

Appendix F. Sewer Analysis Report



SEWER ANALYSIS REPORT

PLACENTIA MIXED-USE

PLACENTIA, CA

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DATE PREPARED: APRIL 2023

JOB NUMBER 1404-007-02

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SEWER ANALYSIS REPORT
PLACENTIA APARTMENTS
PLACENTIA, CA
April 2023

1404-007-02



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1.0 INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this study is to analyze the City of Placentia public sanitary sewer system for existing and proposed conditions for the proposed development. This report includes recommendations for sewer upgrades, if any, that would be required to accommodate wastewater flows associated with the proposed project development. Lastly, recommendations regarding allocations of the proposed onsite flows to the sewer laterals will be presented, if applicable, to prevent potential overloading of any reaches of the public sewer systems by the proposed project.

1.2 SITE DESCRIPTION

The Placentia Mixed-Use project site encompasses a total area of approximately 2.7 acres and is in the City of Placentia. The existing site consists of commercial car dealership-related development, and associated parking.

The site is bounded to the north and east by commercial developments, to the south and west by Orangethorpe Avenue, South Placentia Avenue and a commercial development. A Preliminary Site Diagram was prepared by AO Architects and is included as Appendix 1 of this report. A Vicinity Map is shown below (Figure 1).

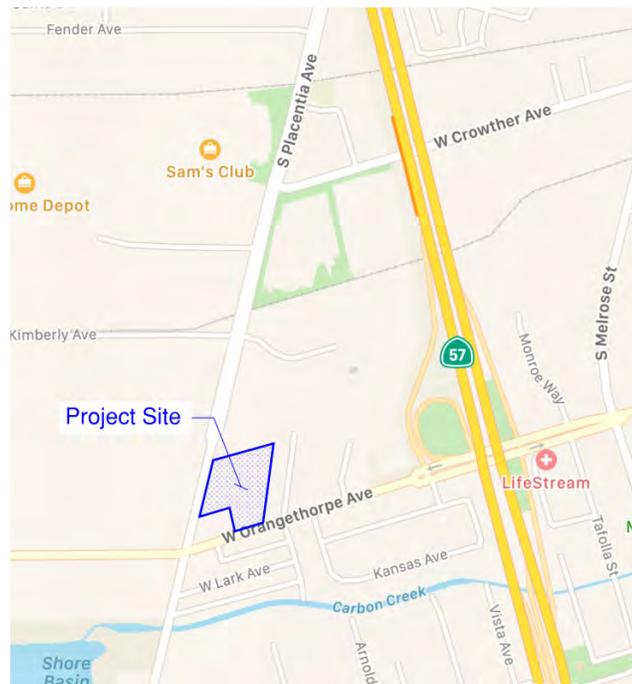


Figure 1 - Vicinity Map

1.3 EXISTING SEWER FACILITIES

Wastewater from the site is currently discharged to the City's public sewer system through two sewer laterals on the west side of the project site. The laterals are currently connected to the existing 12" sewer main in South Placentia Avenue, but are being extended to connect to the new 18" sewer main, which is under construction by the city of Placentia, with an estimated completion date of July 2023. The locations of the sewer systems and laterals are shown on the sewer plans prepared by Dudek and included in this report as Appendix 2. For purposes of this report, the 18" sewer will be considered as existing condition, since the installation will be complete prior to starting construction of the proposed development.

1.4 PROPOSED DEVELOPMENT

The proposed project consists of a mixed-use development with an above-ground parking structure. The project site will encompass approximately 2.7 acres. Construction of retail, recreation area with pool, mail/parcel room, co-work area, and a leasing office are included in the proposed development, along with up to 248 residential units. The Preliminary Site Diagram (Appendix 1) provides a total area of 6,104 square feet for commercial development.

2.0 METHODOLOGY AND EXISTING SEWER FLOWS

The City of Placentia has published design criteria for public sewer systems. A copy of this criteria is included in this report as Appendix 3. The design criteria consists of the following parameters:

- Minimum two manhole locations shall be flow monitored for a two-week wet weather period;
- Peaking factor for dry weather flow shall be 4.5 for local lines and 1.5 for trunk lines;
- Wet weather flow shall be calculated at 400% peak dry weather flow;
- Fixture unit equivalents shall be used to determine the amount of proposed flow;
- The average family unit shall be 3 person per residence and 100 gallons/person/day for the proposed residential flow.

A sewer study was conducted by Dudek for the City of Placentia to evaluate the conditions of the existing (12") sewer. The investigation included the temporary installation of 8 flowmeters in the City of Placentia that were used to monitor the existing wastewater flows in the current sewer system. The locations of the flowmeters are shown on Figure 3-1: Flow Monitoring Locations of the SSMP, included in Appendix 4. Flow Meter No. 6 was installed in the vicinity of the project site as tabulated in Figure 2 and shown on Figure 3-1 and Table 3-3 of the SSMP (Appendix 4).

Flow Meter No.	Location	MH ID	Upstream Pipeline Dia (Inches)
6	North of Orangethorpe Ave and South Placentia Avenue	8900A	12

Figure 2: See SSMP Figure 3-1 and Table 3-3 (Appendix 4)

The wastewater flows were measured for a three-week period, from November 18, 2016, through December 9, 2016. Dudek calculated the existing average dry weather flows (ADWF) and peak dry weather flows (PDWF) using the flow monitoring data. The result for the wastewater flow in the location of Flow Meter No. 6 is summarized as Figure 3 below and included in Table 3-4 of the SSMP (Appendix 4).

Flow Meter No.	Overall Calculated ADWF (gpm)	Overall Calculated PDWF (gpm)
6	130.56	236.10

Figure 3: See SSMP Table 3-4 (Appendix 4)

Following the City of Placentia's sewer design criteria (Appendix 3), the peak wet weather flow (PWWF) was calculated by multiplying the PDWF by a factor of 400%.

The Kutter Flow Depth analysis method was applied to determine the flow depths and percent-full for the existing (as of July 2023) 18" sewer considering PDWF and PWWF. The Kutter Flow Depth calculations are included in Appendix 5 and the results are summarized in Tables 2 and 3.

As shown on Table 2, the existing (as of July 2023) 18" sewer at the location of Flow Meter No. 6 is 22% full during PDWF for existing (as of July 2023) conditions. As shown on Table 3, the 18" sewer will be 45% full during PWWF for existing conditions.

Table 2 – Existing Condition Peak Dry Weather Flow

Location	Pipe Diameter (in)	Pipe Slope (ft/ft)	Overall Calculated PDWF (gpm)	Overall Calculated PDWF (cfs)	Existing PDWF Depth (in)	Existing PDWF % Full
North of Orangethorpe Ave & South Placentia Avenue	18"	0.0024	236.10	0.526	4.04"	22%

Table 3 – Existing Condition Peak Wet Weather Flow

Location	Pipe Diameter (in)	Pipe Slope (ft/ft)	Overall Calculated PDWF (gpm)	Overall Calculated PWWF (gpm)	Overall Calculated PWWF (cfs)	Existing PWWF Depth (in)	Existing PDWF % Full
North of Orangethorpe Ave & South Placentia Avenue	18"	0.0024	236.10	944.4	2.10	8.12"	45%

3.0 PROPOSED SEWER FLOWS

The proposed project wastewater peak flows were calculated for this project using the following information:

Proposed Development:

- Up to 248 residential units
- 6,104 square feet of commercial, including:
 - 1,481 square feet of leasing office
 - 1,046 square feet of mail/parcel room
 - 874 square feet of co-work space
 - 2,703 square feet of retail

The sewer generation calculations and the City of Placentia's Sanitary Sewer Master Plan's table for flow coefficients are included in Appendix 6 of this report. Per the City of Placentia's design criteria (Appendix 3), the calculated sewer flows that an anticipated

from the proposed project shall be multiplied by a peaking factor of 4.5. Therefore, the proposed development is anticipated to generate 0.518 cfs of net wastewater peak dry weather flows. The generated flows were added to the existing PDWF to evaluate the impact of the proposed development will have on the City's sewer system.

The flow depths in the existing (as of July 2023) 18" sewer with the proposed conditions were calculated using the Kutter Flow Depth analysis. The calculations are included in Appendix 7. Table 4 shows the results for the proposed conditions considering the PDWF and Table 5 shows the results accounting for the PWWF.

Table 4 – Proposed Condition Peak Dry Weather Flow

Location	Pipe Diameter (in)	Pipe Slope (ft/ft)	Existing PDWF (cfs)	Project Net Sewer Flow (cfs)	Proposed PDWF (cfs)	Proposed PDWF Depth (in)	Proposed PDWF % Full
North of Orangethorpe Ave & South Placentia Avenue	18"	0.0024	0.526	0.518	1.04	5.62"	31.2%

Table 5 – Proposed Condition Peak Wet Weather Flow

Location	Pipe Diameter (in)	Pipe Slope (ft/ft)	Proposed PDWF (cfs)	Proposed PWWF (cfs)	Proposed PDWF Depth (in)	Proposed PDWF % Full
North of Orangethorpe Ave & South Placentia Avenue	18"	0.0024	1.04	4.16	12.33"	68.5%

The City of Placentia's Sewer Master Plan includes Table 3-2: Evaluation Criteria, see also Figure 4. According to the SSMP, the existing 18" sewer has adequate capacity to convey the required PDWF and PWWF wastewater flows.

Evaluation Criteria	
Maximum d/D (<12")	0.5
Maximum d/D (12" or larger)	0.75

Figure 4: See SSMP Table 3-2 (Appendix 8)

4.0 RESULTS AND CONCLUSIONS

The city of Placentia is currently installing a new 18" sewer in South Placentia Avenue to replace the deficient 12" sewer, with construction estimated to be completed by July 2023. The calculations included in this report included flow-depth analyses for the city's 18" sewer line.

Based on the calculations included in this report, the sewer flow-depth would be 31.2% full for the proposed condition PDWF and would be 68.5% for the proposed condition PWWF. Therefore, based on the city's criteria to allow sewer flow depths of up to 75% full for sewer lines 12" or greater, the calculations and results presented in this report demonstrate that the city's new 18" sewer system in South Placentia Avenue will have sufficient capacity for both PDWF and PWWF for the proposed project conditions.

5.0 APPENDICES

- Appendix 1 Preliminary Site Diagram
- Appendix 2 Dudek Sewer Plans
- Appendix 3 Design Criteria
- Appendix 4 Excerpts from the City of Placentia's Sanitary Sewer Master Plan
- Appendix 5 Kutter Flow Depth Calculations: Existing Conditions
- Appendix 6 Sewer Generation Calculations
- Appendix 7 Kutter Flow Depth Calculations: Proposed Conditions
- Appendix 8 City of Placentia's Sanitary Sewer Master Plan: Evaluation Criteria

Appendix 1

Preliminary Site Diagram



SITE PLAN NOTES

1. THIS ARCHITECTURAL SITE PLAN IS PROVIDED FOR OVERALL SITE REFERENCE. THE LOCATION OF ITEMS INCLUDED IN THIS SET OF PLANS IS FOR AGENCY DEPARTMENT USE ONLY.
2. THIS SITE PLAN IS FOR REFERENCE ONLY, AS AN ARCHITECTURAL PLAN FOR GENERAL LAYOUT AND IDENTIFICATION PURPOSES ONLY.
3. FOR LOT LINE DIMENSIONS & HORIZONTAL CONTROL, SEE CIVIL DRAWINGS.
4. FOR HARDSCAPE AND ALL SITE IMPROVEMENTS, SEE LANDSCAPE DRAWINGS.
5. FOR PARKING GARAGE, SEE SEPARATE SUBMITTAL PACKAGE.
6. FOR "FIRE LANE" DESIGN, SEE CIVIL AND LANDSCAPE DRAWINGS.
7. FOR PERIMETER FENCING, SEE LANDSCAPE DRAWINGS.
8. REFER TO CIVIL AND LANDSCAPE DRAWINGS FOR SPECIFIC SITE REQUIREMENTS.
9. ALL PROPERTY LINES, EASEMENTS, AND BUILDINGS, EXISTING AND PROPOSED ARE SHOWN ON THIS PLAN BUT MUST BE VERIFIED WITH THE CIVIL PLANS.
10. BUILDING SIGNAGE IS DESIGNED BY OTHERS AND INSTALLED BY THE GENERAL CONTRACTOR.
11. SITE SIGNAGE IS DESIGNED BY OTHERS AND INSTALLED BY THE CONTRACTOR.
12. SITE WALLS ARE DESIGNED BY OTHERS.
13. DECORATIVE SITE LIGHTING IS DESIGNED BY OTHERS.
14. SURFACE WATER MUST DRAIN AWAY FROM BUILDING SEE CIVIL AND LANDSCAPE PLANS FOR DRAINAGE DESIGN.

GENERAL NOTES

1. SEE SHEETS L-1 - L-11 FOR LANDSCAPE.
2. SEE SHEETS C-1.00 - C-2.00 FOR CIVIL.

LEGEND

- INDICATES RESIDENTIAL BUILDING
- INDICATES GROUND FLOOR RESIDENTIAL AMENITY
- INDICATES GROUND RETAIL SPACE

Residential Multi-Family Building													05.21.21
UNITS PER LEVEL SUMMARY													
LEVEL	STUDIO			1BR			2BR			TOTAL			
	S1	S1A	A1	A1A	A2	A2A	A3	A3A	B1	B1A	B3	B3A	TOTAL
5	9	2	2	1	5	4	8	6	10	4	0	2	53
4	9	2	2	1	5	4	8	6	10	4	0	2	53
3	9	2	2	1	5	4	8	6	10	4	0	2	53
2	7	2	2	0	4	4	8	6	10	3	0	0	46
1	7	2	2	0	7	5	6	4	5	2	0	0	40
Totals	51		10	3	26	21	38	28	45	17	0	6	245
	16.7%	4.1%	4.1%	1.2%	10.6%	8.6%	15.5%	11.4%	18.4%	6.9%	0.0%	2.4%	100%
	20.8%					51.4%			27.8%				

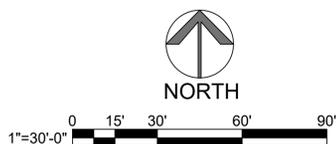
DWELLING UNIT INFO				
Unit	Unit SF	Qty.	%	SF TOT.*
S1	571	41	16.7%	23,411
S1A	530	10	4.1%	5,300
A1	638	10	4.1%	6,380
A1A	591	3	1.2%	1,773
A2	737	26	10.6%	19,162
A2A	681	21	8.6%	14,301
A3	715	38	15.5%	27,170
A3A	715	28	11.4%	20,020
B1	1,067	45	18.4%	48,915
B1A	1,031	17	6.9%	17,527
B3	0	0	0.0%	0
B3A	1,072	6	2.4%	6,432
Avg.	777	245	100.0%	190,391

AVG. SF	
TYPE	SF
STUDIO	563
1-BR	705
2-BR	1072

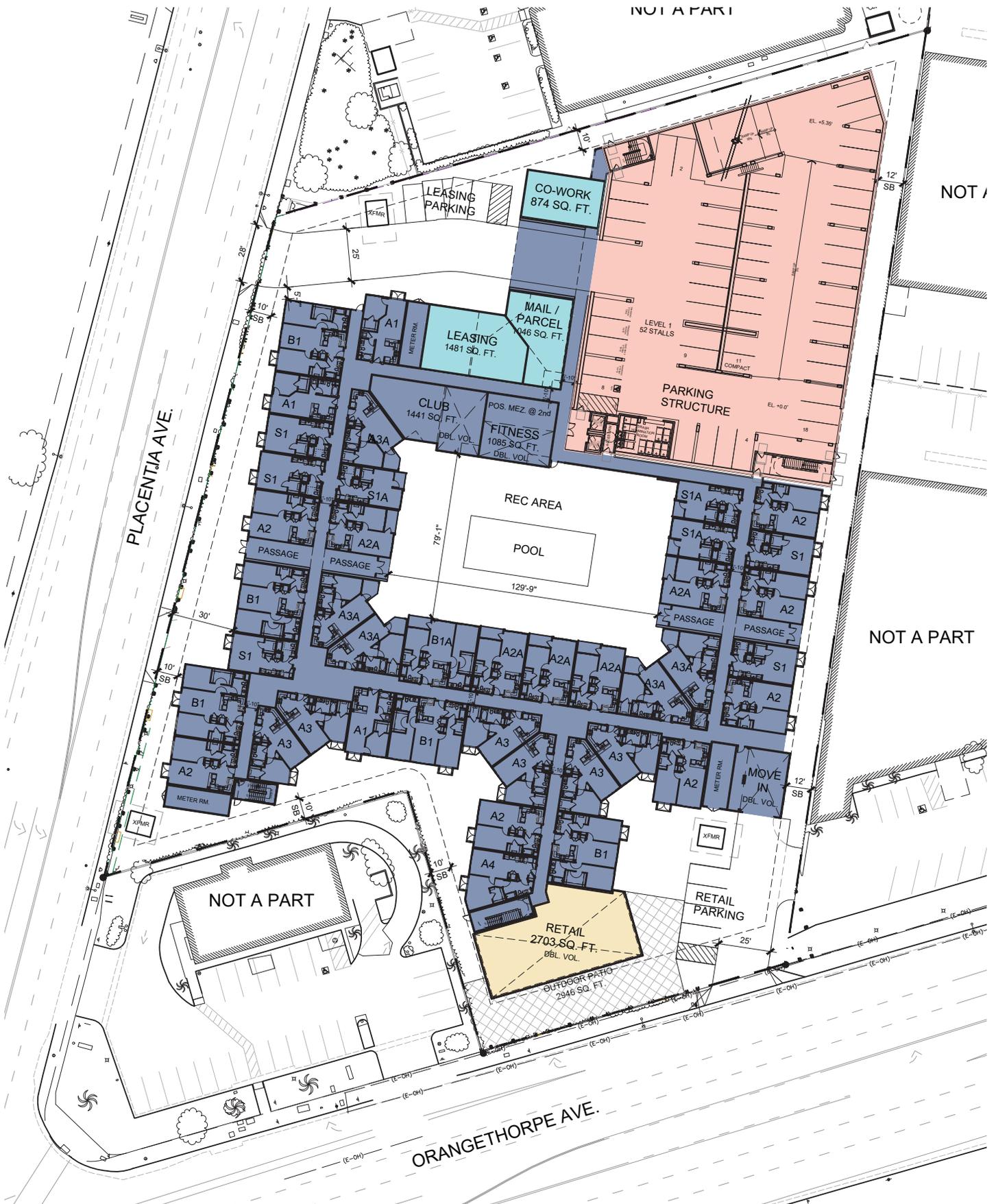
PRIVATE O.S.		
Unit	DECK AREA	TOT. AREA
S1	26	1,066
S1A	41	410
A1	26	260
A1A	44	132
A2	26	676
A2A	58	1,218
A3	28	1,064
A3A	65	1,820
B1	26	1,170
B1A	58	986
B3	0	0
B3A	60	360
TOTAL	9,162	

BUILDING - PARKING SUMMARY					
TYPE	COUNT	REQUIRED		PROVIDED	
		RATIO	STALLS	RATIO	STALLS
STUDIO	51	2.0	102	1.0	51
1 BR	126	2.0	252	1.0	126
2 BR	68	2.0	136	2.0	136
GUEST		0.15	37	0.0	0
TOTALS	245	2.15	527	1.28	313
LEASING			2,183 SF		4
RETAIL X/1000 SF		0.004	3,000 SF		12
MAIL - USPS STALL					1
TOTAL STALLS REQUIRED		RES. RATIO: 2.15			544
TOTAL STALLS PROVIDED		RES. RATIO: 1.28			330

BUILDING - PARKING PROVIDED			
	STD	Acc.	TOTAL
SURFACE PKG	5	1	6
LEVEL 1	46	2	48
LEVEL 2	49	2	51
LEVEL 3	50	1	51
LEVEL 4	50	1	51
LEVEL 5	50	1	51
LEVEL 6	51	0	51
LEVEL 7	21	0	21
TOTAL STALLS	301	8	330
	91%	2%	



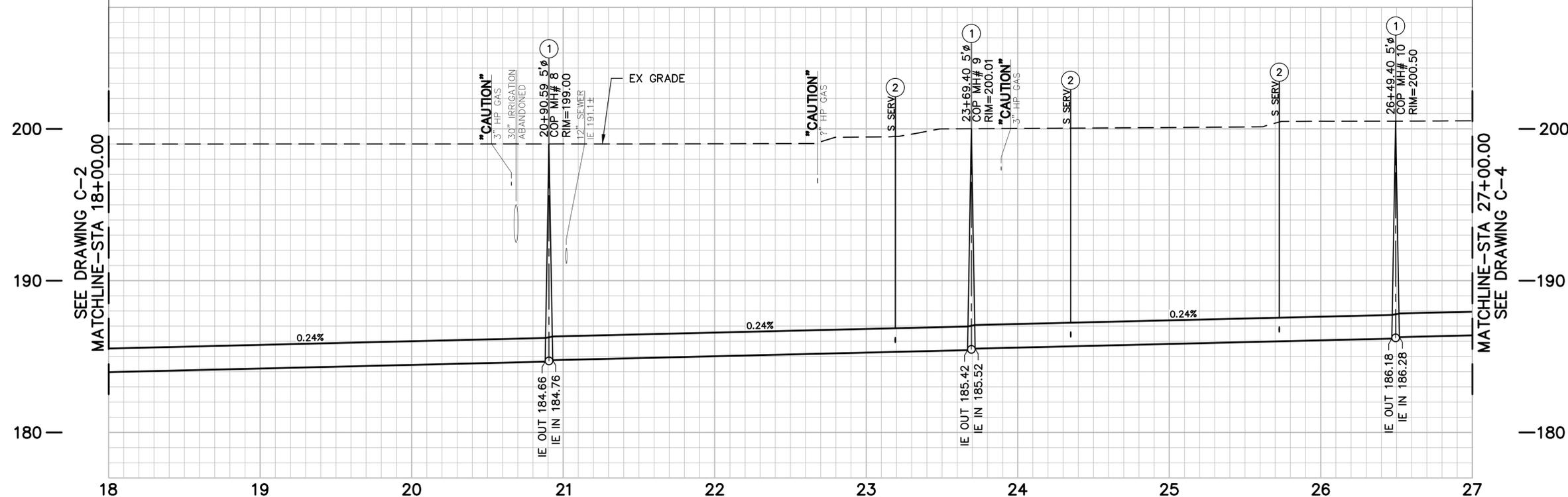
PRELIMINARY SITE DIAGRAM



Appendix 2

Dudek Sewer Plans

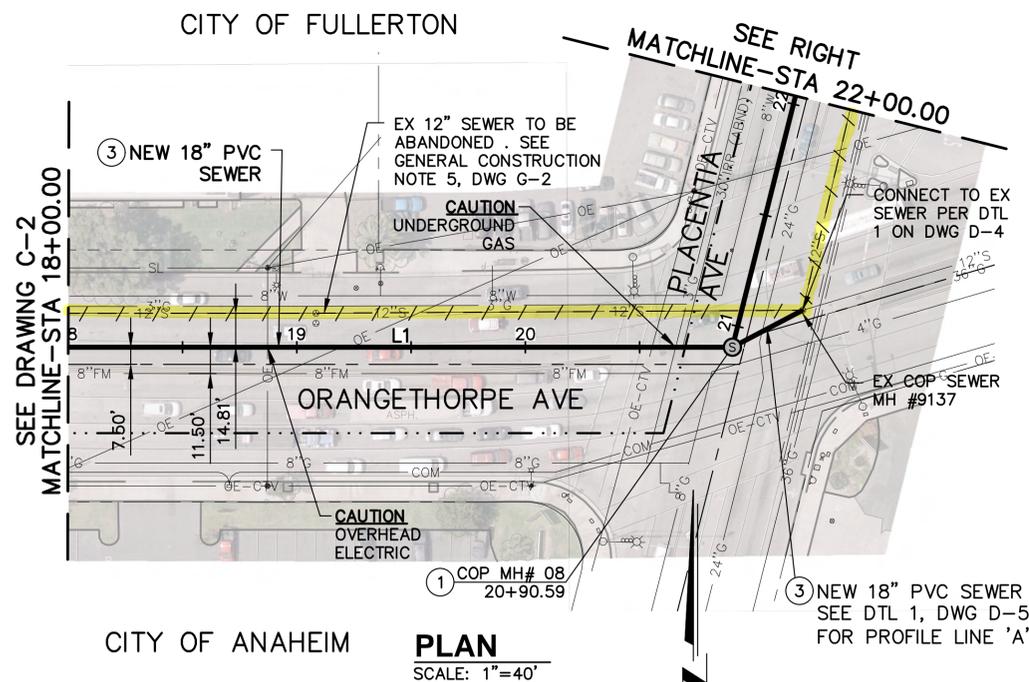
900.00' LF 18" PS115 PVC PIPE



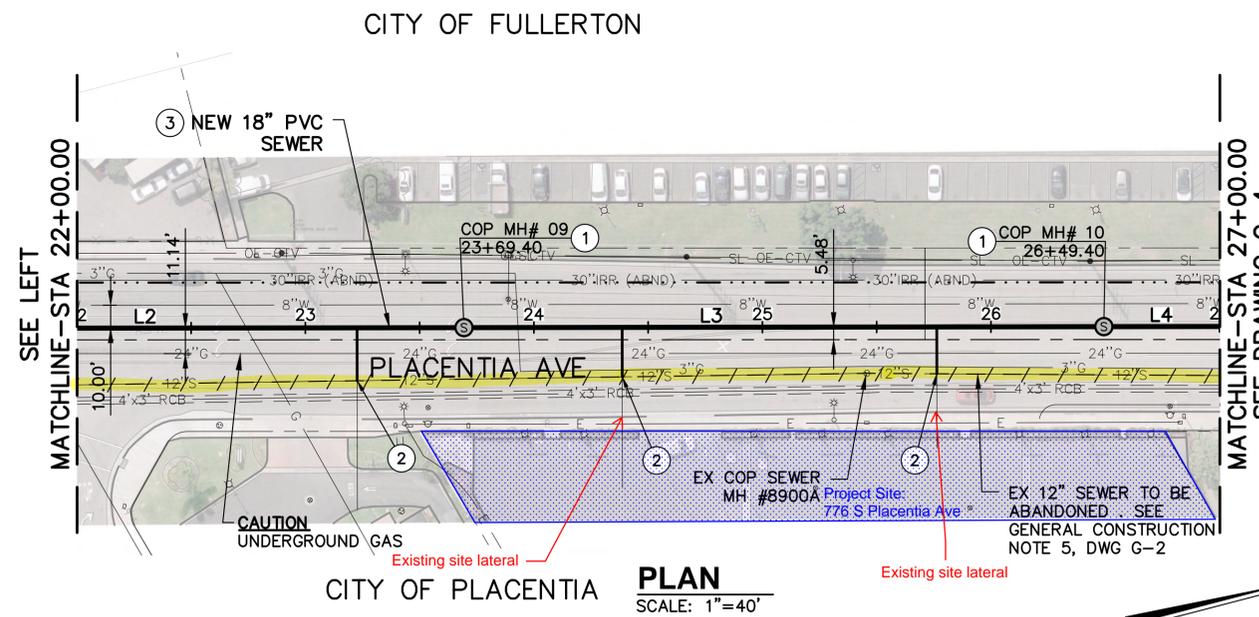
PROFILE
SCALE: 1"=40' HORIZ
1"=4' VERT

CONSTRUCTION LEGEND

- ① INSTALL NEW MANHOLE PER DTL 1, DWG D-2
- ② RECONNECT EXISTING SEWER LATERAL PER DTL 1, DWG D-3
- ③ CONSTRUCT 18" DIA (ASTM F679 PS115) PVC PIPE
- ④ CONSTRUCT 15" DIA (SDR-26) PVC PIPE
- ⑤ RECONNECT EXISTING SEWER LATERAL PER DTL 3, DWG D-3 (TYPE II)
- ⑥ INSTALL 22" DIA (DR17) HDPE PIPE
- ⑦ JACK AND BORE 30" DIA. X 3/8" STL CASING. INSTALL CASING PER DTL 4, DWG D-3
- ⑧ INSTALL 18" DIA (DR17) HDPE PIPE WITH 30" X 3/8" STL CASING, SEE DWG D-1. SEE CALTRANS NOTE 10
- ⑨ INSTALL 45° BEND
- ⑩ JACK AND BORE 30" DIA. X 1/2" STL CASING. INSTALL CASING PER DTL 4, DWG D-3



PLAN
SCALE: 1"=40'

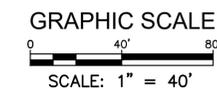


PLAN
SCALE: 1"=40'

NO.	Δ/BEARING	RADIUS	LENGTH
L1	S89°39'20"E	-	290.59'
L2	N14°28'40"E	-	278.80'
L3	N14°28'40"E	-	280.00'
L4	N14°28'40"E	-	50.60'

MH ID#	STATION	MH DIA	DEPTH TO IE	RIM EL
COP MH# 08	20+90.59	5-FT DIA	14.29	199.00
COP MH# 09	23+69.40	5-FT DIA	14.54	200.01
COP MH# 10	26+49.40	5-FT DIA	14.27	200.50

DUDEK
605 Third Street Encinitas, CA 92024
760.942.5147 Fax 760.632.0164



DATE	DWN BY	NO	DESCRIPTION	APPR BY

Bench Mark:
THE ELEVATIONS SHOWN HEREON ARE BASED UPON THE COUNTY OF ORANGE BENCH MARK NO. 2D-26-70.
DATED 2006, ELEVATION = 190.23 FEET, (NAVD88)
Field Notes:

Standard Plans:
Utility Plans:
Sewer Plans:

Prepared under supervision of
Russell J. Bergholz
Date: 4-2-20
RUSSELL J. BERGHOLZ R.C.E. No. 058395, EXP. DATE 12-31-21
Drawn by: KK
Checked by: RB
Recommended: BT
APPROVED: _____ Date: _____
MASOUD SEPAHI R.C.E. No. 52786, EXP. DATE 12-31-20
CITY ENGINEER

TOD CROWTHER SEWER LINE PROJECT
PLAN & PROFILE
STA 18+00.00 TO 27+00.00
CITY OF PLACENTIA

DRAWING NO
C-3
SHEET 7 OF 63

Appendix 3

Design Criteria



City of Placentia

DEPARTMENT OF PUBLIC WORKS

SUBJECT: SEWER CAPACITY STUDY GUIDELINES

Developer is required to determine the impact of certain projects on the City's sewer system. The sanitary sewer capacity study shall analyze the impact of the proposed project on the capacity of the existing sanitary sewer system. The developer is responsible for all costs associated with this study. The following is a guideline for performing this study:

TRIGGER

A sanitary sewer study shall be required for a proposed project if it exceeds one or more of the following criteria:

1. 10 or more residential dwelling units
2. 10,000 square feet of office or commercial facility
3. 1,000 square feet of restaurant
4. Laundromat and/or industrial laundry

CRITERIA

1. At a minimum, two manhole locations shall be flow monitored for a two-week wet weather period to determine existing flow characteristics. The locations shall be at the sewer line nearest the project site, and at the nearest trunk line. The monitoring shall be dynamic, continuous and be recorded at 15-minute intervals.
2. The analysis of this data will use the following peaking factors for dry weather flow: 4.5 for local lines and 1.5 for trunk lines
3. In lieu of wet weather monitoring, wet weather flow will be calculated at 400% of peak dry weather flow.
4. Fixture unit equivalents shall be used to determine the amount of proposed project flow.
5. The average family unit shall be 3.0 persons per residence and 100 gal/person/day for proposed residential flows.

FINDINGS

1. Existing capacity of system.
2. The post-development capacity of system.
3. Percent (%) of pipe full at peak flow.
4. Confirm adequacy of existing local and trunk lines for both existing and anticipated future flows. Recommended actions required to mitigate any impact that overcharges the system.

FLOW MONITORING

Developers shall use a professional Engineer licensed in the State of California and/or a Contractor with at least 5 years' experience in flow monitoring to perform requirements of the Sanitary Sewer Capacity Study.

Appendix 4

Excerpts from the City of Placentia's Sanitary Sewer Master Plan

Sanitary Sewer Master Plan and Condition Assessment

Prepared for:



City of Placentia

Public Works Department
401 East Chapman Avenue
Placentia, California 92870

Prepared by:

DUDEK

605 Third Street

Encinitas, California 92024

Contact: Russ Bergholz, PE

FEBRUARY 2018

etc.) were estimated to allow for complete drainage of all flows from the City's existing and future wastewater collection system.

3.4 Existing Flow Evaluation

Following completion of the preliminary pipeline network, wastewater flow loading is applied to model nodes (manholes). The calculation of flow loading can be estimated using numerous sources of historic flow data. Historic data was not available for model development. Therefore, the process of estimating and applying existing system flows into the model progressed in the following approach:

1. Using City GIS parcel information, assign a land use type to each model node, based on the predominate land usage near the node. (Figure I-4)
2. Estimate the number of equivalent dwelling units (EDU's) or acreage of non-residential land assigned to each model node.
3. Research typical unit flow factors for neighboring sewer service providers.
4. Estimate City of Placentia unit flow factors and use factors and EDU/acreage for preliminary flow input projection.
5. Use flow metering average daily flow rates to refine estimated unit factors. (See Section 3.4.1)
6. Use flow metering 24-hour average flow rates to refine the 24-hour diurnal curve used by each unit flow factor at each model node.

A typical collection system drains to one outfall location, making it relatively simple to measure and sum the flows through the overall system. Flows are then used to refine the unit flow factors by land use type. The City's collection system drains to 35 separate outfall locations from over 40 separate sewersheds or drainage basins, which adds to the complexity of the flow evaluation methodology described above.

3.4.1 Flow Monitoring Program

A flow monitoring program was initiated to begin the existing flow evaluation. Temporary installation of eight flowmeters was used to measure existing wastewater flows and to calibrate the existing dry weather hydraulic model scenario. Flow measurement data was obtained for three weeks from November 18, 2016 through December 9, 2016. Flowmeter locations (See Figure 3-1 and Table 3-3) were chosen based on consideration of several factors including:

- Large upstream sewershed, with singular predominant land use type
- Downstream of another agency's wastewater outfall into the City's collection system
- Downstream of a proposed redevelopment area
- Diverse geographical region of the City
- Older area of the City

Figure 3-1: Flow Monitoring Locations

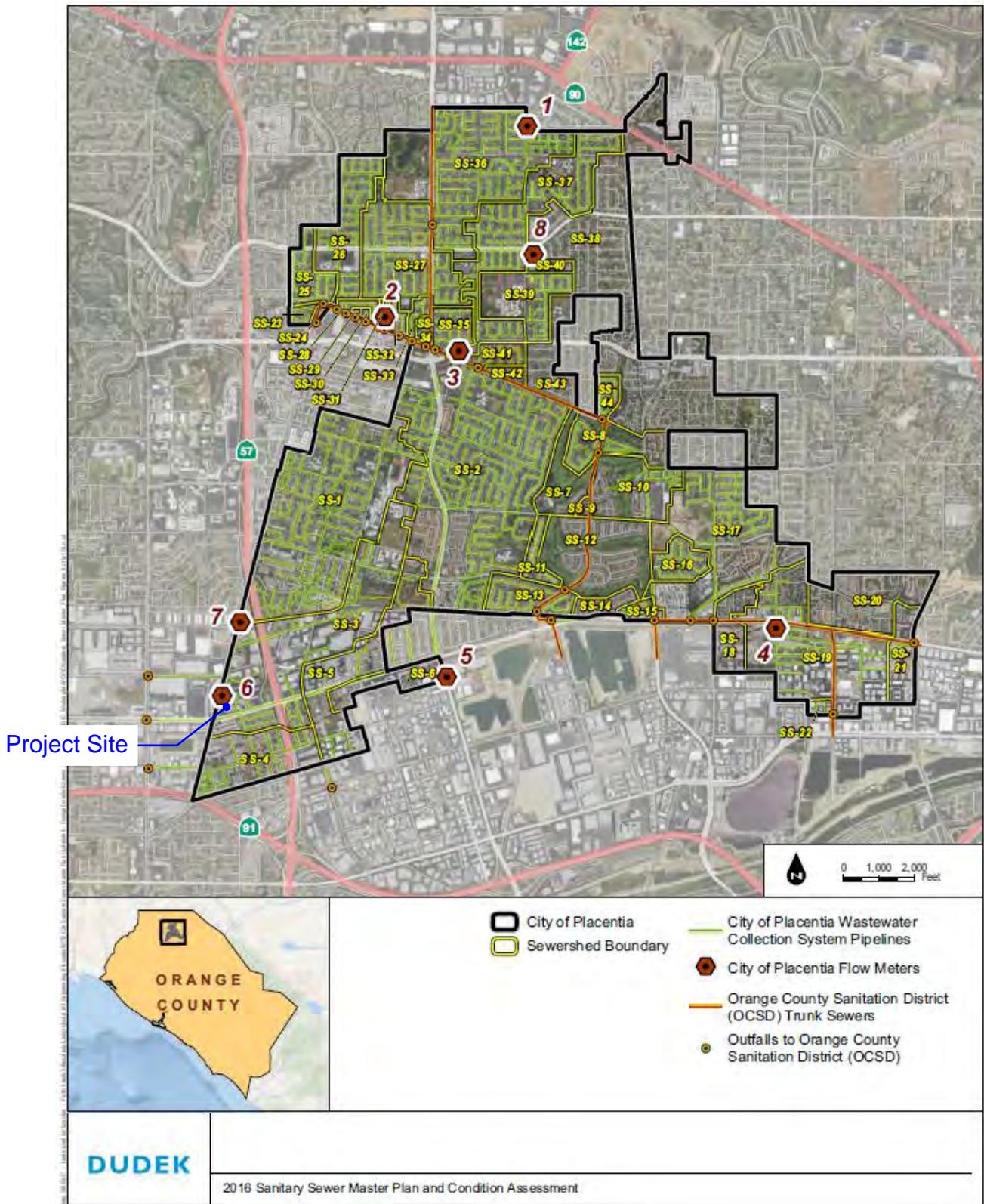


Table 3-3: Flow Monitoring Locations

Flow Meter No.	Location	MH ID	Upstream Pipeline DIA (inches)	Upstream Sewershed(s)	No. of Parcels	Land Use Type
1	E. Elm St and Valencia Ave	1338	8	City of Brea	UNK	UNK
2	North of E. Palm Dr and Tuffree Blvd	3422	8	SS-27	618	Single Family Residential
3	234 Yorba Linda Blvd	3258	12	YLWD / SS-37	YLWD, 630	Single Family Residential
4	South of Orangethorpe Ave and Van Buren St	7204	10	SS-19	183	Mixed (Single Family Residential & Industrial)
5	South of Orangethorpe Ave on Kraemer Blvd	8405	21	City of Anaheim / SS-6	City of Anaheim, 2	UNK
6	North of Orangethorpe Ave and S. Placentia Ave	8900A	12	SS-3	168	Mixed (Single Family Residential & Industrial)
7	North of Fender Ave on S. Placentia Ave	6104	8	SS-1	550	Single Family Residential
8	E. Bastanchury Rd and Valencia Ave	2300	8	YLWD / SS-37	YLWD, 253	Single Family Residential

3.4.2 Existing Average and Peak Dry Weather Flow

Statistical analysis of the flow monitoring data was performed to define the existing average and peak dry weather flow (ADWF and PDWF) for each of the flow meters. ADWF was determined by analyzing the data for the dry days only. A dry day is defined as a day when no rainfall occurred 72 hours prior to that day and when there were no noticeable lingering effects from a previous rainfall. ADWF defines the baseline for comparison with AWWF (average wet weather flow) when considering the presence of defect flow.

Flows for many of the sites differ on Friday evenings compared to Mondays through Thursdays. Similarly, flow patterns for Saturday and Sunday also have unique evening flow patterns. ADWF diurnal patterns are taken from dry days, when rainfall derived inflow (RDI) had the least impact on the baseline flow. The overall ADWF is calculated per the following equation:

$$ADWF = \left(ADWF_{\text{mon - thurs}} \times \frac{4}{7}\right) + \left(ADWF_{\text{fri}} \times \frac{1}{7}\right) + \left(ADWF_{\text{sat}} \times \frac{1}{7}\right) + \left(ADWF_{\text{sun}} \times \frac{1}{7}\right)$$

The ADWF calculated for each of the flow meter sewersheds is shown in Table 3-4.

Table 3-4: Flow Metering ADWF and PDWF

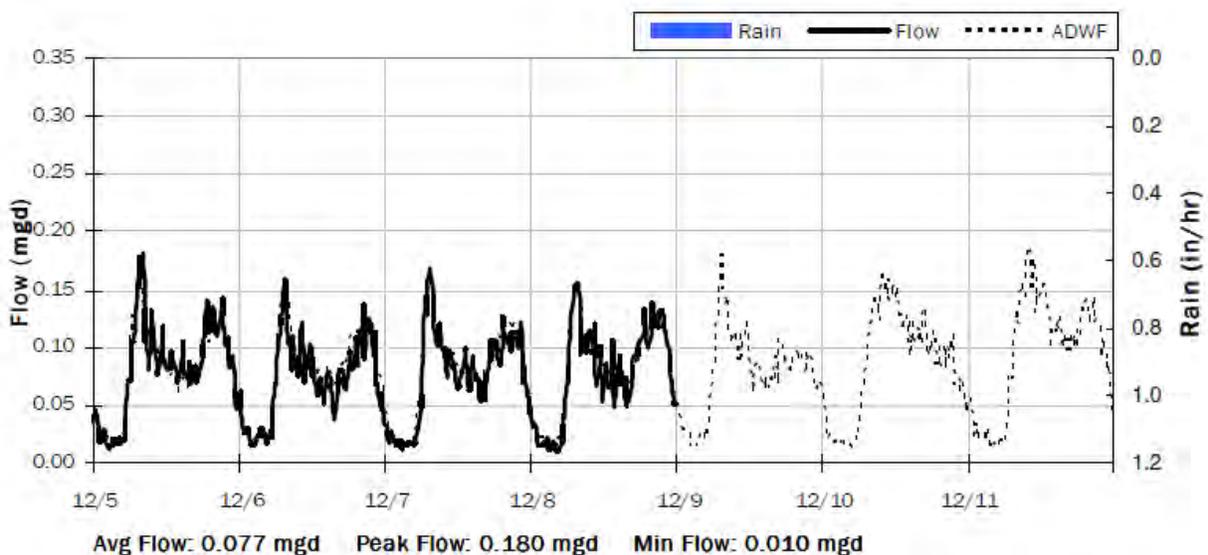
Flow Meter No. ¹	Overall Calculated ADWF (mgd)	Overall Calculated ADWF (gpm)	Overall Calculated PDWF (mgd)	Overall Calculated PDWF (gpm)
1	0.001	0.69	0.060	41.60
2	0.081	56.25	0.210	145.80
3	0.266	184.72	0.570	395.80
4	0.062	43.06	0.160	111.10
6	0.188	130.56	0.340	236.10
7	0.150	104.17	0.320	222.20
8	0.008	5.56	0.050	34.70

Note:

¹ Flow Meter No. 5 was installed on parallel sewer and is removed from analysis.

The dominant land use type for each sewershed is reflected in the flow meter data as shown in Figure 3-2 and Figure 3-3. For example, Meter 2 (Figure 3-2) is dominated by residential flow and shows distinct morning and evening peaks, while Meter 4 (Figure 3-3) is dominated by industrial and commercial flows, with peak flows occurring during weekday business hours.

Figure 3-2: Meter 2 Flow Monitoring Data (Residential Dominant)



Appendix 5

Kutter Flow Depth Calculations: Existing Conditions

Placentia Apartments

Existing Condition: PDWF 18" Sewer in Placentia Ave
776 S Placentia Ave

***Cells that are highlighted can be changed**

GIVEN:

Q _{given} =	0.526	cfs	<== Discharge
n=	0.013		<== Roughness coefficient
S=	0.0024		<== Slope V:H
r=	0.750	ft	<== Radius

TRIAL DEPTH:

h= 4.035 in 22% Full <== Vary this depth to get Q_{assume} = Q_{given}
0.336 ft

CACULATIONS:

beta= 56.52 degree

R= 0.200 ft

C= 81.144

V= 1.778 ft/sec

A= 0.296 sq. ft.

Q_{assume}= 0.526 cfs

Q_{halffull} = 2.53 cfs

Q_{3/4full} = 4.67 cfs

RESULT:

(Q_{given}-Q_{assume}) / Q_{given} %= 0% <===== OK

Flow Depth (in) = 4.035

Capacity d/r = 44.83%

Q_{capacity} = 4.669 cfs

Capacity Q_{given}/Q_{capacity} = 11.27%

(Q_{halffull} = 2.53 cfs
beta_{halffull} = 90.000 degree
R_{halffull} = 0.375 ft
C_{halffull} = 95.403 ft
A_{halffull} = 0.884 sq. ft.
V_{halffull} = 2.862 ft/sec)

(Q_{3/4full} = 4.67 cfs
beta_{3/4full} = 120.00 degree
R_{3/4full} = 0.453 ft
C_{3/4full} = 99.659 ft
A_{3/4full} = 1.422 sq. ft.
V_{3/4full} = 3.284 ft/sec)

Placentia Apartments

Existing Condition: PWWF 18" Sewer in Placentia Ave
776 S Placentia Ave

***Cells that are highlighted can be changed**

GIVEN:

Q _{given} =	2.104	cfs	<== Discharge
n=	0.013		<== Roughness coefficient
S=	0.0024		<== Slope V:H
r=	0.750	ft	<== Radius

TRIAL DEPTH:

h=	8.118	in	45% Full	<== Vary this depth to get Q _{assume} = Q _{given}
		0.677	ft	

CACULATIONS:

beta= 84.38 degree

R= 0.350 ft

C= 93.846

V= 2.721 ft/sec

A= 0.773 sq. ft.

Q_{assume} = 2.104 cfs

Q_{halffull} = 2.53 cfs

Q_{3/4full} = 4.67 cfs

RESULT:

(Q_{given}-Q_{assume}) / Q_{given} % = 0% <===== **OK**

Flow Depth (in) = 8.118

Capacity d/r = 90.20%

Q_{capacity} = 4.669 cfs

Capacity Q_{given}/Q_{capacity} = 45.06%

(Q_{halffull} = 2.53 cfs
beta_{halffull} = 90.000 degree
R_{halffull} = 0.375 ft
C_{halffull} = 95.403 ft
A_{halffull} = 0.884 sq. ft.
V_{halffull} = 2.862 ft/sec)

(Q_{3/4full} = 4.67 cfs
beta_{3/4full} = 120.00 degree
R_{3/4full} = 0.453 ft
C_{3/4full} = 99.659 ft
A_{3/4full} = 1.422 sq. ft.
V_{3/4full} = 3.284 ft/sec)

Appendix 6

Kutter Flow Depth Calculations: Proposed Conditions

Placentia Mixed-Use

Proposed Project Conditions: PDWF in Forthcoming 18" Sewer in Placentia Ave
776 S Placentia Ave

***Cells that are highlighted can be changed**

GIVEN:

Q _{given} =	1.040	cfs	<i><== Discharge</i>
n=	0.013		<i><== Roughness coefficient</i>
S=	0.0024		<i><== Slope V:H</i>
r=	0.750	ft	<i><== Radius</i>

TRIAL DEPTH:

31.2% Full

h=	5.620	in	<i><== Vary this depth to get Q_{assume} = Q_{given}</i>
		0.468 ft	

CALCULATIONS:

beta= 67.94 degree

R= 0.265 ft

C= 87.498

V= 2.206 ft/sec

A= 0.471 sq. ft.

Q_{assume} = 1.040 cfs

Q_{halffull} = 2.53 cfs

Q_{3/4full} = 4.67 cfs

RESULT:

(Q_{given}-Q_{assume}) / Q_{given} %= 0% **<===== OK**

Flow Depth (in) = 5.620

Capacity d/r = 62.44%

Q_{capacity} = 4.669 cfs

Capacity Q_{given}/Q_{capacity} = 22.27%

(Q_{halffull} = 2.53 cfs
beta_{halffull} = 90.000 degree
R_{halffull} = 0.375 ft
C_{halffull} = 95.403 ft
A_{halffull} = 0.884 sq. ft.
V_{halffull} = 2.862 ft/sec)

(Q_{3/4full} = 4.67 cfs
beta_{3/4full} = 120.00 degree
R_{3/4full} = 0.453 ft
C_{3/4full} = 99.659 ft
A_{3/4full} = 1.422 sq. ft.
V_{3/4full} = 3.284 ft/sec)

Placentia Mixed-Use

Proposed Project Conditions: PWWF in Forthcoming 18" Sewer in Placentia Ave
776 S Placentia Ave

***Cells that are highlighted can be changed**

GIVEN:

Q _{given} =	4.160	cfs	<== Discharge
n=	0.013		<== Roughness coefficient
S=	0.0024		<== Slope V:H
r=	0.750	ft	<== Radius

TRIAL DEPTH:

h=	12.331	in	<== Vary this depth to get Q _{assume} = Q _{given}
		1.028 ft	

CALCULATIONS:

	68.5% Full
beta=	111.72 degree

R= 0.441 ft

C= 99.083

V= 3.224 ft/sec

A= 1.290 sq. ft.

Q_{assume} = 4.160 cfs

Q_{halffull} = 2.53 cfs

Q_{3/4full} = 4.67 cfs

RESULT:

(Q_{given}-Q_{assume}) / Q_{given} %= 0% <===== **OK**

Flow Depth (in) = 12.331

Capacity d/r = 137.01%

Q_{capacity} = 4.669 cfs

Capacity Q_{given}/Q_{capacity} = 89.09%

(Q_{halffull} = 2.53 cfs
beta_{halffull} = 90.000 degree
R_{halffull} = 0.375 ft
C_{halffull} = 95.403 ft
A_{halffull} = 0.884 sq. ft.
V_{halffull} = 2.862 ft/sec)

(Q_{3/4full} = 4.67 cfs
beta_{3/4full} = 120.00 degree
R_{3/4full} = 0.453 ft
C_{3/4full} = 99.659 ft
A_{3/4full} = 1.422 sq. ft.
V_{3/4full} = 3.284 ft/sec)

Appendix 7

Sewer Generation Calculations

Sewer Generation Calculations

777 W Orangethorpe Ave - Existing Sewer Demand							
Description	Value	Units	Peak Dry Weather Flows (gpd)	Peaking Factor	Peak Wet Weather Flows (gpd)	Peak Wet Weather Flows (gpm)	Peak Wet Weather Flows (cfs)
1-story Existing Car Dealership Bldg (Commercial)*	0.84	Acre	2670	4.5	10	0.01	0.0000
			Total		10	0.01	0.00002

777 W Orangethorpe Ave - Proposed Sewer Demand							
Description	Value	Units	Peak Flows (gpd)	Peaking Factor	Peak Flows (gpd)	Peak Flows (gpm)	Peak Flows (cfs)
Residential Units	248	# of Units	300	4.5	334,800	232.50	0.5180
Commercial - Retail/Leasing/Mail/Parcel Room/Co-work*	0.14	Acre	2670	4.5	2	0.00	0.000003
			Total		334,802	232.50	0.518

Net Sewer Flows (Proposed - Existing): 0.518 gpd

* Commercial: gpd = 2,670 gpd per acre per City of Placentia's Sanitary Sewer Master Plan (Table 3-5) prepared by Dudek