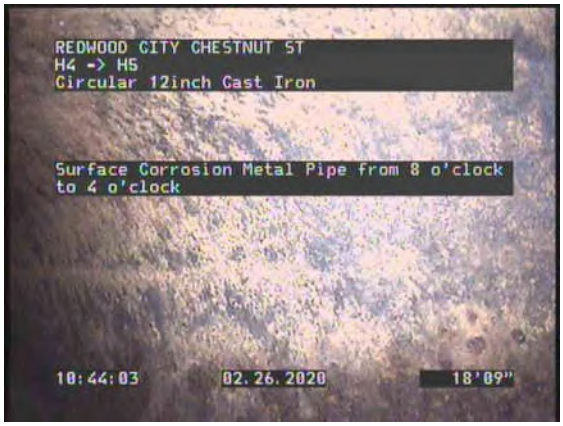


8, 00:03:06, 18.75ft
Deposits Attached Encrustation, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish

WinCan

Section Pictures - 2/26/2020 - H4-H5

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H4-H5**	**7**



9, 00:03:14, 18.75ft
Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock

10, 00:03:14, 18.75ft
Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock

11, 00:03:34, 18.75ft
Survey Abandoned / DSC 25 %

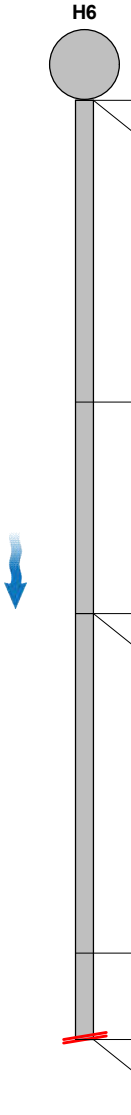
12, 00:03:34, 18.75ft
Survey Abandoned / DSC 25 %

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**H6-H7**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:	**BAISN H**	Upstream MH:	**H6**
Street:	**CHESTNUT ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:		Flow Control:	**Not Controlled**	Downstream MH:	**H7**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Concrete Pipe (non-reinforced)**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



Distance	Code	Observation	Counter	Photo	Grade
0.00	ACB	Catch Basin / H-7	00:00:29	1	
0.00	MWL	Water Level, 0% of the vertical dimension	00:00:43	2	
17.06	DAGS	Deposits Attached Grease, 5% of cross sectional area from 5 o'clock to 7 o'clock	00:01:26	3, 4	M2
29.03	MSC	Shape or Size Change, 8inch dim, 10inch dim	00:02:30	5, 6	
29.03	MMC	Material Change, Corrugated metal pipe / TOP OF PIPE	00:02:51	7, 8	
48.18	LD	Alignment Down, 10% changed	00:04:11	9, 10	M1
53.06	JOL	Joint Offset Large, 1Inch	00:04:43	11, 12	S2
53.06	MSA	Survey Abandoned / JOINT OFFSET LARGE	00:05:00	13, 14	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
2100	2111	2.0	3.0	5.0	2.0	1.5	1.7

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Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

1, 00:00:29, 0.00ft
Catch Basin / H-7

2, 00:00:43, 0.00ft
Water Level, 0% of the vertical dimension

3, 00:01:26, 17.06ft
Deposits Attached Grease, 5% of cross sectional area from 5 o'clock to 7 o'clock

4, 00:01:26, 17.06ft
Deposits Attached Grease, 5% of cross sectional area from 5 o'clock to 7 o'clock

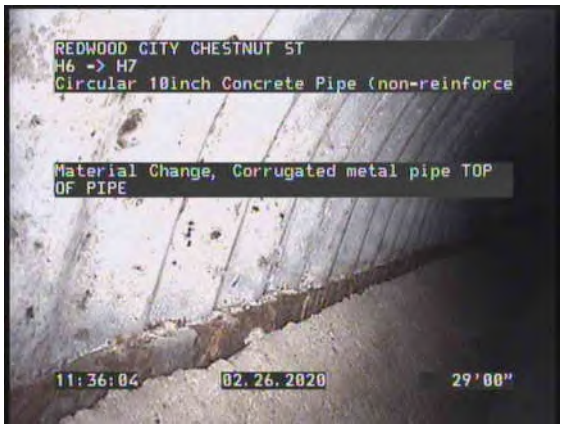
WinCan

Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

5, 00:02:30, 29.03ft
Shape or Size Change, 8inch dim, 10inch dim

6, 00:02:30, 29.03ft
Shape or Size Change, 8inch dim, 10inch dim



7, 00:02:51, 29.03ft
Material Change, Corrugated metal pipe / TOP OF PIPE

8, 00:02:51, 29.03ft
Material Change, Corrugated metal pipe / TOP OF PIPE

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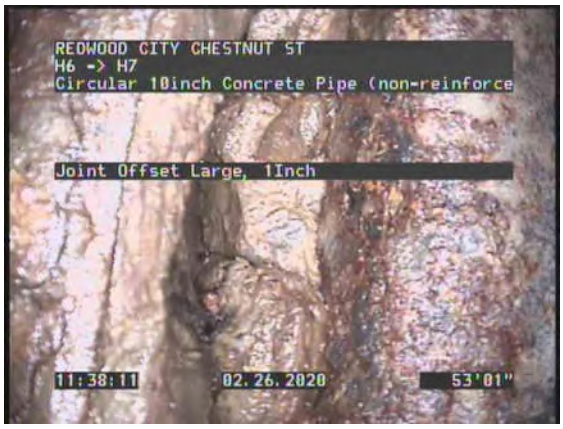
Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

9, 00:04:11, 48.18ft
Alignment Down, 10% changed

10, 00:04:11, 48.18ft
Alignment Down, 10% changed



11, 00:04:43, 53.06ft
Joint Offset Large, 1Inch

12, 00:04:43, 53.06ft
Joint Offset Large, 1Inch

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Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

13, 00:05:00, 53.06ft
Survey Abandoned / JOINT OFFSET LARGE

14, 00:05:00, 53.06ft
Survey Abandoned / JOINT OFFSET LARGE

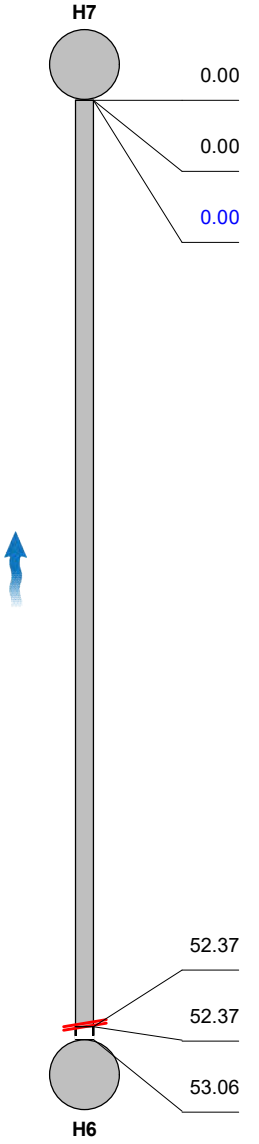
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**H6-H7**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:	**BAISN H**	Upstream MH:	**H6**
Street:	**CHESTNUT ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:		Flow Control:	**Not Controlled**	Downstream MH:	**H7**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Concrete Pipe (non-reinforced)**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



Distance	Code	Observation	Counter	Photo	Grade
0.00	ACB	Catch Basin / H-7	00:00:32	1	
0.00	MWL	Water Level, 5% of the vertical dimension	00:00:44	2	
0.00	DSF	Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock	00:00:49	3	M2
52.37	MSC	Shape or Size Change, 6inch dim, 8inch dim	00:03:17	4, 5	
52.37	MSA	Survey Abandoned / SIZE CHANGE	00:04:00	6	
53.06		End of pipe			

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	2100	0.0	2.0	2.0	0.0	2.0	2.0

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Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

1, 00:00:32, 0.00ft
Catch Basin / H-7

2, 00:00:44, 0.00ft
Water Level, 5% of the vertical dimension

3, 00:00:49, 0.00ft
Deposits Settled Fine, 10% of cross sectional area from 5 o'clock to 7 o'clock

4, 00:03:17, 52.37ft
Shape or Size Change, 6inch dim, 8inch dim

WinCan

Section Pictures - 2/26/2020 - H6-H7

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**CHESTNUT ST**	**2/26/2020**	**H6-H7**	**8**

5, 00:03:17, 52.37ft
Shape or Size Change, 6inch dim, 8inch dim

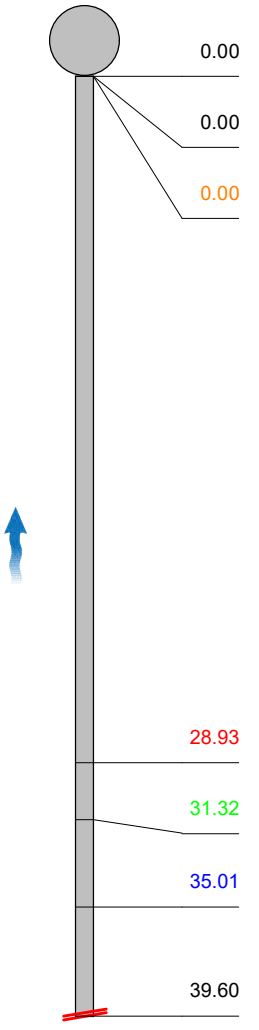
6, 00:04:00, 52.37ft
Survey Abandoned / SIZE CHANGE

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**F163-F164**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:	**BAISN F**	Upstream MH:	**F163**
Street:	**BEECH ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:		Flow Control:		Downstream MH:	**F164**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**
Pipe size:	**12 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Cast Iron**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



Distance	Code	Observation	Counter	Photo	Grade
0.00	ACB	Catch Basin / F164	00:00:27	1	
0.00	MWL	Water Level, 10% of the vertical dimension	00:00:40	2	
0.00	SCP	Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock	00:03:39	3, 4	S3
28.93	H	Hole from 10 o'clock to 2 o'clock, within 8 inch	00:02:10	5, 6	S5
31.32	LD	Alignment Down, 10% changed	00:02:30	7, 8	M1
35.01	DSF	Deposits Settled Fine, 10% of cross sectional area at 8 o'clock	00:02:53	9, 10	M2
39.60	MSA	Survey Abandoned / OBR	00:03:58	11	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5131	2111	8.0	3.0	11.0	4.0	1.5	2.8

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Section Pictures - 2/26/2020 - F163-F164

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**BEECH ST**	**2/26/2020**	**F163-F164**	**9**

1, 00:00:27, 0.00ft
Catch Basin / F164

2, 00:00:40, 0.00ft
Water Level, 10% of the vertical dimension

3, 00:03:39, 0.00ft
Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock

4, 00:03:39, 0.00ft
Surface Corrosion Metal Pipe from 8 o'clock to 4 o'clock

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Section Pictures - 2/26/2020 - F163-F164

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**BEECH ST**	**2/26/2020**	**F163-F164**	**9**

5, 00:02:10, 28.93ft
Hole from 10 o'clock to 2 o'clock, within 8 inch

6, 00:02:10, 28.93ft
Hole from 10 o'clock to 2 o'clock, within 8 inch

7, 00:02:30, 31.32ft
Alignment Down, 10% changed

8, 00:02:30, 31.32ft
Alignment Down, 10% changed

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Section Pictures - 2/26/2020 - F163-F164

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**BEECH ST**	**2/26/2020**	**F163-F164**	**9**

9, 00:02:53, 35.01ft
Deposits Settled Fine, 10% of cross sectional area at 8 o'clock

10, 00:02:53, 35.01ft
Deposits Settled Fine, 10% of cross sectional area at 8 o'clock

11, 00:03:58, 39.60ft
Survey Abandoned / OBR

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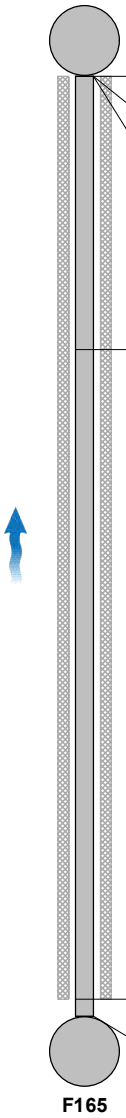
Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**F165-F166**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:			Upstream MH:	**F165**	
Street:	**BEECH ST**	Media Label:			Up Rim to Invert:	**0.0**	
Location Code:		Flow Control:			Downstream MH:	**F166**	
Location Details:		Sheet Number:			Down Rim to Invert:	**0.0**	
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**		Total gallons used:	**0.0**	
Pipe size:	**12 "**	Sewer Category:	**SEC**		Joints passed:	**0**	
Pipe material:	**Cast Iron**	Purpose:	**Routine Assessment**		Joints failed:	**0**	
Lining Method:		Owner:					
Additional Info:							



1:613	Distance		Code	Observation	Counter	Photo	Grade
	0.00		ACB	Catch Basin / F166	00:00:24	1	
	0.00		MWL	Water Level, 10% of the vertical dimension	00:00:33	2	
	0.00	S01	SCP	Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Start	00:00:37	3, 4	
	23.64		LD	Alignment Down, 5% changed	00:01:45	5	M1
	79.70	F01	SCP	Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Finish	00:03:38	6, 7	S3
	81.19		ACB	Catch Basin / F165	00:03:51	8	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3B00	1100	48.0	1.0	49.0	3.0	1.0	2.9

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Section Pictures - 2/26/2020 - F165-F166

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**BEECH ST**	**2/26/2020**	**F165-F166**	**10**

1, 00:00:24, 0.00ft
Catch Basin / F166

2, 00:00:33, 0.00ft
Water Level, 10% of the vertical dimension

3, 00:00:37, 0.00ft
Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Start

4, 00:00:37, 0.00ft
Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Start

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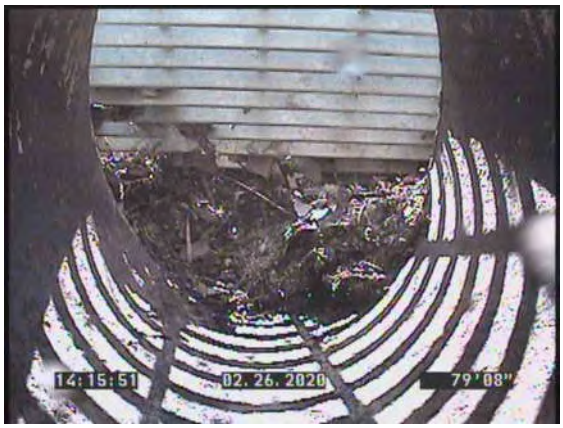
Section Pictures - 2/26/2020 - F165-F166

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**BEECH ST**	**2/26/2020**	**F165-F166**	**10**

5, 00:01:45, 23.64ft
Alignment Down, 5% changed

6, 00:03:38, 79.70ft
Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Finish



7, 00:03:38, 79.70ft
Surface Corrosion Metal Pipe from 7 o'clock to 5 o'clock, Finish

8, 00:03:51, 81.19ft
Catch Basin / F165

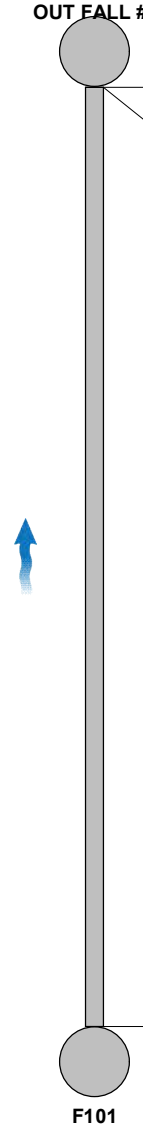
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**F101-REDWOOD CREEK OUT FALL #1**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**F101**
Street:	**REDWOOD CREEK**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Creek**	Flow Control:	**Not Controlled**	Downstream MH:	**REDWOOD CREEK OUT FALL**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:		Total gallons used:	**0.0**
Pipe size:	**15 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



Distance	Code	Observation	Counter	Photo	Grade
0.00	AEP	End of Pipe / REDWOOD CREEK OUT FALL #1	00:00:50	1	
0.00	MWL	Water Level, 0% of the vertical dimension	00:00:54	2	
25.53	ACB	Catch Basin / F101	00:02:14	3	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

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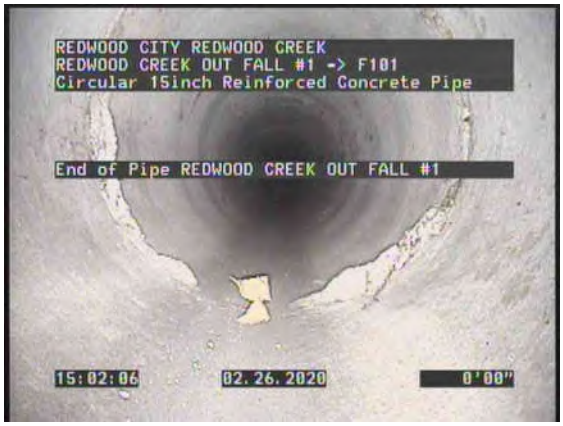
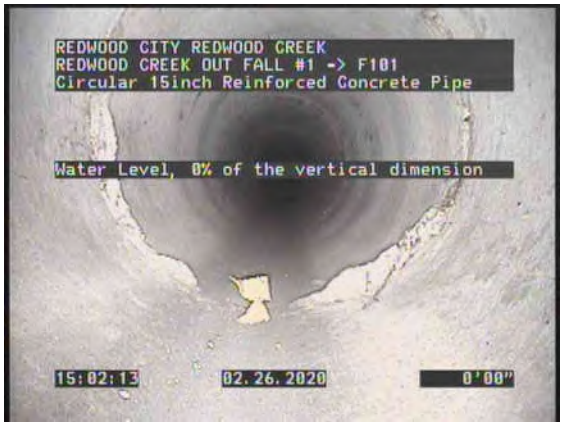
Section Pictures - 2/26/2020 - F101-REDWOOD CREEK OUT FALL #1

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**REDWOOD CREEK**	**2/26/2020**	**F101-REDWOOD CREEK**	**11**



1, 00:00:50, 0.00ft
End of Pipe / REDWOOD CREEK OUT FALL #1



2, 00:00:54, 0.00ft
Water Level, 0% of the vertical dimension

3, 00:02:14, 25.53ft
Catch Basin / F101

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Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/26/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**F102-REDWOOD CREEK OUT FALL #2**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**F102**		
Street:	**REDWOOD CREEK**	Media Label:		Up Rim to Invert:	**0.0**		
Location Code:	**Creek**	Flow Control:		Downstream MH:	**REDWOOD CREEK OUT FALL**		
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**		
Pipe shape:	**Circular**	Sewer Use:	**Stormwater**	Total gallons used:	**0.0**		
Pipe size:	**15 "**	Sewer Category:	**SEC**	Joints passed:	**0**		
Pipe material:	**Reinforced Concrete Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**		
Lining Method:		Owner:					
Additional Info:							

1:259	Distance	Code	Observation	Counter	Photo	Grade
REDWOOD CREEK OUT FALL #2						
	0.00	AEP	End of Pipe / REDWOOD CREEK OUT FALL #2	00:00:25		
	0.00	MWL	Water Level, 0% of the vertical dimension	00:00:28	1	
	34.31	ACB	Catch Basin / F102	00:02:38	2	
F102						

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

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Section Pictures - 2/26/2020 - F102-REDWOOD CREEK OUT FALL #2

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**REDWOOD CREEK**	**2/26/2020**	**F102-REDWOOD CREEK**	**12**

1, 00:00:28, 0.00ft
Water Level, 0% of the vertical dimension

2, 00:02:38, 34.31ft
Catch Basin / F102

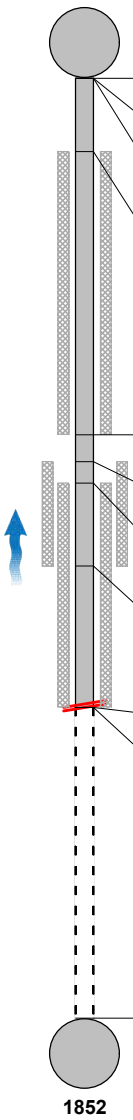
WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
3/23/2020			**ORNELAS F**	**U-717-8333**	**1852-1851**
Year laid:	Pre-cleaning:	Direction: **Upstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1852**
Street:	**MAPLE ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Main highway – urban**	Flow Control:	**De-Watered using Jetter**	Downstream MH:	**1851**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:		Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Clay Tile (not vitrified clay**	Purpose:	**Maintenance Related**	Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:1026 Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1851	00:00:02	1, 2	
0.00		MWL	Water Level, 0% of the vertical dimension	00:00:57	3	
0.00		MWM	Water Mark, 80% of the vertical dimension	00:01:10	4, 5	M5
10.60	S01	LFB	Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Start	00:02:46	6, 7	
51.52	F01	LFB	Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Finish	00:05:36	8, 9	S3
55.42	S03	MWLS	Water Level, Sag in pipe, 15% of the vertical dimension, Start	00:06:05	10, 11	
58.52	S02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Start	00:06:35	12, 13	
70.52	F03	MWLS	Water Level, Sag in pipe, 15% of the vertical dimension, Finish	00:07:29	14, 15	S2
90.93	F02	DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Finish	00:09:31	16, 17	M2
90.93		MSA	Survey Abandoned / 90 DEGREE ALGINMNET	00:09:53	18, 19	
135.94			End of pipe			

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3823	5126	30.0	17.0	47.0	2.7	2.4	2.6

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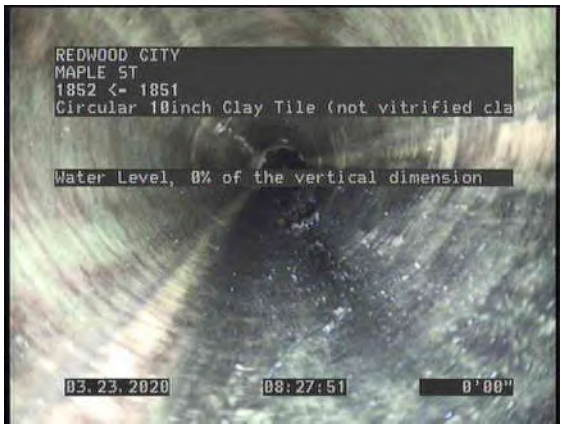
Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

1, 00:00:02, 0.00ft
Manhole / 1851

2, 00:00:02, 0.00ft
Manhole / 1851



3, 00:00:57, 0.00ft
Water Level, 0% of the vertical dimension

4, 00:01:10, 0.00ft
Water Mark, 80% of the vertical dimension

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Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

5, 00:01:10, 0.00ft
Water Mark, 80% of the vertical dimension

6, 00:02:46, 10.60ft
Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Start

7, 00:02:46, 10.60ft
Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Start

8, 00:05:36, 51.52ft
Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Finish

WinCan

Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

9, 00:05:36, 51.52ft
Lining Failure Blistered from 7 o'clock to 5 o'clock, within 8 inch, Finish

10, 00:06:05, 55.42ft
Water Level, Sag in pipe, 15% of the vertical dimension, Start

11, 00:06:05, 55.42ft
Water Level, Sag in pipe, 15% of the vertical dimension, Start

12, 00:06:35, 58.52ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Start

WinCan

Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

13, 00:06:35, 58.52ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Start

14, 00:07:29, 70.52ft
Water Level, Sag in pipe, 15% of the vertical dimension, Finish

15, 00:07:29, 70.52ft
Water Level, Sag in pipe, 15% of the vertical dimension, Finish

16, 00:09:31, 90.93ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Finish

WinCan

Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

17, 00:09:31, 90.93ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 1 o'clock, within 8 inch, Finish

18, 00:09:53, 90.93ft
Survey Abandoned / 90 DEGREE ALGINMNET

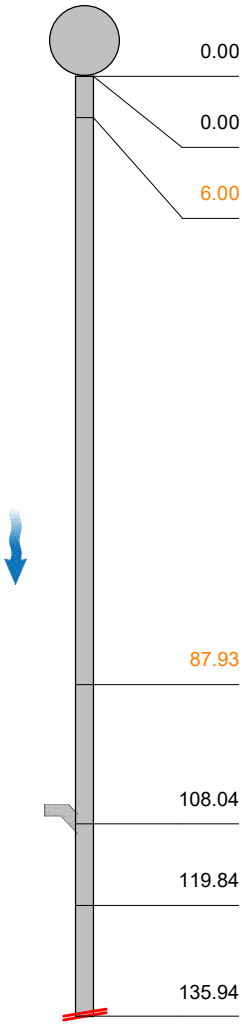
19, 00:09:53, 90.93ft
Survey Abandoned / 90 DEGREE ALGINMNET

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
3/23/2020			**ORNELAS F**	**U-717-8333**	**1852-1851**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1852**
Street:	**MAPLE ST**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:	**Main highway – urban**	Flow Control:	**De-Watered using Jetter**	Downstream MH:	**1851**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:		Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Clay Tile (not vitrified clay**	Purpose:	**Maintenance Related**	Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



Distance	Code	Observation	Counter	Photo	Grade
0.00	AMH	Manhole / 1852	00:00:02	1, 2	
0.00	MWL	Water Level, 60% of the vertical dimension	00:00:30	3	
6.00	DAGS	Deposits Attached Grease, 20% of cross sectional area from 10 o'clock to 2 o'clock	00:01:48	4, 5	M3
87.93	MWLS	Water Level, Sag in pipe, 50% of the vertical dimension	00:05:19	6	S3
108.04	TF	Tap Factory Made at 3 o'clock, 6inch dim	00:06:45	7	
119.84	MGO	General Observation / MH 63	00:07:51	8	
135.94	MSA	Survey Abandoned / 90 BEND	00:09:59	9, 10	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3100	3100	3.0	3.0	6.0	3.0	3.0	3.0

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Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

1, 00:00:02, 0.00ft
Manhole / 1852

2, 00:00:02, 0.00ft
Manhole / 1852

3, 00:00:30, 0.00ft
Water Level, 60% of the vertical dimension

4, 00:01:48, 6.00ft
Deposits Attached Grease, 20% of cross sectional area from 10 o'clock to 2 o'clock

WinCan

Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

5, 00:01:48, 6.00ft
Deposits Attached Grease, 20% of cross sectional area from 10 o'clock to 2 o'clock

6, 00:05:19, 87.93ft
Water Level, Sag in pipe, 50% of the vertical dimension

7, 00:06:45, 108.04ft
Tap Factory Made at 3 o'clock, 6inch dim

8, 00:07:51, 119.84ft
General Observation / MH 63

WinCan

Section Pictures - 3/23/2020 - 1852-1851

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE ST**	**3/23/2020**	**1852-1851**	**13**

9, 00:09:59, 135.94ft
Survey Abandoned / 90 BEND

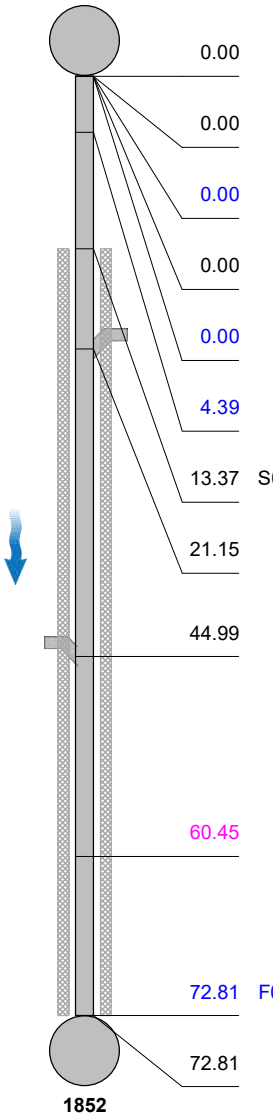
10, 00:09:59, 135.94ft
Survey Abandoned / 90 BEND

WinCan

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
3/20/2020		**Dry**	**R.DION N.P.S**	**U-816-07005058**	**1185-POST-1852**
Year laid:	Pre-cleaning:	Direction: **Downstream**	Pipe Joint Length:	Total Length:	Length Surveyed:

City:	**REDWOOD CITY**	Drainage Area:		Upstream MH:	**1185-POST**
Street:	**MAPLE STREET**	Media Label:		Up Rim to Invert:	**0.0**
Location Code:		Flow Control:	**De-Watered using Jetter**	Downstream MH:	**1852**
Location Details:		Sheet Number:		Down Rim to Invert:	**0.0**
Pipe shape:	**Circular**	Sewer Use:		Total gallons used:	**0.0**
Pipe size:	**10 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Vitrified Clay Pipe**	Purpose:	**Routine Assessment**	Joints failed:	**0**
Lining Method:	**Cured in Place**	Owner:			
Additional Info:	**POST CLEANING**				



1:550 Distance		Code	Observation	Counter	Photo	Grade
0.00		AMH	Manhole / 1185-POST	00:00:13	1	
0.00		MWL	Water Level, 30% of the vertical dimension	00:00:00	2	
0.00		DAZ	Deposits Attached Other, 5% of cross sectional area from 9 o'clock to 3 o'clock	00:00:32	3, 4	M2
0.00		MGO	General Observation / POST CLEAN	00:00:41	5	
0.00		DAGS	Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 12 o'clock	00:05:17	6	M2
4.39		DAGS	Deposits Attached Grease, 5% of cross sectional area at 2 o'clock	00:06:17	7, 8	M2
13.37	S01	DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start	00:07:37	9, 10	
21.15		TF	Tap Factory Made at 10 o'clock, 4inch dim	00:07:59	11	
44.99		TFC	Tap Factory Made Capped at 4 o'clock, 4inch dim	00:08:58	12	
60.45		DAGS	Deposits Attached Grease, 25% of cross sectional area from 9 o'clock to 3 o'clock	00:11:52	13, 14	M4
72.81	F01	DAGS	Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish	00:13:56	15, 16	M2
72.81		AMH	Manhole / 1852	00:13:57	17	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	412B	0.0	34.0	34.0	0.0	2.1	2.1

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Section Pictures - 3/20/2020 - 1185-POST-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**3/20/2020**	**1185-POST-1852**	**15**

1, 00:00:13, 0.00ft
Manhole / 1185-POST

2, 00:00:00, 0.00ft
Water Level, 30% of the vertical dimension

3, 00:00:32, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 9 o'clock to 3 o'clock

4, 00:00:32, 0.00ft
Deposits Attached Other, 5% of cross sectional area from 9 o'clock to 3 o'clock

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Section Pictures - 3/20/2020 - 1185-POST-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**3/20/2020**	**1185-POST-1852**	**15**

5, 00:00:41, 0.00ft
General Observation / POST CLEAN

6, 00:05:17, 0.00ft
Deposits Attached Grease, 5% of cross sectional area from 11 o'clock to 12 o'clock

7, 00:06:17, 4.39ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock

8, 00:06:17, 4.39ft
Deposits Attached Grease, 5% of cross sectional area at 2 o'clock

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Section Pictures - 3/20/2020 - 1185-POST-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**3/20/2020**	**1185-POST-1852**	**15**

9, 00:07:37, 13.37ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start

10, 00:07:37, 13.37ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Start

11, 00:07:59, 21.15ft
Tap Factory Made at 10 o'clock, 4inch dim

12, 00:08:58, 44.99ft
Tap Factory Made Capped at 4 o'clock, 4inch dim

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Section Pictures - 3/20/2020 - 1185-POST-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**3/20/2020**	**1185-POST-1852**	**15**

13, 00:11:52, 60.45ft
Deposits Attached Grease, 25% of cross sectional area from 9 o'clock to 3 o'clock

14, 00:11:52, 60.45ft
Deposits Attached Grease, 25% of cross sectional area from 9 o'clock to 3 o'clock

15, 00:13:56, 72.81ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish

16, 00:13:56, 72.81ft
Deposits Attached Grease, 5% of cross sectional area from 8 o'clock to 4 o'clock, Finish

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Section Pictures - 3/20/2020 - 1185-POST-1852

City	Street	Date	Pipe Segment Reference	Nr.
REDWOOD CITY	**MAPLE STREET**	**3/20/2020**	**1185-POST-1852**	**15**

17, 00:13:57, 72.81ft
Manhole / 1852

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APPENDIX D

PACP Defect Guide

NASSCO'S PIPELINE ASSESSMENT & CERTIFICATION PROGRAM (PACP)©

Section 4—Continuous Defect Coding

"TRULY" 4-1

"Truly" continuous defects run along the sewer without any interruption for more than three feet (1 meter).
Examples:
- Longitudinal Fractures
- Longitudinal Cracks

"REPEATED" 4-1

"Repeated" continuous defects occur at regular intervals along the sewer. These occur at pipe joints and include:
-Encrustation
-Open Joints
-Circumferential Fractures

Code Changes in Version 6.0.2

Added:
None

Section 5—Structural Defect Coding (Module 6A)

C CRACK 5-2 CL Longitudinal 5-2 CC Circumferential 5-2 CM Multiple 5-2 CS Spiral 5-2 CH Hinge 5-2	**F FRACTURE 5-7** FL Longitudinal 5-7 FC Circumferential 5-7 FM Multiple 5-7 FS Spiral 5-7 FH Hinge 5-7	**B BROKEN 5-15** BSV -Soil Visible Beyond Defect 5-15 BVV -Void Visible Beyond Defect 5-15	**H HOLE 5-17** HSV -Soil Visible Beyond Defect 5-17 HVV -Void Visible Beyond Defect 5-17	**D DEFORMED 5-19** DV Deformed Vertically (brick) 5-19 DH Deformed Horizontally (brick) 5-19	**X COLLAPSE 5-23** XP Pipe Collapse 5-23 XB Brick Collapse 5-23	**J JOINT 5-26** JO Joint Offset (Displaced) 5-26 JS Joint Separated (Open) 5-26 JA Joint Angular 5-26
S SURFACE DAMAGE 5-31 SRI Roughness Increased 5-31 SRI - M - Mechanical SRI - C - Chemical SRI - Z - Not Evident	**S SURFACE DAMAGE 5-31** SAV Aggregate Visible 5-31 SAV - M - Mechanical SAV - C - Chemical SAV - Z - Not Evident	**S SURFACE DAMAGE 5-31** SAP Aggregate Projecting 5-31 SAP - M - Mechanical SAP - C - Chemical SAP - Z - Not Evident	**S SURFACE DAMAGE 5-31** SAM Aggregate Missing 5-31 SAM - M - Mechanical SAM - C - Chemical Attack SAM - Z - Not Evident	**S SURFACE DAMAGE 5-31** SRV Reinforcement Visible 5-31 SRV - M - Mechanical SRV - C - Chemical Attack SRV - Z - Not Evident	**S SURFACE DAMAGE 5-31** SRP Reinforcement Projecting 5-31 SRP - M - Mechanical SRP - C - Chemical Attack SRP - Z - Not Evident	**S SURFACE DAMAGE 5-31** SRC Reinforcement Corroded 5-31 SRC - M - Mechanical SRC - C - Chemical Attack SRC - Z - Not Evident
S SURFACE DAMAGE 5-31 SMW Missing Wall 5-32 SMW - M - Mechanical SMW - C - Chemical Attack SMW - Z - Not Evident	**S SURFACE DAMAGE 5-31** SSS Surface Spalling 5-32 SSS - M - Mechanical SSS - C - Chemical Attack SSS - Z - Not Evident	**S SURFACE DAMAGE 5-31** SZ Other 5-32 SZ - M - Mechanical SZ - C - Chemical Attack SZ - Z - Not Evident	**S SURFACE DAMAGE 5-31** SCP Corrosion (metal pipe) 5-32 *no modifiers used	**K BUCKLING 5-45** KW Wall 5-45 KD Dimpling 5-45 KI Inverse Curvature 5-45	**LF LINING FEATURES 5-49** LFD Detached Lining 5-49 LFDE Defective End 5-49 LFB Blistered Lining 5-49 LFCS Service Cut Shifted 5-49 LFAC Abandoned Connection 5-49	**LF LINING FEATURES 5-49** (continued) LFOC Overcut Service 5-49 LFUC Undercut Service 5-49 LFBK Buckled Lining 5-49 LFW Wrinkled Lining 5-49 LFAS Annular Space 5-49
LF LINING FEATURES 5-49 LFBU Bulges 5-50 LFDC Discoloration 5-50 LFDL Delamination 5-50 LFRS Resin Slug 5-50 LFPH Pinholes 5-50 LFZ Other 5-50	**WF WELD FAILURE 5-67** WFL Longitudinal 5-67 WFC Circumferential 5-67 WFM Multiple 5-67 WFS Spiral 5-67 WFZ Unidentified 5-67	**RP POINT REPAIR 5-69** RPR Pipe Replaced 5-69 RPR - D -Defective 5-69 RPP Patch Repair 5-69 RPP - D -Defective 5-69	**RP POINT REPAIR 5-69** RPL Localized Pipeliner 5-69 RPL - D -Defective 5-69 RPZ Other 5-69 RPZ - D -Defective 5-69	**BRICKWORK 5-75** DB Displaced 5-75 MB Missing 5-75 DI Dropped Invert 5-75	**BRICKWORK 5-75** MM Missing Mortar 5-75 S -Small 5-75 M -Medium 5-75 L -Large 5-75	Updated July 2013

NASSCO'S PIPELINE ASSESSMENT & CERTIFICATION PROGRAM (PACP)©

Section 6—Operational and Maintenance (Module 6B)

D DEPOSITS 6-1		
DA	Attached	6-2
DAE	-Encrustation	6-2
DAG	-Grease	6-2
DAR	-Rugging	6-2
DAZ	-Other	6-2

D DEPOSITS 6-1		
DS	Settled	6-2
DSF	-Fine	6-2
DSGV	-Gravel	6-2
DSC	-Hard/Compacted	6-2
DSZ	-Other	6-2

D DEPOSITS (continued) 6-1		
DN	Ingress	6-3
DNF	-Fine (silt & sand)	6-4
DNGV	-Gravel	6-4
DNZ	-Other	6-4

R ROOTS 6-7		
RF	Fine	6-7
RFB	-Barrel	6-7
RFL	-Lateral	6-7
RFC	-Connection	6-7
RFJ	-Joint	6-8

R ROOTS 6-7		
RT	Tap	6-7
RTB	-Barrel	6-7
RTL	-Lateral	6-7
RTC	-Connection	6-7
RTJ	-Joint	6-8

R ROOTS 6-7		
RM	Medium	6-7
RMB	-Barrel	6-7
RML	-Lateral	6-7
RMC	-Connection	6-7
RMJ	-Joint	6-8

R ROOTS 6-7		
RB	Ball	6-7
RBB	-Barrel	6-7
RBL	-Lateral	6-7
RBC	-Connection	6-7
RBJ	-Joint	6-8

I INFILTRATION 6-13		
IS	Stain	6-13
IW	Weeper	6-13
ID	Dripper	6-13
IR	Runner	6-13
IG	Gusher	6-13

OB OBSTACLES/ OBSTRUCTIONS 6-19		
OBB	Brick or Masonry	6-19
OBM	Pipe Material in Invert	6-19
OBI	Object protruding through wall	6-19

OB OBSTACLES/ OBSTRUCTIONS 6-19		
OBJ	Object wedged in joint	6-19
OBC	Object through connection/junction	6-19
OBP	External Pipe Cable	6-19

OB OBSTACLES/ OBSTRUCTIONS 6-19		
OBS	Built into structure	6-19
OBN	Construction Debris	6-20
OBR	Rocks	6-20
OBZ	Other	6-20

V VERMIN 6-31		
VR	Rat	6-31
VC	Cockroach	6-31
VZ	Other	6-31

G GROUT TEST & SEAL 6-33		
GTP	Grout Test Passed	6-33
GTP -J - Joint		6-33
GTP -L - Lateral		6-33
GTF	Grout Test Failed	6-33
GTF -J-Joint		6-33
GTF -L-Lateral		6-33

G GROUT TEST & SEAL 6-33		
GTU	Grout Test Unable	6-34
GTU - J - Joint		6-34
GTU - L - Lateral		6-34
GRT	Grout Test Location	6-34

Section 7—Construction Features Coding (Module 6C)

T TAP 7-1		
TF	Factory Made	7-1
TFI	-Intruding	7-2
TFA	-Active	7-2
TFC	-Capped	7-2
TFB	-Abandoned	7-2
TFD	-Defective	7-2

T TAP 7-1		
TB	Break In/Hammer	7-2
TBI	-Intruding	7-2
TBA	-Active	7-2
TBC	-Capped	7-2
TBB	-Abandoned	7-2
TBD	-Defective	7-2

T TAP 7-1		
TS	Saddle	7-2
TSI	-Intruding	7-2
TSA	-Active	7-2
TSC	-Capped	7-2
TSB	-Abandoned	7-2
TSD	-Defective	7-2

T TAP 7-1		
TR	Rehabilitated	7-2
TRI	-Intruding	7-2
TRA	-Active	7-2
TRC	-Capped	7-2
TRB	-Abandoned	7-2
TRD	-Defective	7-2

IS INTRUDING SEALING MATERIAL 7-9		
ISSR	Sealing Ring	7-9
ISSRH	-Hanging	7-9
ISSRB	-Broken	7-9
ISSRL	-Loose	7-9

IS INTRUDING SEALING MATERIAL 7-9		
ISGT	Grout	7-9
ISZ	Other	7-9

L LINE (of sewer) 7-11		
LL	Left	7-11
LLU	Left Up	7-11
LLD	Left Down	7-11
LR	Right	7-11

L LINE (of sewer) 7-11		
LRU	Right Up	7-11
LRD	Right Down	7-11
LU	Up	7-11
LD	Down	7-11

A ACCESS POINT 7-13		
AMH	Manhole	7-13
AWA	Wastewater Access	7-13
ADP	Discharge Point	7-13
ATC	Tee Connection	7-13

A ACCESS POINT 7-13		
AOC	Other Special Chamber	7-13
AM	Meter	7-13
AWW	Wet Well	7-13
AJB	Junction Box	7-14

A ACCESS POINT 7-13		
ACO	Clean Out	7-14
ACOM	-Mainline	7-14
ACOP	-Property	7-14
ACOH	-House	7-14

A ACCESS POINT 7-13		
ACB	Catch Basin	7-14
AEP	End of Pipe	7-14

Section 8—Miscellaneous Features Coding (Module 6D)

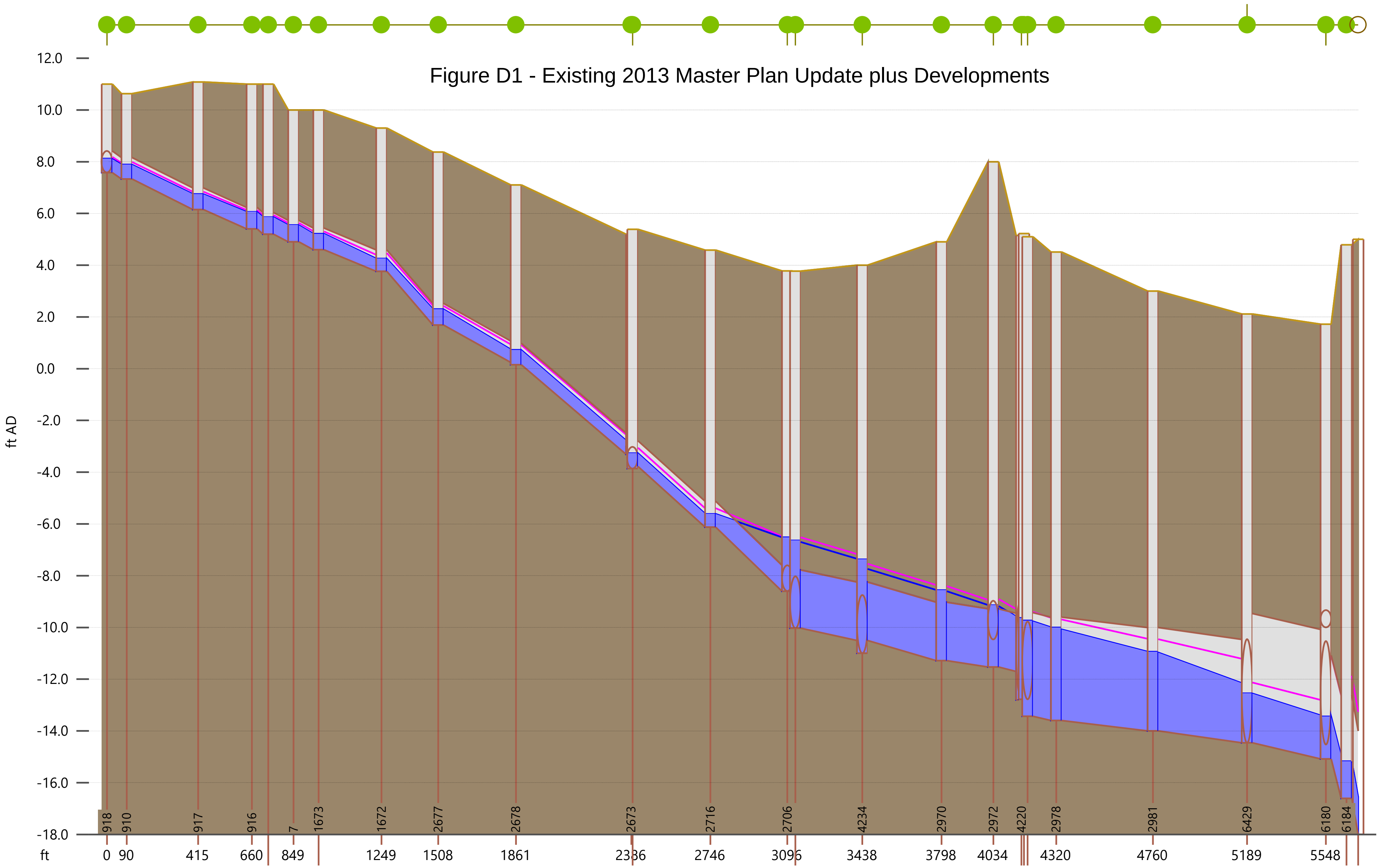
M MISCELLANEOUS FEATURES 8-1		
MCU	Camera Underwater	8-1
MGO	General Observation	8-1
MGP	General Photograph	8-1
MSC	Shape/Size Change (Sewer Dimension/Vertical/ Horizontal)	8-1
MJL	Joint Length Change	8-1

M MISCELLANEOUS FEATURES 8-1		
MLC	Lining Change	8-2
MMC	Material Change	8-2
MSA	Survey Abandoned	8-2
MWL	Water Level	8-2
MWLS	-Sag	8-2

M MISCELLANEOUS FEATURES 8-1		
MWM	Water Mark	8-2
MY	Dye Test	8-2
MYV	-Dye Visible	8-2
MYN	-Not Visible	8-2

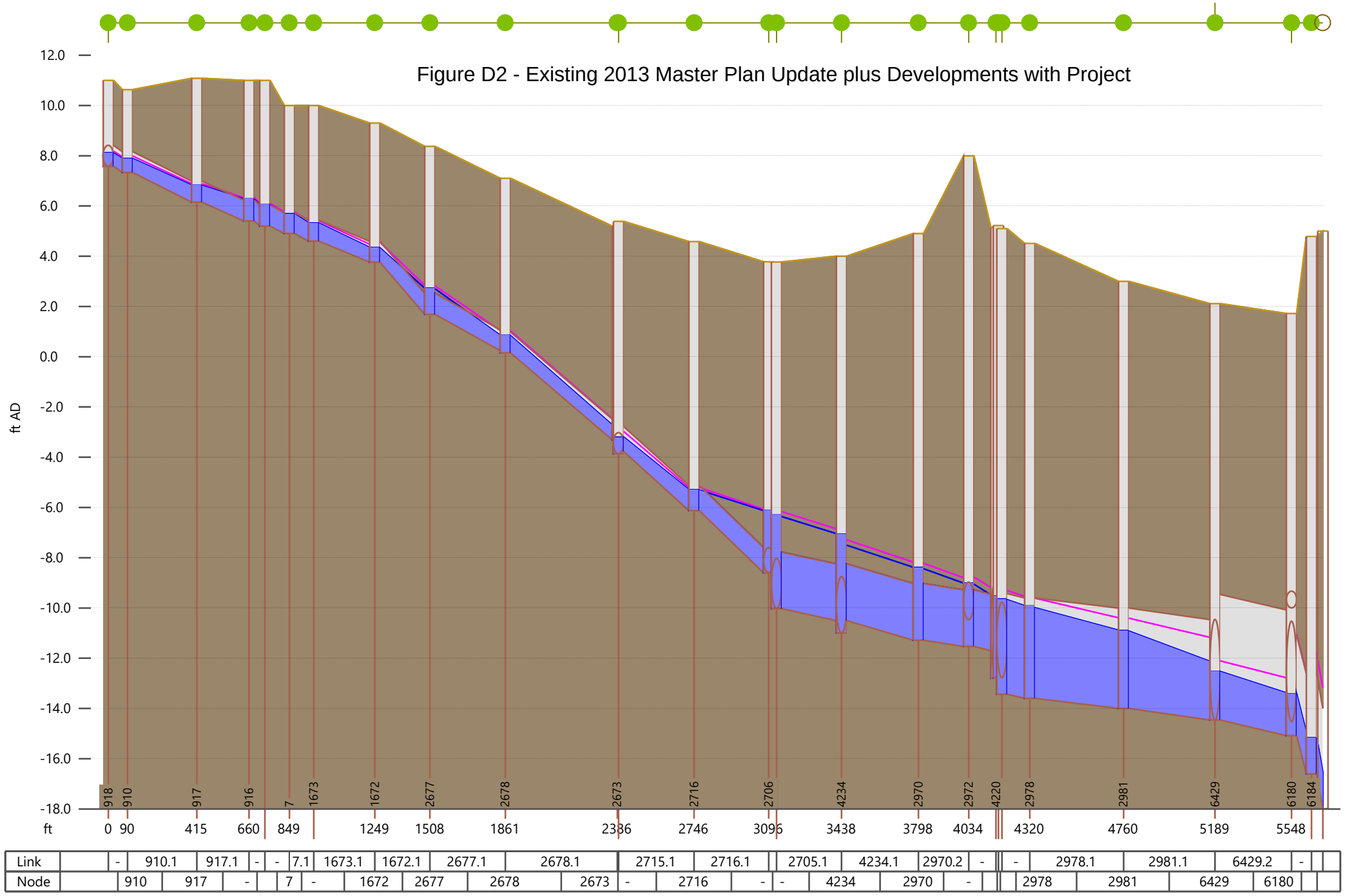
Updated July 2013

APPENDIX D
Sanitary Sewer Profiles



Link	-	910.1	917.1	-	-	7.1	1673.1	1672.1	2677.1	2678.1	2715.1	2716.1	2705.1	4234.1	2970.2	-	-	2978.1	2981.1	6429.2	-
Node	910	917	-	7	-	1672	2677	2678	2673	-	2716	-	-	4234	2970	-	2978	2981	6429	6180	

Section for Network - 2012 _Cal_ModRev2_IH_Dev



Section for Network - 2012 _Cal_ModRev2_IH_Dev

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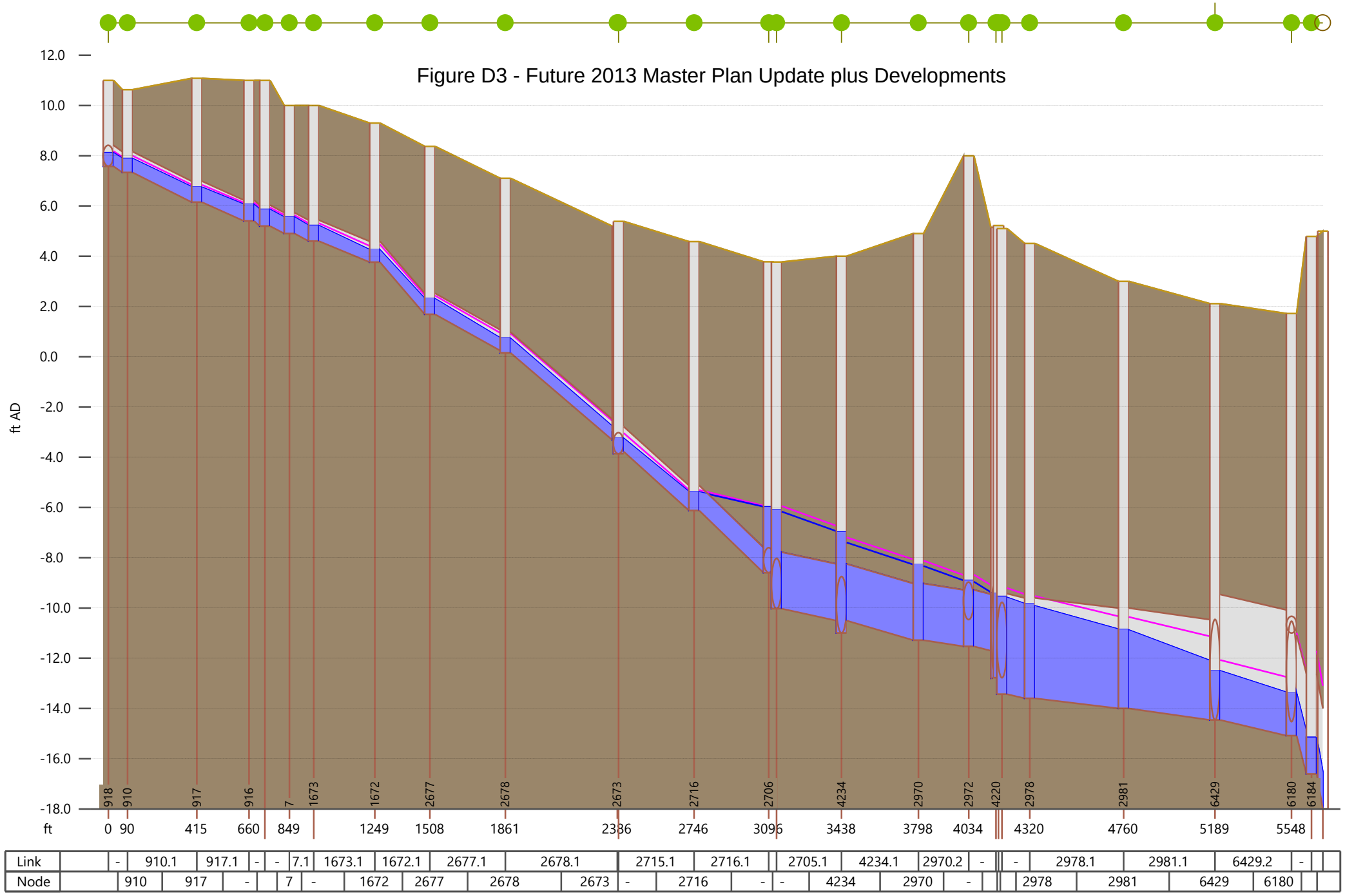

Section for Network - 2012 _Cal_ModRev2_IH_Dev_Fut

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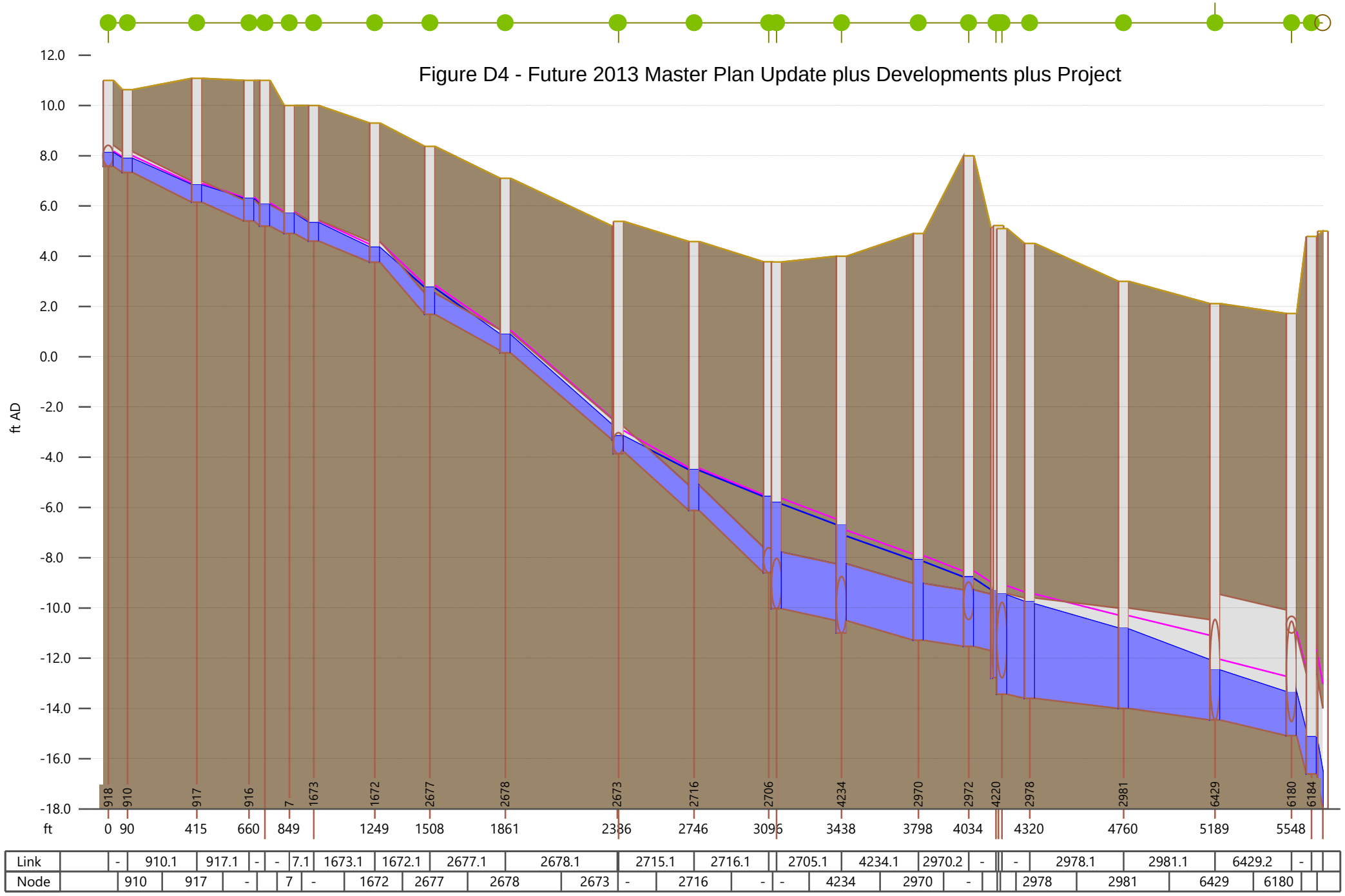

Section for Network - 2012 _Cal_ModRev2_IH_Dev_Fut

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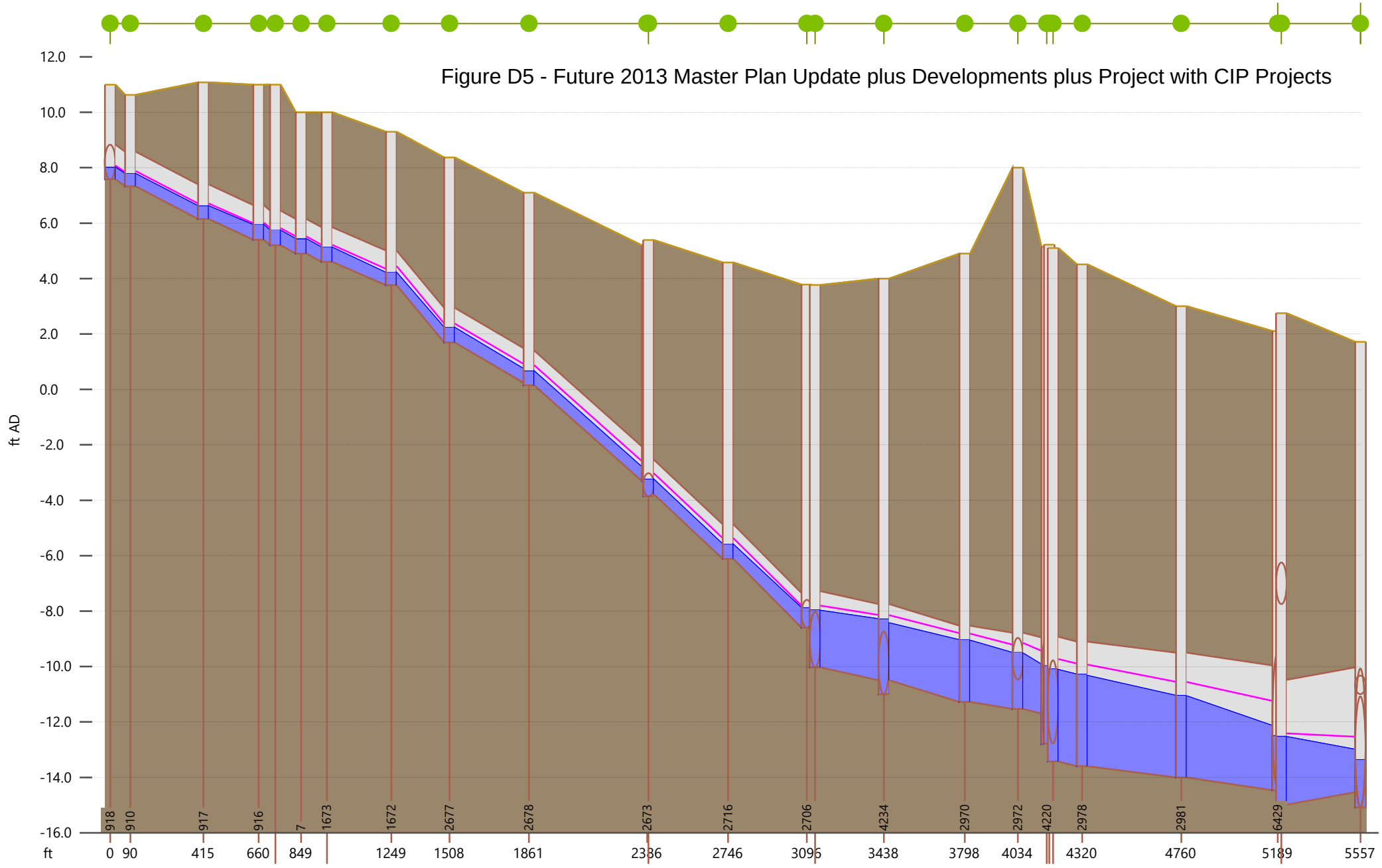
Figure D5 - Future 2013 Master Plan Update plus Developments plus Project with CIP Projects



Link		-	910.1	917.1	-	-	7.1	1673.1	1672.1	2677.1	2678.1	2715.1	2716.1	2705.1	4234.1	2970.2	-	-	2978.1	2981.1	2997.1	
Node		910	917	-		7	-	1672	2677	2678	2673	-	2716	-	-	4234	2970	-		2978	2981	6429	-	-

Section for Network - 2012 _Cal_ModRev2_IH_Dev_Fut

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