CITY OF SEAL BEACH

SEWER MASTER PLAN
2018

Submitted to
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LIST OF ABBREVIATIONS

Abbreviations	Explanation
ac	Acres
acp	Asbestos Cement Pipe
amsl	Above Mean Sea Level
CCTV	Closed Circuit Televison
cfs	Cubic Feet per Second
cip	Cast Iron Pipe
CIP	Capital Improvement Program
City	City of Seal Beach
d/D	Depth to Diameter Ratio
du	Dwelling Unit
dip	Ductile Iron Pipe
fps	Feet per Second
GIS	Geographic Information System
gpcd	Gallons per Capita per Day
gpd	Gallons per Day
gpm	Gallons per Minute
HGL	Hydraulic Grade Line
hp	Horsepower
hwy	Highway
I/I	Inflow and Infiltration
KTSS	Knott Trunk Sewer System
LADWP	Los Angeles Department of Water and Power
LF	Linear Feet
mg	Million Gallons
mgd	Million Gallons per Day
NEC	National Electric Code
NFPA	National Fire Prevention Association
OCSD	Orange County Sanitation District
O&M	Operations and Maintenance
OSHA	Occupational Safety & Health Administration
PCH	Pacific Coast Highway
PHD	Peak Hour Demand
pvc	Polyvinyl Chloride
RLD	Residential Low Density
RMD	Residential Medium Density
RHD	Residential High Density
SBSD	Sunset Beach Sanitary District
tsf	Thousand Square Feet
USGS	United States Geological Survey
vcp	Vitrified Clay Pipe
VFD	Variable Frequency Drive
WDR	Waste Discharge Requirements

EXECUTIVE SUMMARY

ES-1 BACKGROUND

The City of Seal Beach was incorporated in 1915 and has been in operation under its own charter since 1964. It covers an area of 11.5 square miles in the northwest corner of Orange County. The City's total population was 24,168 in 2010 (Census information). The expected ultimate population is 24,824 (*Ref: California Dept. of Finance Demographic Research Unit, 2016*).

The Seal Beach Public Works Division provides wastewater collection service to approximately 5,000 customers in the northeast and southwest portions of the City and the Sunset Aquatic Park. The northeast region covers the College Park East area, Old Ranch Golf Course, Old Ranch Towne Center and Centex Homes. The southwest region is the area of the City located south of Westminster Avenue and mostly west of Seal Beach Boulevard. This includes the Boeing Integrated Defense Systems, Adolfo Lopez Drive, Hellman Ranch, and the areas of Bridgeport, Marina Hill, and Old Town. The City does not maintain the sewers serving the Naval Weapons Station, but accepts flows from the base at Pump Station No. 35. The remainder of the City is serviced by either the Orange County Sanitation District (OCSD), the Rossmoor/Los Alamitos Area Sewer District, or the Sunset Beach Sanitary District (SBSD).

Until 1972, Seal Beach treated and disposed of sewage generated in the City through a local wastewater treatment plant located on the southwestern edge of the City. The main trunk line carried flows west in Electric Avenue to the treatment plant. In 1972, the City demolished the sewage treatment plant and rerouted the system so that the wastewater would ultimately be treated and disposed of by the Orange County Sanitation District. The main trunk line was replaced with a 21-inch/24-inch vitrified clay pipe (VCP) interceptor sewer that carried flows east in Electric Avenue to the newly constructed Pump Station No.35. At the same time, a 16-inch ductile steel force main and 24-inch VCP gravity line were constructed in Seal Beach Boulevard from Pump Station No. 35 to the OCSD Seal Beach Pump Station at the corner of Seal Beach Boulevard and Westminster Avenue. The Seal Beach Pump Station lifts the sewage into the OCSD system where it is conveyed by gravity to Plant Number 2 in Huntington Beach for treatment and disposal.

The existing wastewater system consists of approximately 181,000 feet of gravity sewers, 780 manholes, and six existing sewer pump stations and their force mains.

ES-2 STUDY AREA

The City of Seal Beach is located along the California coastline in northwestern Orange County. It is bordered to the north by the City of Los Alamitos, and the unincorporated Rossmoor community; to the east by the Cities of Garden Grove, Westminster, and Huntington Beach; to the south by the Pacific Ocean and City of Huntington Beach; and to the northwest by the City of Long Beach (Los Angeles County).

The service area includes the areas in which the City of Seal Beach provides wastewater collection service or is tributary to one of its sewer facilities. The service area covers approximately 1,705 acres of the City's 7,551 acre area and consists of several separate sewersheds, namely Pump Station No. 35 (includes Bridgeport, Marina Hill, Old Town, and portion of Naval Weapons Station), Adolfo Lopez P.S. (includes Hellman Ranch), Boeing P.S., College Park East, Centex Homes, Old Ranch Towne Center, and Sunset Aquatic Park. The

service area does not include College Park West, Leisure World, Rossmoor, Surfside, and most of the U.S. Naval Weapons Station.

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to one of over 24,000. The Center for Demographic Research estimates that the total City population will increase to 24,824 by the year 2040.

Excluding the open space lying within the boundary of the Naval Weapons Station, the City is approximately 98 percent developed, or proposed for development, with a mix of residential, commercial, industrial and public land uses.

ES-3 CRITERIA

Establishing performance standards is an important part of evaluating the existing wastewater collection system, as it forms the basis for most of the system improvement recommendations. These standards include methodology for estimating wastewater flows, and minimum design standards for the collection system pipes, pump stations and force mains.

Average dry weather wastewater flows can be reasonably estimated from land use and unit flow factors, with the results then compared to measured flows. The components used to estimate design wastewater flows include unit flow factors, peaking factors, and infiltration/inflow allowances.

Collection system design standards include minimum pipe size, minimum flow velocity, and depth of flow to pipe diameter ratio. Pump station criteria includes sizing requirements for pumps, wet wells and forcemains. It also includes provisions for redundancy, emergency storage, emergency power, and remote monitoring and control.

Unit Flow Factors

For this Master Plan study, the sewage loads utilized in the hydraulic model were based on the average FY 2014-2015 pump flow data at all sewer pump stations. This data was compiled from weekly meter readings recorded by City staff.

Current sewage loads are significantly lower than the previously estimated loads developed using unit flow factors and land use information.

Peaking Factors

The adequacy of a sewage collection system is based upon its ability to convey peak flows. At any individual point in the system, peak dry weather flow is estimated by converting the total average dry weather flow upstream of the point in question to peak dry weather flow by an empirical relationship.

Peak dry weather flows used in analyzing the system are estimated from average dry weather flows and infiltration as follows:

$$Q_{pdw} = 1.85 \times Q_{adw}^{0.92} + \text{dry weather infiltration}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{adw} = Average dry weather flow in cfs

Peak wet weather flow will be determined as follows:

$$Q_{pww} = 1.35 \times Q_{pdw}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{pww} = Peak wet weather flow in cfs

Inflow and Infiltration

Inflow is the surface water that typically gains entry to the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as groundwater entering the wastewater collection system through defective pipes, pipe joints, connections, or manhole walls. Together, inflow and infiltration (I/I) can make up a substantial portion of the system loading if not properly managed.

To reduce previously identified inflow into the wastewater collection system, the City has made several improvements to the storm drain system that will reduce flooding instances, particularly along Electric Avenue and in College Park East. Other activities that could further reduce inflow include installing new manhole covers which have one vent hole and one pick hole, or cover some of the existing manhole cover openings with plugs.

The City reports that infiltration into manholes is clearly visible in College Park East. The CCTV inspections conducted in 2013 showed infiltration in a number of reaches in both Old Town and College Park East. In 2005, a comparison of flow monitoring results and water meter records also indicated that the magnitude of infiltration in College Park East was about 375 gallons per acre per day. Using the same methodology, infiltration in Bridgeport and the portions of Old Town with deeper sewers is estimated at 850 gallons per acre per day.
The flow monitoring data collected for the previous Master Plan study are now quite dated. It is therefore recommended that the City re-evaluate the magnitude of current infiltration rates in College Park East, Old Town, and Bridgeport. This could be accomplished through a separate study which compares a current flow monitoring effort to water meter use data. Ideally, this flow monitoring effort should be performed at a time of year when outdoor water use is minimized. Results from this study could be used to increase the accuracy of the hydraulic model by specifically identifying the locations where infiltration is occurring, as well as the quantities involved.

Sewer System Performance Evaluation Criteria

Sewer system performance evaluation criteria are established to ensure that the wastewater collection system can operate effectively. Each pipe segment must be capable of carrying design peak wet weather flows without surcharging the system. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

The performance of a sewer pump station is of particular importance since a failure could have far reaching ramifications. It must therefore be reliable, sized with sufficient capacity, and contain redundant and/or backup equipment. A plan must also be in place so that appropriate staff can be notified in the event of a failure.

Sewer system performance evaluation criteria is summarized in Table ES-1.

Table ES-1

Sewer System Performance Evaluation Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 fps at average flow or;
	3.0 fps at peak flow
Flow Depth to Pipe Diameter Ratio (d/D) with Peak Dry Weather Flows	
15-inch and under	0.50
18-inch and over	0.64
Pump Station	
Pumps	▪ Minimum 2 each sized at peak flow
	▪ Minimum solids handling capacity 3”
Wet Wells	▪ Sized to limit pump cycling to less than 6 times/hr for motor HP up to 20; 4 times/hr up to 50 HP; 3 times/hr up to 75 HP; 2 times/hr 100 HP and above
	▪ Provide 30 minutes of storage at peak flow to allow response to a failure
	▪ Equipment to be maintained must be accessible without entering the structure
Ventilation	▪ 12-air changes/hour minimum in dry well and as required by NFPA 820
Controls	Redundant system. Float operated back-up controls
Emergency Power	Stationary source in locations which cannot provide 30-minute response time without overflowing. Provisions for connection of a portable power source at all other locations
Telemetry	Dialer system at all pump stations to alert personnel in the event of a station failure
Force Mains	▪ Minimum velocity 3.0 ft/sec
	▪ Minimum size 4”
	▪ Air/Vacs installed in vaults

ES-4 EXISTING COLLECTION SYSTEM

The City's existing wastewater collection system is made up of a network of gravity sewers, pump stations, and sewer force mains. The gravity system consists of approximately 181,000 feet of pipe and 800 manholes serving about 5000 customers. The majority of the gravity sewers are constructed of vitrified clay pipe with sizes ranging from 6-inches to 24-inches in diameter. There are six existing pump stations and associated force mains maintained by the City.

The City's sewer service area consists of seven major sewersheds as follows:

1. Pump Station No. 35 – includes Bridgeport, Marina Hill, Old Town, and a portion of the U.S. Naval Weapons Station
2. Adolfo Lopez Pump Station
3. Boeing Pump Station
4. Aquatic Park Pump Station
5. College Park East
6. Old Ranch Towne Centre
7. Centex Homes

The City is part of the Orange County Sanitation District's Revenue Area 3. All of the sewage generated within the City is ultimately conveyed to one of two OCSD pump stations, where it is then pumped to the OCSD interceptor system for conveyance to Plant No.2 in Huntington Beach for treatment and disposal.

ES-5 HYDRAULIC MODEL

To perform a detailed analysis of the wastewater collection system, it is essential to create a mathematical model that is capable of simulating the operating characteristics of the system. The City's hydraulic model was updated utilizing the Innovyze InfoSewer 7.6 platform, which is a GIS based computer program with the ability to perform steady state analyses of the flows in wastewater collection systems. The program also manages and maintains the database that stores the sewer analysis input and output results. Manning's Equation is used for depth of flow calculations in the gravity sewer pipes.

The wastewater collection system is modeled by entering pipe diameters, lengths, slopes, and roughness coefficients. The sewer model includes all of the City's existing manholes, sewer pipes (excluding laterals, private sewers, and sewers belonging to other agencies), sewer pump stations, and tributary area boundaries. The model identifies points of connection to regional facilities belonging to OCSD.

The model uses the average dry weather flows and determines peak flows based upon relationships specified by the user. Pumped flows and measured flows can be entered at any manhole as a fixed flow.

At the completion of a modeling run, output data is created for viewing on the screen or for printing. Output data for pipes include average and peak flow rate, velocity, pipe capacity, and ratio of flow depth to pipe diameter (d/D).

ES-6 GRAVITY SYSTEM HYDRAULIC ANALYSIS

The gravity system capacity analysis was generally conducted with the estimated peak dry weather flows. One exception to this is the 24-inch Seal Beach Boulevard Trunk Sewer. This sewer was evaluated to see if it could convey the sum of the firm capacities of Pump Station No. 35, Adolfo Lopez Pump Station, and Boeing Pump Station as applicable. This is the most conservative evaluation of this sewer line because pump station firm capacities are based on the larger of three times the average dry weather flow or 1.35 times the peak dry weather flow. Most likely, the pumped flows are attenuated by the time they reach the Seal Beach Boulevard Trunk Sewer, meaning lower flows are experienced in the sewer itself.

System Velocities

The topography of the City is generally flat and the majority of the gravity sewer lines have been designed and built with less than desirable slopes that attempt to follow the grade of the ground surface. This has resulted in a system that is velocity deficient in many areas where velocities are under 2.0 feet per second with average dry weather flows, and under 3.0 feet per second with peak dry weather flows.

It is not cost-effective or practical to correct these deficiencies until the sewer is scheduled for replacement due to a condition deficiency. In some instances, such as in College Park East, it may not be possible to correct the problem without constructing a costly pump station. This deficiency should, therefore, be noted with the understanding that the collection system will inevitably require continual maintenance and cleaning in order to flush out materials that periodically settle in the sewer lines.

Capacity Analysis

Based on the hydraulic model results, there were no pipe capacity deficiencies identified for the City's collection system. As such, no capital improvement projects directly related to capacity will be recommended in this Master Plan Update.

Future System Scenarios

It was not deemed necessary to create a hydraulic model of a build-out scenario until planned development or infill can be specifically identified. It is recommended that the Adolfo Lopez Pump Station and Boeing Pump Station sewersheds be monitored closely as conditions change to ensure that sufficient capacity remains available in these areas.

ES-7 SEWER PUMP STATIONS

The City of Seal Beach currently owns and operates six (6) sewer pump stations located throughout the City. A seventh pump station, located on the Municipal Pier, was destroyed by fire in early 2016. The Pier Pump Station will be rebuilt with insurance proceeds. The former Marina Community Center Pump Station was eliminated by constructing a gravity sewer in 2002. In addition, Aquatic Park Pump Station No.2 was removed from service when the Aquatic Park Pump Station No.1 tributary wastewater was diverted to the City of Huntington Beach system via a renovated pump station and new force main in 2005.

Table ES-2 provides a summary of the City's sewer pump stations. The existing sewer pump stations were each assessed and evaluated for condition and capacity purposes. The details of the assessments and subsequent recommendations are provided in Section 7 of this report.

Table ES-2
Sewer Pump Station Summary

Name	Type	Number of Pumps, Manufacturer, Type	Rated Conditions	Motor HP	Existing Flow (gpm)			Ultimate Flow (gpm)			Forcemain			Year Constructed
					Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Size (in)	Material	Length (ft)	
Adolfo Lopez	Submersible	(2) Torque flow Model 4x11S	200 gpm @ 89 ft TDH 1750 RPM	30	15	36	49	39	87	120	4"	PVC	1100	2005
Aquatic Park	Submersible	(2) ABS Piranha Model 35-2 Grinder	30 gpm @ 103 ft TDH 3450 RPM	5	1.6	4.6	6.4	1.6	4.6	6.4	2-2" 1-4"	PVC PVC	3,902 3,902	2005
Boeing	Submersible	(2) Wemco 6x6 ES Vortex	530 gpm @ 21 ft TDH 1170 RPM	10	27	63	89	167	334	451	8" 12"	PVC PVC	50 110	2003
8th Street	Wet Well / Dry Well	(2) Wemco Torque flow 4x11 CLCESR	290 gpm @ 22 ft TDH 1170 RPM	7.5	23	54	73	35	76	103	1-6" 1-6"	PVC PVC&Cl	391 245	2015
1st Street	Submersible	(2) Wemco	290 gpm @ 19 ft TDH 1170 RPM	3	0.9	3	4	6	16	20	4"	PVC	500	2007
Pump Station No. 35	Wet Well / Dry Well	(3) Wemco Hidrostal Model H8K-H-H4W 10x8	1500 gpm @ 97 ft TDH to 2940 gpm @ 67 ft TDH 1210 RPM	100	448	829	1119	454	839	1133	16"	DIP & PVC	4150	2006

ES-8 COLLECTION SYSTEM CONDITION ASSESSMENT

Thorough knowledge of the system's condition is essential in maximizing the useful life of this very important and significant asset in a cost effective manner. Additionally, the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems requires the development of a rehabilitation and replacement plan to address condition deficiencies.

The City had about 165,000 feet of pipe inspected with the use of closed circuit television (CCTV) recordings in 2013. This is approximately 91 percent of the entire system.

The purpose of CCTV inspections is to determine the condition of the City's existing gravity sewers, and formulate a rehabilitation plan for the defective sewers. The inspection report database summary was used in selecting the recordings to be reviewed in detail. The pipe reaches selected for detailed review were those that showed the most severe structural problems and multiple deficiencies. Based on review of inspections, priorities are assigned to the sewer reaches. The priorities are selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of sanitary sewer overflows and leakage. The six (6) priority categories utilized in this report are as follows:

a. Severe Condition – This category primarily includes structural defects of deformed pipe, hole in pipe, broken pipe, and large joint offsets.

b. Major Condition – This category primarily includes structural defects of multiple fractures, medium joint offsets and major sags. Pipes with a large number of cracks are also included.

c. Moderate Condition – Pipes in this category have fractures, cracks, small and medium joint offsets, and sags.

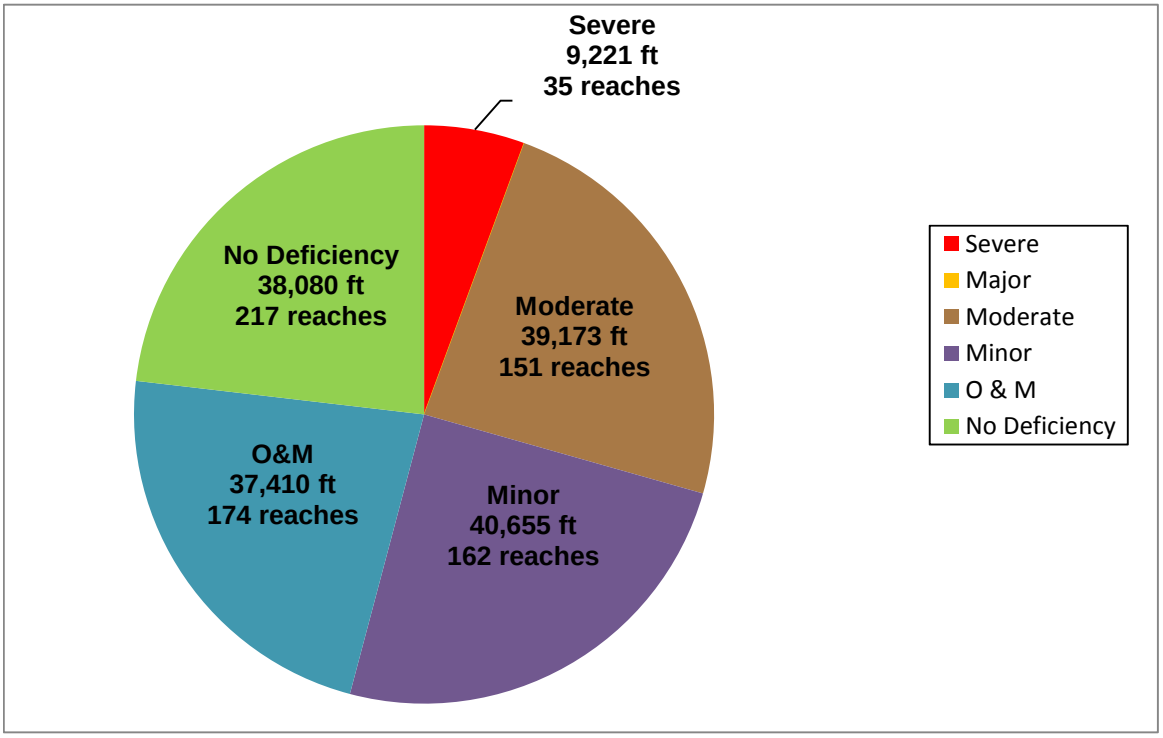
d. Minor Condition – Pipes in this category have slight sags, cracks, and small joint offsets.

e. O&M – This condition is for operational and maintenance problems and construction feature defects. There are no structural defects.

f. No Defects – This condition is for the pipe with no structural, operation and maintenance or construction feature defects.

Figure ES-1 shows the distribution of the condition priorities assigned to the pipes with completed inspections.

Figure ES-1
CCTV Inspection Priorities



A total of approximately 9,221 feet of pipe (35 reaches) is recommended for rehabilitation due to being identified as having PACP priorities of "Severe" condition. Planning level recommendations are included and are based upon the pipe defects reported in the CCTV Inspection Reports and review of select recordings. Actual improvements must be designed based upon further detailed review of each recording, taking into consideration other factors such as location, age and flow capacity of the pipe, existing utilities, and concurrent infrastructure construction projects. At a minimum, all identified locations will require spot repairs. The actual scope of work for each project should be determined through further review of the CCTV inspections.

ES-9 CAPITAL IMPROVEMENT PROGRAM

The primary goal of a Capital Improvement Program (CIP) is to provide the City with a short and long-range planning tool to implement the construction of needed infrastructure improvements in an orderly manner and provide a basis for financing of these improvements. To accomplish this goal, it is necessary to determine the estimated cost of the projects included in the capital improvement program and prioritize them to result in reliable service in a fiscally responsible manner. Funding mechanisms to finance the improvements can then be identified to implement the program.

The capital improvement projects were selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of overflows. As all system pipes and pump stations were shown to have adequate capacity, the projects identified in this section are driven solely by

the pipeline condition assessment and the field inspection of the six active pump stations, which took place on December 21, 2016.

The Capital Improvement Program is developed based upon the results of the hydraulic analyses and the established priorities. The highest priority, near-term CIP projects to be completed in the next five years are listed in Table ES-3. The remaining projects were identified to be of lower priority (with a target completion dates between 2024 and 2033) are listed in Table ES-4. Cost estimates are based on January 2018 dollars. The locations of all CIP projects are shown in and shown on Figures ES-2 and ES-3.

The recommended projects have been based upon the best information currently available. It should be updated as new information becomes available from sources such as CCTV inspections and from maintenance crew observations. The project priorities should be reviewed annually and may be revised to correspond to changed conditions, such as impending facility failures, or to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work. Some of the projects recommended are small and it may not be feasible to implement them as a single project. Therefore, several projects should be combined and bid as a package.

Pipeline replacement costs are generally more conservative and will therefore allow the City more flexibility for each project. The City of Seal Beach is largely occupied and some areas are densely populated with limited project staging capacity (such as Old Town alleys) and there are many existing utilities to consider. Therefore, the costs of replacing sewer facilities will be generally higher than in an area that is undeveloped. The pipeline construction costs are based upon $40 / diameter in / ft for typical construction in streets. If the project location is within an alley, the construction estimates are based upon replacement at $60 per diameter inch foot of pipe due to the limited access and concrete material required. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

Spot repairs are estimated at $40,000 per site in typical streets and $60,000 per site in alleys. These costs are based upon review of recent local bids for similar type work. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

Table ES-3
Capital Improvement Projects (2018-2023)

CIP Project	Sub-project ID	Up-stream Manhole ID	Down-stream Manhole ID	Description	Alley	Dia-meter (in)	Material	Qty	Unit Basis	Unit Cost	Total Estimated Cost with Pipe Replacements Implemented ($)	Spot Repair Locations	Unit Repair Cost ($)	Total Estimated Cost with Pipe Repairs Implemented ($)
1	1a	F02-269	F02-269A	4th St Alley Repair/Replace	Y	8	VCP	305	LF	$ 480	$ 204,960	2	$ 60,000	$ 168,000
	1b	F05-312	F02-311	7th St Alley Repair/Replace (2 seg)	Y	8	PVC	594	LF	$ 480	$ 399,168	1	$ 60,000	$ 84,000
	1c	F03-301	F03-266A	5th St Alley Repair/Replace	Y	8	VCP	340	LF	$ 480	$ 228,480	2	$ 60,000	$ 168,000
	1d	F06-316	F06-315A	8th St Alley Repair/Replace	Y	8	VCP	258	LF	$ 480	$ 173,376	2	$ 60,000	$ 168,000
	1e	F28-386A	F28-384	Main St Alley Repair/Replace	Y	8	VCP	220	LF	$ 480	$ 147,840	1	$ 60,000	$ 84,000
	1f	F04-307	F04-306	6th St Alley Repair/Replace	Y	8	VCP	308	LF	$ 480	$ 206,976	1	$ 60,000	$ 84,000
	1g	F15-320	F06-C319	8th St Repair/Replace	N	8	VCP	169	LF	$ 320	$ 75,712	1	$ 40,000	$ 56,000
	1h	F01-C295	F01-294	2nd St Alley Repair/Replace	Y	8	VCP	240	LF	$ 480	$ 161,280	1	$ 60,000	$ 84,000
	1i	F10-344A	F10-344	11th St Alley Repair/Replace	Y	8	VCP	354	LF	$ 480	$ 237,888	1	$ 60,000	$ 84,000
	1j	F06-317	F06-316A	8th St Alley Repair/Replace	Y	8	VCP	273	LF	$ 480	$ 183,456	1	$ 60,000	$ 84,000
	1k	F09-340	F09-339	12th St Alley Repair/Replace	Y	8	VCP	129	LF	$ 480	$ 86,688	1	$ 60,000	$ 84,000
	1l	F15-C372	F15-371	East Seal Way Repair/Replace	N	8	VCP	600	LF	$ 320	$ 268,800	1	$ 40,000	$ 56,000
	Subtotal							**3,790**			**$ 2,374,624**			**$ 1,204,000**
2	2a	D06-151	D05-138	Bolsa Ave Repair/Replace	N	10	VCP	246	LF	$ 400	$ 137,760	1	$ 40,000	$ 56,000
	2b	D02-115 & D02-114	D02-113	Avalon & Crestview Repair/Replace (2 seg,)	N	8	VCP	440	LF	$ 320	$ 197,120	2	$ 40,000	$ 112,000
	2c	D05-132	D05-130	Coastline Dr Repair/Replace	N	12	VCP	285	LF	$ 480	$ 191,520	1	$ 40,000	$ 56,000
	2d	D02-102	D02-099	Carmel Ave Repair/Replace	N	8	VCP	330	LF	$ 320	$ 147,840	1	$ 40,000	$ 56,000
	2e	D09-193	D09-192	Catalina Ave Repair/Replace	N	8	VCP	356	LF	$ 320	$ 159,488	1	$ 40,000	$ 56,000
	2f	D03-119	D03-117	Marvista Ave Repair/Replace (2 seg)	N	8	VCP	544	LF	$ 320	$ 243,712	2	$ 40,000	$ 112,000
	2g	D07-176	D07-175	Beachcomber Dr Repair/Replace	N	8	VCP	259	LF	$ 320	$ 116,032	1	$ 40,000	$ 56,000
	2h	D05-134	D05-133	Fathom Ave Repair/Replace	N	8	VCP	193	LF	$ 320	$ 86,464	1	$ 40,000	$ 56,000
	2i	D08-188	D08-187	Bayou Way Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
	2j	D04-150	D04-146	Catalina Ave Repair/Replace	N	8	VCP	353	LF	$ 320	$ 158,144	1	$ 40,000	$ 56,000
	2k	D04-144	D04-143	Balboa Dr Repair/Replace	N	8	VCP	242	LF	$ 320	$ 108,416	1	$ 40,000	$ 56,000
	2l	D08-182	D08-180	Bayside Dr Repair/Replace	N	8	VCP	215	LF	$ 320	$ 96,320	1	$ 40,000	$ 56,000
	2m	D07-170	D07-169	Sea Breeze Dr Repair/Replace	N	8	VCP	354	LF	$ 320	$ 158,592	1	$ 40,000	$ 56,000
	2n	D04-142	D04-128	Driftwood Ave Repair/Replace	N	8	VCP	341	LF	$ 320	$ 152,768	1	$ 40,000	$ 56,000
	2o	E07-219	E07-218	Riviera Dr Repair/Replace	N	8	VCP	253	LF	$ 320	$ 113,344	1	$ 40,000	$ 56,000
	2p	D08-186	D08-185	Harbor Way Repair/Replace	N	8	VCP	148	LF	$ 320	$ 66,304	1	$ 40,000	$ 56,000
	2q	D06-155	D06-154	South Shore Dr Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
	Subtotal							**4,861**			**2,269,120**			**$ 1,064,000**
3	3a	B07-G01	B07-A23	Dogwood Ave Repair/Replace	N	8	VCP	122	LF	$ 320	$ 54,656	Replace		$ 54,656
	3b	B16-J16	B16-A45	Wisteria St Repair/Replace	N	8	VCP	268	LF	$ 320	$ 120,064	1	$ 40,000	$ 56,000
	3c	U02-E20	U02-E19	Apollo Ct Lateral Repair/Replace	N	8	VCP	182	LF	$ 320	$ 81,536	1	$ 40,000	$ 56,000
	Subtotal							**572**			**$ 256,256**			**$ 166,656**
4	-	-	-	**Adolfo Lopez Pump Station**										
				Construct Parallel Force Main - Next 5 years	N	6	PVC	1,100	LF	$ 200	$ 308,000	-	-	$ 308,000
				Subtotal - Adolfo Lopez Pump Station							***$ 308,000***	***-***	***-***	***$ 308,000***
5	-	-	-	**Boeing Pump Station**										
				Connect to SCADA System				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
				Construct Parallel Force Main - Next 5 years	N	10	PVC	160	LF	$ 400	$ 90,000	-	-	$ 90,000
				Subtotal - Boeing Pump Station							***$ 174,000***	***-***	***-***	***$ 174,000***
6	-	-	-	**8th Street Pump Station**										
				Construct Canopy Over Electrical Enclosures - Next 5 Years				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
				Subtotal - 8th Street Pump Station							***$ 84,000***	***-***	***-***	***$ 84,000***
7	-	-	-	**1st Street Pump Station**										
				Raise Electric Cabinets - Next two years				1	LS	$ 50,000	$ 70,000	-	-	$ 70,000
				Reline Wet Well - Next 2 years				1	LS	$ 20,000	$ 28,000	-	-	$ 28,000
				Subtotal - 1st Street Pump Station							***$ 98,000***	***-***	***-***	***$ 98,000***
8	-	-	-	Install Smart Manhole Covers at Potential Overflow Sites				12	EA	$ 5,000	$ 84,000	-	-	$ 84,000
9	-	-	-	Evaluate infiltration/inflow in College Park East, Old Town, and Bridgeport				1	LS	$120,000	$ 168,000	-	-	$ 168,000
10	-	-	-	Survey All Sewers and Update Hydraulic Model				1	LS	$150,000	$ 210,000	-	-	$ 210,000
TOTAL REPLACEMENT COST (2018-2023)											***$ 6,026,000***	***TOTAL EST. COST (2018-2023)***		***$ 3,560,656***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies

Table ES-4
Capital Improvement Projects (2024-2033)

CIP Project	Description	Qty	Unit Basis	Unit Cost	Total Cost ($)
11	**Adolfo Lopez Pump Station**				
	Replace Mechanical and Electrical Equipment - 2025	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2025	1	LS	$ 70,000	$ 98,000
	Site Improvements - 2025	1	LS	$ 50,000	$ 70,000
	Replace Standby Generator - 2030	1	LS	$ 150,000	$ 210,000
	Subtotal Adolfo Lopez Pump Station				**$ 1,218,000**
12	**Aquatic Park Pump Station**				
	Replace Pump Station if not Transferred to Huntington Beach	1	LS	$ 1,000,000	$ 1,400,000
	Subtotal - Aquatic Park Pump Station				***$ 1,400,000***
13	**Boeing Pump Station**				
	Replace Mechanical and Electrical Equipment - 2023	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2023	1	LS	$ 80,000	$ 112,000
	Replace Standby Generator - 2033	1	LS	$ 150,000	$ 210,000
	Subtotal - Boeing Pump Station				***$ 1,162,000***
14	**8th Street Pump Station**				
	Replace Cast Iron Force Main - 2025	N	6	PVC	150 LF $ 240 $ 51,000
	Extend New Force Main - 2025	N	6	PVC	185 LF $ 300 $ 78,000
	Subtotal - 8th Street Pump Station				***$ 129,000***
15	**1st Street Pump Station**				
	Construct Parallel Force Main - 2027	N	4	PVC	500 LF $ 120 $ 84,000
	Replace Mechanical and Electrical Equipment - 2027				1 LS $ 200,000 $ 280,000
	Replace Valve Vault, Valves and Meter - 2027				1 LS $ 100,000 $ 140,000
	Replace Influent Sewers - 2027 or when paving is replaced				350 LF $ 180 $ 88,800
	Subtotal - 1st Street Pump Station				***$ 592,800***
16	**Pump Station No.35**				
	Replace Pumps with Close Coupled Units - 2028				3 EA $ 150,000 $ 630,000
	Construct Natural Gas Standby Generator with ATS - 2028				1 LS $ 360,000 $ 504,000
	Replace the Electrical and Control Equipment - 2028				1 LS $ 600,000 $ 840,000
	Construct Parallel Force Main - 2025	N	16	DI	4,150 LF $ 640 $ 3,719,000
	Subtotal - Pump Station No.35				***$ 5,693,000***
TOTAL REPLACEMENT COST (2024-2033)					***$10,194,800***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies

OCSD Seal Beach P.S.

Westminster Blvd

Westminster Av

Boeing P.S. CIP 5, 13

3c

City of Long Beach

Adolfo Lopez P.S. CIP 4, 11

Adolfo Lopez Dr

Seal Beach Blvd

Heron Pt

U.S. NAVAL WEAPONS STATION

2b Crestview Av

2d Catalina Av

2j Catalina Av 2e

2f Mar Vista Av

2k 2g 2i

Driftwood Pl 2n

2o Southshore Dr

Taper Dr

Sandpiper Dr

Beachcomber Dr

2m Sea Breeze Dr

Islandview Dr

2l Bayside Dr

2p Harbor Wy

2h Fathom Av

2c Coastline Dr

2a

P.S. #35 FM CIP 16

Marina Dr

Marina Dr

1st St

2nd St

3rd St

4th St

5th St

6th St

7th St

8th St

9th St

Main St

10th St

11th St

12th St

13th St

14th St

15th St

16th St

17th St

1h 1a 1c 1b 1d 1e 1f 1g 1i 1k 1j 1l

2g

Balboa Dr

Crystal Pl

Electric Av

Dolphin Av

Ocean Av

1st St P.S. CIP 7, 15

8th St P.S. CIP 6, 14

Pacific Ocean

Pier P.S. (to be rebuilt)

P.S. #35 CIP 16

Seal Beach Blvd

Pacific Coast Hwy

NATIONAL WILDLIFE REFUGE

Aquatic Park P.S. CIP 12

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers
- CIP Improvement Project Location
- City Sewer
- City Boundary

N

0 625 1,250 2,500 Feet

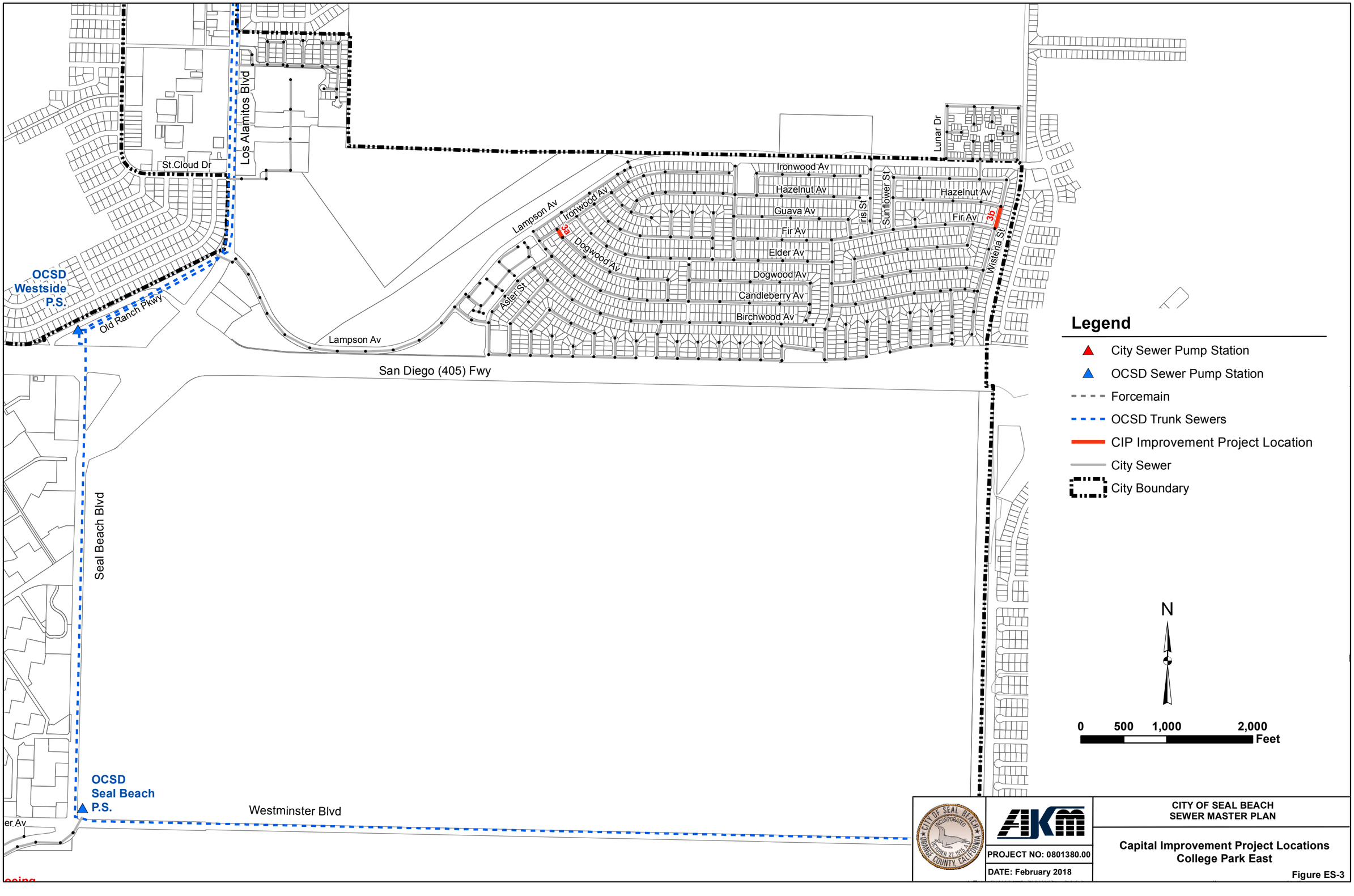
CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Capital Improvement Project Locations
Boeing, Adolfo Lopez, and P.S. 35 Sewersheds

Figure ES-2


St Cloud Dr
Los Alamitos Blvd
Lunar Dr
Ironwood Av
Hazelnut Av
Guava Av
Fir Av
Elder Av
Dogwood Av
Candleberry Av
Birchwood Av
Iris St
Sunflower St
Wisteria St
Lampson Av
Aster St
3a
3b
OCSD
Westside
P.S.
Old Ranch Pkwy
San Diego (405) Fwy
Seal Beach Blvd
OCSD
Seal Beach
P.S.
Westminster Blvd
er Av
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
CIP Improvement Project Location
City Sewer
City Boundary
N
0
500
1,000
2,000
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
Capital Improvement Project Locations
College Park East
PROJECT NO: 0801380.00
DATE: February 2018
Figure ES-3

SECTION 1
INTRODUCTION

1-1 BACKGROUND

The City of Seal Beach was incorporated in 1915 and has been in operation under its own charter since 1964. It covers an area of 11.5 square miles in the northwest corner of Orange County. The City's total population was 24,168 in 2010 (Census information). The expected ultimate population is 24,824 (*Ref: California Dept. of Finance Demographic Research Unit, 2016*).

Originally called Bay City, Seal Beach was developed in the early 1900's as a resort destination for residents of the Los Angeles area. Its early growth was accelerated by the construction of the Pacific Electric Railway Trolley, which reached the City in 1906. The railway allowed visitors to reach the City more easily and in greater numbers to enjoy the many hotels, bathhouses and dance halls which were constructed for their recreation. In 1926, oil was discovered in the City, and the oil boom that followed resulted in the development of Seal Beach into the residential community it is today.

The City is divided into several distinct communities as described in the following subsections.

Old Town

Old Town, which is the area south of Electric Avenue and Marina Drive, between 1st Street and Seal Beach Boulevard, was developed in the 1920's and is the oldest area within the City's corporate limits. High density residential and commercial land uses are prevalent in this area. Large single-family residential lots located directly on the beach are found in the Gold Coast District. The City's mile long beach in Old Town is used for surfing and swimming. The Seal Beach Pier, located at the end of Main Street, provides fishing facilities and a restaurant.

Bridgeport

Bridgeport is the area located west of Pacific Coast Highway and north of Marina Drive. It was primarily developed in the 1960's and consists of medium density and high density residential land uses (Oakwood Apartments and Seal Beach Mobile Home Park).

Marina Hill

Marina Hill was developed in the 1950's and consists of single-family homes. This area is located north of Pacific Coast Highway, adjacent to the southerly edge of the Hellman Ranch property.

Surfside

Surfside, a colony which was incorporated in the 1930's, became a part of Seal Beach in 1969. The area consists of single-family homes located on the south spit of Anaheim Bay. Although Surfside is a gated community, pedestrian and bicycle access to the beach is available and it is a popular location for surfing and swimming.

College Park East and West

College Park East and West were both developed in the late 1960's. They are single-family residential communities located north of the San Diego Freeway.

The Leisure World Retirement Community

The Leisure World Retirement Community is located between Westminster Boulevard and the San Diego Freeway west of Seal Beach Boulevard. It was built in 1961 and is a gated community of 1200 acres. Leisure World includes 6482 cooperative apartments and 126 condominiums housing an approximate population of 9000. Leisure World provides a secure, serene environment for seniors 55 and older. Medical, religious, commercial and recreational facilities are all provided within the compound limits.

Boeing Integrated Defense Systems

Boeing Integrated Defense Systems occupies 107 acres southwest of Seal Beach Boulevard and Westminster Avenue. The plant manufactures satellites, and has laboratory and testing facilities to support Boeing's space program. Engineering and design operations are also conducted from this facility. The remaining land will be developed as a business park combined with hotel, commercial, and light industrial uses.

Hellman Ranch

Hellman Ranch occupies 231-acre parcel of land located west of Seal Beach Boulevard, just north of the Marina Hill Community. It consists of approximately 65 single-family residences, the Gum Grove Nature Park, public access, oil extraction, saltwater marsh wetlands, and freshwater wetlands.

Anaheim Bay

Anaheim Bay, once part of an extensive system of coastal marshes, consists of an outer harbor formed by jetties, an inner harbor dredged to accommodate oceangoing ships, and a wetland system of salt marshes and tidal channels. In 1944, the U.S. Navy acquired 5,256 acres (including the Wildlife Refuge) of the Bay and adjoining property for construction of the Naval Weapons Station. This is the largest land use within the City's limits.

The Seal Beach National Wildlife Refuge

The Seal Beach National Wildlife Refuge was established in 1972 and preserves 920 acres of salt marsh and upland area in Anaheim Bay. The refuge is located within the boundaries of the U.S. Naval Weapons Station and there is no public access.

Sunset Aquatic Park

Sunset Aquatic Park was acquired by the County in 1962 from the U.S. Navy. It encompasses 67 acres of Anaheim Bay and is the site of a public marina and park.

1-2 WASTEWATER SERVICE

The Seal Beach Public Works Division provides wastewater collection service to approximately 5,000 customers in the northeast and southwest portions of the City and the Sunset Aquatic Park. The northeast region covers the College Park East area, Old Ranch Golf Course, Old Ranch Towne Center and Centex Homes. It is bounded by the San Diego Freeway to the south, Bolsa Chica Channel to the east, the Armed Forces Reserve Center to the north, and Seal Beach Boulevard to the west. The predominant land use in College Park East and Centex Homes is residential low density (RLD) housing. The Old Ranch Towne Center is a commercial area.

The southwest region is the area of the City located south of Westminster Avenue and mostly west of Seal Beach Boulevard. This includes the Boeing Integrated Defense Systems, Adolfo Lopez Drive, Hellman Ranch, and the areas of Bridgeport, Marina Hill, and Old Town. The City does not maintain the sewers serving the Naval Weapons Station, but accepts flows from the base at Pump Station No. 35.
The remainder of the City is serviced by either the Orange County Sanitation District (OCSD), the Rossmoor/Los Alamitos Area Sewer District, or the Sunset Beach Sanitary District (SBSD).

Until 1972, Seal Beach treated and disposed of sewage generated in the City through a local wastewater treatment plant located on the southwestern edge of the City. The main trunk line carried flows west in Electric Avenue to the treatment plant. In 1972, the City demolished the sewage treatment plant and rerouted the system so that the wastewater would ultimately be treated and disposed of by the Orange County Sanitation District. The main trunk line was replaced with a 21-inch/24-inch vitrified clay pipe (VCP) interceptor sewer that carried flows east in Electric Avenue to the newly constructed Pump Station No.35. At the same time, a 16-inch ductile steel force main and 24-inch VCP gravity line were constructed in Seal Beach Boulevard from Pump Station No. 35 to the OCSD Seal Beach Pump Station at the corner of Seal Beach Boulevard and Westminster Avenue. The Seal Beach Pump Station lifts the sewage into the OCSD system where it is conveyed by gravity to Plant Number 2 in Huntington Beach for treatment and disposal.

The existing wastewater system consists of approximately 181,000 feet of gravity sewers, 780 manholes, and six existing sewer pump stations and their force mains.

1-3 PREVIOUS STUDIES

The City of Seal Beach's first comprehensive Sewer System Master Plan was completed in 1999. It developed service criteria, evaluated the capacity of the then existing system, identified future capacity deficiencies, and recommended a capital improvement program to relieve the existing and future capacity deficiencies. Additionally, the 1999 Master Plan evaluated the condition and capacity of the nine sewer pump stations that existed at the time. It recommended the elimination of two pump stations, and improvements to the remaining seven to ascertain that these critical facilities provide proper service.

The City of Seal Beach updated its sewer rate structure in 2001. The new structure included a Capital Fund Fee to provide dedicated revenues for constructing the facilities recommended by the Master Plan.

In 2005, the City performed an update of the Sewer System Master Plan. Forty-one capital improvements projects were recommended for implementation as a result of this study.

Since 2005, the City has implemented many of the recommended improvements, including:

- Replacement of the Lampson Avenue trunk line
- Electrical and control system upgrades at Pump Station No. 35
- Replacement of gravity sewers in College Park East on Lampson Avenue, Candleberry Avenue, Ironwood Avenue, Elder Avenue, and Basswood Street
- 1st Street Pump Station Improvements

- Replacement of the 8th Street Pump Station
- Replacement of Ocean Avenue Alley gravity sewers
- Replacement of Boeing Pump Station
- Replacement of Adolfo Lopez Pump Station

1-4 STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS

The State Water Resources Control Board (SWRCB), which oversees all wastewater permitting and enforcement, adopted Resolution 2004-80 requiring staff to work with stakeholders in developing a regulatory program that will provide a consistent approach for reducing sanitary sewer overflows (SSOs). To assist in the development of the regulatory program, a statewide SSO Guidance Committee composed of representatives from the Regional Water Quality Control Boards, county environmental health departments, environmental groups, U.S. EPA, local public collection system owners and other collection system experts was formed. SWRCB staff and the SSO Guidance Committee drafted Statewide General Waste Discharge Requirements (WDR) for Sewage Collection System Agencies.

The State Water Resources Control Board adopted the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems and the associated monitoring and reporting program by issuing Order No. 2006-0003 on May 2, 2006.

The WDR and reporting program addresses SSO reporting and proper collection system management and operation necessary to protect the public health, water quality, the environment, and the public's investment in the sewer system infrastructure.

The fifth paragraph of the preamble to the Waste Discharge Requirements is:

> "To facilitate proper funding and management of sanitary sewer systems, each Enrollee must develop and implement a system-specific Sewer System Management Plan (SSMP). To be effective, SSMPs must include provisions to provide proper and efficient management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management and cost benefit analysis. Additionally, an SSMP must contain a spill response plan that establishes standard procedures for immediate response to an SSO in a manner designed to minimize water quality impacts and potential nuisance conditions."

The Sewer System Management Plan must address the following elements:

1. Goals
2. Organization Structure
3. Legal Authority
4. Operation and Maintenance Program, including a Preventive Maintenance Program and a Rehabilitation and Replacement Program
5. Design and Performance Provisions
6. Overflow Emergency Response Plan

7. Fats, Oils, and Grease (FOG) Control Program
8. System Evaluation and Capacity Assurance Plan (SECAP)
9. Monitoring, Measurement, and Program Modifications
10. Sewer System Management Plan Program Audits
11. Communication Program

The Waste Discharge Requirements define a sanitary sewer system as, "Any system of pipes, pump stations, sewer lines, or other conveyances, upstream of a Wastewater Treatment Plant headworks used to collect and convey wastewater to the publicly owned treatment facility. Temporary storage and conveyance facilities (such as vaults, temporary piping, construction trenches, wet wells, impoundments, tanks, etc.) are considered to be part of the sanitary sewer system, and discharges into these temporary storage facilities are not considered to be SSOs"

Enrollees are required to certify that the final SSMP and its constituent subparts are in compliance with the Sanitary Sewer Order within the time frame above. Enrollees are also required to obtain their governing board's approval of the SSMP Development Plan and Schedule and final SSMP at a public hearing prior to certification as complete and in compliance. Enrollees do not send their SSMP to the State or Regional Water Boards for review or approval, but need to make them available upon request.

1-5 GOVERNMENT ACCOUNTING STANDARDS BOARD STATEMENT 34 (GASB 34)

Government Accounting Standards Board Statement 34 (GASB 34), issued in June 1999, requires that agencies have an asset management system in place. They must establish the condition in which they will maintain their assets, assess the condition of their infrastructure, estimate the useful lives and replacement costs, and determine the cost to maintain the desired condition of the infrastructure. Complying with Statement 34 will provide agencies with the necessary tools for maintaining the integrity of their assets, and will most likely improve their bond rating.

1-6 OBJECTIVE

The purpose of this study is to provide the City of Seal Beach with a comprehensive Sewer System Master Plan Update. The Update will include an assessment of the condition and capacity of the collection system and all pump stations, as well as a capital improvement program with current cost estimates for eliminating the deficiencies identified. The products of the study will be used to meet the requirements of Order No. 2006-0003. The recommended capital improvement program and the operational needs of the system will be utilized in conducting financial studies and developing a funding mechanism for a sustainable Sewer Enterprise Fund.

SECTION 2
STUDY AREA

2-1 PURPOSE

This section describes the study area of the Sewer Master Plan, existing land uses within the study area, and population estimates for present day and ultimate build-out. This information, along with recent pump station flow data, is utilized in the subsequent sections to estimate current system loads.

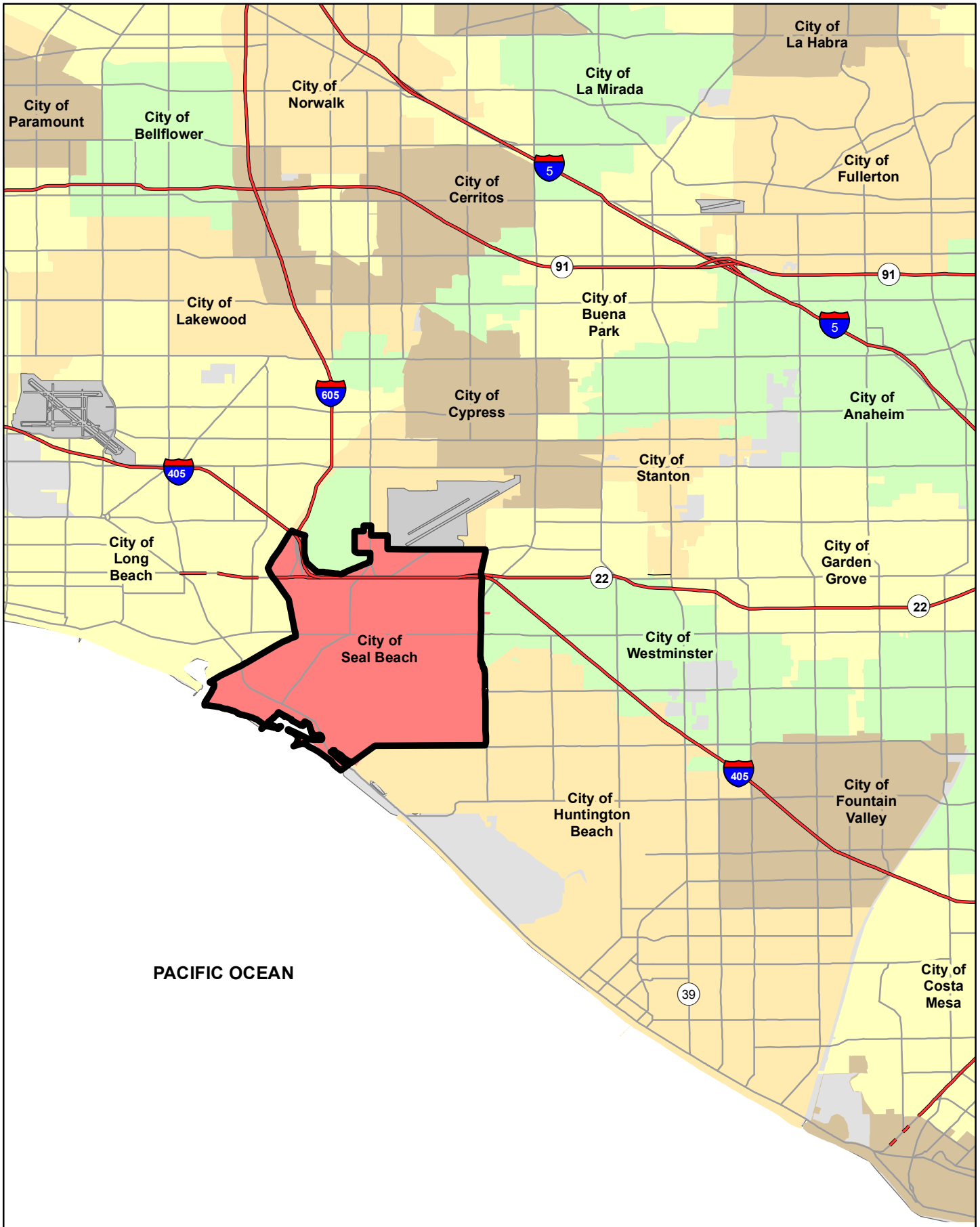
2-2 LOCATION

The City of Seal Beach is located along the California coastline in northwestern Orange County. It is bordered to the north by the City of Los Alamitos, and the unincorporated Rossmoor community; to the east by the Cities of Garden Grove, Westminster, and Huntington Beach; to the south by the Pacific Ocean and City of Huntington Beach; and to the northwest by the City of Long Beach (Los Angeles County). Figure 2-1 shows the location of the City of Seal Beach and the neighboring communities.

2-3 SERVICE AREA

The service area includes the areas in which the City of Seal Beach provides wastewater collection service or is tributary to one of its sewer facilities. The service area covers approximately 1,705 acres of the City's 7,551 acre area and consists of several separate sewersheds shown in Figure 2-2 and described below.

1. **Pump Station No. 35 Sewershed:** Bridgeport, Old Town, Marina Hill North, Marina Hill South and the southwesterly portion of the U.S, Naval Weapons Station drain to Pump Station No. 35, located east of Seal Beach Boulevard and north of Electric Avenue
2. **Adolfo Lopez P.S Sewershed:** Hellman Ranch, properties along Adolfo Lopez Drive, and the southern portion of Boeing Integrated Defense Systems drain to the Adolfo Lopez Pump Station located in the City's Maintenance Yard, south of Adolfo Lopez Drive
3. **Boeing P.S. Sewershed:** The northern portion of Boeing Integrated Defense Systems and the commercial area located south of Westminster Avenue and west of Seal Beach Boulevard drain to the Boeing Pump Station located west of Seal Beach Boulevard and south of Westminster Avenue
4. **College Park East Sewershed:** College Park East, the Old Ranch Golf Course, and the commercial properties south of Lampson Avenue and east of Seal Beach Boulevard drain to Orange County Sanitation District's Los Alamitos Sub-Trunk Sewer at the intersection of Lampson Avenue and Seal Beach Boulevard.
5. **Old Ranch Towne Center Sewershed:** Old Ranch Towne Center, located east of Seal Beach Boulevard and north of Lampson Avenue drains to Orange County Sanitation District's West Side Relief Interceptor in Seal Beach Boulevard.
6. **Centex Homes Sewershed:** Centex Homes, located north of Old Ranch Towne Center drains to OCSD's West Side Relief Interceptor at Seal Beach Boulevard and Plymouth Drive
7. **Sunset Aquatic Park Sewershed:** Sunset Aquatic Park drains to the Aquatic Park Pump Station, which pumps the wastewater to the City of Huntington Beach's system.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Location Map

Project No: 11316.00

Date: February 2018

Figure 2-1

Each of the service area sewersheds lies entirely within the corporate boundaries of Seal Beach, with the exception of the College Park East/Lampson sewershed. A small residential housing tract located north of Lampson Avenue and west of Bolsa Chica Channel, which is in the City of Los Alamitos, drains into the College Park East/Lampson system at Tulip Street and Lampson Avenue.

The Leisure World Retirement Community is served directly by the Orange County Sanitation District (OCSD). The southern portion of the community drains into Orange County Sanitation District's Seal Beach Interceptor in Seal Beach Boulevard, which terminates at the Seal Beach Pump Station. The remainder drains to the north across the 405 Freeway into Los Alamitos Sub-Trunk.

The Rossmoor Center commercial area, located north of the San Diego Freeway and west of Seal Beach Boulevard, are served by the Rossmoor/Los Alamitos Area Sewer District.

The Rossmoor-Los Alamitos Area Sewer District serves most of the College Park West community with the exception of the sewers in Loyola Plaza and College Park Drive, between Loyola Plaza and Harvard Lane, which are maintained by the City (not included in this study).

Surfside, a coastal residential community, south of Pacific Coast Highway and east of Seal Beach Boulevard, is served by the Sunset Beach Sanitary District (SBSD).

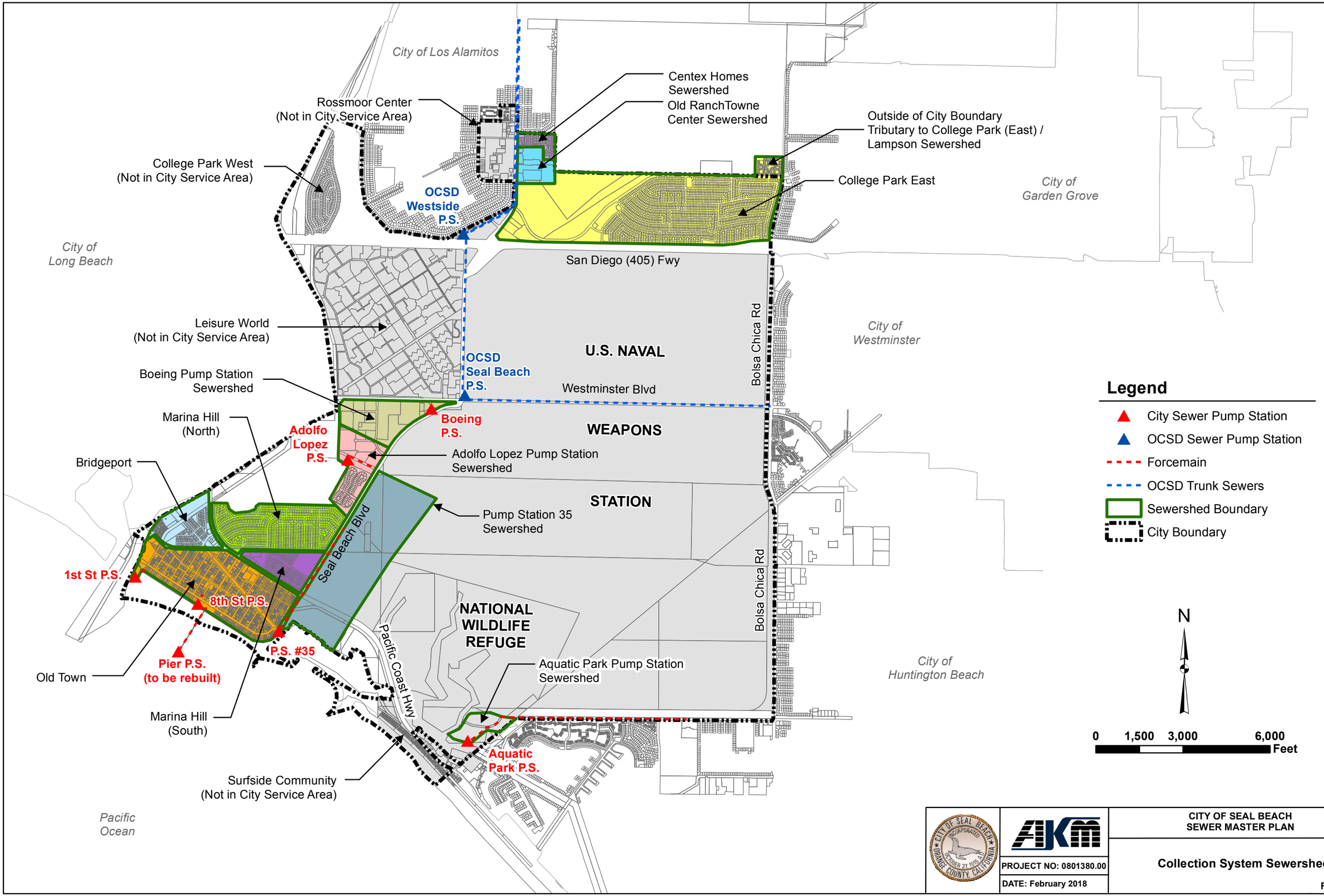
2-4 TOPOGRAPHICAL DESCRIPTION

The majority of the City is located within an alluvial plain that extends southward from the convergence of Coyote Creek and the San Gabriel River. The two channels drain from the northeast and north respectively and the combined flow reaches the ocean at the Alamitos Gap. Landing Hill (located within Seal Beach), Alamitos Heights (in Long Beach), and Bolsa Chica Mesa (in Huntington Beach), consist of uplifted blocks within the Newport-Inglewoood fault zone, and are the major topographic features within and near the City.

Ground surface elevations in the study area vary between sea level at the Pacific Ocean and 54 feet above mean sea level (amsl) at Landing Hill (Marina Hill North). The highest elevations in the Old Town area are found along Ocean Avenue between Second Street and Main Street (26 feet amsl). Areas adjacent to this point either slope north and east towards Electric Avenue or south and west towards the Pacific Ocean. The remaining portions of Old Town, Bridgeport, and Marina Hill South are very flat, which seems to have resulted in the construction of sewage facilities with minimal slopes.

Hellman Ranch, the Adolfo Lopez sewershed, and western portions of the Boeing Integrated Defense Systems (also known as Pacific Gateway Business Center) property slope towards the west end of Adolfo Lopez Drive. Elevations vary from 40 feet amsl in Hellman Ranch to 6 feet amsl between the City's Maintenance Yard and the Animal Shelter.

The eastern portion of the Boeing Integrated Defense Systems property slopes east towards Seal Beach Boulevard. The elevations in this area vary from 27 feet to 9 feet amsl. The western portions of this area slope west and south towards the San Gabriel River.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Collection System Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 2-2

The College Park East area slopes southwesterly from 23 feet amsl at Lampson Avenue and Bolsa Chica Channel to 16 feet at Lampson Avenue and Basswood Street.

The Old Ranch Towne Center and Centex Homes generally slope from east to west towards Seal Beach Boulevard. Elevations vary from 15 feet to 12 feet amsl.

2-5 GEOTECHNICAL INFORMATION

The predominant soil classifications found within each of the major regions of the City's service area are shown in Table 2-1.

Table 2-1
Soil Classifications within Service Area

Service Area Region	Soil Classification Hydrologic Group
Bridgeport	B
College Park East - East Residential Area	C
College Park East - West Residential Area	B
College Park East – Golf Course	C
Marina Hill	D
Old Town	B
U.S. Naval Weapons Station	C
Future Hellman Ranch Site & Boeing Facility	C & D

Group B soils are generally well drained sandy loam, having moderate infiltration and water transmission rates. Group C soils are mostly silty-loam with slow infiltration and water transmission rates. Group D soils consist primarily of clays which have very slow infiltration rates when thoroughly wetted.

The soils with higher infiltration rates permit better passage of water through them to the groundwater table. Sewer lines constructed in Group B soils would therefore be more susceptible to infiltration through defective pipe joints and manholes than Group C soils. Sewers located in Group D soils would have the least susceptibility to infiltration.

High groundwater is prevalent throughout the City. Groundwater levels in the Old Town, and Bridgeport areas are at approximately elevation +3.0 feet amsl. Sewers with inverts below this elevation are therefore continually under the influence of groundwater. Sewers in the community of Marina Hill North are mostly at elevations above the groundwater table and should not be affected by significant rates of infiltration.

Groundwater levels in College Park East are also known to be high (10-15 feet amsl). Some of the sewers in this area are also located within the groundwater zone and subject to high levels of infiltration.

2-6 CLIMATE

The climate in the area is typical of Southern California with generally mild temperatures, virtually no days below freezing, and approximately 340 days of sunshine per year. The average annual rainfall in the City is approximately 11 inches. Most of the rainfall occurs between the months of November and March.

2-7 POPULATION

Population estimates for the service area were based upon information from the Center for Demographic Research at California State University, Fullerton. These population projections take into consideration national, state, and local trends, as well as land use and immigration policies.

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to one of over 24,000. The Center for Demographic Research estimates that the total City population will increase to 24,824 by the year 2040. Total City population projections are listed in Table 2-2.

The modest increase in population seen in Table 2-2 is due to the future residential development planned for the Hellman Ranch and old Department of Water and Power property southwesterly of Marina Drive and First Street, and the increase in net allowable densities in the existing developed areas at ultimate build-out.

Table 2-2
City of Seal Beach Population Estimates

Year	Population	Annual % Growth
2010	24,168	---
2015	24,581	1.71
2020	24,585	0.00
2025	24,799	0.87
2030	24,846	0.19
2040	24,824	-0.08

**Ref: California State Fullerton Center for Demographic Research*

The service area population was calculated from data collected from census tract numbers 995.02, 995.04, 995.11, 995.12, and 1100.12. It excludes the Leisure World Retirement Community, the College Park West Area and Surfside. A small tract of homes located in the northeast corner of College Park East, which is part of the City of Los Alamitos, is also included. The 2010 sewer service area population is estimated at 14,604 persons based on 2010 Census data. Like the total City population, the sewer service area population is not expected to increase significantly over the planning period of this study.

2-8 LAND USE

The land use information utilized in the preparation of this update of the Sewer System Master Plan was obtained from City's GIS.

Excluding the open space lying within the boundary of the Naval Weapons Station, the City is approximately 98 percent developed, or proposed for development, with a mix of residential, commercial, industrial and public land uses. The service area covers approximately 1,705 acres of the City's 7,551 acre area. This does not include College Park West, Leisure World, Rossmoor, Surfside, and most of the U.S. Naval Weapons Station. Land use designations for the City service area are shown on Figure 2-3.

City of Los Alamitos

City of Garden Grove

City of Long Beach

San Diego (405) Fwy

U.S. NAVAL

Westminster Blvd

Bolsa Chica Rd

City of Westminster

WEAPONS

STATION

Seal Beach Blvd

NATIONAL WILDLIFE REFUGE

Pacific Coast Hwy

Bolsa Chica Rd

City of Huntington Beach

Pacific Ocean

Legend

- Residential Low Density
- Residential Medium Density
- Residential High Density
- Light Commercial
- General Commercial
- Service Commercial
- Main Street Specific Plan (Commercial)
- Light Manufacturing
- Oil Extraction
- Public Use
- Golf Course
- Open Space
- Specific Plan Regulatory Zone (currently vacant)
- Not in City Service Area
- City Boundary

N

0 1,500 3,000 6,000 Feet

CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Existing Land Use

Figure 2-3

Land use throughout the service area is predominantly residential. Low density residential zoning is found in the areas known as Hellman Ranch (Heron Point), College Park East, the Gold Coast area of Old Town, and Marina Hill. Medium and high density residential uses are located in Bridgeport and Old Town. The land uses by sewershed area are shown in Table 2-3.

Table 2-3
Existing Land Use

Sewershed		Land Use Area (Acres)														Total Area (Acres)
		RLD	RMD	RHD	L-C	C-2	C-1	MSSP	M-1	O-E	PLU	BIX	OS	SPR	ROW	
1	Pump Station 35															
	Bridgeport	14.5		22.3		5.2				4.3	2.9				20.3	69.5
	Marina Hill (south)	21.0					7.9				13.7				17.8	60.5
	Marina Hill (north)	110.2				0.9									43.6	154.7
	Old Town	9.1	17.2	89.3	4.0	6.3	0.2	13.4			14.0		9.4		150.9	314.0
	U.S. Naval Weapons Station										237.4		71.0		22.5	330.9
2	Adolfo Lopez Pump Station	12.6							27.9		5.8		15.4		15.4	77.2
3	Boeing Pump Station					7.5			70.9				0.9		17.9	97.1
4	Aquatic Park Pump Station										48.3				0.0	48.3
5	College Park East/Lampson*	216.5	7.2			32.6					3.3	157.6	1.4		89.5	508.0
6	Old Ranch Towne Center					26.1									1.0	27.1
7	Centex Homes	9.8				0.8							2.2		4.7	17.4
	Total	**393.7**	**24.4**	**111.6**	**4.0**	**67.1**	**8.1**	**13.4**	**95.1**	**4.3**	**298.8**	**157.6**	**69.5**	**0.6**	**283.5**	**1,705**

**Includes small area outside of City boundary*

RLD	Residential Low Density
RMD	Residential Medium Density
RHD	Residential High Density
L-C	Light Commercial
C-2	General Commercial
C-1	Service Commercial
MSSP	Main Street Specific Plan (Commercial)
M-1	Light Manufacturing
O-E	Oil Extraction
PLU	Public Use
BIX	Golf Course
OS	Open Space
SPR	Specific Plan Regulatory Zone (currently vacant)
ROW	Public Right-of-Ways

SECTION 3
CRITERIA

3-1 GENERAL

Establishing performance standards is an important part of evaluating the existing wastewater collection system, as it forms the basis for most of the system improvement recommendations. These standards include methodology for estimating wastewater flows, and minimum design standards for the collection system pipes, pump stations and force mains.

Average dry weather wastewater flows can be reasonably estimated from land use and unit flow factors, with the results then compared to measured flows. The components used to estimate design wastewater flows include unit flow factors, peaking factors, and infiltration/inflow allowances.

Collection system design standards include minimum pipe size, minimum flow velocity, and depth of flow to pipe diameter ratio. Pump station criteria includes sizing requirements for pumps, wet wells and forcemains. It also includes provisions for redundancy, emergency storage, emergency power, and remote monitoring and control.

3-2 UNIT FLOW FACTORS

Previous Master Plan studies developed unit flow factors for the various land uses within the City's service area. These unit flow factors, shown in Table 3-1, were developed from flow monitoring data, flow records at Pump Station No. 35, water meter records, and the census data provided in the City's General Plan. The Orange County Sanitation District (OCSD) recommended wastewater flow generation factors were used for manufacturing and public recreation land uses.

For this Master Plan study, the sewage loads utilized in the hydraulic model were based on the average FY 2014-2015 pump flow data at all sewer pump stations. This data was compiled from weekly meter readings recorded by City staff.

Current sewage loads are significantly lower than the previously estimated loads developed using unit flow factors and land use information.

Table 3-1
Unit Flow Factors

Land Use Category		Unit Flow Factor	
Use	Description	gpd/Ac	gpd/du
RHD	Residential High Density	4,000	160
RMD	Residential Medium Density	3,230	190
RLD - CPE, OT	Residential Low Density - College Park East, Old Town	1,825	225
RLD - MH	Residential Low Density - Marina Hill	1,550	225
RLD - HR	Residential Low Density - Hellman Ranch	765	300
C	Commercial	2,500	
R-G	Recreation / Grass	200	
PLU/R	Public Land Use / Recreation	200	
O-E	Oil Extraction	0	
MSSP	Main Street Specific Plan	2,500	
M-1	Light Manufacturing - Pacific Gateway	3,167	

3-3 PEAKING FACTORS

The adequacy of a sewage collection system is based upon its ability to convey peak flows. At any individual point in the system, peak dry weather flow is estimated by converting the total average dry weather flow upstream of the point in question to peak dry weather flow by an empirical relationship.

Based on flow monitoring efforts in 2005, the following empirical relationship between peak dry weather and average dry weather flow was developed for use in the system hydraulic analysis:

$$Q_{pdw} = 1.85 \times Q_{adw}^{0.92} + \text{dry weather infiltration}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{adw} = Average dry weather flow in cfs

Peak wet weather flow will be determined as follows:

$$Q_{pww} = 1.35 \times Q_{pdw}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{pww} = Peak wet weather flow in cfs

3-4 INFLOW AND INFILTRATION

Inflow is the surface water that typically gains entry to the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as groundwater entering the wastewater collection system through defective pipes, pipe joints, connections, or manhole walls. Together, inflow and infiltration (I/I) can make up a substantial portion of the system loading if not properly managed. The following subsections describe the extent to which the City system is impacted by I/I.

3-4.1 INFLOW

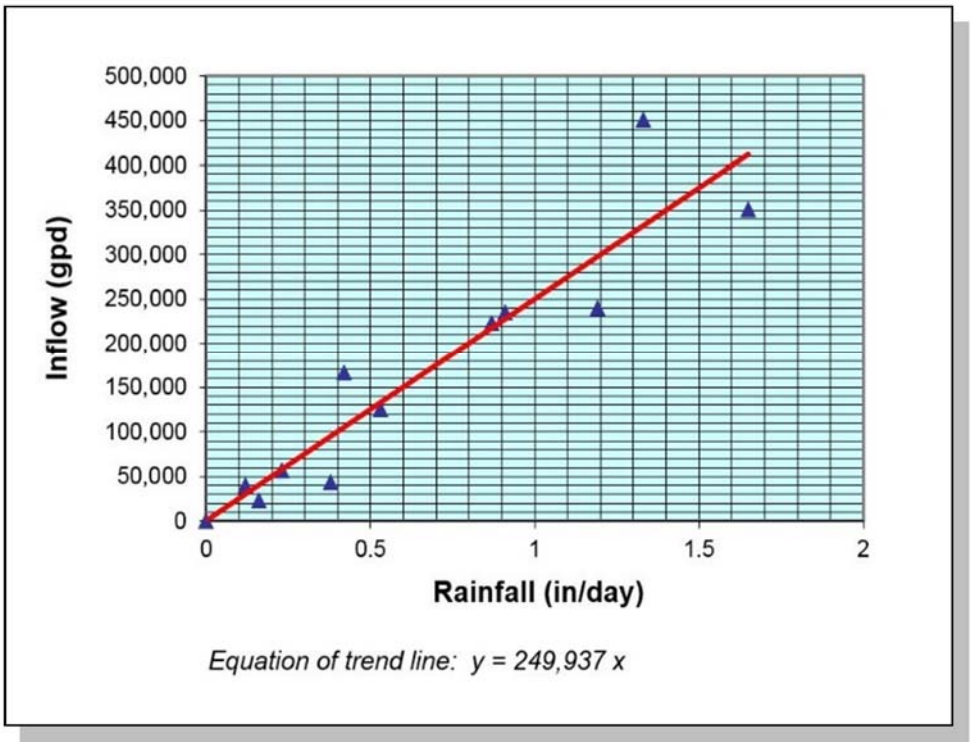
Tests have indicated that leakage through manhole covers can range from 20 to 70 gpm with a depth of 1 inch over the cover (*Clay Pipe Engineering Manual, National Clay Pipe Institute, 1990*). This could lead to a significant volume of water entering the sewer system, resulting in surcharging and increased pumping and treatment costs.

Hydrologic data and sewage flows at Pump Station No.35 during both dry and wet weather were examined during the preparation of the 1999 Master Plan to quantify the amount of inflow entering the City's sewage collection system. The Orange County Resources and Development Management Department provided daily records for rainfall from Station No. 170 (Los Alamitos), located within Seal Beach in the vicinity of Westminster Avenue and the western city boundary. The City provided total daily sewage flow records as well as the daily navy flow records at Pump Station No.35.

The wastewater flow produced by the City was determined by subtracting the US Naval Weapons Station flow from the total flow. An average flow was then calculated for the month under examination. On days in which a rainfall event occurred, inflow was determined by calculating the difference between the measured wastewater flow for that day and the average flow. The inflow was determined for several different rainfall events and plotted versus inches of rainfall per day. The results are displayed in Figure 3-1. Generally, the relationship can be defined as linear and the amount of inflow expected (gpd) is about 250,000 times the amount

of rainfall (in/day). This relationship was based upon sewage flows entering and leaving Pump Station No.35 only. It is assumed that the College Park East drainage area will have similar characteristics and follow the same trend as displayed above.

Figure 3-1 Pump Station No. 35 Inflow vs. Rainfall



It is seen that inflow contributes a significant amount of excess water into the system during rainfall events. According to hydrologic data taken at rainfall station No. 170, the City of Seal Beach has an average annual rainfall of 10.14 inches per year. This would amount to approximately 2.5 million gallons of inflow into the sewage collection system tributary to Pump Station No.35 each year. For an average rainfall of 0.5 inches, an increase in the sewer average dry weather flows of 20 percent can be expected for the Pump Station No.35 service area and 33 percent for the College Park East area. Identifying reaches where manholes are most likely to be inundated with storm water and then taking steps to either relocate or seal these manholes can reduce the volume of inflow. This would include manholes located in the vicinity of gutters and other flow paths of storm water, and sump areas that experience ponding.

The City of Seal Beach is relatively flat, especially in the areas of Old Town and College Park East where there have been problems with water ponding in streets and alleys. Historically, the City has reported flooding in Old Town at the following locations:

- First Street between Marina Drive and PCH, including Seal Beach Mobile Home Park
- 7th Street and Marina Drive
- 2nd Street and Marina Drive
- Corsair Way east of Caravel Way
- Clipper Way east of Caravel Way
- 15th, 16th, and 17th Streets between Electric Avenue and Landing Avenue

- The north side of Electric Avenue from 12th Street to Seal Beach Boulevard
- Seal Beach Boulevard south of Pacific Coast Highway
- Near the beach between 8th Street and 11th Street, especially the beach parking lot located at 10th Street

The majority of sewer manholes in Old Town are located in the center of back alleys lying directly in the path of stormwater runoff. College Park East is extremely flat, causing water to pond nearly throughout the area.

To reduce inflow into the wastewater collection system, the City has made several improvements to the storm drain system that will reduce flooding instances, particularly along Electric Avenue and in College Park East. Other activities that could further reduce inflow include installing new manhole covers which have one vent hole and one pick hole, or cover some of the existing manhole cover openings with plugs.

3.4-2 INFILTRATION

A significant portion of the sewer system is subject to infiltration due to the high groundwater levels in many parts of the City and the age of the pipelines, many of which are over 40 years old.

The City reports that infiltration into manholes is clearly visible in College Park East. The CCTV inspections conducted in 2013 showed infiltration in a number of reaches in both Old Town and College Park East. In 2005, a comparison of flow monitoring results and water meter records also indicated that the magnitude of infiltration in College Park East was about 375 gallons per acre per day. Using the same methodology, infiltration in Bridgeport and the portions of Old Town with deeper sewers is estimated at 850 gallons per acre per day.

The flow monitoring data collected for the previous Master Plan study are now quite dated. It is therefore recommended that the City re-evaluate the magnitude of current infiltration rates in College Park East, Old Town, and Bridgeport. This could be accomplished through a separate study which compares a current flow monitoring effort to water meter use data. Ideally, this flow monitoring effort should be performed at a time of year when outdoor water use is minimized. Results from this study could be used to increase the accuracy of the hydraulic model by specifically identifying the locations where infiltration is occurring, as well as the quantities involved.

3-5 SEWER SYSTEM PERFORMANCE EVALUATION CRITERIA

Sewer system performance evaluation criteria are established to ensure that the wastewater collection system can operate effectively. Each pipe segment must be capable of carrying design peak wet weather flows without surcharging the system. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

3-5.1 PIPE SIZES AND VELOCITIES

At a minimum, all pipes should be 8 inches or larger in diameter and the velocity of flow in the pipe should be greater than 2 ft/s during average flow conditions. This velocity will prevent deposition of solids in the sewer. A minimum velocity of 3 ft/sec is required during peak dry weather flow conditions, to resuspend any materials which may have already settled in the pipe. The minimum corresponding slope for various pipe sizes is presented in Table 3-2.

Table 3-2
Minimum Sewer Slopes

Pipe Size (in)	Minimum Slope
8*	0.0075
10*	0.0056
12*	0.0044
15*	0.0032
18**	0.0021
21**	0.0017
24**	0.0014

** 0.50 full with peak dry weather flow*
** *0.64 Full with peak dry weather flow*

It is important to note that the slopes listed in Table 3-2 assume the depth of flow to pipe diameter ratio to be 0.50 or 0.64. If there is insufficient flow to create this condition, greater slopes than those shown may be required.

3-5.2 FLOW DEPTH TO PIPE DIAMETER RATIOS

The design and analysis of collection system pipes is typically based upon the depth of flow to diameter ratio (d/D). All new pipe should be designed with a peak dry weather depth of flow to pipe diameter ratio less than or equal to 0.50 for 15-inch and smaller pipes, and 0.64 for 18-inch and larger pipes. The remaining pipeline capacity is reserved for wet weather related inflow and infiltration into the system. Additionally, the area above the water surface helps to keep the sewage aerated, preventing septic conditions and resulting odors. The peak wet weather depth of flow to pipe diameter ratio should not exceed 0.80.

Sewer system performance evaluation criteria are summarized in Table 3-3. Additional design criteria details are included in the “City of Seal Beach Design Criteria for Sewer Facilities”.

3-6 SEWER PUMP STATION PERFORMANCE EVALUATION CRITERIA

The performance of a sewer pump station is of particular importance since a failure could have far reaching ramifications. It must therefore be reliable, sized with sufficient capacity, and contain redundant and/or backup equipment. A plan must also be in place so that appropriate staff can be notified in the event of a failure.

The primary components of a sewer pump station are the wet well, pumps, dry well, force main, and electrical controls.

The wet well stores the incoming wastewater until a pump is activated to discharge it. It should be designed with sufficient capacity to prevent short cycles whereby the pumps continually start and stop, yet small enough that it will be regularly evacuated to prevent the wastewater from becoming septic. The desired number of pump cycles should be limited to no more than six (6) per hour for motors up to 20 HP, and less for larger motors.

The pumps should be sized to efficiently handle peak flows. A minimum of two pumps sized at the peak flow to the station should be provided so that sufficient standby capacity is available when one pump is removed for repairs. The pumps should be able to pass a minimum solid size of 3 inches without clogging. The shafts, seals and impellers should be constructed of wear resistant material to provide long life. Tungsten Carbide seals, Ni-Hard impellers, and 316 stainless steel pump shafts are recommended. For services where aggressive agents may be found in the sewage, such as at golf courses, complete stainless steel construction is recommended. This includes the pump bowl, shaft, impeller, and motor housing.

The dry well houses the valves, pumps, motors and electrical controls. It must be well ventilated and provide unobstructed access to all equipment. A minimum 3-foot clearance from all obstructions should be provided. Greater clearances may be required for equipment with special maintenance needs. Facilities for equipment removal, including hatches, large door openings, and hoists, should also be provided.

The force mains should be selected to operate within a 3 feet per second to 5 feet per second velocity range, but should not be smaller than 4-inches in diameter.

While submersible pump stations may be utilized for the small flows, the larger pump stations should be the wet well/dry type. They should be designed with easy access to all equipment. Wet wells of wastewater pumping stations are classified by the National Electric Code as Class I, Group D, Division 1 facilities if ventilated at less than 12 air changes per hour and Division 2 if continuously ventilated at 12 or more air changes per hour. Dry wells, which are physically separated from wet wells, if ventilated at less than 12 air changes per hour, are classified as Class I, Group D, Division 2 locations. Wet wells and under certain circumstances dry wells, should be considered confined spaces and should be entered in accordance with the corresponding requirements of Occupational Safety and Health Administration (OSHA).

All pump stations should incorporate redundant control systems for operation of the pumps. A float system should be used as a backup for a primary control system that utilizes an ultrasonic device or a bubbler.

Telemetry equipment (dialer) must be provided at all pump stations. The dialer notifies personnel when an alarm or failed condition occurs. The dialer must be capable of calling several pre-programmed numbers until the alarm is acknowledged by an operator. The dialer can also be used to remotely check the status of the station if desired.

While pump stations may be necessary to serve portions of the City's service area because of topographic requirements, all feasible efforts should be made to eliminate their use. In evaluating the feasibility of constructing a pump station, a detailed comparison with a gravity alternative should be made. The service lives of the two facilities, the cost of operation and maintenance, as well as the many problems associated with the development of flows during the first several years should be carefully considered.

Sewer pump station performance evaluation criteria are summarized in Table 3-3.

Table 3-3

Sewer System Performance Evaluation Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 fps at average flow or;
	3.0 fps at peak flow
Flow Depth to Pipe Diameter Ratio (d/D) with Peak Dry Weather Flows	
15-inch and under	0.5
18-inch and over	0.64
Pump Station	
Pumps	▪ Minimum 2 each sized at peak flow
	▪ Minimum solids handling capacity 3”
Wet Wells	▪ Sized to limit pump cycling to less than 6 times/hr for motor HP up to 20; 4 times/hr up to 50 HP; 3 times/hr up to 75 HP; 2 times/hr 100 HP and above
	▪ Provide 30 minutes of storage at peak flow to allow response to a failure
	▪ Equipment to be maintained must be accessible without entering the structure
Ventilation	▪ 12-air changes/hour minimum in dry well and as required by NFPA 820
Controls	Redundant system. Float operated back-up controls
Emergency Power	Stationary source in locations which cannot provide 30-minute response time without overflowing. Provisions for connection of a portable power source at all other locations
Telemetry	Dialer system at all pump stations to alert personnel in the event of a station failure
Force Mains	▪ Minimum velocity 3.0 ft/sec
	▪ Minimum size 4”
	▪ Air/Vacs installed in vaults

3-7 SERVICE LIFE OF PIPE AND PUMP STATION EQUIPMENT

In addition to the design criteria discussed in previous sections, the useful lives for which one can expect relatively trouble-free service is also of great importance when assessing an existing or future sewer system. Once the service life of a facility is exceeded, it becomes subject to failure and is often expensive to maintain. The determination of useful life can be difficult and depends on many different considerations including the following:

- Type of materials used and recorded performance of similar installations
- Velocities and flow rates expected in the system
- Chemical and biological conditions of the wastewater
- Construction methods and installation

However, the values listed in Table 3-4 are generally accepted as prudent planning criteria and are used as benchmarks for replacement recommendations in this study.

Table 3-4
Planning Criteria for Facility Useful Life

Facility	Description	Useful Life (Yrs.)
Gravity Sewers	Cast Iron Pipe (cip)	20
	Plastic Pipe	70
	Vitrified Clay Pipe (VCP)	70
Force Mains	Asbestos-Cement Pipe (acp)	40
	Ductile Iron Pipe (dip)	40
	Plastic Pipe	30
Pump Stations	Structure	60
	Piping	30
	Valving	20
	Mechanical	15
	Electrical	15

SECTION 4
EXISTING COLLECTION SYSTEM

4-1 GENERAL DESCRIPTION

The City's existing wastewater collection system is made up of a network of gravity sewers, pump stations, and sewer force mains. The gravity system consists of approximately 181,000 feet of pipe and 800 manholes serving about 5000 customers. The majority of the gravity sewers are constructed of vitrified clay pipe with sizes ranging from 6-inches to 24-inches in diameter. There are six existing pump stations and associated force mains maintained by the City. These facilities are discussed in detail in Section 6.

Originally, the City maintained a trunk sewer in Electric Avenue that conveyed wastewater flows northwesterly to a local wastewater treatment plant at the northwestern border of the City. In 1973, the treatment plant was demolished and Pump Station No. 35 was constructed at the southeast end of Electric Avenue. A new 21-inch to 24-inch diameter interceptor, also in Electric Avenue, was constructed to convey wastewater in the opposite direction towards Pump Station No. 35.

Currently, the gravity trunk sewer in Electric Avenue collects wastewater from the areas of Bridgeport, Marina Hill, and Old Town, and transports it southeast to Pump Station No. 35. Wastewater from the U.S. Naval Weapons Station flows directly into Pump Station No. 35 from the east as well.

Wastewater is then pumped from Pump Station No. 35 north via a 16-inch force main in Seal Beach Boulevard to a high point in the road. The wastewater then enters the existing 24-inch Seal Beach Boulevard Trunk Sewer which terminates at OCSD's Seal Beach Pump Station, located on the northeast corner of Westminster Avenue and Seal Beach Boulevard. Flows from the Adolfo Lopez Pump Station and Boeing Pump Station are also discharged into the 24-inch Seal Beach Boulevard Trunk Sewer.

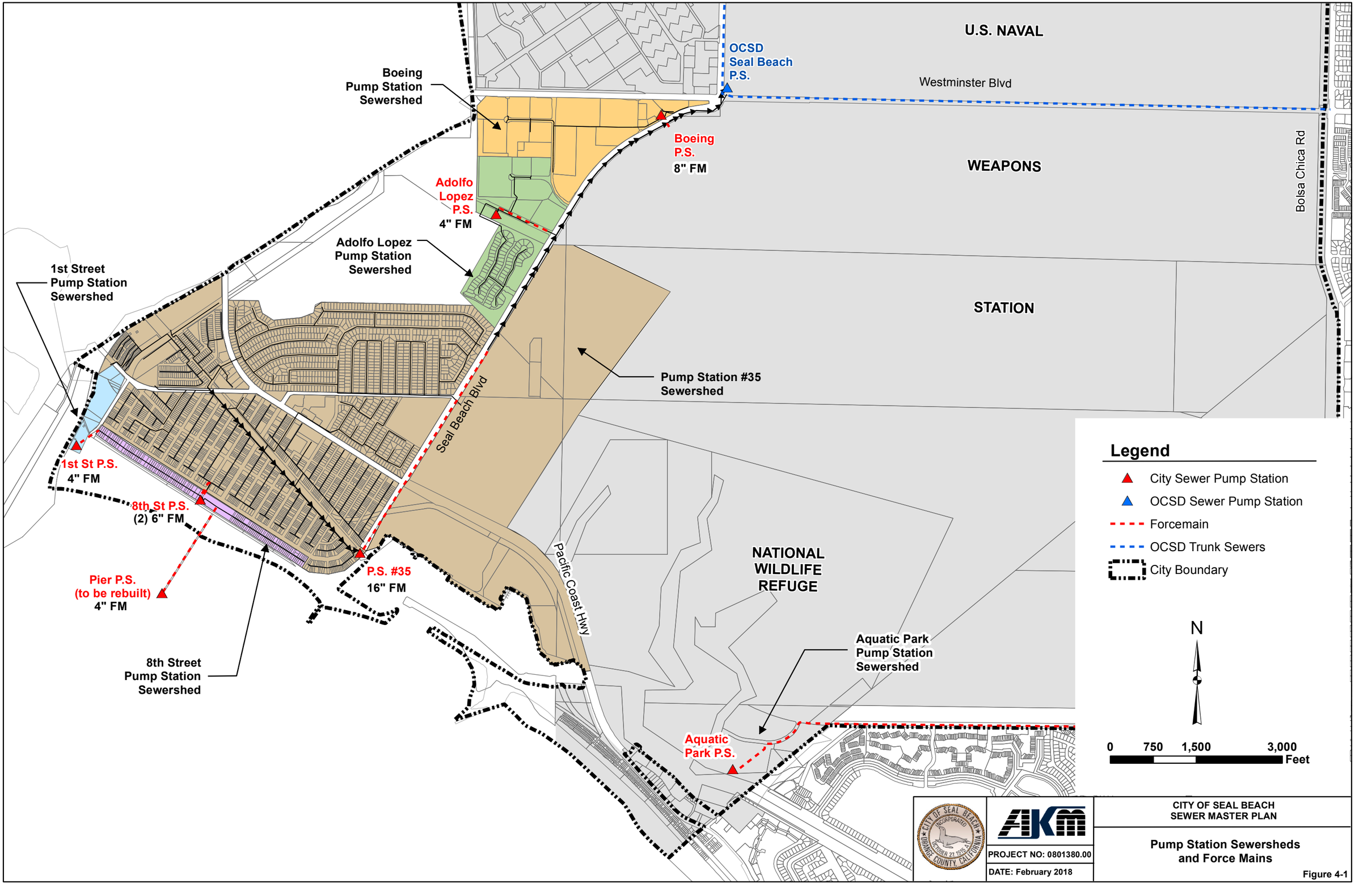
The system of sewers in College Park East community conveys the wastewater to the existing 15-inch VCP Lampson Avenue Trunk Sewer, which extends from Basswood Street to Seal Beach Boulevard. This sewer increases to 18-inches in diameter at Seal Beach Boulevard before entering OCSD's 30-inch diameter VCP Los Alamitos Sub-Trunk Sewer located on the west side of Seal Beach Boulevard. The Los Alamitos Sub-Trunk sewer terminates at OCSD's Westside Pump Station located between Yellowtail Drive and Bixby Storm Channel.

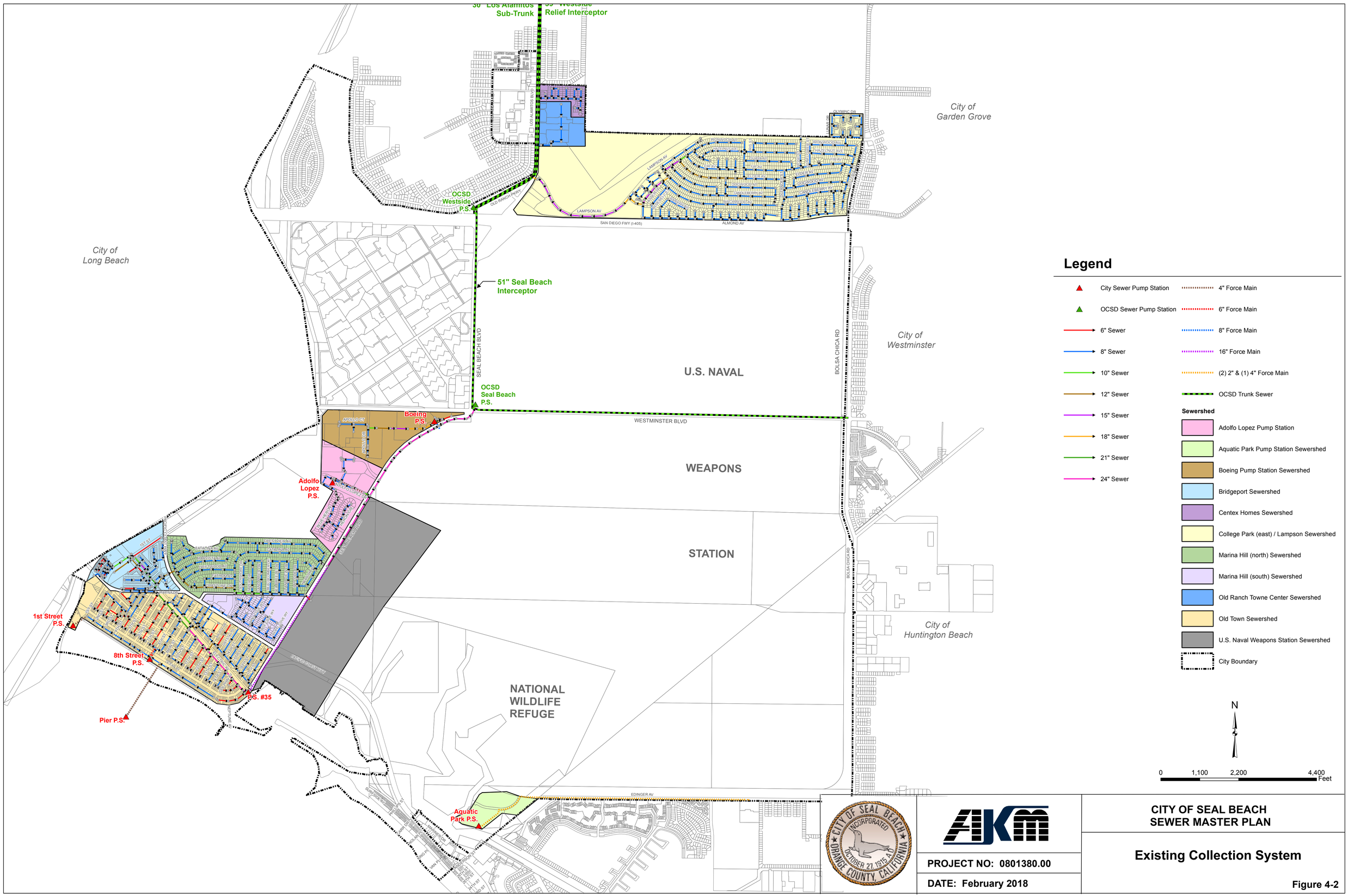
4-2 DRAINAGE REGIONS (SEWERSHEDS)

The City's sewer service area consists of seven major sewersheds as shown in Table 4-1 and on Figure 4-1. The existing wastewater collection system as currently maintained by the City of Seal Beach is shown on Figure 4-2.

Table 4-1
Major Sewersheds

1	Pump Station No 35
	Bridgeport
	Marina Hill North
	Marina Hill South
	Old Town
	U.S. Naval Weapons Station
2	Adolfo Lopez Pump Station
3	Boeing Pump Station
4	Aquatic Park Pump Station
5	College Park East
6	Old Ranch Towne Center
7	Centex Homes


U.S. NAVAL
WEAPONS
STATION
NATIONAL WILDLIFE REFUGE
Westminster Blvd
Bolsa Chica Rd
Seal Beach Blvd
Pacific Coast Hwy
OCSD Seal Beach P.S.
Boeing Pump Station Sewershed
Boeing P.S. 8" FM
Adolfo Lopez P.S. 4" FM
Adolfo Lopez Pump Station Sewershed
1st Street Pump Station Sewershed
1st St P.S. 4" FM
8th St P.S. (2) 6" FM
Pier P.S. (to be rebuilt) 4" FM
8th Street Pump Station Sewershed
P.S. #35 16" FM
Pump Station #35 Sewershed
Aquatic Park Pump Station Sewershed
Aquatic Park P.S.
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
City Boundary
N
0 750 1,500 3,000
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
PROJECT NO: 0801380.00
DATE: February 2018
Pump Station Sewersheds and Force Mains
Figure 4-1



CITY OF SEAL BEACH
SEWER MASTER PLAN

Existing Collection System

PROJECT NO: 0801380.00

DATE: February 2018

Figure 4-2

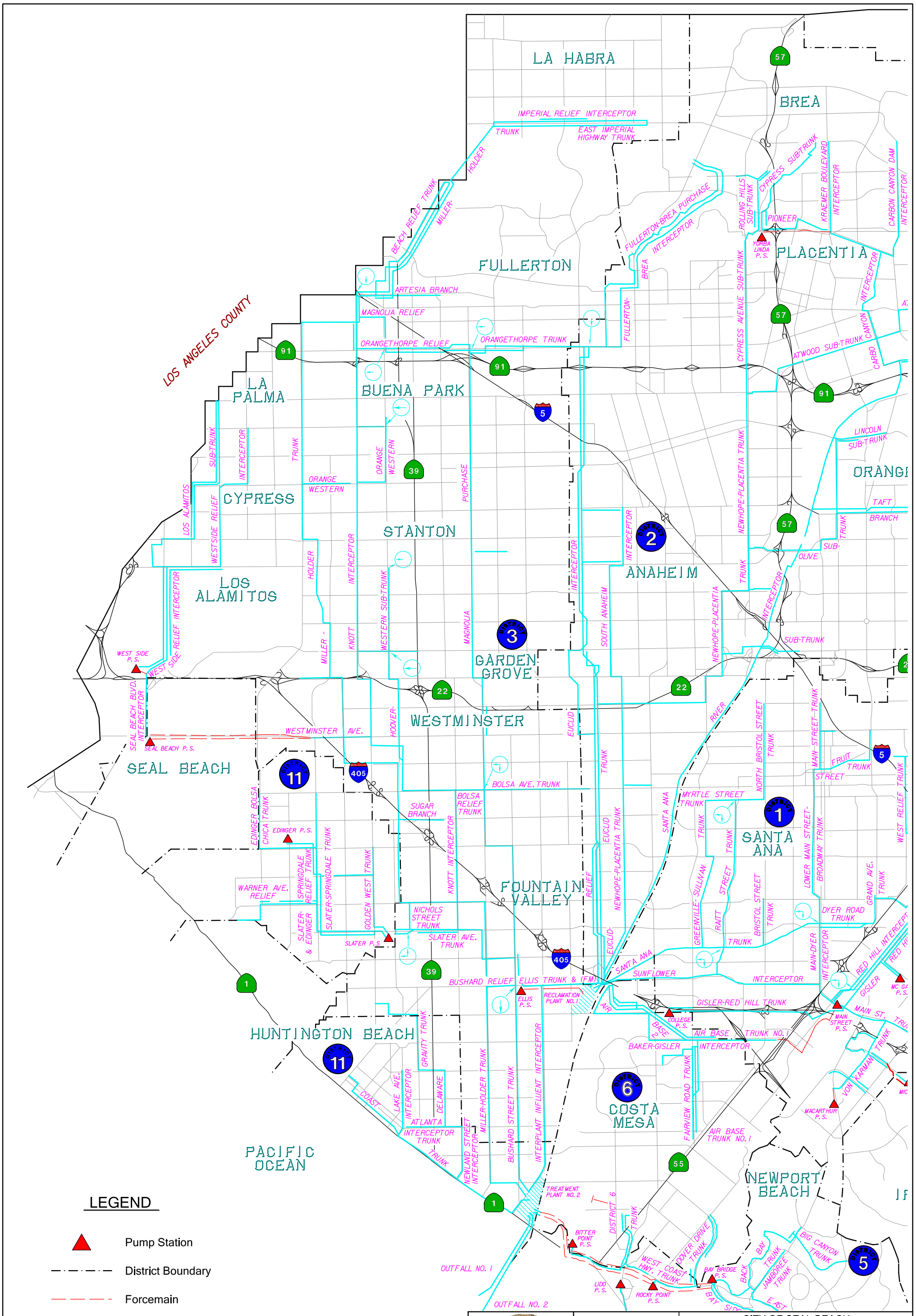
4-3 ORANGE COUNTY SANITATION DISTRICT (OCSD) WASTEWATER COLLECTION SYSTEM

The City of Seal Beach is a part of Orange County Sanitation District's (OCSD) Revenue Area No. 3. The City's wastewater collection system ultimately conveys sewage to one of two OCSD pump stations. Sewage collected at Pump Station No. 35 is conveyed northeast in Seal Beach Boulevard via a 16-inch diameter force main and a 24-inch diameter gravity sewer to OCSD's Seal Beach Pump Station, located on the northeast corner of Seal Beach Boulevard and Westminster Avenue. The wastewater collected at the City's Boeing and Adolfo Lopez Pump Stations are also pumped to the 24-inch diameter trunk sewer in Seal Beach Boulevard, terminating at the Seal Beach Pump Station. Flows from College Park East, Old Ranch Golf Course, and commercial area east of Seal Beach Boulevard and south of Lampson Avenue discharge into OCSD's 30-inch diameter Los Alamitos Sub-trunk sewer in Seal Beach Boulevard. This facility carries the wastewater to OCSD's Westside Pump Station, located at 3112 Yellowtail Drive just north of the San Diego Freeway.

The Westside Pump Station has a 20-inch diameter force main that discharges to the Seal Beach Interceptor. This is a 51-inch reinforced concrete pipe in Seal Beach Boulevard that transports flows south to the Seal Beach Pump Station. The Seal Beach Pump Station then takes the flows it receives from the Seal Beach Interceptor and Pump Station No. 35, and lifts it into the Westminster Avenue Interceptor.

The Westminster Avenue Interceptor conveys the flow east from the Seal Beach Pump Station to a connection with OCSD's Knott Trunk Sewer System (KTSS) at the intersection of Westminster Avenue and Golden West Street. The KTSS is one of four major sewer trunk lines serving the western portion of Orange County. The KTSS begins in Fullerton at the intersection of Knott Avenue and Artesia Street and terminates at OCSD's Treatment Plant No. 2, located in the City of Huntington Beach next to the Santa Ana River and east of Pacific Coast Highway.

The unit operations at Treatment Plant No. 2 include: screening, grit removal, primary clarification, aeration, secondary clarification, and disinfection. Treated effluent is disposed of through an ocean outfall system. Figure 4-3 shows the locations of OCSD's trunk lines, pump stations, and treatment plants.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Orange County Sanitation District
Collection System

PROJECT No. 0801380.00

DATE: February 2018

FIGURE 4-3

SECTION 5
HYDRAULIC MODEL

5-1 GENERAL

To perform a detailed analysis of the wastewater collection system, it is essential to create a mathematical model that is capable of simulating the operating characteristics of the system. The City's hydraulic model was updated utilizing the Innovyze InfoSewer 7.6 platform, which is a GIS based computer program with the ability to perform steady state analyses of the flows in wastewater collection systems. The program also manages and maintains the database that stores the sewer analysis input and output results. Manning's Equation is used for depth of flow calculations in the gravity sewer pipes.

The wastewater collection system is modeled by entering pipe diameters, lengths, slopes, and roughness coefficients. The sewer model includes all of the City's existing manholes, sewer pipes (excluding laterals, private sewers, and sewers belonging to other agencies), sewer pump stations, and tributary area boundaries. The model identifies points of connection to regional facilities belonging to OCSD.

The model uses the average dry weather flows and determines peak flows based upon relationships specified by the user. Pumped flows and measured flows can be entered at any manhole as a fixed flow.

At the completion of a modeling run, output data is created for viewing on the screen or for printing. Output data for pipes include average and peak flow rate, velocity, pipe capacity, and ratio of flow depth to pipe diameter (d/D).

5-2 INFRASTRUCTURE UPDATES

The hydraulic model was updated to include all sewer infrastructure projects completed by the City since the last Master Plan was completed in 2005. Some of the recent projects added into the model include:

- Hellman Ranch gravity sewers
- Upsized trunk sewers in College Park East sewershed – Elder Avenue, Ironwood Avenue, Candleberry Avenue, Aster Street, Basswood Avenue, and Lampson Avenue
- Gravity sewers in the Boeing Pump Station and Adolfo Lopez Pump Station sewersheds
- Lampson Well Offsite gravity sewer
- Ocean Avenue Alley gravity sewer
- Electric Avenue Alley gravity sewer
- Seal Beach Boulevard crossing of Lampson Avenue Trunk Sewer
- Eighth Street P.S. parallel force mains

With respect to pipeline simulations, Manning's Equation was used for all gravity flow calculations in pipes, with Manning's "n" coefficients of 0.013 and 0.010 used for vitrified clay pipe (VCP) and polyvinyl chloride (PVC) pipe, respectively.

5-3 INVERT ELEVATIONS

During the course of this study, the pipe elevations and slopes in the Old Town alleys were modified per a thorough investigation of available historical plans. The changes made resulted in a more accurate representation of the available pipe capacities in these locations.

The inverts input into the model based upon recent as-built plans in the Old Town and College Park East areas were often found to not match up well with the inverts in the City's existing model. The reason could be due to different years of construction and datum differences. In some areas, the information is more clearly an error. There has always been a lack of invert data for the older sewers constructed in the Old Town area. Plans for these sewers do not exist which explains the lack of information in the City's GIS information.

Unfortunately, the lack of invert data for older pipes has resulted in a situation where some upstream sewer pipes in the model terminate at lower elevations than the downstream pipe. This of course is not how the system is constructed. Hydraulically, the model can handle this situation for a steady-state simulation because it treats each sewer pipe as an individual segment and uses open channel flow calculation to determine depths and velocities. As long as the pipe slopes are correct for each individual reach and as long as the sewage is free flowing and not backing up in the system, the resulting capacity evaluation will be accurate.

However, given the age of some of the sewer pipes in the system, as well as the overall lack of information on many pipe inverts in the system, it is recommended that the City perform a manhole survey to determine inverts for all of its pipes. Such an effort would validate the model and allow for future dynamic modeling should that effort ever be required.

5-4 MODEL LOADS

During the process of updating the model for this study, the sewer loads were modified within the model to more accurately match the flows seen at the pump stations for FY 2014-2015. In total, the system wide modeled average daily flow in the City's previous sewer model was 2.03 mgd. Based on the FY 2014-2015 pump station records, the average daily flow in the updated model was reduced to 1.31 mgd.

The reasons for the reduction in sewage flow are at least two-fold. First, the unit flow factors previously used to develop the average dry weather flows were likely very conservative. Second, the more recent onset of extreme drought conditions and the resulting conservation efforts have reduced water use significantly. The modeled average daily flows were modified to be more representative of actual current flow rates in order to calculate the remaining capacity of the system more accurately.

To establish loads within a given pump station sewershed, the average daily flows recorded at the pump stations for FY 2014-2015 were used, with the exception of the 8th Street Pump Station. The 8th Street Pump Station was under construction for much of the FY 2014-15 period, with construction completed in October 2015. Therefore, the average daily flows for November and December 2015 were used to determine the loads in this sewershed.

The College Park East sewershed loads were reduced by a factor similar to what was calculated for the Pump Station No. 35 sewershed, due to its similarity in tributary land use which is primarily residential. This assumes that water conservation occurred similarly in both areas. Table 5-1 is a summary of the total average sewer loads applied in the model for each of the major sewersheds.

As noted in Section 3-4.2, the 2005 master plan study quantified infiltration in the College Park East and Bridgeport/Old Town sewersheds at about 375 gallons per acre per day and 850 gallons per acre per day, respectively. The College Park East infiltration rate of 375 gpd/ac was applied throughout the sewershed to each manhole. The Bridgeport/Old Town infiltration rate of 850 gpd/ac was applied to manholes with a top of pipe elevation less than 3 ft amsl, which is below ground water levels and primarily applied to the Electric Avenue trunk sewer. As previously recommended, the City should reevaluate the current infiltration rates and update the model as needed.

Table 5-1
Average Sewer Loads

Sewershed	Average Sewer Load (mgd)
P.S. 35 (includes 8th St, Pier, and 1st St)	*0.640
Adolfo Lopez	0.022
Boeing	0.039
College Park East/Centex Homes	**0.610
Total	**1.311**

*Includes infiltration at manholes with elevation <3 ft amsl

**Includes approximately 0.19 mgd infiltration at manholes in CPE/Centex Homes area

5-5 PUMP STATION FLOWS

The model was run as a steady-state simulation for a peak dry weather flow scenario. Pumps and force mains were not simulated directly. Instead, average dry weather flows tributary to a pump station were transferred to the location of the end of the force main, where they were reallocated as loads and peaked along with all other loads for each pipe reach.

An analysis of pumped flow based on pump run times at each sewer pump station revealed that average daily station flows during FY 2014- 2015 were generally much lower than the average dry weather flows simulated during the development of the City's model for its previous master plans.

SECTION 6
GRAVITY SYSTEM HYDRAULIC ANALYSIS

6-1 GENERAL

The gravity system capacity analysis was generally conducted with the estimated peak dry weather flows. One exception to this is the 24-inch Seal Beach Boulevard Trunk Sewer. This sewer was evaluated to see if it could convey the sum of the firm capacities of Pump Station No. 35, Adolfo Lopez Pump Station, and Boeing Pump Station as applicable. This is the most conservative evaluation of this sewer line because pump station firm capacities are based on the larger of three times the average dry weather flow or 1.35 times the peak dry weather flow. Most likely, the pumped flows are attenuated by the time they reach the Seal Beach Boulevard Trunk Sewer, meaning lower flows are experienced in the sewer itself.

6-2 SYSTEM VELOCITIES

The topography of the City is generally flat and the majority of the gravity sewer lines have been designed and built with less than desirable slopes that attempt to follow the grade of the ground surface. This has resulted in a system that is velocity deficient in many areas where velocities are under 2.0 feet per second with average dry weather flows, and under 3.0 feet per second with peak dry weather flows.

It is not cost-effective or practical to correct these deficiencies until the sewer is scheduled for replacement due to a condition deficiency. In some instances, such as in College Park East, it may not be possible to correct the problem without constructing a costly pump station. This deficiency should, therefore, be noted with the understanding that the collection system will inevitably require continual maintenance and cleaning in order to flush out materials that periodically settle in the sewer lines.

The City of Seal Beach cleans the entire collection system once every year. Additionally, portions of the system with frequent settlement problem are included in the “Frequent Maintenance Location” list, which are cleaned quarterly or monthly. The Frequent Maintenance Locations are included in the City’s Preventative Maintenance Program. It is updated as new problem areas are identified through the CCTV inspection program. Figures 6-1 and 6-2 depict a map of collection system flow velocities under a peak dry-weather flow scenario.

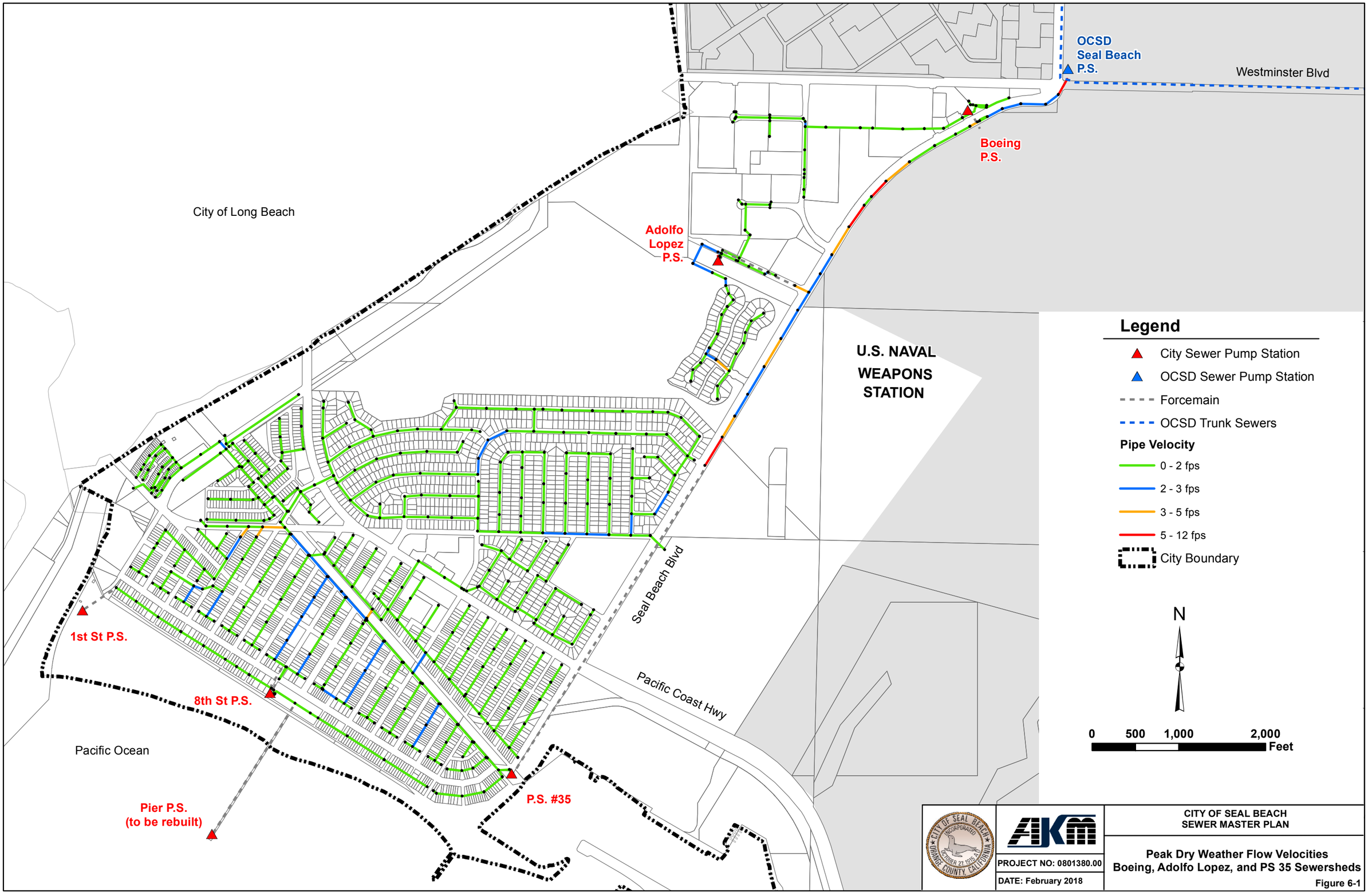
6-3 CAPACITY ANALYSIS

Based on the hydraulic model results, there were no pipe capacity deficiencies identified for the City’s collection system. As such, no capital improvement projects directly related to capacity will be recommended in this Master Plan Update. Figures 6-3 and 6-4 display existing system model results for the peak dry weather flow scenario. Sewer pipes in the figures are color coded by flow depth to diameter ratio (d/D).

6-4 FUTURE SYSTEM SCENARIOS

Per Center for Demographic Research at California State University, Fullerton, the population of the City of Seal Beach at the end of the current planning period in 2040 is only 700 persons higher than the current population. Since there are no significant developments currently planned, the additional population can be assumed to be infill among current residential neighborhoods. It is unknown if the increase in population will occur within the City’s sewer service area. It was not deemed necessary to create a hydraulic model of a build-out scenario until planned development or infill can be specifically identified.

The commercial/industrial areas within the Adolfo Lopez Pump Station and Boeing Pump Station sewersheds are currently experiencing low occupancy rate and therefore low sewage generation rates. The City is currently evaluating whether the Adolfo Lopez Pump Station sewershed has the capacity to accept wastewater flow from nearby oil & gas operations in the vicinity of the Hellman Ranch property. It is recommended that the Adolfo Lopez Pump Station and Boeing Pump Station sewersheds be monitored closely as conditions change to ensure that sufficient capacity remains available in these areas.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Peak Dry Weather Flow Velocities
Boeing, Adolfo Lopez, and PS 35 Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 6-1

City of Los Alamitos

Seal Beach Blvd

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers

Pipe Velocity

- 0 - 2 fps
- 2 - 3 fps
- 3 - 5 fps
- 5 - 12 fps
- City Boundary

N

0 500 1,000 2,000 Feet

City of Garden Grove

OCSD Westside P.S.

Old Ranch Pkwy

Lampson Ave

San Diego (405) Fwy

U.S. NAVAL WEAPONS STATION

Seal Beach Blvd

Bolsa Chica Rd

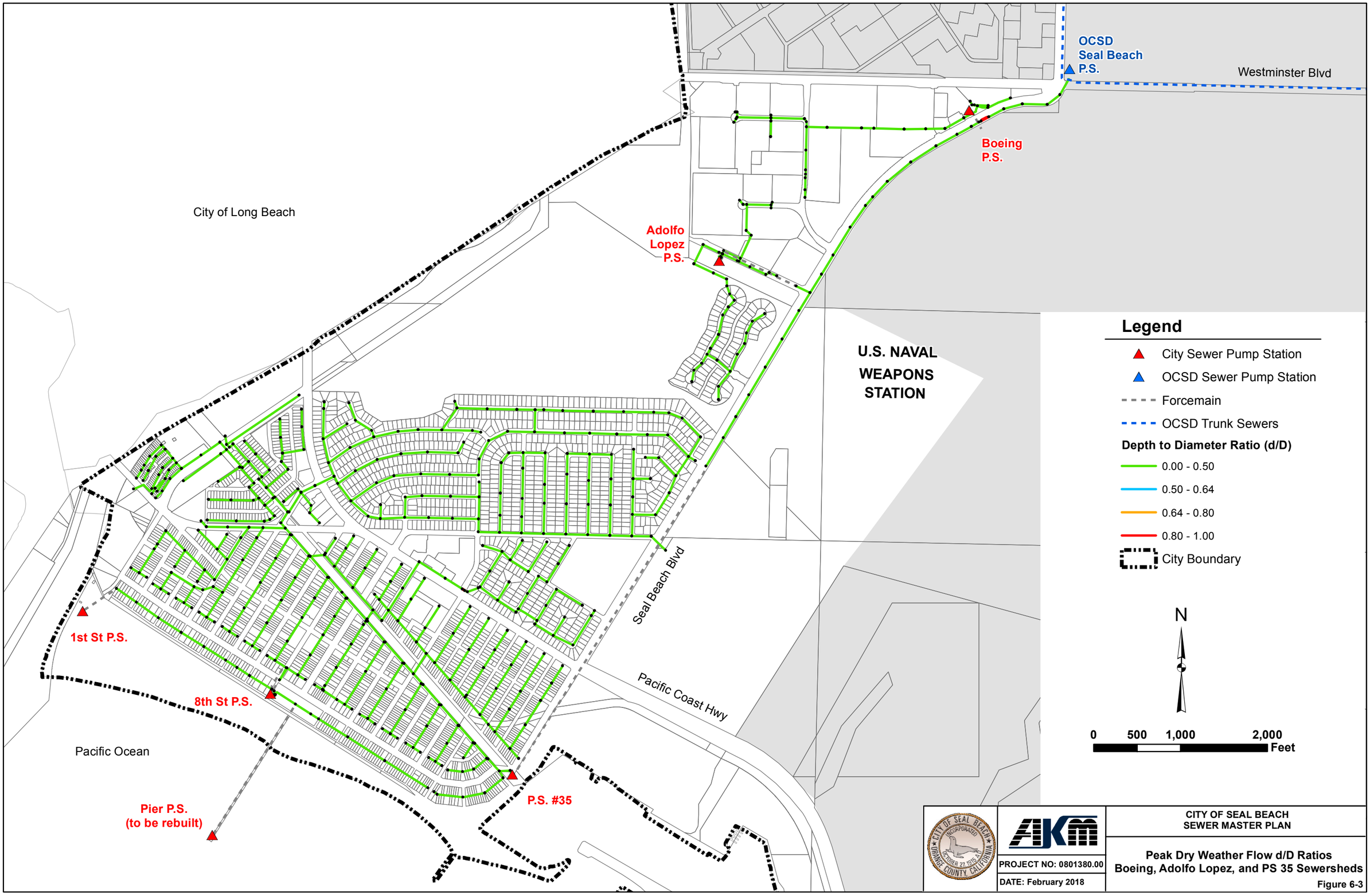
CITY OF SEAL BEACH
SEWER MASTER PLAN

Peak Dry Weather Flow Velocities
College Park East, Old Ranche Towne Center, and Centix Homes Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 6-2



CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Peak Dry Weather Flow d/D Ratios
Boeing, Adolfo Lopez, and PS 35 Sewersheds

Figure 6-3

City of Los Alamitos

Seal Beach Blvd

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers

Depth to Diameter Ratio (d/D)

- 0.00 - 0.50
- 0.50 - 0.64
- 0.64 - 0.80
- 0.80 - 1.00
- City Boundary

N

0 500 1,000 2,000 Feet

City of Garden Grove

OCSD Westside P.S.

Old Ranch Pkwy

Lampson Ave

San Diego (405) Fwy

U.S. NAVAL WEAPONS STATION

Seal Beach Blvd

Bolsa Chica Rd

CITY OF SEAL BEACH
SEWER MASTER PLAN

Peak Dry Weather Flow d/D Ratios
College Park East / Lampson, Olde Ranche Towne Center, and Centix Homes Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 6-4

SECTION 7

PUMP STATIONS

7-1 GENERAL

The City of Seal Beach currently owns and operates six (6) sewer pump stations located throughout the City as shown on Figure 4-1. A seventh pump station, located on the Municipal Pier, was destroyed by fire in early 2016. The Pier Pump Station will be rebuilt with insurance proceeds. The former Marina Community Center Pump Station was eliminated by constructing a gravity sewer in 2002. In addition, Aquatic Park Pump Station No.2 was removed from service when the Aquatic Park Pump Station No.1 tributary wastewater was diverted to the City of Huntington Beach system via a renovated pump station and new force main in 2005.

The 1st Street, Pier and 8th Street Pump Stations service small areas and discharge into the collection system in Old Town that eventually drains into the City's Pump Station No.35, located at the intersection of Electric Avenue and Seal Beach Boulevard. Pump Station No.35 collects wastewater generated by the Naval Weapons Station, Bridgeport, Marina Hill, and Old Town. It then pumps the wastewater through a 16-inch diameter force main into the 24-inch Seal Beach Boulevard Trunk Sewer just south of Catalina Avenue. The Seal Beach Boulevard Trunk Sewer extends northward in Seal Beach Boulevard, terminating at the Orange County Sanitation District's Seal Beach Pump Station located northeast of the intersection of Seal Beach Boulevard and Westminster Avenue. The Boeing and Adolfo Lopez Pump Stations discharge directly into the Seal Beach Boulevard Trunk Sewer.

At the time of writing of the previous Master Plan Update in 2005, the Boeing and Adolfo Lopez Pump Stations had been recently replaced with new facilities (in 2003 and 2005, respectively). All of the remaining pump stations had been identified as having deficiencies. On the recommendation of the 2005 Sewer Master Plan, the City has rebuilt or upgraded each of its pump stations.

Pump Station No. 35 was upgraded in two phases - Phase I in 2005 and Phase II in 2006. Upgrades to the station involved a complete renovation of the dry well, including installation of three 1500 gpm, variable frequency drive (VFD) operated pumps, as well as the replacement of all electrical and control equipment. Two of the pumps are equipped with combination drives, and can be operated by either electric motors or natural gas engines.

Improvements to the Aquatic Park Pump Station were implemented shortly after the completion of the 2005 Master Plan Update, which consisted of installation of two 30 gpm submersible grinder pumps, and a new control panel.

Improvements to the 1st Street Pump Station were completed in 2007, including installation of two 120 gpm submersible pumps.

The 8th Street Pump Station was completely rebuilt in 2014, and a parallel force main was installed. The 8th Street Pump Station now features two 290 gpm submersible pumps.

Table 7-1 provides a summary of the City's sewer pump stations.

Table 7-1
Sewer Pump Station Summary

Name	Type	Number of Pumps, Manufacturer, Type	Rated Conditions	Motor HP	Existing Flow (gpm)			Ultimate Flow (gpm)			Forcemain			Year Constructed
					Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Size (in)	Material	Length (ft)	
Adolfo Lopez	Submersible	(2) Torque flow Model 4x11S	200 gpm @ 89 ft TDH 1750 RPM	30	15	36	49	39	87	120	4"	PVC	1100	2005
Aquatic Park	Submersible	(2) ABS Piranha Model 35-2 Grinder	30 gpm @ 103 ft TDH 3450 RPM	5	1.6	4.6	6.4	1.6	4.6	6.4	2-2" 1-4"	PVC PVC	3,902 3,902	2005
Boeing	Submersible	(2) Wemco 6x6 ES Vortex	530 gpm @ 21 ft TDH 1170 RPM	10	27	63	89	167	334	451	8" 12"	PVC PVC	50 110	2003
8th Street	Wet Well / Dry Well	(2) Wemco Torque flow 4x11 CLCESR	290 gpm @ 22 ft TDH 1170 RPM	7.5	23	54	73	35	76	103	1-6" 1-6"	PVC PVC&CI	391 245	2015
1st Street	Submersible	(2) Wemco	290 gpm @ 19 ft TDH 1170 RPM	3	0.9	3	4	6	16	20	4"	PVC	500	2007
Pump Station No. 35	Wet Well / Dry Well	(3) Wemco Hidrostal Model H8K-H-H4W 10x8	1500 gpm @ 97 ft TDH to 2940 gpm @ 67 ft TDH 1210 RPM	100	448	829	1119	454	839	1133	16"	DIP & PVC	4150	2006

7-2 EXISTING PUMP STATION DESCRIPTIONS AND EVALUATIONS

The following subsections describe each of the existing sewer pump stations in detail.

7-2.1 ADOLFO LOPEZ PUMP STATION

General

The Adolfo Lopez Pump Station is a submersible facility located at the City's Maintenance Yard near the west end of Adolfo Lopez Drive (Photograph 7-1). Currently, it services the Hellman Ranch (Heron Pointe) development, the southern portion of the Pacific Gateway development, the animal shelter, the police station, and the City Maintenance Yard located on Adolfo Lopez Drive. Ultimately, it may also service oil and gas facilities on the Hellman Ranch property. The ground elevation at the pump station is 6.3 feet above mean sea level (amsl). The pump station service area is shown on Figure 7-1.

Figure 7-1: Adolfo Lopez Pump Station Service Area

Construction of the existing pump station was completed in 2005. It incorporates all elements of the City's criteria, including emergency storage and standby power. The wet well bottom is at elevation -17.0 feet. It has an 8-foot diameter PVC lined reinforced concrete wet well with two 30 HP submersible WEMCO 4x11S vortex pumps (Photograph 7-2). The isolation and check valves are located above ground. There have been no prolonged power outages at the station, nor sewage spills reported.

Photograph 7-1
Adolfo Lopez Pump Station
Discharge Pipes and Motor Control Center

Photograph 7-2
Adolfo Lopez Pump Station
Wet Well

Flows

Based upon logs of pump running hours from the station for the period 2014-2015, the current average flow through the station is approximately 15 gpm. The City has been asked by the adjacent oil and gas operations (owned by the Hellman Ranch developers) to evaluate the possibility of discharging wastewater to the 8-inch influent sewer line west of the station. Hydraulic modeling revealed that the Adolfo Lopez Pump Station could accept an ultimate peak dry weather flow of approximately 87 gpm without violating its sewer criteria. The corresponding peak wet weather flow would be 120 gpm. The pump station's firm capacity of 200 gpm is greater than the ultimate peak wet weather flow.

Collection System

The collection system tributary to the Adolfo Lopez Pump Station consists of 8-inch sewers from west and east in Adolfo Lopez Drive. The gravity sewer from the west is an 8-inch PVC line, which conveys wastewater from Heron Point development and the animal shelter.

The 8-inch VCP sewer from the east conveys flows from the eastern part of Adolfo Lopez Drive as well as the southern portion of the Pacific Gateway Business Park. In addition to the business park, this line currently conveys wastewater from the Seal Beach Police Department facility, and the City's Maintenance Yard.
The influent sewer enters the wet well with an invert elevation of -14.0 feet.

Disposal System

The pump station lifts wastewater through 1,100 feet of 4-inch PVC force main in Adolfo Lopez Drive. The lead pump is set to start at a wet well elevation of -12.5 feet and stop at -14 feet. The lag pump is set to start at -11.5 feet and stop at -14.0 feet. The force main terminates at a manhole just west of Seal Beach Boulevard. An 8-inch diameter VCP gravity sewer extends east from this manhole and terminates at the 24-inch diameter Seal Beach Boulevard Trunk Sewer. The 24-inch trunk sewer conveys flows to OCSD's Seal Beach Pump Station located at the corner of Seal Beach Boulevard and Westminster Avenue. The sewage is ultimately conveyed to OCSD's Plant No. 2 in Huntington Beach for treatment and disposal. Pump station information is shown in Table 7-2.

Table 7-2
Adolfo Lopez Pump Station

Pump Station Name	Adolfo Lopez Pump Station	
Location	8' diameter wet well at City of Seal Beach Maintenance Yard south of Adolfo Lopez Drive.	
Plan Identification	Plans for the construction of Adolfo Lopez Sewage Pump Station (21 Sheets)	
Construction Date	2005	
Pump Information		
Pump No.	1	2
Type of Pump	4" submersible	Torque flow Model 4x11S
Capacity (gpm)	200	200
Head (ft)	89	89
HP	30	30
RPM	1750	1750
Voltage	480V	480 V
Number of Phases	3	3
Impeller Diameter (in)	10.25	10.25
Force Main Information		
Start Point	Adolfo Lopez Pump Station	
Wet Well Invert (ft)	-17.0	
End Point	48" diameter manhole west of Seal Beach Blvd. (63' west of centerline)	
End Point Invert (ft)	31.75	
Size (in)	4	
Material	PVC	
Length (ft)	1100	

Deficiencies

The construction of Adolfo Lopez Pump Station was completed in 2005. The new pump station incorporates all current criteria, including on-site standby power (100 kW natural gas generator), 30 minutes of peak hour storage, standby pump, flow meter, PVC lined wet well, and telemetry. The slide rail system allows removal of the pumps without entering the wet well. With proper maintenance, this station should provide many years of reliable service. The mechanical and electrical equipment will reach the end of their useful lives around 2025.

The station pad has experienced some settling since its construction in 2005. The station pad is now approximately two inches lower than the rim elevation of the wet well (which was flush upon construction) It is recommended that the City resurvey the property to more accurately establish the rate of settlement.

When the new pump station was constructed in 2005, most of the original force main, constructed in 1978, was left in service. It is approaching the end of its useful life.

Recommended Improvements

1. Construct a parallel force main
2. Replace the pumps and the electrical equipment in 2025
3. Replace the discharge piping within and through the wet well with 316L stainless steel pipe in 2025
4. C7-onstruct site improvements to eliminate further settlement in 2025
5. Replace the standby generator in 2030.

The new parallel force main should be used for primary conveyance, with the existing force main remaining in service as a backup.

7-2.2 AQUATIC PARK PUMP STATION

General

Located in Anaheim Bay, within the corporate boundaries of Seal Beach, but segregated from the Old Town area by the Wildlife Refuge and Naval Weapons Station, is the Sunset Aquatic Park. The 63-acre park was acquired by the County in 1963 from the Navy and provides boat slips, boat ramps and picnic areas to the public.

Sewer service to the Park is provided through a small collection system owned by the County of Orange and maintained by the City of Seal Beach, and a submersible pump station owned and operated by the City. Park facilities being served by the sewer system consist of five restroom buildings, the Harbor Patrol building, a dockside café, the marina management offices, and the Sunset Aquatic Shipyard. The ground elevation at the pump station is 5.1 ft amsl.

Photograph 7-3
Aquatic Park Pump Station
Wet Well

The Aquatic Park Pump Station was renovated in 2005 and is located within the greenbelt area of the park's parking lot. It is a small submersible station installed within an unlined concrete wet well (Photograph 7-3).

The station originally contained two submersible pumps mounted in a small steel wet well with shafting to a motor mounted above. In 2005, the pump and motor arrangement was replaced with two submersible grinder pumps. The isolation and check valves, the magnetic flow meter, and the bypass pumping connection are contained in a concrete vault located to the east of the wet well (Photograph 7-4). The electrical panel was replaced in 2005.

Up to 2005, all wastewater collected at the facility was pumped under a channel through a 4-inch force main to a second pump station located on a peninsula in Anaheim Bay. The second pump station then lifted the flow into the City's collection system on Seal Beach Boulevard.

Photograph 7-4
Aquatic Park
Valve and Meter Box

Due to two failures of the force main under the channel (1985 and 2003), the flow was diverted to the City of Huntington Beach's collection system at Edinger Avenue and Trinidad Lane. At that time, the second pump station located on the Anaheim Bay Peninsula was demolished by the City.

The active force main consists of two parallel 2-inch diameter mostly Schedule 80 PVC pipes, except where they cross Bolsa Chica Channel, they are 316 stainless steel in galvanized steel casing mounted on the bridge. A separate 4-inch diameter PVC force main was also constructed, but the section of the pipe crossing the channel was not installed. The two parallel force mains terminate at a drop manhole with invert elevations of approximately 2 feet amsl at the intersection of Edinger Avenue and Trinidad Lane. The 2-inch diameter force mains are currently utilized because of capacity limitations in the City of Huntington Beach system. The sewage is pumped through one 2-inch force main, and the other 2-inch force main serves as a standby facility. When the receiving City of Huntington Beach system is improved, the

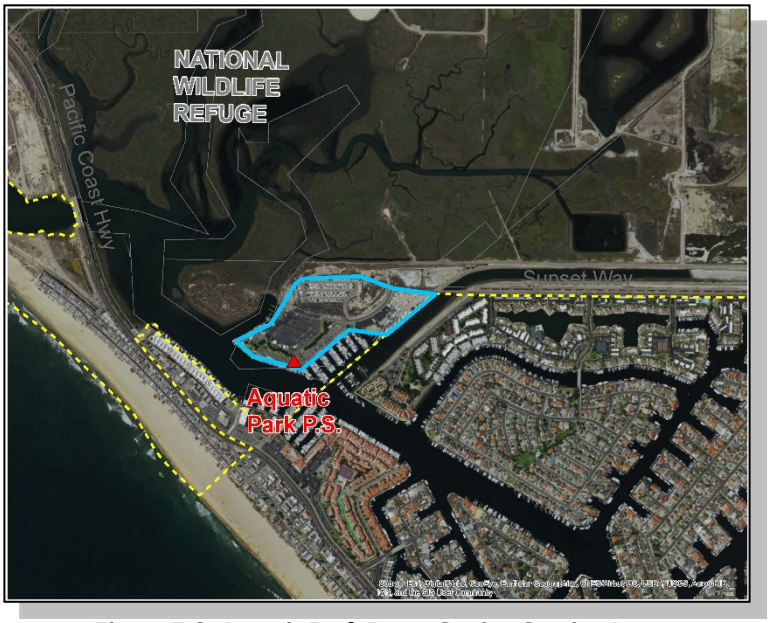


Figure 7-2: Aquatic Park Pump Station Service Area

4-inch diameter force main can be used to convey the Aquatic Park Pump Station flows. This will require a new pump station with a firm pumping capacity of 120 gpm. Alternatively, storage could be constructed at the Aquatic Park Pump Station, and the larger capacity pumps could operate only during off-peak hours, enabling the use of the 4-inch force main.

The Aquatic Park System is shown on Figure 7-2. Detailed information on Aquatic Park Pump Station is shown in Table 7-3.

Flows

Flows are limited to those generated at the five restroom buildings, Harbor Patrol building, dockside café, marina management offices, and the Sunset Aquatic Shipyard.

Pumpage data for 2014-2015 suggests the average influent flow to the Aquatic Park Pump Station has come down from approximately 2.7 gpm in 2002 to about 1.6 gpm in 2014-2015. The current peak dry weather flow is estimated at 4.6 gpm, with a peak wet weather flow estimated at 6.4 gpm. The City staff indicates that the existing pumps deliver 14 gpm to 19 gpm. While these are still significantly greater than the projected peak wet weather flows, the pumps should be planned for replacement around 2025.

Any additional development in the tributary area will increase the average and peak flows. Such development should only be approved if additional capacity is shown to be available at the pump station as well as in the City of Huntington Beach collection system.

The lead pump is set to start at wet well level of -2.2 feet and stop at -3.2 feet. The lag pump is set to start at wet well level of -1.2 feet.

Collection System

The collection system consists of 6-inch and 8-inch VCP sewers confined to the Sunset Aquatic Park. The two gravity sewers confluence at a manhole located to the south of the wet well. An 8-inch VCP gravity sewer extends north from the junction manhole and enters the wet well with an invert elevation of -3.2 feet. The sewers are owned by the County of Orange but maintained by the City of Seal Beach.

Disposal System

The pump station lifts sewage through 3,902 feet of 2-inch Schedule 80 PVC and stainless steel force main to the City of Huntington Beach system at Edinger Avenue and Trinidad Lane. The pump station has a complete standby parallel 2-inch diameter force main. Additionally, a parallel 4-inch diameter AWWA C-900 Class 200 PVC force main was installed, except at the Bolsa Chica Channel Bridge. This 4-inch forcemain, along with larger pumps can be placed into service when the capacities of the downstream City of Huntington Beach facilities are improved. Alternatively, the pumps could be upgraded and the 4-inch force main put into service if sufficient storage is installed at the pump station to enable only off-peak pumping.

The force mains extend east and northeast through the Park's parking area to Sunset Way, then northeast to Edinger Avenue and across Bolsa Chica Channel. At the Bolsa Chica Channel crossing, the 2-inch force mains are 316 stainless steel, inside 4-inch diameter galvanized steel casing pipes. They are supported by braces attached to the bridge stringers.

From the channel crossing to the north of Trinidad Lane, the pipes are located in the north shoulder of Edinger Avenue. They terminate at a PVC lined City of Seal Beach manhole 21 feet north of the centerline of Edinger Avenue. The wastewater is then conveyed in 26 feet of 10-inch VCP gravity sewer to a City of Huntington Beach manhole to the east.

Pump Station Equipment

The existing pumping equipment is listed in Table 7-3. All equipment is located in the concrete vault which encloses the wet well and pumps.

Deficiencies

The pump station deficiencies are primarily due to age and limited access to equipment. The specific facility deficiencies are described below.

1. Telemetry System: There is an automatic dialer at the station, which alerts staff of high wet well level and commercial power failure. There are no provisions for connection to the City's planned SCADA system at this time.
2. Emergency Power: The station has a portable generator connection and a manual transfer switch. Therefore, commercial power failures can only be mitigated by dispatching staff to the site to connect a portable generator, and manually transfer the power source.

Recommended Improvements

1. The City should install an RTU at the site to connect the pump station to the City's SCADA system.
2. When the City of Huntington Beach increases capacity in its receiving sewer facilities (or agrees to allow the discharge of increased flows at off-peak hours), the pump station should be upgraded with 120 gpm capacity vortex submersible pumps. The 4-inch PVC forcemain should also be made continuous at that time. The larger pumps are recommended for their solids handling capacity (4-inch). The 120 gpm pumping rate is recommended to maintain

Table 7-3
Aquatic Park Pump Station

Pump Station Name	Aquatic Park Pump Station	
Location	Sunset Aquatic Park 2901 Edinger Avenue	
Plan Identification	Aquatic Park Pump Station and 2-Inch Forcemain 2003 (15 Sheets)	
Construction Date	2005 (pump station improvements were limited to replacement of pumps and the control panel)	
Pump Information		
Pump No.	1	2
Type of Pump	ABS Piranha Model 35-2 Submersible Grinder	ABS Piranha Model 35-2 Submersible Grinder
Capacity (gpm)	30	30
Head (ft)	103	103
HP	5	5
RPM	3450	3450
Voltage	208V	208 V
Number of Phases	3	3
Impeller Diameter (in)	6.25	6.25
Force Main Information		
Start Point	Aquatic Park Pump Station No. 1	
Wet Well Invert (ft)	-5.2	
End Point	48" Manhole at Edinger Avenue and Trinidad Lane	
End Point Invert (ft)	2.0	
Size (in)	2-2", 1-4"	
Material	Sch. 80 PVC, AWWA C900 Class 200 PVC, 316 Stainless Steel at Bolsa Chica Channel Bridge	
Length (ft)	3,902 each	

a 3 ft/sec self-cleansing velocity in the 4-inch forcemain. If the Huntingdon Beach collection system is not improved, additional storage would need to be installed at the Aquatic Park Pump Station as well.

3. If the pump station is not transferred to the City of Huntington Beach, the City should implement the upgrades included in the 2005 design project, including improvements to the wet well, a new valve vault, new motor control center.

7-2.3 PIER PUMP STATION

General

The Pier Pump Station was a small submersible facility located at the end of the Municipal Pier under the pier deck Its purpose was to service the needs of the restaurant and the restrooms at the end of the pier. This pump station was destroyed by fire in early 2016. A new pump station and force main are currently in the design phase as part of a larger pier restoration project.

Historically, this station's wet well accumulated a considerable amount of grease. The restaurant did not maintain a grease trap and the pump station wet well acted in this capacity. The City should remedy this issue as the station and restaurant are rebuilt.

Flows

Flows into the pump station will be limited to wastewater generated by the Pier restaurant and the restrooms.

Disposal System

The Pier Pump Station force main, mounted to the underside of the pier deck, was also destroyed by the fire. When it is rebuilt, the planned 4-inch force main will discharge to an 8-inch gravity sewer which parallels Ocean Avenue. This sewer eventually terminates at the 8th Street Pump Station, which pumps into the Old Town gravity system at 8th Street and Ocean Avenue. The sewage then flows by gravity to Pump Station No.35.

Pump Station Equipment

The Pier Pump Station equipment is currently in design and the planned specifications are shown in Table 7-4.

Table 7-4
Pier Pump Station - In Design

Pump Station Name	Pier Pump Station	
Location	End of Seal Beach Municipal Pier (Ocean & Main)	
Plan Identification	2017 Pier Restoration	
Construction Date	TBD (in design)	
Pump Information		
Pump No.	1	2
Type of Pump	TBD	TBD
Capacity (gpm)	120	120
Head (ft)	25	25
HP	5	5
RPM	1750	1750
Voltage	480 V	480 V
Number of Phases	TBD	TBD
Impeller Diameter (in)	TBD	TBD
Force Main Information		
Start Point	Pier Pump Station	
Wet Well Invert (ft)	TBD	
End Point	Manhole near Main & Ocean Ave.	
End Point Invert (ft)	TBD	
Size (in)	4"	
Material	TBD	
Length (ft)	160	

7-2.4 BOEING PUMP STATION

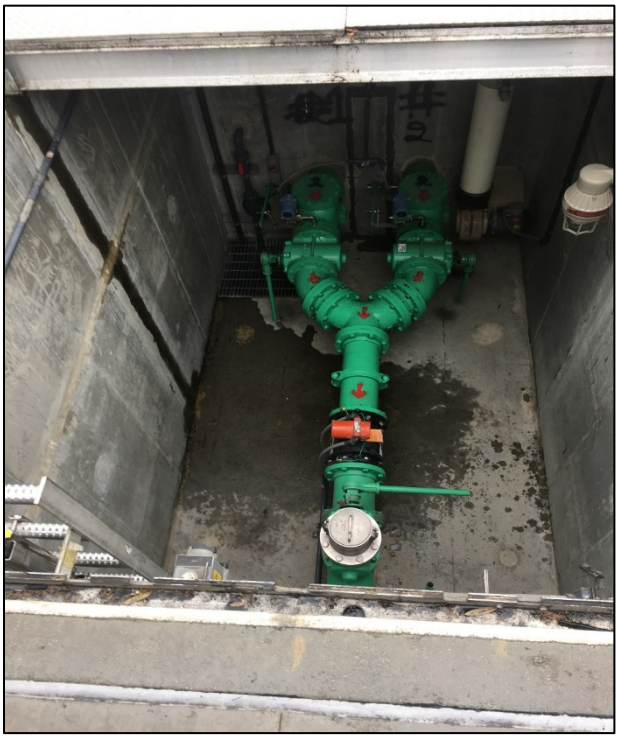
General

The Boeing Pump Station is situated on the northeast corner of the Boeing Integrated Defense Systems property located at 2600 Westminster Avenue (Photograph 7-5). It services the existing development on Boeing facility as well as a portion of the Pacific Gateway development. A total of approximately 85 acres of commercial and industrial development drains to the pump station. The ground elevation at the pump station is 8.5 feet amsl.

The original pump station, which was constructed in 1966, was replaced with a new pump station in 2003. The City reported that wet well levels in excess of 100-inches in the original pump station (elevation -2.66 feet) would cause sewage overflows in the Boeing "Clean Room".

The new pump station incorporated all current design criteria, and includes a standby pump, on-site standby power (100 KW natural gas generator), PVC lined 8-foot diameter wet well, slide rail system, and telemetry (Photograph 7-6). The wet well is significantly deeper than the old wet well, minimizing the possibility of overflows in the "Clean Room." The wet well bottom is at elevation -19.5 feet. An 8 ft wide, 12.5 ft long, and 10.08 ft deep valve vault is located to the east of the wet well. It houses the 8-inch diameter check valves, isolation plug valves, magnetic flow meter, and bypass pumping connection (Photograph 7-7).

Photograph 7-5
Boeing Pump Station
Pump Station Site



Photograph 7-6
Boeing Pump Station
Valve Vault

Flows

The existing wastewater flows into the station are generated from the Boeing facilities and the northern section of the Pacific Gateway Business Park. Although the station and influent sewer have firm pumping capacity of 530 gpm, current flows estimated from pump running hours and pump rated capacities are only about 27 gpm on average, despite the buildout of the business park. In 2005, with only a few buildings on site, the average flows were 29 gpm. Unquestionably, the occupancy and use of the area tributary to this station has changed substantially since the pump station was originally constructed.

Photograph 7-7
Boeing Pump Station
Wet Well

Clearly, influent flows to the Boeing Pump Station are highly dependent on the occupancy of the tributary business park, the types of businesses present, and the overall employment population in the park. Previously, the Boeing property tributary was planned for 60.2 acres of light manufacturing and 16.6 acres of commercial development, including a 120 room hotel. Projected average dry weather and peak wet weather flows were 167 gpm and 451 gpm. While the property is now fully-developed, the flows are nowhere near that magnitude. The modeled peak dry weather flow is currently 63 gpm, with a peak wet weather flow of 89 gpm. The existing pump station firm capacity of 530 gpm is much greater than the currently projected peak wet weather flow.

Collection System

The influent sewer to the pump station is an 18-inch diameter PVC pipe that enters the wet well with an invert elevation of -16.5 feet. Such depth of the main line is required to serve some of the below-grade areas at the Boeing Plant.

Disposal System

Figure 7-3 shows the service area of the Boeing Pump Station. Sewage collected at the Boeing Pump Station is pumped through an 8-inch to 12-inch diameter Class 200 AWWA C900 PVC force main across Seal Beach Boulevard to a manhole on the 24-inch gravity sewer, which flows to the OCSD's Seal Beach

Figure 7-3: Boeing Pump Station Service Area

Pump Station. Th7-1is facility then pumps the sewage ito the OCSD gravity system where it is conveyed to Plant No. 2 for treatment and disposal.

Pump Station Equipment

The existing pumping equipment is listed in Table 7-5. The pumps are located in the PVC lined 8-foot diameter wet well. The check valves, isolation valves, and bypass pumping connection are located in a below ground reinforced concrete vault located to the east of the wet well.

Deficiencies

The pump station was constructed in 2003, and has operated without problems. It is not connected to the SCADA system. It is 14 years old. The City should plan on replacing the pumps and the electrical equipment when they reach the end of their useful lives. The wet well piping is ductile iron, and is showing signs of corrosion. The station has a single force main.

During the field visit to the station on December 21, 2016, the flow meter reading (100 gpm to 180 gpm) was noted to be significantly lower than the rated pump capacity (530 gpm). The pump station operational data from February 2017 indicates that the pumps are operating near their design flows. The flow meter should be calibrated as soon as possible.

Table 7-5
Boeing Pump Station

Pump Station Name	Boeing Pump Station	
Location	Seal Beach Blvd. & Westminster Ave. (south of train tracks)	
Plan Identification	Boeing Sewage Pump Station Replacement, 2/12/03	
Construction Date	2003	
Pump Information		
Pump No.	1	2
Type of Pump	Wemco 6x6 ES Vortex	Wemco 6x6 ES Vortex
Capacity (gpm)	530	530
Head (ft)	21	21
HP	10	10
RPM	1170	1170
Voltage	480 V	480 V
Number of Phases	3	3
Impeller Diameter (in)	9.37	9.37
Force Main Information		
Start Point	Boeing Pump Station	
Wet Well Invert (ft)	-19.50	
End Point	Manhole located just north connected to 24" VCP leading into OCSD Seal Beach Pump Station	
End Point Invert (ft)	2.56	
Size (in)	8"/12"	
Material	PVC	
Length (ft)	160	

Recommended Improvements

1. Construct a parallel force main
2. Connect to SCADA system
3. Replace the mechanical and electrical equipment in 2023.
4. Replace the wet well piping with 316L stainless steel pipe in 2023
5. Replace the standby generator in 2033

The lead pump is set to start at wet well level of -13.0 feet and stop at -16.5 feet. The lag pump is set to start at wet well level of -12.0 feet.

7-2.5 8TH STREET PUMP STATION

General

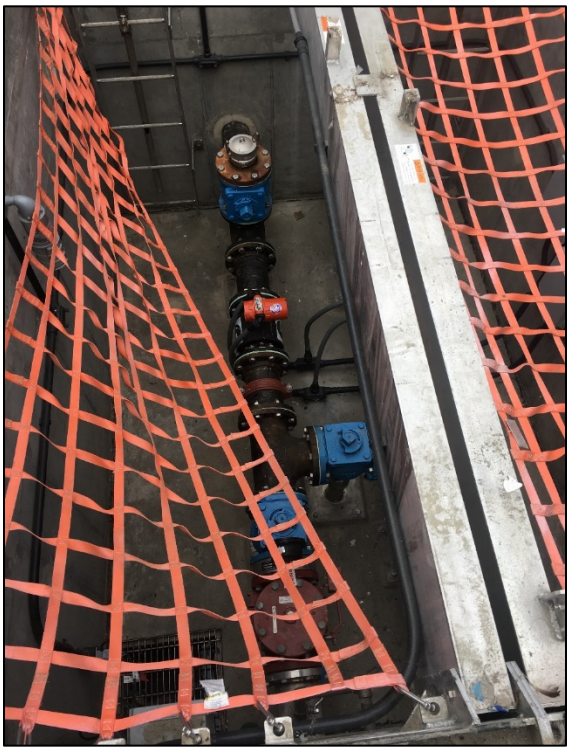
The 8th Street Pump Station is located in the beach parking lot at the end of 8th Street. The station serves the entire strip of residential homes south of Ocean Avenue, and the Pier.

The 8th Street Pump Station was the oldest pump station in the City, constructed in the 1920's. As a result of the recommendation in the 2005 Master Plan Update, this pump station was completely rebuilt in 2014-15. The ground elevation at the pump station is 12.7 feet amsl. The improvement project implemented structural improvements and combined the original wet well and dry well into a new wet well. The original dry well section is lined with PVC, and the original wet well is coated with Sancon 100 epoxy/polyurethane system. The main chamber of the wet well where the pumps are located is 6 feet wide, 5.33 feet long and 15.23 feet deep (Photograph 7-8). The auxiliary chamber is 7.33 feet wide, 6.67 feet long, and 9.2 feet to 12.7 feet deep. The two chambers are connected with a 12-inch diameter PVC sleeve through the common wall.

The new facility has an 8 ft wide, 11 ft long, and 6.7 ft deep valve vault located to the east of the main wet well chamber (Photograph 7-9). The discharge pipes are connected to two separate force mains, each with a 6-inch magnetic flow meter. The flow of both pumps can be diverted to either one of the force mains with the use of the valves in the vault. Each discharge pipe has a bypass pumping connection

In order to mitigate the grease problems that existed at pump station, the new facility was constructed with a grease interceptor upstream of the wet well.

Photograph 7-8
8th Street Pump Station
Wet Well



Photograph 7-9
8th Street Pump Station
Valve Vault

The pump station has a 100 kW natural gas fuel standby generator and an automatic transfer switch to operate the facility in case of a commercial power outage.

Flows

Flows to the pump station are generated from the strip of residential homes south of Ocean Avenue, and the small area at the end of First Street, which includes a beach side restroom and café, and the City's maintenance shop. When the Pier Pump Station is rebuilt, the 8th Street Pump Station will also receive flow from the Pier.

Average day flows calculated from pump running hours in November and December 2015 (after the completion of all construction activities at the station) suggest an average day influent flow of approximately 23 gpm.

At ultimate buildout, the average dry weather flows to the station are expected to increase to 35 gpm, primarily from the development of the vacant Department of Water and Power (DWP) parcel. The expected ultimate peak dry and wet weather flows are 76 gpm and 103 gpm, respectively. The existing firm capacity of 290 gpm is adequate for the ultimate peak wet weather flow.

Collection System

The 8th Street Pump Station collection system consists of two 8-inch VCP gravity sewers approaching the pump station: one from the west conveying the Gold Coast and 1st Street Pump Station flows; and one from the east, conveying the flows from the residential properties along Seal Way and the Pier Pump Station. The two 8-inch gravity sewers are routed through the grease interceptor. A 12-inch gravity sewer extends north from the grease interceptor and enters the wet well with an invert elevation of 1.0 ft amsl. There is also a 12-inch diameter grease interceptor overflow pipe, which enters the wet well with an invert elevation of 3.65 ft amsl. Figure 7-4 shows the 8th Street Pump Station collection system service area.

Figure 7-4: 8th Street Pump Station Service Area

Disposal System

Sewage collected at the 8th Street Pump Station is lifted through a 6-inch PVC and cast iron force main or a recently constructed 6-inch PVC force main parallel to the older line, to terminal manholes in Ocean Avenue and 8th Street. From this point, the sewage flows by gravity to Electric Avenue and then to Pump Station No.35 where it is pumped to OCSD's Seal Beach Pump Station.

Pump Station Equipment

The existing pump station equipment is listed in Table 7-6. Pumps are submersible and located in wet well.

Table 7-6
8th Street Pump Station

Pump Station Name	8th Street Pump Station	
Location	8th Street (south of Ocean Ave in beach parking lot)	
Construction Date	2015	
Pump Information		
Pump No.	1	2
Type of Pump	Wemco Torque Flow 4x11 CLCSER	Wemco Torque Flow 4x11 CLCSER
Capacity (gpm)	290	290
Head (ft)	22.0	22.0
HP	7.5	7.5
RPM	1150	1150
Voltage	480 V	480 V
Number of Phases	3	3
Impeller Diameter (in)	8	8
Force Main Information		
Start Point	8th Street Pump Station	
Wet Well Invert (ft)	-1.53	
End Point	Manhole located at 8th Street and Ocean Avenue Alley – invert elevation 17.7 ft amsl; Manhole located at the intersection of 8th Street and Ocean Avenue – invert elevation 17.5 ft amsl	
End Point Invert (ft)	17.5	
Size (in)	1-6"; 1-6"	
Material	PVC; PVC and Cast Iron	
Length (ft)	391'; 245'	

Deficiencies

The pump station was recently upgraded. A portion of the original cast iron force main, 185 feet in length and over 70 years old, was maintained as an extension of the second force main to Ocean Avenue. Although this force main is typically used as a backup, it is recommended that the cast iron portion of the force main be eventually replaced with a PVC pipe.

Staff indicated that some storm water enters the electrical enclosures. The enclosures need to be sealed to preclude entry of stormwater.

Recommended Improvements

1. The original cast iron force main should be replaced with a new one to provide a reliable, redundant disposal pathway for the 8th Street Pump Station. Additionally, the existing 6-inch PVC force main should be replaced in Ocean Avenue and 8th Street from the end of the new force main to the existing terminal manhole.
2. Construct a canopy over the electrical enclosures to provide protection, and ability to work on the equipment during storm events.

7-2.6 1ST STREET PUMP STATION

General

The 1st Street Pump Station is a small submersible facility located directly adjacent to a beach parking lot at the end of First Street. Currently, the station services a beach restroom facility and the 1st Street Restaurant, as well as the City's maintenance shop located adjacent to the San Gabriel River.

The pump station was originally constructed in 1968. It consists of a 5-foot diameter manhole (recently lined) which serves as the wet well. The original pumps and control panel were replaced in the mid 1980's and again in 2007, when the pump station was upgraded (Photograph 7-10, and Photograph 7-11). A 6 ft wide and 10 ft

long concrete valve vault is located to the southwest of the wet well. It houses the check valves, isolation valves, the 4-inch magnetic flow meter, and the bypass pumping connection. Because this upgrade was considered interim, the valve vault did not have a concrete bottom, and the piping and valves therein rest on 3/4 –inch crushed rock (Photograph 7-12).

The City reports that the pump station is reliable but does have a minor sanding problem. In addition, site improvements constructed subsequent to the completion of the upgrade work in 2007 has created a sump area where the electrical and control enclosures are located (Photograph 7-13). Flooding has been a problem in this area. The enclosures should be raised to eliminate the flooding problem. The ground elevation at the pump station site was 7.7 feet amsl when it was upgraded in 2007, and the wet well top is at elevation 9.2 ft amsl.

The concrete pad, which was constructed around the wet well and the valve vault, is at elevation 8.3 ft amsl. There have been no sewage spills documented at the pump station.

Photograph 7-10
1st Street Pump Station
Pump Station Site with 2007 Improvements

Photograph 7-11
1st Street Pump Station
Wet Well

Photograph 7-12
1st Street Pump Station
Valve Vault

Photograph 7-13
1st Street Pump Station
Pump Station Site Concrete Paving after the 2007 Improvements

Collection System

The pump station's collection system is limited to a 4-inch PVC gravity sewer from the City maintenance building and a 4-inch PVC sewer from the restrooms and the restaurant which confluence upstream of the manhole located just to the northwest of the wet well, and continue as a 4-inch PVC pipe to the wet well with an invert elevation of 4.1 ft amsl.

Figure 7-5 shows the 1st Street Pump Station service area.

Figure 7-5: 1st Street Pump Station Service Area

Flows

Flow to the station is currently limited to domestic sewage generated at the restaurant and the City's maintenance shop located adjacent to the San Gabriel River. For the period 2014-2015, available pump operation data suggests an average flow through the station of 0.9 gpm. Peak dry weather and wet weather flows are estimated at approximately 3 gpm and 4 gpm, respectively.

Disposal System

The existing pump station lifts sewage through a 500-ft long, 4-inch PVC force main to a manhole located just east of the River Beach parking lot access road, approximately 155 feet south of the centerline of Ocean Avenue, where it discharges to the 8-inch gravity sewer referred to as the Gold Coast Sewer. The sewage then flows to the 8th Street Pump Station from where it is pumped into the collection system tributary to Pump Station No. 35.

Pump Station Equipment

The existing pump station equipment is listed in Table 7-7. All equipment is located in the pump station wet well.

Deficiencies

The specific deficiencies at the pump station are:

1. Bottom of the electrical and control enclosures flood because of the sump area created by the construction of a concrete pad around the wet well and the valve vault
2. The SCADA system constructed with the 2007 improvements is not relaying information to 8th Street Pump Station site.
3. Wet well lining, which was installed in 2012, is blistering
4. Influent sewer is difficult to clean because of its small size
5. The pump station has a single force main, which is nearly 50 years old

The lead pump is set to start at a wet well sewage elevation of 5.5 ft amsl, and stop at 4.1 ft. The lag pump is set to start at 6.0 ft amsl, and stop at 4.1 ft. The float switch is set to start both pumps at 6.5 ft amsl.

Recommended Improvements

1. Raise the electrical and controls cabinets to an elevation where they will not be flooded
2. Implement repairs to the SCADA system for transmittal of pump station data to the City's base station.
3. Reline the wet well
4. Construct a parallel force main
5. Replace the influent sewers with 6-inch pipes when the parking lot is re-paved.
6. Plan on replacing the pumps, discharge piping, the valve vault, and the electrical/controls equipment in 2027.
7. Construct a new pump station with a deeper wet well and a new parallel force main if flows increase.

Table 7-7

1st Street Pump Station

Pump Station Name	1st Street Pump Station	
Location	10 Ocean Ave (Ocean & 1st St)	
Plan Identification		
Construction Date	2007	
Pump Information		
Pump No.	1	2
Type of Pump	Wemco	Wemco
Capacity (gpm)	120	120
Head (ft)	19	19
HP	3	3
RPM	1170	1170
Voltage	240 V	240 V
Number of Phases	3	3
Impeller Diameter (in)		
Force Main Information		
Start Point	1st Street Pump Station	
Wet Well Invert (ft)	3.1	
End Point	Manhole located to the south of River Beach parking access road, approximately 130 feet west of Ocean Avenue – invert elevation 10.8 ft amsl.	
End Point Invert (ft)	10.8	
Size (in)	4	
Material	PVC	
Length (ft)	500	

7.2.7 PUMP STATION No. 35

General

Pump Station No.35 is located in the southeast corner of the Old Town area at Electric Avenue and Seal Beach Boulevard (Photograph 7-14). It is a large wet well/dry well station which receives all of the flows generated in the Old Town, Marina Hill, and Bridgeport communities, as well as the U.S. Naval Weapons Station. From the

station, sewage is pumped through a 16-inch diameter force main to the Seal Beach Boulevard Trunk line, which terminates at OCSD's Seal Beach Pump Station located at the intersection of Seal Beach Boulevard and Westminster Avenue. Pump Station No. 35 was constructed in 1973 as part of a comprehensive program that eliminated the City's wastewater treatment facility. The project redirected flows from the southwest quadrant of the City, where the treatment plant was located, to the southeast quadrant of the City where the pump station was constructed. Pump Station No. 35 was upgraded in 2006 and 2007, with most of the mechanical equipment replaced.

Photograph 7-14
Pump Station 35
Pump Station Housing

The upgraded facility incorporates three dry well pumps (Photograph 7-15), all rated at 1500 gpm. All three are connected to a variable frequency drive (VFD) and an electric motor. Two of the three pumps are backed up by a natural gas engine, which can operate the pumps in the event of a power outage (Photograph 7-16).
The dry well has stairway access from the building above, which houses the electric motors, natural gas engines, and electrical switchgear. There is an overhead crane in the building which can be positioned over a hatch in the floor to remove the pumps below. The maintenance staff has noted that the crane and ceiling height are too low to remove the motors and drives.

Photograph 7-15
Pump Station 35
Dry Well and Pumps

Photograph 7-16
Pump Station 35

The station's dry well is a 19' x 20' x 21' deep structure which houses the pumps, valves, discharge piping, and ventilation equipment. The pumps are connected by long shafts to the motors and drives above. The City has reported problems maintaining these shafts. Bearings are located 15 feet from the floor and are difficult to replace while on a ladder.

Wastewater enters the wet well through a screening structure with a main channel and a bypass channel. The wet well varies from 4-feet to 6-feet wide and extends the length of the dry well, or 20 feet. It is hoppered to prevent solids from settling in the corners.

The floor elevation at the pump station motor/engine room is 7.1 ft. amsl. The dry well floor elevation is -13.9 ft, and the wet well invert elevation is -12.9 feet.

Flows

Pump Station No. 35 collects and pumps wastewater generated from the Bridgeport, Marina Hill North, Marina Hill South, Old Town areas, and the US Naval Weapons Station. On average, the station pumps 0.7 million gallons per day (448 gpm), including dry weather infiltration. The existing peak dry and wet weather flows are estimated at 829 gpm and 1119 gpm, respectively.

Collection System

The area tributary to Pump Station No. 35 is large (roughly 750 acres) and includes three (3) pump stations. Flows are generally collected in the 24-inch Electric Avenue Trunk Sewer, which turns northeast along Seal Beach Boulevard, and then east into the pump station's wet well. A 12-inch VCP gravity sewer from the Naval Weapons Station extends to a manhole located 30 feet southwest of the pump station, where the flow is measured. The 12-inch sewer continues 7 feet west, then 50 feet north, confluencing with the 24-inch diameter sewer at a manhole just to the west of the wet well.

Figure 7-6 shows the pump station's tributary area.

Figure 7-6: Pump Station No.35 Service Area

Disposal System

Sewage collected at Pump Station No. 35 is pumped through 4,150 feet of 16-inch ductile-iron and a short section of PVC force main in Seal Beach Boulevard to the 24-inch VCP Seal Beach Boulevard Trunk Sewer, just south of Catalina Avenue. The 24-inch trunk sewer extends north in Seal Beach Boulevard to OCSD's Seal Beach Pump Station for further conveyance to the OCSD system.

Pumping Equipment

The existing pumping equipment is listed in Table 7-8. All equipment is located in the dry well and superstructure above.

The lead pump is set to start at a wet well sewage elevation of -6.4 feet (6.5 feet above the wet well invert), and stop at -8.4 feet. The lag pump is set to start at a wet well sewage elevation of -5.9 feet (7.0 feet above the wet well invert), and stop at -7.9 feet.

Table 7-8

Pump Station No. 35

Pump Station Name	Pump Station No. 35		
Location	Seal Beach Blvd. & Electric Ave		
Plan Identification	Interceptor Sewers and Pumping Station S-0073-A thru S-0109-A		
Construction Date	2006		
Pump Information			
Pump No.	1	2	3
Type of Pump	Wemco Hidrostal Model H8K-H-H4W 10x8	Wemco Hidrostal Model H8K-H-H4W 10x8	Wemco Hidrostal Model H8K-H-H4W 10x8
Capacity (gpm)	1500/2940	1500/2940	1500/2940
Head (ft)	97/67	97/67	97/67
HP	100 (I.S. Motor)	100 (I.S. Motor)	100 (I.S. Motor)
RPM	1210	1210	1210
Voltage	480 V	480 V	480 V
Number of Phases	3	3	3
Impeller Diameter (in)			
Force Main Information			
Start Point	Pump Station No. 35		
Wet Well Invert (ft)	-12.9		
End Point	Manhole connecting to 24" VCP gravity sewer in Seal Beach Boulevard south of Catalina Avenue		
End Point Invert (ft)	41.1		
Size (in)	16		
Material	DIP/PVC		
Length (ft)	4150		

Deficiencies

While the overall condition of the station is good, the following concerns exist:

1. It is difficult to maintain the long drive shafts connecting the pumps to the motors because the intermediate bearings are high and they are difficult to access. Close-coupled motors would make maintenance easier. However, this would require replacing the two natural gas engines with a standby generator so that the pump station can be operated in case of a commercial power outage.
2. The City has been primarily using Pump No.3, which is the pump without a gas engine drive. The engines for Pumps No.1 and 2 are old. All three pumps need to be operated regularly to ascertain that they will be available when needed. Due to air quality regulations, it will be difficult to permit new engine drivers that would operate regularly.
3. The pump station experiences grease problems.
4. The single force main is over 40 years old

Recommended Improvements

The following recommendations are provided to keep this very important facility in operation in accordance with the City's criteria:

1. Construct a parallel force main
2. Increase the wet well cleaning frequency from once every three months to every month to maintain the wet well free of grease accumulation
3. Prepare for replacement of the pumps with close coupled electric motor driven units in the next 10 years. Construct a natural gas engine generator to power the entire facility in case of a commercial power outage. Replace the electrical and control system at that time.
4. Increase public education as part of the City's Fats, Oils and Grease Program to reduce grease tributary to the pump station.

SECTION 8
COLLECTION SYSTEM CONDITION ASSESSMENT

8-1 GENERAL

Thorough knowledge of the system's condition is essential in maximizing the useful life of this very important and significant asset in a cost effective manner.

As discussed in Section 1-4, the State Water Resources Control Board adopted the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems and the associated monitoring and reporting program by issuing Order No. 2006-0003 on May 2, 2006. Provision D13.iv of the WDR requires each enrollee to develop and maintain an Operation and Maintenance Program with specified elements. One of the elements is a "*rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency*". The program should include the following:

1. Regular visual and TV inspections of the manholes and sewer pipes
2. System for ranking the condition of sewer pipes
3. Scheduling of rehabilitation
4. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects.
5. Capital improvement plan that addresses proper management and protection of the infrastructure assets
6. Time schedule for implementing the short and long term plans
7. Schedule for developing the funds needed for the capital improvement plan

This section of the report describes the history of the City's condition assessment activities and updates the rehabilitation and replacement plan for the sewer system.

8-2 CONDITION ASSESSMENT HISTORY

The City of Seal Beach's wastewater collection system dates back to the 1920's. Through most of the 20th century, the condition of the system was not comprehensively evaluated. Limited closed circuit television inspection of the system was available when the 1999 Master Plan was completed. Presence of significant infiltration in parts of the system was verified at that time, and an asset replacement program was recommended. To start, the City began replacing aging collection system pipes in portions of Old Town.

At the same time, the City hired a contractor and conducted CCTV inspection and condition assessment of nearly the entire system between 2002 and 2004. Many rehabilitation (lining and spot repairs) projects were performed since then based on the recommendations of the 2005 Master Plan Update.

The City again conducted CCTV inspection and condition assessment of nearly the entire system between in 2013. A very small portion of the pipes could not be accessed due to lack of manholes at the upstream end.

8-3 2013 CLOSED CIRCUIT TELEVISION INSPECTIONS OF GRAVITY PIPES

Empire Pipe Cleaning and Equipment, Inc. (Empire) performed video inspection work on approximately 165,000 feet of pipe between March 2013 and October 2013. A total of 739 reaches of pipe were inspected. Each inspection report lists the service connections and deficiencies by location in the inspected pipe. Photographs of the identified deficiencies are included in the inspection reports.

The locations of City sewers with CCTV inspections completed in 2013 are shown on Figures 8-1 and 8-2. The CCTV inspected sewer pipes range in size from 6-inches to 24-inches in diameter. The majority of the pipes inspected is made of vitrified clay pipe (VCP).

National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) coding procedures formed the basis of the inspection work and reports prepared by Empire.

8-4 INSPECTION REPORT DATABASE SUMMARY

Initially, a database summary was developed utilizing the CCTV inspection written reports. This database summary contained a tabulation of the deficiencies identified in the written reports, including the following information:

- DVD Number
- Inspection (Run) Number
- Reversal DVD Number
- Reversal Inspection (Run) Number
- Location (Street Name)
- CCTV Inspection Date
- Pipe Identification Number in CCTV Data and in Model
- Upstream Manhole and Downstream Manhole Identification Numbers
- Direction of Camera
- Pipe Size and Material
- Atlas Length and CCTV Inspected Length of Pipe
- Deficiency Tabulation from Written Reports using PACP codes

8-5 REVIEW OF REPRESENTATIVE CCTV RECORDINGS

The inspection report database summary was used in selecting the recordings to be reviewed in detail. The pipe reaches selected for detailed review were those that showed the most severe structural problems and multiple deficiencies.

First, the reaches that had listed deficiencies such as deformed pipe, hole in pipe, broken pipe, large offset joint, large obstacles, and ball roots were selected for review. These deficiencies can be a cause of sanitary sewer collapse, overflow or exfiltration into the surrounding soil and may need immediate attention. Next, reaches that had numerous or multiple deficiencies such as fractures, cracks, roots, deposits, obstructions, sags, camera underwater, and survey abandoned were selected. Finally, several reaches without listed deficiencies were selected in order to develop insight into the overall condition of the CCTV inspected system.

OCSD
Seal Beach
P.S.

Westminster Blvd

Boeing
P.S.

City of Long Beach

Adolfo
Lopez
P.S.

U.S. NAVAL
WEAPONS
STATION

Seal Beach Blvd

Pacific Coast Hwy

1st St P.S.

8th St P.S.

Pacific Ocean

Pier P.S.
(to be rebuilt)

P.S. #35

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers
- 2013 CCTV Inspection Location
- Not Inspected
- City Boundary

N

0 500 1,000 2,000
Feet

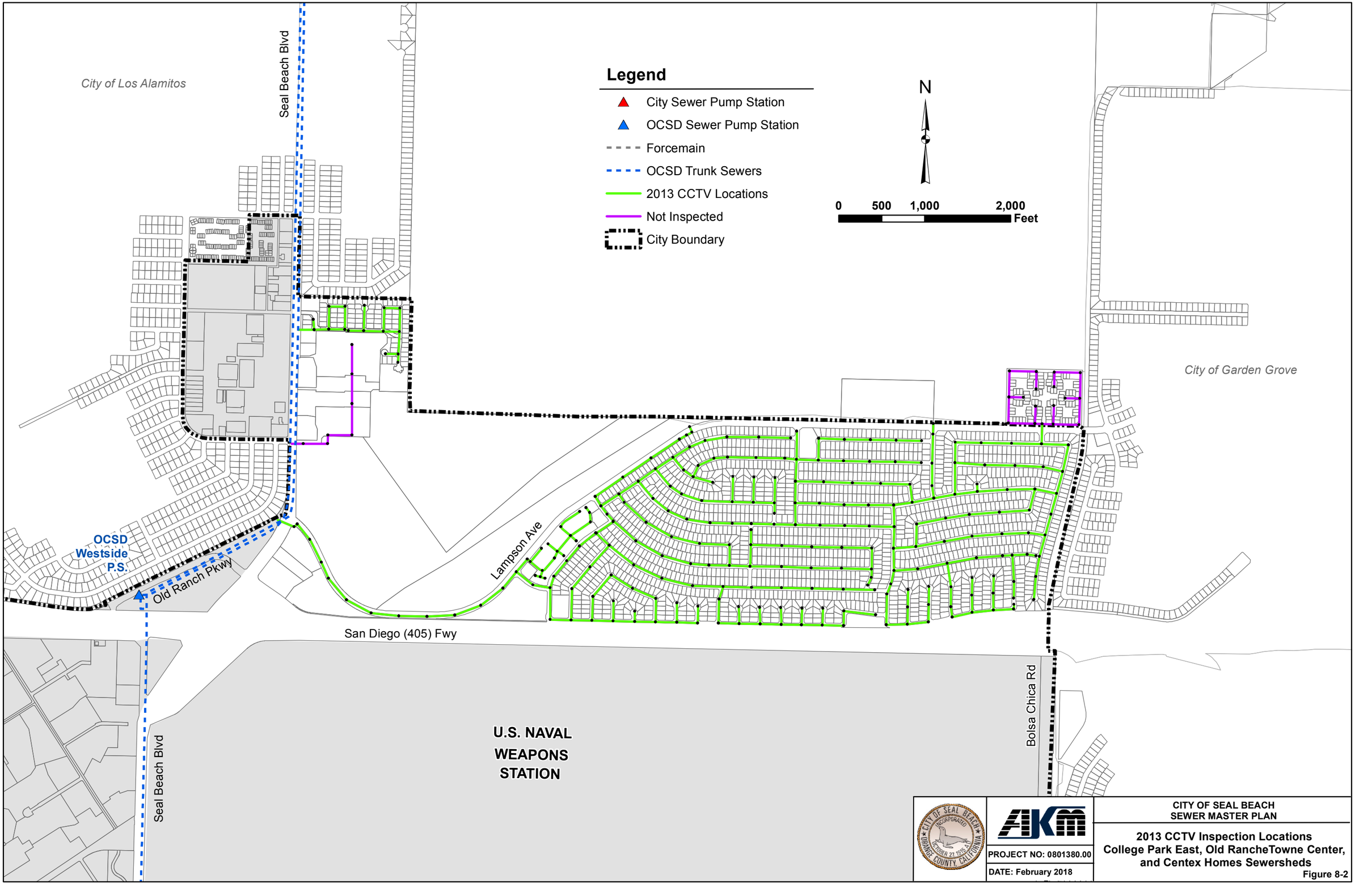
CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

2013 CCTV Inspection Locations
Boeing, Adolfo Lopez, and P.S. 35 Sewersheds

Figure 8-1



CITY OF SEAL BEACH
SEWER MASTER PLAN

2013 CCTV Inspection Locations
College Park East, Old RancheTowne Center, and Centex Homes Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 8-2

Recordings for 43 reaches were selected and reviewed in detail. The assessment information of pipes reviewed in detail was incorporated into the original Inspection Report Database Summary. Forty-eight (48) reverse inspections were conducted and are included in the database summary. The reverse set-ups were conducted to complete runs when the camera was blocked for any reason. The length recorded for some of the reaches where reverse inspections were necessary may be shorter than actual due to blockages in the pipe, as sometimes the camera was not able to reach the same point in the pipe from two directions.

8-6 CONDITION GRADING

The PACP condition grading system was used to assign a condition rating for structural defects and operation and maintenance defects for each reach of pipe. The rating provides the ability to quantitatively measure the difference in pipe condition between one inspection and subsequent inspections, and to prioritize among different pipe segments. A grade of 1 to 5 is assigned to each defect based on potential for further deterioration or pipe failure. Pipe failure is defined as when it can no longer convey the design capacity. The grades are as follows:

5 – Immediate Attention	Defects requiring immediate attention
4 – Poor	Severe defects that will become Grade 5 defects within the foreseeable future
3 – Fair	Moderate defects that will continue to deteriorate
2 – Good	Defects that have not begun to deteriorate
1 – Excellent	Minor defects

A truly continuous defect is defined as a defect that extends more than 3 feet. A repeated continuous defect is defined as a defect that occurs in a length of pipe in at least 75 percent of the joints (i.e. 3 out of 4 joints).

The equivalent number (quantity) of “truly” and “repeating” continuous defects is calculated by dividing the length of the continuous defect by 5, normalizing the defects for comparison to other reaches. Each unit in the number of defects represents an occurrence of defect or a joint length of defective pipe. This is a PACP standard.

The grade values for the most common structural defects are shown in Table 8-1. Operational and maintenance issues and construction features are assigned defect codes and condition grades as shown in Table 8-2. For defects with variable grade values dependent on the degree of deficiency of the defect, an estimated average value was used.

Figure 8-3 shows the number of reaches where an identified deficiency was found at least once within the reach. It provides a general sense of the magnitude of the problems that were found in the City’s collection system. The problems identified most often were grease (235 reaches, 20% of total), sags (223 reaches, 19% of total) and cracks (191 reaches, 16% of total).

Table 8-1

Structural Defect Codes and Condition Grades

Structural Defects		PACP Grade
Crack - circumferential	CC	1
Crack - longitudinal	CL	2
Crack - multiple	CM	3
Crack - spiral	CS	2
Fracture - circumferential	FC	2
Fracture - longitudinal	FL	3
Fracture - multiple	FM	4
Fracture - spiral	FS	3
Fracture - hinge	FH2	4
Broken - soil visible	BSV	5
Broken - void visible	BVV	5
Hole - soil visible	HSV	5
Hole - void visible	HVV	5
Collapsed	XP	5
Deformed - horizontal	DH	5
Deformed - vertical	DV	5
Joint Offset - medium	JOM	3[a]
Joint Offset - large	JOL	5[b]
Joint Separated - medium	JSM	1
Joint Separated - large	JSL	2
Joint Angular	JA	2
Surface Damage	S	2
Lining Failure	LF	3
Point Repair - defective	RPPD	4
Sags	MWLS	2

[a] *PACP grade is 1. Considered a major defect for this report.*

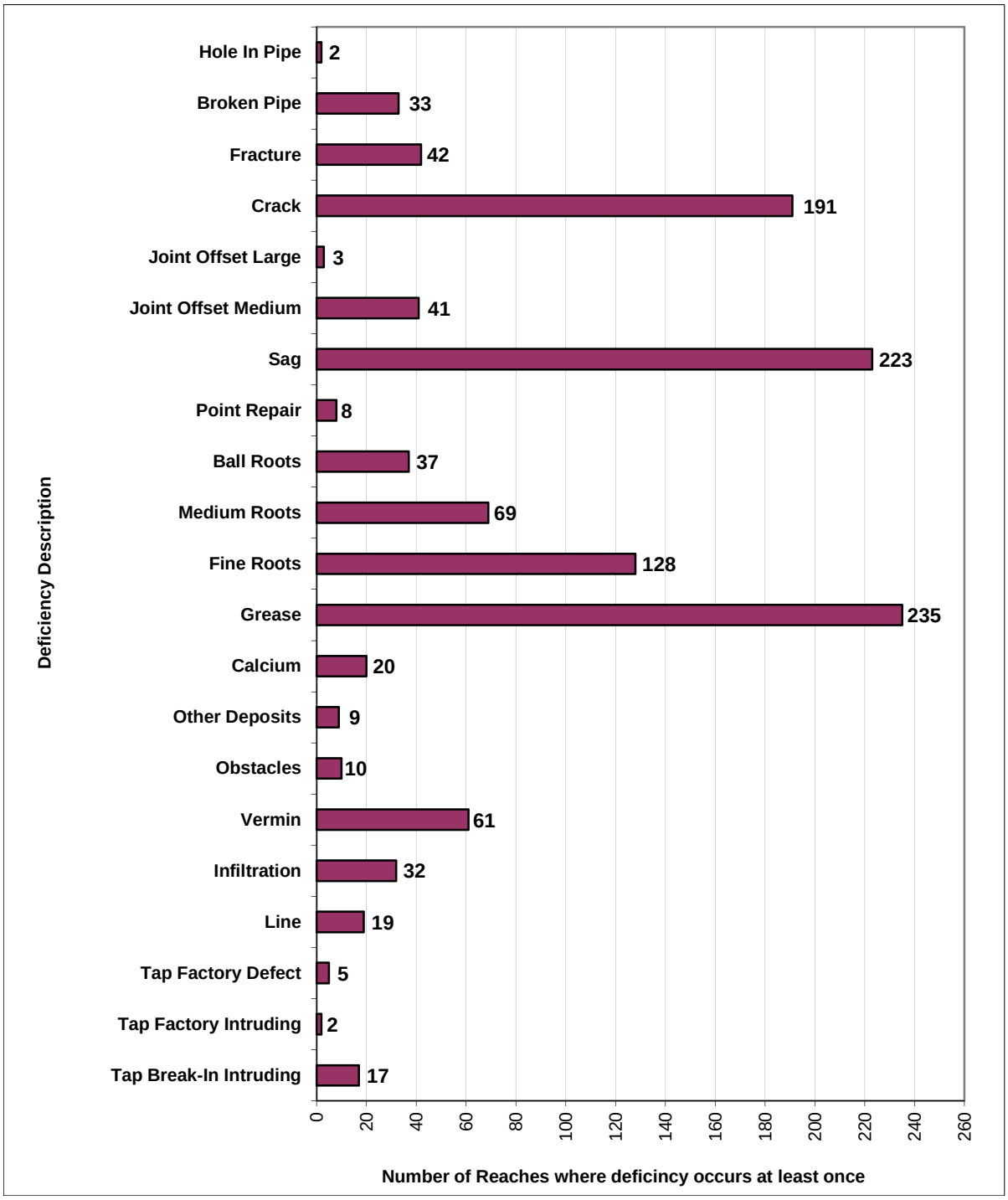
[b] *PACP grade is 2. Considered a severe defect for this report.*

Table 8-2

O&M and Construction Features Defect Codes and Condition Grades

Operational & Maintenance / Construction Feature Defects		Grade
Deposits Attached - encrustation barrel	DAE	2
Deposits Attached - grease	DAGS	2
Deposits Attached - other	DAZ	3
Deposits Settled	DS	2
Deposits Ingress	DN	2
Roots Fine - barrel	RFB	2
Roots Fine - lateral	RFL	1
Roots Fine - joint	RFJ	1
Roots Fine - connection	RFC	1
Roots Tap - barrel	RTB	3
Roots Tap - lateral	RTL	2
Roots Tap - joint	RTJ	2
Roots Tap - connection	RTC	2
Roots Medium - barrel	RMB	4
Roots Medium - lateral	RML	3
Roots Medium - joint	RMJ	3
Roots Medium - connection	RMC	3
Roots Ball - barrel	RBB	5
Roots Ball - lateral	RBL	4
Roots Ball - joint	RBJ	4
Roots Ball - connection	RBC	4
Infiltration - weeper	IW	2
Infiltration - dripper	ID	3
Infiltration - runner	IR	4
Infiltration - gusher	IG	5
Obstacles	OB	4
Vermin	V	1
Tap (Lateral) factory made - defective	TFD	2
Tap (Lateral) break in - intruding	TBI	3
Tap (Lateral) break in - defective	TBD	3
Line	L	2
Intruding Sealing Material - ring hanging	ISSRH	4
Intruding Sealing Material - ring	ISSR	4
Miscellaneous - camera underwater	MCU	4
Miscellaneous - camera blocked	MSA	0

Figure 8-3
Sewer Reaches with Identified Deficiencies

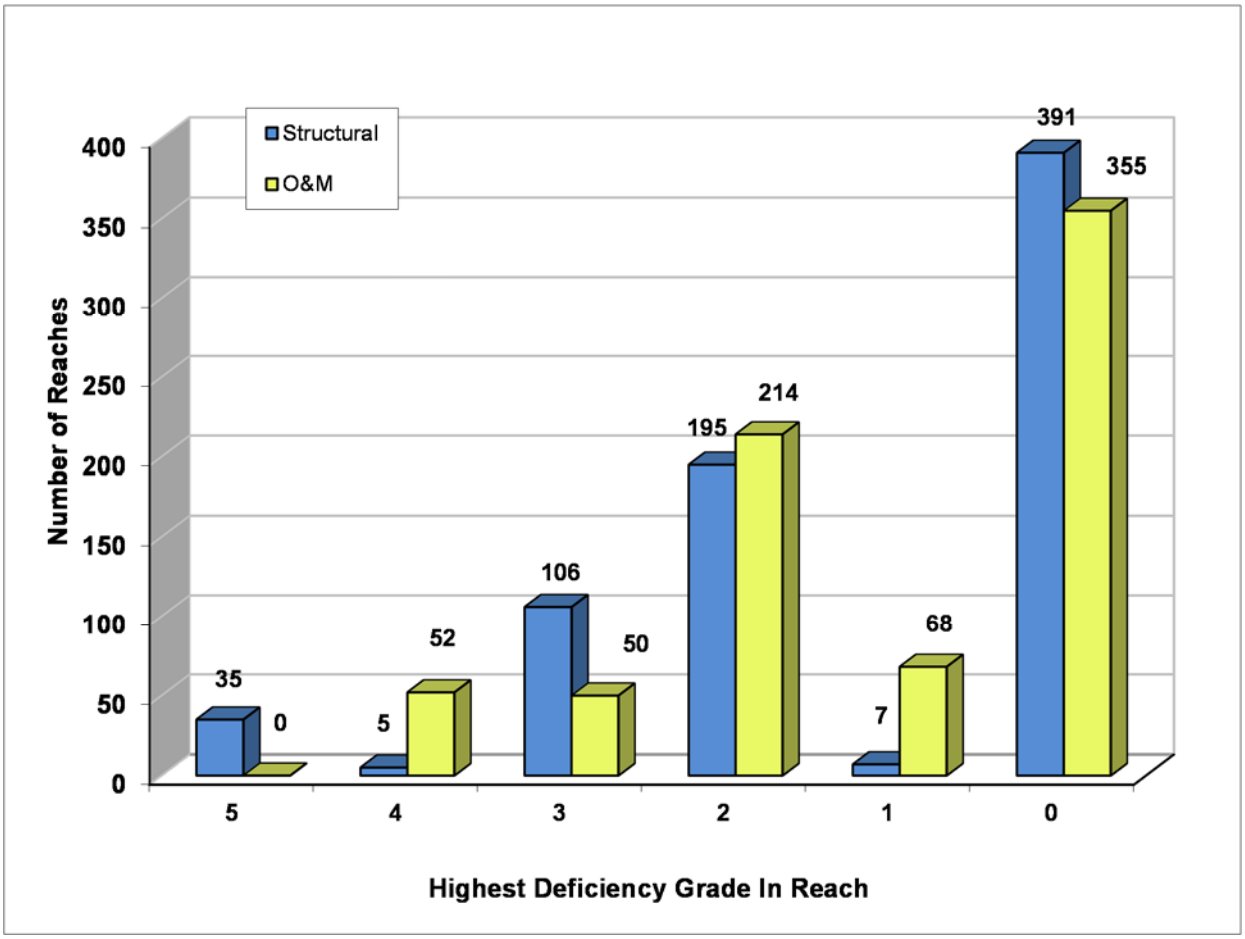


The structural defect score and O& M defect score is calculated by multiplying the number of occurrences of each defect by its assigned grade and summing them.

The structural defect index and the O&M defect index is calculated by dividing the defect score by the number of defects. It is an indicator of the distribution of defect severity.

Figure 8-4 is a plot of the number of reaches versus the highest deficiency grades found in each reach. For example, there were 218 reaches found with at least one structural deficiency grade of 5 and 4 reaches found with at least one operation and maintenance deficiency grade of 5.

Figure 8-4
Deficiency Grades



8-7 REHABILITATION AND REPLACEMENT PROPERTIES

The purpose of CCTV inspections is to determine the condition of the City's existing gravity sewers, and formulate a rehabilitation plan for the defective sewers. The defect scores and indexes provide a good indication as to which pipes are in poor condition, but cannot be relied upon solely to prioritize improvement projects. The priorities are selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of sanitary sewer overflows and leakage. The pipe capacity, location of particular defects, and the tributary areas/wastewater flow rates are other considerations

used in formulating the final capital improvement project priorities.

The initial priorities for improvements to the sewers are based on the severity of the pipe defects. The six (6) categories utilized in this report are as follows:

a. Severe Condition – This category primarily includes structural defects of deformed pipe, hole in pipe, broken pipe, and large joint offsets.

b. Major Condition – This category primarily includes structural defects of multiple fractures, medium joint offsets and major sags. Pipes with a large number of cracks are also included.

g. Moderate Condition – Pipes in this category have fractures, cracks, small and medium joint offsets, and sags.

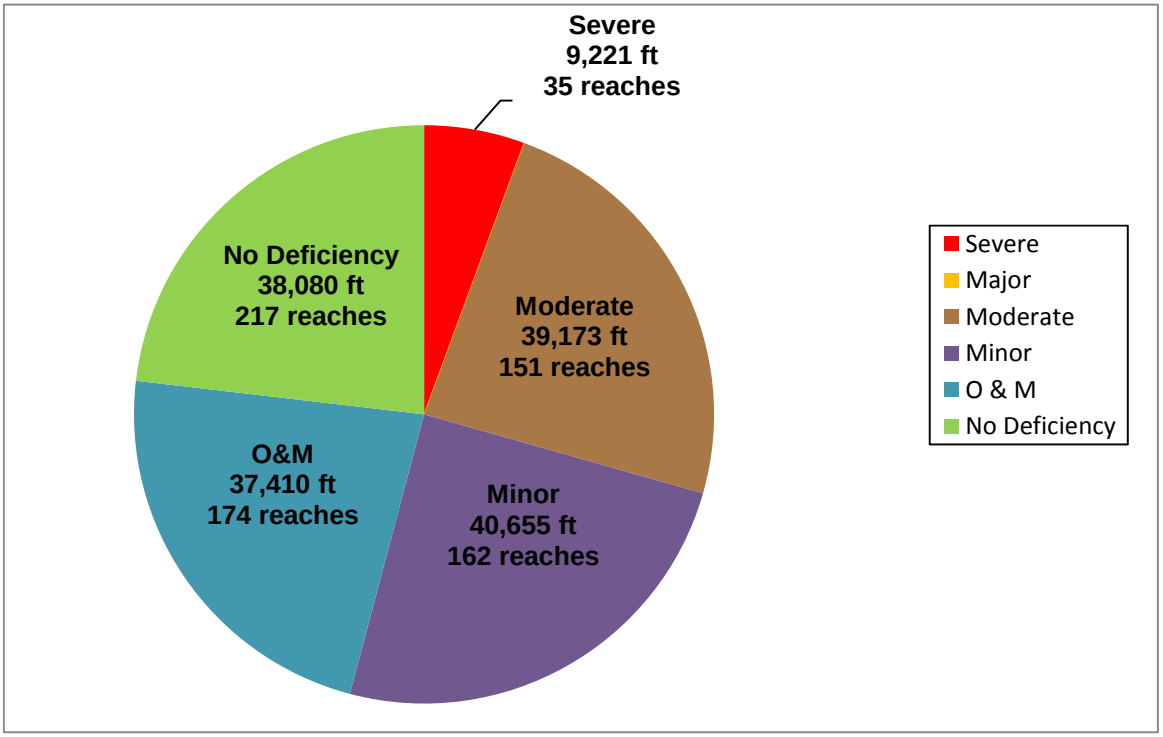
h. Minor Condition – Pipes in this category have slight sags, cracks, and small joint offsets.

i. O&M – This condition is for operational and maintenance problems and construction feature defects. There are no structural defects.

j. No Defects – This condition is for the pipe with no structural, operation and maintenance or construction feature defects.

Figure 8-5 shows the distribution of the condition priorities assigned to the pipes with completed inspections. Figure 8-6 and 8-7 shows the CCTV locations, color coded by condition priority.

Figure 8-5
CCTV Inspection Priorities



OCSD Seal Beach P.S.

Westminster Blvd

Boeing P.S.

City of Long Beach

Adolfo Lopez P.S.

U.S. NAVAL WEAPONS STATION

Seal Beach Blvd

Pacific Coast Hwy

1st St P.S.

8th St P.S.

Pacific Ocean

Pier P.S. (to be rebuilt)

P.S. #35

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers
- City Boundary

Priority

- Severe
- Moderate
- Minor
- O & M
- No Defect
- Not Inspected

N

0 500 1,000 2,000 Feet

[redacted]

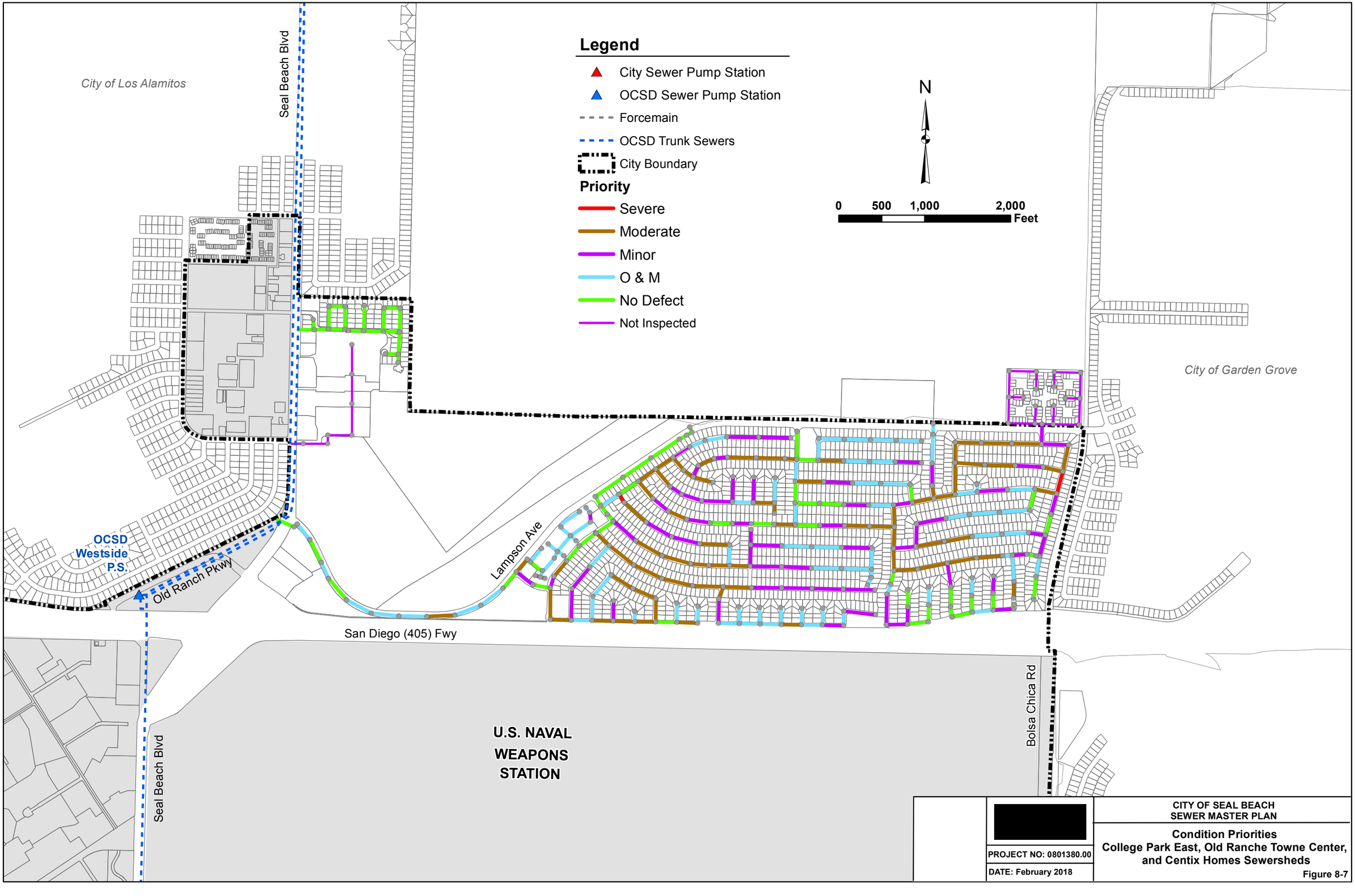
CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Condition Priorities
Boeing, Adolfo Lopez, and P.S. 35 Sewersheds

Figure 8-6



[redacted]

CITY OF SEAL BEACH
SEWER MASTER PLAN

Condition Priorities
College Park East, Old Ranche Towne Center, and Centix Homes Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 8-7

The CCTV inspection summary of gravity pipe identified as a Severe Condition Priority is shown in Table 8-3. Planning level recommendations are included and are based upon the pipe defects reported in the CCTV Inspection Reports and review of select recordings. Actual improvements must be designed based upon further detailed review of each recording, taking into consideration other factors such as location, age and flow capacity of the pipe, existing utilities, and concurrent infrastructure construction projects. The initial priorities are given to the reaches with severe and major structural defects.

A total of approximately 9,221 feet of pipe (35 reaches) is recommended for rehabilitation due to being identified as having PACP priorities of "Severe" condition. At a minimum, all identified locations will require spot repairs. The actual scope of work for each project should be determined through further review of the CCTV inspections. These projects are described in detail in Section 9 and cost estimates are provided for each.

8-8 FOLLOW-UP CCTV INSPECTION AND CONDITION ASSESMENT PROGRAM

As structural deficiency mitigation projects are implemented, their condition will be reclassified, and they will be included in the appropriate category for follow up CCTV inspection and condition assessment work.

a. Portions of the system rated to be in **Severe Structural Deficiency** condition will be inspected **annually** and evaluated to determine if immediate corrective action is needed.

b. Portions of the system rated to be in **Major Structural Deficiency** condition will be CCTV inspected and evaluated once every **three (3) years**

c. Portions of the system rated to be in **Moderate Structural Deficiency** condition will be CCTV inspected and evaluated once every **five (5) years**

d. Portions of the system rated to be in **Minor Structural Deficiency** condition will be CCTV inspected and evaluated once every **ten (10) years**

e. Portions of the system with **no structural deficiencies** will be CCTV inspected and evaluated once every **ten (10) years**

f. Portions of the system with **Operational and Maintenance** deficiencies, except the **Hot Spots**, will be CCTV inspected and evaluated once every **four (4) years.**

g. **Hot Spots**, except siphons, will be CCTV inspected and evaluated **before and after each maintenance activity and cleaning for one year** to establish the appropriateness of the method, and then **annually**.

Table 8-3
Sewer Reaches Identified as a Severe Condition Priority

DVD No.	Inspection No.	Reversal DVD No.	Reversal Inspection No.	DVD Watched? (Y)	Manhole Start MH ID	Manhole End MH ID	Direction of Camera	Location	CCTV Date	Pipe Size (in)	Pipe Material	CCTV Length (ft)
R311-2013-048	242			Y	F02-269	F02-269A	D/S	Alley	08/27/13	8	VCP	304.8
R311-2013-027	450			Y	D06-151	D05-138	D/S	Bolsa Ave	07/22/13	10	VCP	245.9
R311-2013-050	219			Y	F05-312	F05-311A	D/S	Alley	08/29/13	8	PVC	267.9
R311-2013-049	236			Y	F03-301	F03-266A	D/S	Alley	08/28/13	6	VCP	340.2
R311-2013-050	227			Y	F06-316	F06-315A	D/S	Alley	08/29/13	8	VCP	258.2
R311-2013-029	424			Y	D02-114	D02-113	D/S	Avalon Dr	07/24/13	8	VCP	84.1
R311-2013-044	294	R311-2013-044	293	Y	F28-386A	F28-384	D/S	Alley	08/20/13	8	VCP	219.9
R311-2013-050	214			Y	F04-307A	F04-306	D/S	Alley	08/29/13	6	VCP	308.1
R311-2013-058	136			Y	F15-320	F06-C19	D/S	8th St	09/11/13	8	VCP	168.5
R311-2013-032	389			Y	D05-132	D05-130	D/S	Coastline Dr	07/29/13	12	VCP	284.7
R311-2013-031	410				D02-102	D02-099	D/S	Carmel Ave	07/26/13	8	VCP	329.5
R317-2013-024	175			Y	D09-193	D09-192	D/S	Balboa Dr	07/16/13	8	VCP	355.8
R311-2013-042	309			Y	F01-C295	F01-294	D/S	Alley	08/16/13	6	VCP	240.2
R311-2013-055	167			Y	F10-344A	F10-344	D/S	Alley	09/06/13	6	VCP	353.9
R311-2013-031	404			Y	D03-119	D03-118	D/S	Marvista Ave	07/26/13	8	VCP	286.5

Inspection No.	Structural Crack (C) L	Crack (C) C	Crack (C) M	Fracture (F) L	Fracture (F) C	Fracture (F) M	Fracture (F) H2	Broken (B) SV	Broken (B) VV	Hole (H) SV	Hole (H) VV	Joint (J) O	Joint (J) O	Point Repair (RP)	Sags	PACP Quick Struct Rating	Total Structural Defects	Total Structural Defect Score	Structural Defect Index
												M	L						
	2	1	3	3	2	4	4	5	5	5	5	3	5	4	2				
242			3			2			2	1		1			20	5342	29	75	2.59
450		2				5			2							5245	9	32	3.56
219				1		2			1				1			5242	5	21	4.20
236			1					2				1		2	8	5232	12	32	2.67
227			1	1				1	1							5232	4	16	4.00
424									1							5100	1	5	5.00
294													1		16	512B	17	37	2.18
214			2						1			1				5133	4	14	3.50
136										1						5100	1	5	5.00
389	2			6			1		1							5141	10	31	3.10
410			2			5			1						21	5145	29	73	2.52
175		5	2		1	1			1			1				5141	11	23	2.09
309						2	1		1			1				5143	5	20	4.00
167								1								5100	1	5	5.00
404		1	1			1			1						12	5141	16	37	2.31

Inspection No.	Operational and Maintenance Deposits (D) AGS	Deposits (D) AE	Deposits (D) Z	Roots Fine (RF) B	Roots Fine (RF) L	Roots Fine (RF) J	Roots Fine (RF) C	Roots Medium (RM) B	Roots Medium (RM) L	Roots Medium (RM) J	Roots Medium (RM) C	Roots Ball (RB) B	Roots Ball (RB) L	Roots Ball (RB) J	Roots Ball (RB) C	Infiltration (I) G	Infiltration (I) D	Infiltration (I) R	Infiltration (I) W	Obstacles (OB) B	Obstacles (OB) M	Obstacles (OB) I	Vermin (V) C	Vermin (V) R
																				C	Z	%		
	2	2	2	2	1	1	1	4	3	3	3	5	4	4	4	5	3	4	2	4	4		1	1
242																								
450		8																						
219	19					2	1																	
236	24				1																			
227		76				1			1															
424																								
294	19																							
214		31																						
136	55																							
389																								
410																								
175					2	15				1			3											
309		23																						1
167	19	21			1	17			2				1											
404																								

Inspection No.	PACP Quick Maint Rating	Total O&M Defects	Total O&M Defect Score	O&M Defect Index	Construction Features Tap - T (Lateral) FD	Tap - T (Lateral) BI	Tap - T (Lateral) FI	Line (L) D	Line (L) L	Line (L) R	Miscellaneous (M) SA	Miscellaneous (M) CU	Miscellaneous (M) MC	Priority	Priority No.	CIP Project	Comments	Recommendations
					2	3	3	2	2	2		4						
242	0000	0	0	0.00										Severe	1	1a	3' & 5' BVV, 267.9' HSV.	Spot Repair 1' to 7' & 267' to 270'
450	2800	8	16	0.00										Severe	2	2a	Inspection Report shows 220' CM & 236' FM .Those are BVV and we changed them. Also Continuous Fracture.	Spot Repair 216' to 224' & 232' to 237'
219	2B13	22	41	1.86									1	Severe	3	1b	8' JOL (At MMC Point) & 162.8' BVV.	Spot Repair 8' to 10' & 162.8' to 165'
236	2C11	25	49	1.96										Severe	4	1c	19.8' & 32.9' BSV. Also 333.8' & 337' RPP Looks BVV Pipe.	Spot Repair18' to 21', 32.9' to 36' & 333' to 338'
227	312N	78	156	2.00										Severe	5	1d	189.2' BSV & 252.3' BVV. 189.2' Inside Lateral. 36.8' Heavy DAGS.	Spot Repair 252.3' to 255'. Replace Lateral @ 189.2' and clean DAGS
424	0000	0	0	0.00										Severe	6	2b	84.1' BVV (End of the Sewer Line Possible at Lateral connection).	Spot Repair @ 84.1'
294	2B00	19	38	2.00							2			Severe	8	1e	25.5' JOL. MSA (JOL) & 194.4' from D/S MH MSA (JOL). Complete Run. . U/S inspection Blurry, unable to see any defect	Spot Repair @ 25.5'
214	2E00	31	62	2.00										Severe	9	1f	64.9' BVV.	Spot Repair @ 64.9' to 67.3'
136	2J00	55	110	2.00										Severe	10	1g	166.5' HSV (End of the Sewer Line)	Spot Repair @ 166.5'
389	0000	0	0	0.00										Severe	11	2c	215.3' BVV.	Spot Repair @ 209' to219
410	0000	0	0	0.00										Severe	12	2d	Inspection Report shows 115.4' FM. It's was also BVV.	Spot Repair 115.4' to 121'
175	4331	21	32	1.52										Severe	13	2e	4.5' BVV.	Spot Repair @ 0' to 4.5'
309	2C11	24	47	0.00										Severe	14	1h	Inspection Report shows 29.9' FM. It's BVV.	Spot Repair @ 27' to 30'
167	4132	62	110	1.77				1					2	Severe	15	1i	274.3' BSV.	Spot Repair @ 273' to 275.2"
404	0000	1	2	2.00	1									Severe	16	2f	Inspection Report shows 53.5' BSV. It was inside the lateral. 281.7' Small BVV (Inspection Report shows FC).	Spot Repair @ 281.7' & Replace Lateral @ 53.5'

Table 8-3 (continued)
Sewer Reaches Identified as a Severe Condition Priority

DVD No.	Inspection No.	Reversal DVD No.	Reversal Inspection No.	DVD Watched? (Y)	Manhole: Start MH ID	Manhole: End MH ID	Direction of Camera	Location	CCTV Date	Pipe: Size (in)	Pipe: Material	Pipe: CCTV Length (ft)	Structural: Crack (C) L	Crack (C) C	Crack (C) M	Fracture (F) L	Fracture (F) C	Fracture (F) M	Fracture (F) H2	Broken (B) SV	Broken (B) VV	Hole (H) SV	Hole (H) VV	Joint (J) O M	Joint (J) O L	Point Repair (RP)	Sags	PACP Quick Struct Rating	Total Structural Defects	Total Structural Defect Score	Structural Defect Index	Operational and Maintenance: Deposits (D) AGS	Deposits (D) AE	Deposits (D) Z	Roots Fine (RF) B	Roots Fine (RF) L	Roots Fine (RF) J	Roots Fine (RF) C	Roots Medium (RM) B	Roots Medium (RM) L	Roots Medium (RM) J	Roots Medium (RM) C	Roots Ball (RB) B	Roots Ball (RB) L	Roots Ball (RB) J	Roots Ball (RB) C	Infiltration (I) G	Infiltration (I) D	Infiltration (I) R	Infiltration (I) W	Obstacles (OB) B C	Obstacles (OB) M Z	Obstacles (OB) I %	Vermin (V) C	Vermin (V) R	PACP Quick Maint Rating	Total O&M Defects	Total O&M Defect Score	O&M Defect Index	Construction Features: Tap - T (Lateral) FD	Tap - T (Lateral) BI	Tap - T (Lateral) FI	Line (L) D	Line (L) L	Line (L) R	Miscellaneous (M) SA	Miscellaneous (M) CU	Miscellaneous (M) MC	Priority	Priority No.	CIP Project	Comments	Recommendations
													2	1	3	3	2	4	4	5	5	5	5	3	5	4	2					2	2	2	2	1	1	1	4	3	3	3	5	4	4	4	5	3	4	2	4	4		1	1					2	3	3	2	2	2		4						
R317-2013-021	168			Y	B07-G01	B07-A23	D/S	Dogwood Ave	07/08/13	8	VCP	122								1							2	5122	3	9	3.00	5																								2500	5	10	2.00										Severe	17	3a	4.5' BSV.	Spot Repair @ 4.5' to 9.5'
R311-2013-026	461	R311-2013-026	457	Y	D07-176	D07-175	D/S	Island View Dr	07/19/13	8	VCP	259.4													1			5100	1	5	5.00					1																				1100	1	1	1.00							2			Severe	18	2g	252' JOL. 254.4' MSA (JOL) . Inspection not complete. Very close to Ending MH	Spot Repair @ 252'
R311-2013-032	395			Y	D05-134	D05-133	D/S	Fathom Ave	07/29/13	8	VCP	193.4	1		1						1							5132	3	10	3.33						1																			1100	1	1	1.00										Severe	19	2h	189.1' BVV. .	Spot Repair @ 189.1' to 192'
R317-2013-023	483			Y	D08-188	D08-187	D/S	Bayou Way	07/12/13	8	VCP	151.2	1	2	6			1			1							5141	11	31	2.82				1		24			1																3121	26	29	1.12										Severe	20	2i	146.1' BVV. Inspection Report shows FM.	Spot Repair @ 146.1' to 149'
R311-2013-028	434			Y	D04-150	D04-146	D/S	Catalina Ave	07/23/13	8	VCP	352.5		1	1			1		1								5141	4	13	3.25					3	7			1																311A	11	13	1.18										Severe	21	2j	54.2' BSV.	Spot Repair @ 54.2' to 60
R311-2013-028	431			Y	D04-144	D04-143	D/S	Balboa Dr	07/23/13	8	VCP	241.5			1			5		1								5145	7	28	4.00					1				1																3111	2	4	2.00										Severe	22	2k	237' BSV.	Spot Repair @ 237' to 240
R311-2013-050	225			Y	F06-317	F06-316A	D/S	Alley	08/29/13	8	PVC	272.7		3	3						1							5133	7	17	2.43		85							1									1							4131	87	177	2.03									1	Severe	23	1j	132' BVV.	Spot Repair @ 132' to 134'
R311-2013-049	228			Y	F05-311A	F05-311	D/S	Alley	08/28/13	6	VCP	326			2	1		1			1							5141	5	18	3.60		20																							312C	21	43	2.05		1								Severe	24	1b	Inspection Report shows 54.5' FM. It's BVV.	Spot Repair @ 54' to 57'
R311-2013-031	403			Y	D03-118	D03-117	D/S	Marvista Ave	07/26/13	8	VCP	257									1							5100	1	5	5.00	34																								2E00	34	68	2.00										Severe	25	2f	5.8' BVV.	Spot Repair @ 5.8' to 8.9'
R317-2013-002	6			Y	B16-J16	B16-A45	D/S	Wisteria St	06/06/13	8	VCP	267.9									1						5	5125	6	15	2.50		1																							2100	1	2	2.00										Severe	26	3b	236.4' BVV.	Spot Repair @236.4' to 241'
R311-2013-055	173	R311-2013-055	172	Y	F09-340	F09-339	D/S	Alley	09/06/13	6	VCP	128.7									1			1			23	5131	25	54	2.16		42							1																322G	44	90	2.05		1					2			Severe	27	1k	19.8' BVV . 58.7' MSA (TBI), 70' from D/S MH MSA (JOM). Inspection not complete. Inspection from D/S MH unable to see any defect because of SAG.	Spot Repair 1@ 18.2' to 20.6'
R311-2013-060	110			Y	4	5	D/S	Apollo Ct Easement	09/13/13	8	VCP	181.9						1			1							5141	2	9	4.50		14																					11		2A1A	25	39	1.56										Severe	28	2r	178.1' BVV. Inspection Report shows FM.	Spot Repair @ 178.1' to 181'
R317-2013-023	480			Y	D08-182	D08-180	D/S	Bayside Dr	07/12/13	8	VCP	215.3		1	3			2			1							5142	7	23	3.29						2							1												4112	3	6	2.00										Severe	29	2l	Inspection Report shows 210.2' FM. It's BVV.	Spot Repair @ 210.2' to 213.2'
R311-2013-026	456			Y	D07-170	D07-169	D/S	Sea Breeze Dr	07/19/13	8	VCP	354.1	1					3			1							5143	5	19	3.80	4				1	2																			2413	7	11	1.57										Severe	30	2m	21.8' BVV.	Spot Repair @ 21.8' to 24
R311-2013-031	402			Y	D04-142	D04-128	D/S	Driftwood Ave	07/26/13	8	VCP	341.3			5			2			1							5142	8	28	3.50						4							1												4114	5	8	1.60										Severe	31	2n	251.9' BVV.	Spot Repair @ 251.9' to 257

Table 8-3 (continued)
Sewer Reaches Identified as a Severe Condition Priority

DVD No.	Inspection No.	Reversal DVD No.	Reversal Inspection No.	DVD Watched? (Y)	Manhole: Start MH ID	Manhole: End MH ID	Direction of Camera	Location	CCTV Date	Pipe: Size (in)	Pipe: Material	Pipe: CCTV Length (ft)
R311-2013-033	377			Y	E07-219	E07-218	D/S	Riviera Dr	07/30/13	8	VCP	253
R317-2013-024	171			Y	D08-186	D08-185	D/S	Harbor Way	07/16/13	8	VCP	148.4
R311-2013-056	151	R311-2013-057		Y	F15-C372	F15-371	D/S	Alley	09/09/13	8	VCP	599.8
R311-2013-029	425			Y	D02-115	D02-113	D/S	Crestview Ave	07/24/13	8	VCP	355.4
R311-2013-028	439			Y	D06-155	D06-154	D/S	Southshore Dr	07/23/13	8	VCP	151.2

DVD No.	Structural: Crack (C)			Fracture (F)				Broken (B)		Hole (H)		Joint (J)		Point Repair (RP)	Sags	PACP Quick Struct Rating	Total Structural Defects	Total Structural Defect Score	Structural Defect Index
	L	C	M	L	C	M	H2	SV	VV	SV	VV	O	O						
												M	L						
	2	1	3	3	2	4	4	5	5	5	5	3	5	4	2				
R311-2013-033					1		1		1							5141	3	9	3.00
R317-2013-024			1						1							5131	2	8	4.00
R311-2013-056						2			1			2			42	5142	47	103	2.19
R311-2013-029		4	5			1			1							5141	11	28	2.55
R311-2013-028	2		1			2			1							5142	6	20	3.33

DVD No.	Operational and Maintenance: Deposits (D)			Roots Fine (RF)				Roots Medium (RM)				Roots Ball (RB)				Infiltration (I)				Obstacles (OB)			Vermin (V)		PACP Quick Maint Rating	Total O&M Defects	Total O&M Defect Score	O&M Defect Index
	AGS	AE	Z	B	L	J	C	B	L	J	C	B	L	J	C	G	D	R	W	B	M	I	C	R				
																				C	Z	%						
	2	2	2	2	1	1	1	4	3	3	3	5	4	4	4	5	3	4	2	4	4		1	1				
R311-2013-033					1	2																			1300	3	3	1.00
R317-2013-024																									0000	0	0	0.00
R311-2013-056			1		1	2			1																3221	6	11	1.83
R311-2013-029					2	5			1																3117	8	10	1.25
R311-2013-028						1							1												4111	2	5	2.50

DVD No.	Construction Features: Tap - T (Lateral)			Line (L)			Miscellaneous (M)			Priority	Priority No.	CIP Project	Comments	Recommendations
	FD	BI	FI	D	L	R	SA	CU	MC					
	2	3	3	2	2	2		4						
R311-2013-033										Severe	32	2o	248.6' BVV.	Spot Repair @ 248.6' to 251.6'
R317-2013-024										Severe	33	2p	5' BVV.	
R311-2013-056		1					2			Severe	34	1l	471.6' BVV. 526.6 MSA (TBI). Complete run.	Spot Repair 471.6' to 476' & Clean Deposits at D/S MH
R311-2013-029										Severe	35	2b	351.4' BVV. Inspection Report shows FM.	Spot Repair @ 351.4' to 354'
R311-2013-028										Severe	36	2q	67.9' BVV. Inspection Report shows FM.	Spot Repair @ 67.9' to 70.8'

SECTION 9
CAPITAL IMPROVEMENT PROGRAM

9-1 GENERAL DESCRIPTION

The primary goal of a Capital Improvement Program (CIP) is to provide the City with a short and long-range planning tool to implement the construction of needed infrastructure improvements in an orderly manner and provide a basis for financing of these improvements. To accomplish this goal, it is necessary to determine the estimated cost of the projects included in the capital improvement program and prioritize them to result in reliable service in a fiscally responsible manner. Funding mechanisms to finance the improvements can then be identified to implement the program.

9-2 CAPITAL IMPROVEMENT PROJECT PRIORITIES

The capital improvement projects were selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of overflows. As all system pipes and pump stations were shown to have adequate capacity, therefore the projects identified in this section are driven solely by the pipeline condition assessment and the field inspection of the six active pump stations, which took place on December 21, 2016.

Collection System Condition Improvement Projects

The condition improvement projects are prioritized solely on the condition of the pipe as determined from reviews of the 2013 CCTV recordings. The condition deficiencies with critical structural damage and severe obstructions were given the highest priority. Sewer pipes with conditions categorized as “Severe” are included in the recommended improvements.

The planning level recommendations are based upon the ranking and pipe defects from the CCTV inspection reports, and reviews of recordings. It may be possible to spot repair some of the existing gravity pipes, in lieu of replacing them. Actual improvements should be designed based upon further detailed reviews of each recording, taking into consideration other factors such as location, age, capacity of the pipe, existing utilities, and concurrent infrastructure construction projects. The useful life gained from replacing the deficient facilities will be longer than spot repair projects. The CIP includes costs for full replacement as well as spot repairs.

Pump Station Improvements

The recommended pump station capital improvement projects have been based upon condition assessment of each facility, capacity analysis, and conformance with the adopted criteria. The implementation priorities should be based upon the likelihood of a failure that may result in a spill, the volume of spill, and its impact on the public and the environment. The condition assessment and analysis results are described in detail Section 7 for each pump station.

9-3 PROPOSED CAPITAL IMPROVEMENT PROGRAM

The Capital Improvement Program is developed based upon the results of the hydraulic analyses and the established priorities. The highest priority, near-term CIP projects to be completed in the next five years are listed in Table 9-1. The remaining projects were identified to be of lower priority (with a target completion dates

between 2024 and 2033) are listed in Table 9-2. Cost estimates are based on January 2018 dollars. The locations of all CIP projects are shown in and shown on Figures 9-1 and 9-2.

The recommended projects have been based upon the best information currently available. It should be updated as new information becomes available from sources such as CCTV inspections and from maintenance crew observations. The project priorities should be reviewed annually and may be revised to correspond to changed conditions, such as impending facility failures, or to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work. Some of the projects recommended are small and it may not be feasible to implement them as a single project. Therefore, several projects should be combined and bid as a package.

Pipeline replacement costs are generally more conservative and will therefore allow the City more flexibility for each project. The City of Seal Beach is largely occupied and some areas are densely populated with limited project staging capacity (such as Old Town alleys) and there are many existing utilities to consider. Therefore, the costs of replacing sewer facilities will be generally higher than in an area that is undeveloped. The pipeline construction costs are based upon $40 / diameter in / ft for typical construction in streets. If the project location is within an alley, the construction estimates are based upon replacement at $60 per diameter inch foot of pipe due to the limited access and concrete material required. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

Spot repairs are estimated at $40,000 per site in typical streets and $60,000 per site in alleys. These costs are based upon review of recent local bids for similar type work. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

9-3.1 COLLECTION SYSTEM CONDITION IMPROVEMENT PROJECTS

The pipeline condition related projects are grouped into three planning level projects in Table 9-1 based on location as described below:

Project No. 1 Old Town Replacement or Rehabilitation Projects

This capital improvement project consists of spot repairs, patching, or pipe replacements within the Old Town area that will eliminate the structural deficiencies identified. Of the five highest priority pipe segments identified by the condition assessment, four are located in alleys of Old Town. In all 3,790 feet of pipe has been identified as in need of repair in the Old Town area. The total replacement cost for all components of Project No. 1 is estimated at about $2,289,800.

Project No. 2 Marina Hill Replacement or Rehabilitation Projects

This capital improvement project consists of spot repairs, patching, or pipe replacements within the Marina Hill area that will eliminate the structural deficiencies identified. In all 4,861 feet of pipe has been identified as in need of repair in the Marina Hill area. The total replacement cost for all pipe segments of Project No. 2 is estimated at about $2,188,100.

Project No. 3 College Park East and Boeing Replacement or Rehabilitation Projects

This capital improvement project consists of spot repairs, patching, or pipe replacements within the College Park East and Boeing Sewershed areas that will eliminate the structural deficiencies identified. In all 572 feet of pipe has been identified as in need of repair in the College Park East and Boeing areas. The total replacement cost for all pipe segments of Project No. 3 is estimated at about $247,100.

9-3.2 PUMP STATION IMPROVEMENT PROJECTS

The pump station improvement projects are shown in Table 9-1 and Table 9-2. Details of the improvements were discussed in Section 7.

Project No. 4 and 11 are improvements related to the Adolfo Lopez Pump Station.

Project No. 12 is improvements related to the Aquatic Park Pump Station.

Project No. 5 and 13 are improvements related to the Boeing Pump Station.

Project No. 6 and 14 are improvements related to the 8th Street Pump Station.

Project No. 7 and 15 are improvements related to the 1st Street Pump Station.

Project No. 16 is improvements related to Pump Station No. 35.

Table 9-1
Capital Improvement Projects (2018-2023)

CIP Project	Sub-project ID	Up-stream Manhole ID	Down-stream Manhole ID	Description	Alley	Dia-meter (in)	Material	Qty	Unit Basis	Unit Cost	Total Estimated Cost with Pipe Replacements Implemented ($)	Spot Repair Locations	Unit Repair Cost ($)	Total Estimated Cost with Pipe Repairs Implemented ($)
1	1a	F02-269	F02-269A	4th St Alley Repair/Replace	Y	8	VCP	305	LF	$ 480	$ 204,960	2	$ 60,000	$ 168,000
	1b	F05-312	F02-311	7th St Alley Repair/Replace (2 seg)	Y	8	PVC	594	LF	$ 480	$ 399,168	1	$ 60,000	$ 84,000
	1c	F03-301	F03-266A	5th St Alley Repair/Replace	Y	8	VCP	340	LF	$ 480	$ 228,480	2	$ 60,000	$ 168,000
	1d	F06-316	F06-315A	8th St Alley Repair/Replace	Y	8	VCP	258	LF	$ 480	$ 173,376	2	$ 60,000	$ 168,000
	1e	F28-386A	F28-384	Main St Alley Repair/Replace	Y	8	VCP	220	LF	$ 480	$ 147,840	1	$ 60,000	$ 84,000
	1f	F04-307	F04-306	6th St Alley Repair/Replace	Y	8	VCP	308	LF	$ 480	$ 206,976	1	$ 60,000	$ 84,000
	1g	F15-320	F06-C319	8th St Repair/Replace	N	8	VCP	169	LF	$ 320	$ 75,712	1	$ 40,000	$ 56,000
	1h	F01-C295	F01-294	2nd St Alley Repair/Replace	Y	8	VCP	240	LF	$ 480	$ 161,280	1	$ 60,000	$ 84,000
	1i	F10-344A	F10-344	11th St Alley Repair/Replace	Y	8	VCP	354	LF	$ 480	$ 237,888	1	$ 60,000	$ 84,000
	1j	F06-317	F06-316A	8th St Alley Repair/Replace	Y	8	VCP	273	LF	$ 480	$ 183,456	1	$ 60,000	$ 84,000
	1k	F09-340	F09-339	12th St Alley Repair/Replace	Y	8	VCP	129	LF	$ 480	$ 86,688	1	$ 60,000	$ 84,000
	1l	F15-C372	F15-371	East Seal Way Repair/Replace	N	8	VCP	600	LF	$ 320	$ 268,800	1	$ 40,000	$ 56,000
							Subtotal	**3,790**			**$ 2,374,624**			**$ 1,204,000**
2	2a	D06-151	D05-138	Bolsa Ave Repair/Replace	N	10	VCP	246	LF	$ 400	$ 137,760	1	$ 40,000	$ 56,000
	2b	D02-115 & D02-114	D02-113	Avalon & Crestview Repair/Replace (2 seg,)	N	8	VCP	440	LF	$ 320	$ 197,120	2	$ 40,000	$ 112,000
	2c	D05-132	D05-130	Coastline Dr Repair/Replace	N	12	VCP	285	LF	$ 480	$ 191,520	1	$ 40,000	$ 56,000
	2d	D02-102	D02-099	Carmel Ave Repair/Replace	N	8	VCP	330	LF	$ 320	$ 147,840	1	$ 40,000	$ 56,000
	2e	D09-193	D09-192	Catalina Ave Repair/Replace	N	8	VCP	356	LF	$ 320	$ 159,488	1	$ 40,000	$ 56,000
	2f	D03-119	D03-117	Marvista Ave Repair/Replace (2 seg)	N	8	VCP	544	LF	$ 320	$ 243,712	2	$ 40,000	$ 112,000
	2g	D07-176	D07-175	Beachcomber Dr Repair/Replace	N	8	VCP	259	LF	$ 320	$ 116,032	1	$ 40,000	$ 56,000
	2h	D05-134	D05-133	Fathom Ave Repair/Replace	N	8	VCP	193	LF	$ 320	$ 86,464	1	$ 40,000	$ 56,000
	2i	D08-188	D08-187	Bayou Way Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
	2j	D04-150	D04-146	Catalina Ave Repair/Replace	N	8	VCP	353	LF	$ 320	$ 158,144	1	$ 40,000	$ 56,000
	2k	D04-144	D04-143	Balboa Dr Repair/Replace	N	8	VCP	242	LF	$ 320	$ 108,416	1	$ 40,000	$ 56,000
	2l	D08-182	D08-180	Bayside Dr Repair/Replace	N	8	VCP	215	LF	$ 320	$ 96,320	1	$ 40,000	$ 56,000
	2m	D07-170	D07-169	Sea Breeze Dr Repair/Replace	N	8	VCP	354	LF	$ 320	$ 158,592	1	$ 40,000	$ 56,000
	2n	D04-142	D04-128	Driftwood Ave Repair/Replace	N	8	VCP	341	LF	$ 320	$ 152,768	1	$ 40,000	$ 56,000
	2o	E07-219	E07-218	Riviera Dr Repair/Replace	N	8	VCP	253	LF	$ 320	$ 113,344	1	$ 40,000	$ 56,000
	2p	D08-186	D08-185	Harbor Way Repair/Replace	N	8	VCP	148	LF	$ 320	$ 66,304	1	$ 40,000	$ 56,000
	2q	D06-155	D06-154	South Shore Dr Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
							Subtotal	**4,861**			**2,269,120**			**$ 1,064,000**
3	3a	B07-G01	B07-A23	Dogwood Ave Repair/Replace	N	8	VCP	122	LF	$ 320	$ 54,656	Replace		$ 54,656
	3b	B16-J16	B16-A45	Wisteria St Repair/Replace	N	8	VCP	268	LF	$ 320	$ 120,064	1	$ 40,000	$ 56,000
	3c	U02-E20	U02-E19	Apollo Ct Lateral Repair/Replace	N	8	VCP	182	LF	$ 320	$ 81,536	1	$ 40,000	$ 56,000
							Subtotal	**572**			**$ 256,256**			**$ 166,656**
4	-	-	-	**Adolfo Lopez Pump Station**										
				Construct Parallel Force Main - Next 5 years	N	6	PVC	1,100	LF	$ 200	$ 308,000	-	-	$ 308,000
							Subtotal - Adolfo Lopez Pump Station				***$ 308,000***	***-***	***-***	***$ 308,000***
5	-	-	-	**Boeing Pump Station**										
				Connect to SCADA System				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
				Construct Parallel Force Main - Next 5 years	N	10	PVC	160	LF	$ 400	$ 90,000	-	-	$ 90,000
							Subtotal - Boeing Pump Station				***$ 174,000***	***-***	***-***	***$ 174,000***
6	-	-	-	**8th Street Pump Station**										
				Construct Canopy Over Electrical Enclosures - Next 5 Years				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
							Subtotal - 8th Street Pump Station				***$ 84,000***	***-***	***-***	***$ 84,000***
7	-	-	-	**1st Street Pump Station**										
				Raise Electric Cabinets - Next two years				1	LS	$ 50,000	$ 70,000	-	-	$ 70,000
				Reline Wet Well - Next 2 years				1	LS	$ 20,000	$ 28,000	-	-	$ 28,000
							Subtotal - 1st Street Pump Station				***$ 98,000***	***-***	***-***	***$ 98,000***
8	-	-	-	Install Smart Manhole Covers at Potential Overflow Sites				12	EA	$ 5,000	$ 84,000	-	-	$ 84,000
9	-	-	-	Evaluate infiltration/inflow in College Park East, Old Town, and Bridgeport				1	LS	$120,000	$ 168,000	-	-	$ 168,000
10	-	-	-	Survey All Sewers and Update Hydraulic Model				1	LS	$150,000	$ 210,000	-	-	$ 210,000
										TOTAL REPLACEMENT COST (2018-2023)	***$ 6,026,000***	***TOTAL EST. COST (2018-2023)***		***$ 3,560,656***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies

Table 9-2
Capital Improvement Projects (2024-2033)

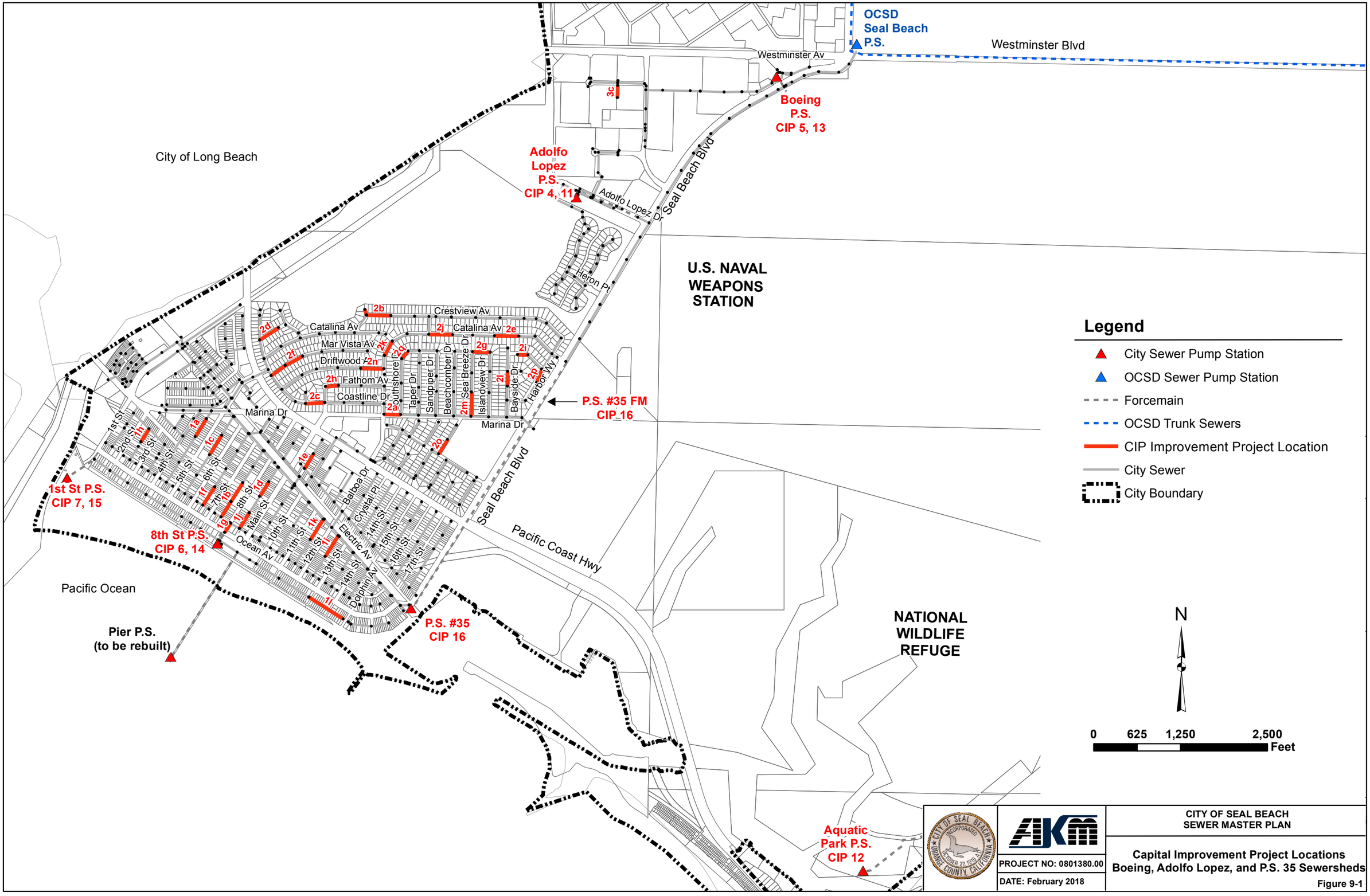
CIP Project	Description	Qty	Unit Basis	Unit Cost	Total Cost ($)
11	**Adolfo Lopez Pump Station**				
	Replace Mechanical and Electrical Equipment - 2025	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2025	1	LS	$ 70,000	$ 98,000
	Site Improvements - 2025	1	LS	$ 50,000	$ 70,000
	Replace Standby Generator - 2030	1	LS	$ 150,000	$ 210,000
	Subtotal Adolfo Lopez Pump Station				**$ 1,218,000**
12	**Aquatic Park Pump Station**				
	Replace Pump Station if not Transferred to Huntington Beach	1	LS	$ 1,000,000	$ 1,400,000
	Subtotal - Aquatic Park Pump Station				***$ 1,400,000***
13	**Boeing Pump Station**				
	Replace Mechanical and Electrical Equipment - 2023	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2023	1	LS	$ 80,000	$ 112,000
	Replace Standby Generator - 2033	1	LS	$ 150,000	$ 210,000
	Subtotal - Boeing Pump Station				***$ 1,162,000***
14	**8th Street Pump Station**				
	Replace Cast Iron Force Main - 2025	N	6	PVC	150 LF $ 240 $ 51,000
	Extend New Force Main - 2025	N	6	PVC	185 LF $ 300 $ 78,000
	Subtotal - 8th Street Pump Station				***$ 129,000***
15	**1st Street Pump Station**				
	Construct Parallel Force Main - 2027	N	4	PVC	500 LF $ 120 $ 84,000
	Replace Mechanical and Electrical Equipment - 2027				1 LS $ 200,000 $ 280,000
	Replace Valve Vault, Valves and Meter - 2027				1 LS $ 100,000 $ 140,000
	Replace Influent Sewers - 2027 or when paving is replaced				350 LF $ 180 $ 88,800
	Subtotal - 1st Street Pump Station				***$ 592,800***
16	**Pump Station No.35**				
	Replace Pumps with Close Coupled Units - 2028				3 EA $ 150,000 $ 630,000
	Construct Natural Gas Standby Generator with ATS - 2028				1 LS $ 360,000 $ 504,000
	Replace the Electrical and Control Equipment - 2028				1 LS $ 600,000 $ 840,000
	Construct Parallel Force Main - 2025	N	16	DI	4,150 LF $ 640 $ 3,719,000
	Subtotal - Pump Station No.35				***$ 5,693,000***
	TOTAL REPLACEMENT COST (2024-2033)				***$10,194,800***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies


OCSD
Seal Beach
P.S.
Westminster Blvd
Westminster Av
Boeing
P.S.
CIP 5, 13
3c
City of Long Beach
Adolfo
Lopez
P.S.
CIP 4, 11
Adolfo Lopez Dr
Seal Beach Blvd
Heron Pt
U.S. NAVAL
WEAPONS
STATION
2b
Crestview Av
2d
Catalina Av
2j
Catalina Av
2e
2f
Mar Vista Av
2k
2g
2i
Driftwood Pl
2n
2o
Southshore Dr
Taper Dr
Sandpiper Dr
Beachcomber Dr
Sea Breeze Dr
Islandview Dr
Bayside Dr
Harbor Wy
2h
Fathom Av
2c
Coastline Dr
2a
2m
2l
2p
P.S. #35 FM
CIP 16
Marina Dr
Marina Dr
1st St
2nd St
3rd St
4th St
5th St
6th St
7th St
8th St
9th St
Main St
10th St
11th St
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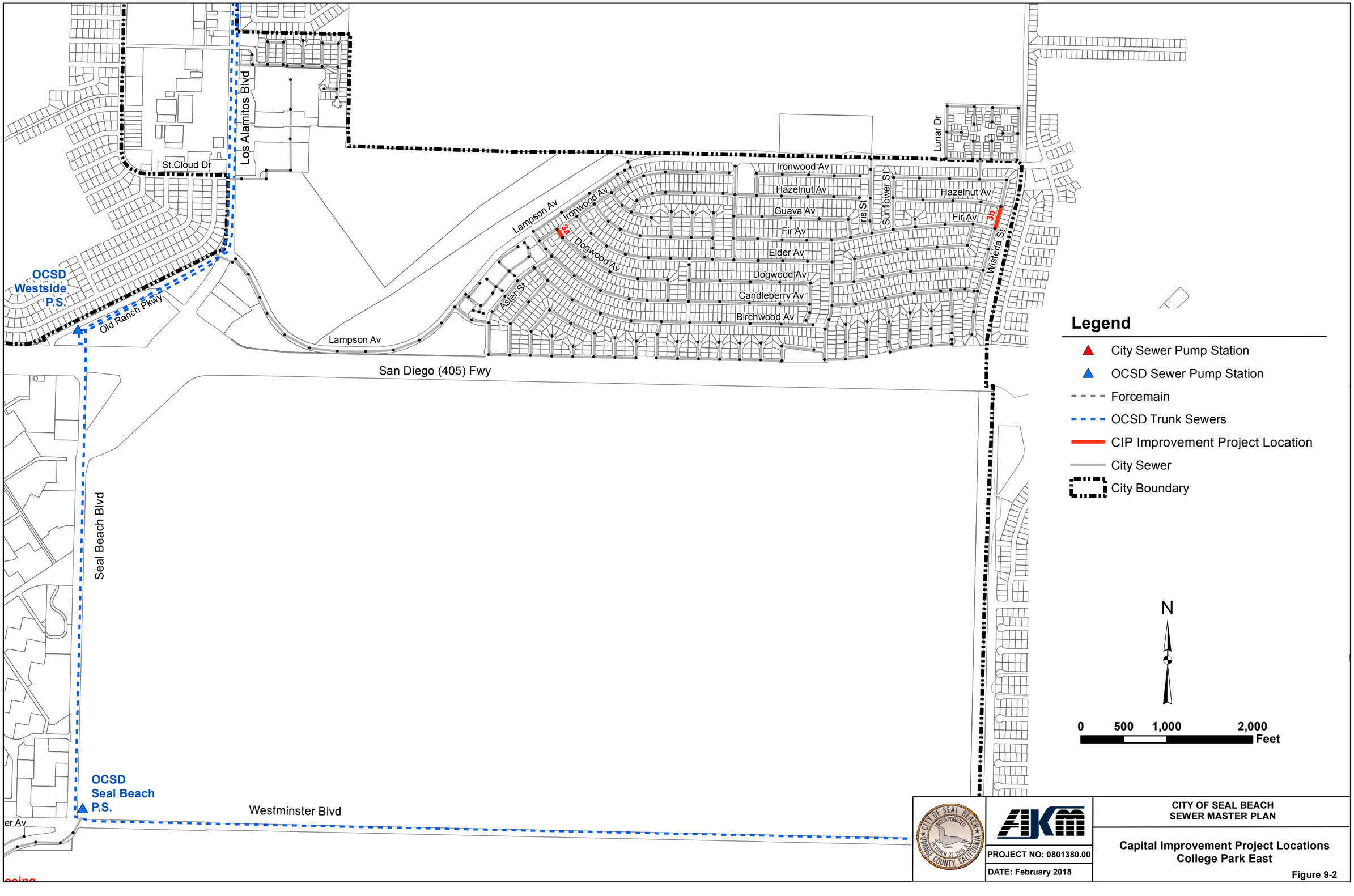
13th St
14th St
15th St
16th St
17th St
1h
1a
1c
1e
1f
1g
1d
1b
1i
1k
1j
1l
2o
Balboa Dr
Crystal Pl
Electric Av
Dolphin Av
Ocean Av
Seal Beach Blvd
Pacific Coast Hwy
1st St P.S.
CIP 7, 15
8th St P.S.
CIP 6, 14
Pacific Ocean
Pier P.S.
(to be rebuilt)
P.S. #35
CIP 16
NATIONAL
WILDLIFE
REFUGE
Aquatic
Park P.S.
CIP 12
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
CIP Improvement Project Location
City Sewer
City Boundary
N
0
625
1,250
2,500
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
Capital Improvement Project Locations
Boeing, Adolfo Lopez, and P.S. 35 Sewersheds
Figure 9-1
PROJECT NO: 0801380.00
DATE: February 2018


St Cloud Dr
Los Alamitos Blvd
Lunar Dr
Ironwood Av
Hazelnut Av
Guava Av
Fir Av
Elder Av
Dogwood Av
Candleberry Av
Birchwood Av
Iris St
Sunflower St
Wisteria St
Lampson Av
Aster St
3a
3b
OCSD
Westside
P.S.
Old Ranch Pkwy
San Diego (405) Fwy
Seal Beach Blvd
OCSD
Seal Beach
P.S.
Westminster Blvd
er Av
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
CIP Improvement Project Location
City Sewer
City Boundary
N
0
500
1,000
2,000
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
Capital Improvement Project Locations
College Park East
Figure 9-2
PROJECT NO: 0801380.00
DATE: February 2018