Appendix F: Infrastructure Technical Report

Appendices

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MIDTOWN SPECIFIC PLAN

INFRASTRUCTURE TECHNICAL REPORT FOR HYDROLOGY, SEWER, WATER, & WATER QUALITY

City of Long Beach
County of Los Angeles, California

Prepared For

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Date Prepared: July 1, 2015
Job Number: 511.018.01

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CITY OF LONG BEACH
MIDTOWN SPECIFIC PLAN

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JULY 1, 2015

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Acronyms & Abbreviations

ATS	Active Treatment System
BAT	Best Available Technology Economically Available
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practice
CCP	Community Commercial Pedestrian
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CTR	California Toxics Rule
CWA	Clean Water Act
d/D	Maximum Flow within Pipe Over Depth Ratio
DCV	Design Capture Volume
DU	Dwelling Units
EIR	Environmental Impact Report
FAR	Floor to Area Ratio
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GCP	General Construction Permit
gpd	gallons per day
LACFCD	Los Angeles County Flood Control District
LACSD	Los Angeles County Sanitation District
LB	City of Long Beach
LBWD	City of Long Beach Water Department
LID	Low Impact Development
MEP	Maximum Extend Possible
MGD	Millions of Gallons per Day
MS4	Municipal Separate Storm Sewer Systems
MWD	Metropolitan Water District of Southern California
NAL	Numeric Action Levels
NEL	Numeric Effluent Limits
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PD-29	Planned Development District 29
PRD	Project Registration Documents
RCP	Reinforced Concrete Pipe
RUSLE	Revised Universal Soil Loss Equation

RWQCB	Regional Water Quality Control Board
SF	Square Feet
SFHA	Special Flood Hazard Area
SUSMP	Standard Urban Stormwater Management Plan
SWPPP	Storm Water Pollution Prevention Program
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
US EPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
WDR	Waste Discharge Requirement
WQO	Water Quality Objective
WRD	Water Replenishment District of Southern California

1. INTRODUCTION & BACKGROUND

The Midtown Specific Plan project site is located in the City of Long Beach in southeastern Los Angeles County. The City of Long Beach is proposing the Midtown Specific Plan to establish a land use, development and implementation framework to encourage redevelopment of a two-mile segment of Long Beach Blvd to support residential uses, job creation, commercial and employment space, as well as hotel uses. The two-mile segment along Long Beach Blvd starts at Spring Street to the north and ends at Anaheim Street to the south.

The Midtown Specific Plan covers approximately 373 acres divided up into four development districts including the Transit Node District, the Corridor District, the Medical District and the Open Space District including 4 additional acres outside the Specific Plan area but adjacent to the Midtown Specific Plan boundary. The 4-acre area includes Officer Black Park (west of Pasadena Avenue between 21st Street and 20th Street). This area is currently within the zoning sphere of PD-29 but will be converted to residential zoning (R Zone) including R-1-N Zone, R-3-S Zone and Park Zone (P Zone). These areas make up the Midtown Project and together, comprise 373 acres spanning from Anaheim Street to Wardlow Road. The Midtown Project will support approximately 3,700 dwelling units, 3 million square feet of commercial/employment and almost 16,000 jobs. This represents an increase of approximately 1,736 units, 370,000 sf of commercial /employment and 2,787 employees. Figure 1 and Figure 2 provide a vicinity map and an aerial over view with the Development District overlay.

Table 1 summarizes the various development districts, their acreage, and proposed land use.

Table 1 Midtown Project Summary

Development District ID	Development District	Acreage (ac)	Proposed Land Use Description
Corridor District	1 2 3	22 51 20	93 acres supporting mixed use housing options, commercial/employment areas and neighborhood-serving uses within walking distance of a transit node. Multi-family and mixed use may reach up to 5 stories.
Medical District	4	63	63 acres of medical zoning to establish a comprehensive health campus based on the Long Beach Memorial Medical Center's prior master planning efforts.
Transit Node District	5 6 7	44 20 19	83 acres supporting compact, transit-oriented mixed-use and residential development centered along 3 Metro Blue Line stations. Maximum FAR of 4.0.
R Zone		4	4 acres with no proposed development changes.
Open Space		18	18 acres of existing and new open space for community and mini parks and increased open space connections to existing park facilities.
ROW		112	112 acres consisting of improved multi-model opportunities and streetscape improvements.
Total		**373**	3,695 Residential Units (increase of 1,736 units) 3.0 million sf of non-residential (increase of ~370,000 sf)

The City of Long Beach is seeking approval of a General Plan Amendment, the Midtown Specific Plan, the Zone Change and the Program EIR Certification. As part of this CEQA process, infrastructure such as drainage, sewer, and water systems that support the existing and proposed land uses will be analyzed at a level consistent with the program-level planning of an EIR. The land use changes have the potential to change impervious conditions, sewer/wastewater flow rates, water demands, and water quality impacts. Table 1 provides a summary of each of the seven planning districts and conventional zoning, including the number of proposed residential units and the total proposed square footage of non-residential uses as compared to existing conditions. Figure 3 provides a summary of the existing and proposed zoning.

This report analyzes the proposed land use changes within the development district areas and how these changes may impact the existing infrastructure that lies within or immediately downstream. For those areas where the land use changes may impact the existing infrastructure, measures will be identified to improve the infrastructure to support the proposed land uses. The analysis will include a review of the Master Plans of Drainage, Water, and Wastewater systems, as well as the existing drainage (storm drain systems), sewer systems, water systems, and water quality systems currently in place. For water quality, measures to reduce potential impacts to surface water as a result of post-construction operations will be addressed in this report. This includes structural Best Management Practices (BMPs) and Low Impact Development (LID) strategies for post-construction water quality protection. Additional details on water quality will occur during the site planning process through the City of Long Beach and the development of site-specific (e.g. project-specific) (LID) BMP Plans.

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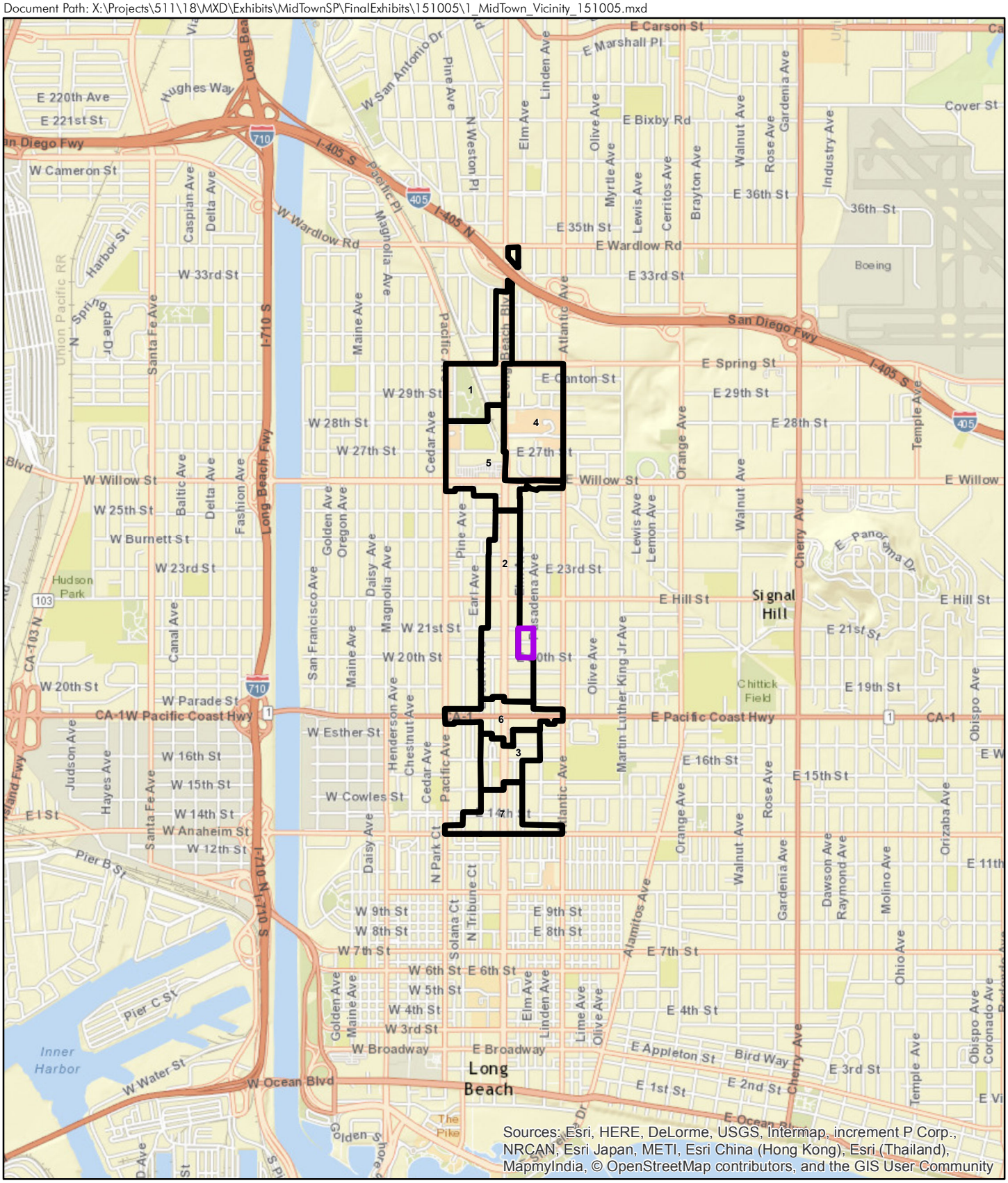

Midtown Specific Plan

City of Long Beach

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District Boundary

Residential Zoning

Figure 1
Vicinity Map

Date: 10/6/2015

0 1,500 3,000 6,000 Feet

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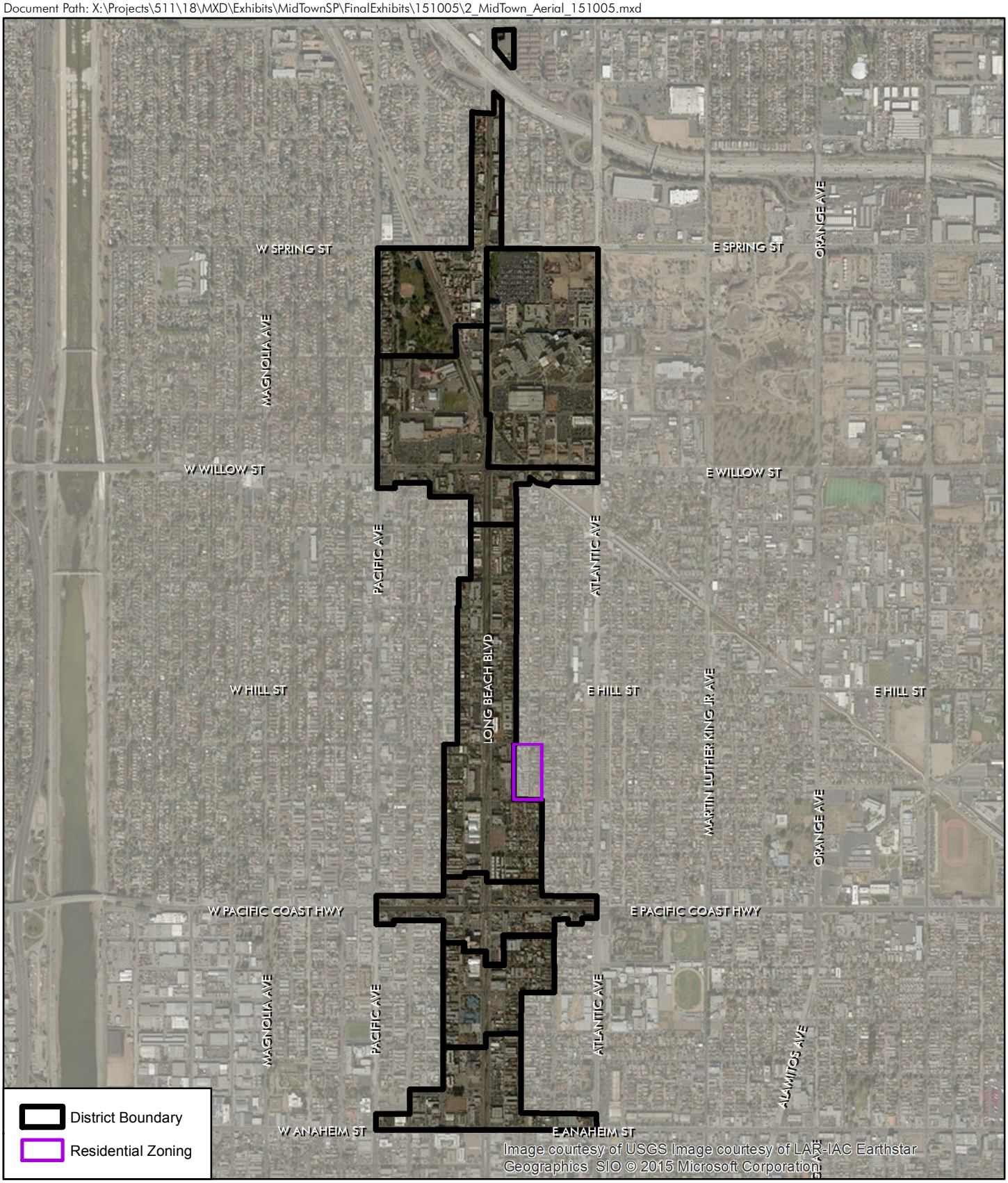

Midtown Specific Plan

City of Long Beach

Figure 2

Aerial Extent with Development District Overlay

Date: 10/6/2015

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0 800 1,600 3,200 Feet

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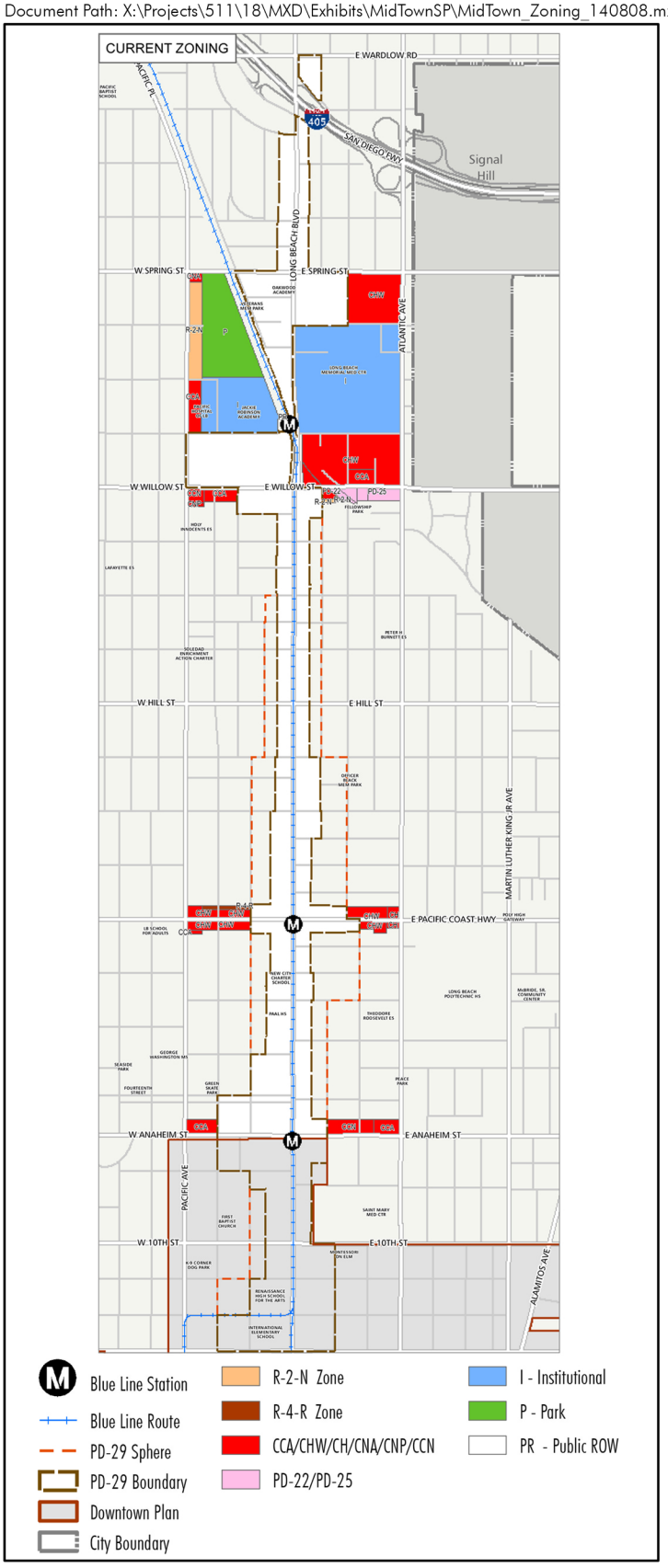

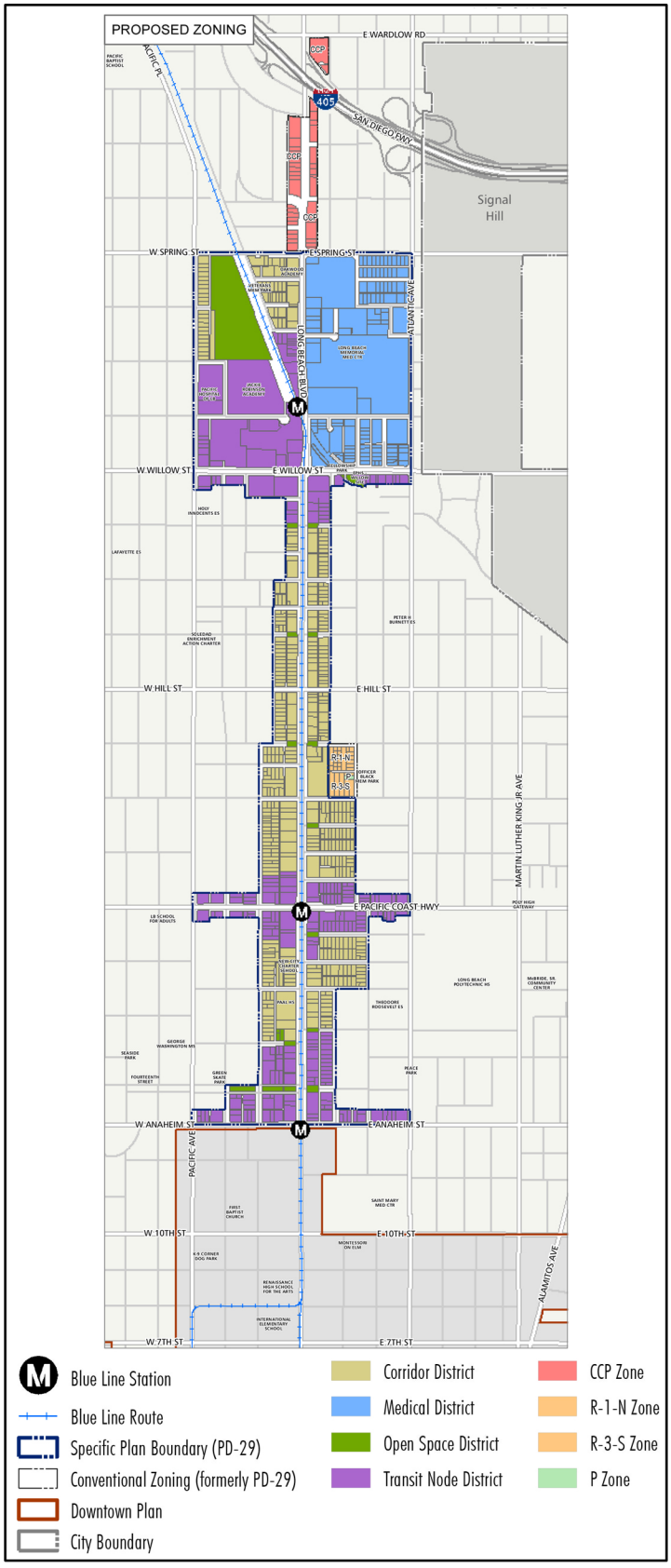

Midtown Specific Plan

City of Long Beach

Figure 3

Current and Proposed Zoning

Date: 8/18/2014

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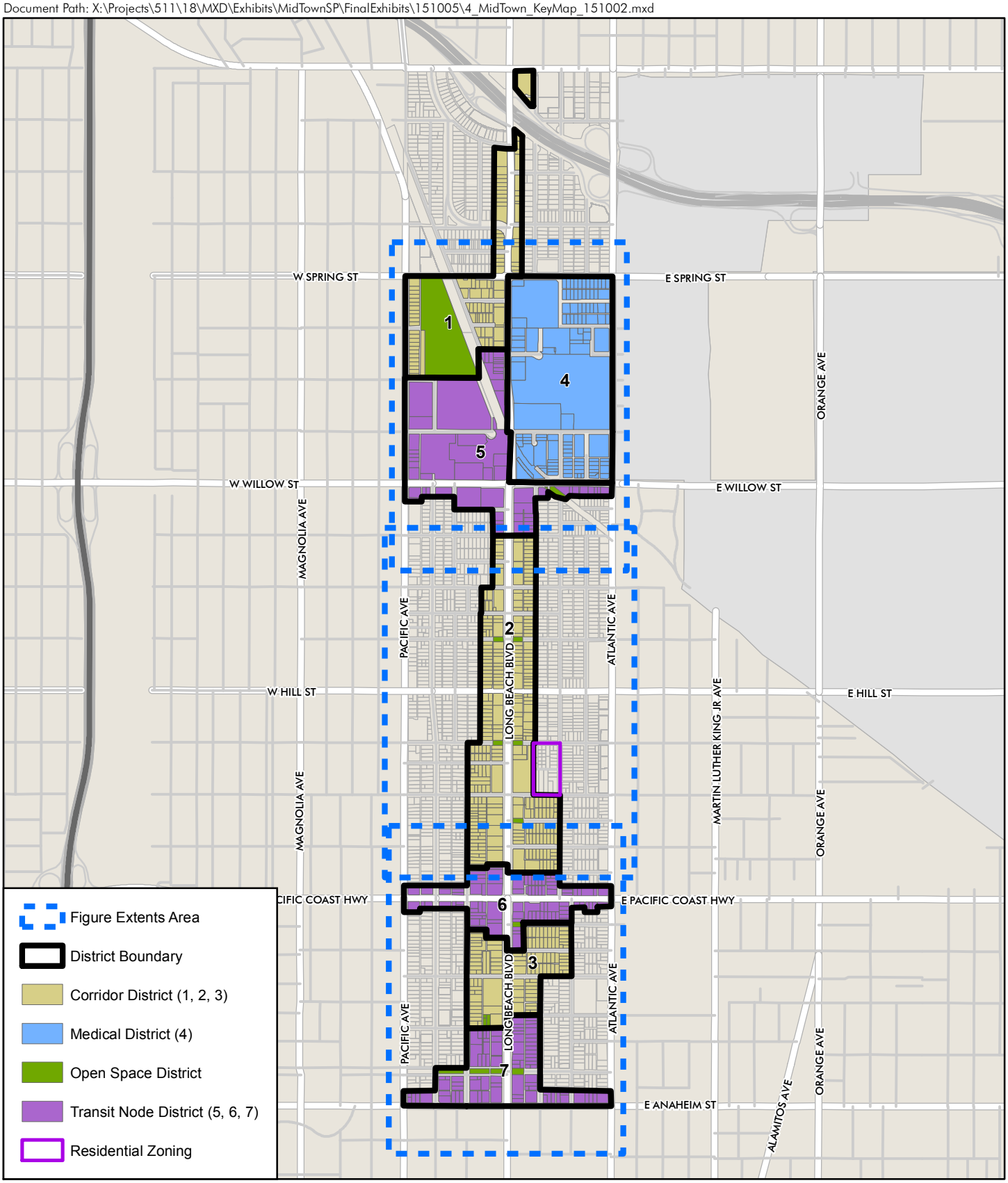

Midtown Specific Plan

City of Long Beach

Figure 4
Key Map

Date: 10/6/2015

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0 700 1,400 2,800 Feet

2. ENVIRONMENTAL SETTING

2.1 HYDROLOGY

The purpose of the hydrology evaluation is to evaluate the existing status of the storm drain system based on best available information (Master Plan of Drainage, specific studies within the project study area, etc.) and determine if the system can accommodate the proposed land use changes. Where applicable, storm drain system improvements will be identified to support the proposed land plan based on the most current Master Plan of Drainage. The analysis is based on information provided by the City of Long Beach and the Los Angeles County Department of Public Works.

2.1.1 Watershed Setting and Existing Drainage Facilities

The Midtown Project site resides within the Los Angeles River Watershed within Los Angeles County. Approximately 19 square miles of the 834 square-mile Los Angeles River watershed is located within the boundary of Long Beach. The Los Angeles River is a 51-mile long, largely concrete-lined channel that flows from the western San Fernando Valley to the Pacific Ocean at Long Beach.[1] The river has a natural bottom with riprap side slopes south of 25th street in Long Beach and a concrete bottom north of 25th St.[2] There are fifteen (15) pump stations that discharge into the river within the City of Long Beach. The nearest stream gauging station on the Los Angeles River is approximately one-half mile north of Midtown's northern extent and shows an average maximum daily flow rate recorded in a given year of approximately 16,500 cfs from 1990-2010.[3]

The Midtown study area is served by two primary flood control and drainage systems.

1) The City of Long Beach (LB) operates and maintains a storm drain system including catch basins, storm drain pipes (primarily RCP) that range from 12" to 90" pipes within the study area.
2) Los Angeles County Flood Control District (LBCFCD) operates and maintains flood control facilities including the larger systems primarily ranging from 48" to 93" within the study area.

Due to the long linear nature of the project area, the project has been divided into three segments for exhibit purposes including a north area, center area and south area. Figure 5A-C (North, Center and South) provide a summary of the existing LB and LACFCD facilities within the study area and brief descriptions are provided below.

[1] Lower Los Angeles River Watershed Committee. (2013). "Geographic Scope of Watershed Management Program", Lower Los Angeles River Watershed Management Plan. Retrieved June 18, 2014, from http://www.swrcb.ca.gov/losangeles/water_issues/programs/stormwater/municipal/watershed_management/los_angeles/lower_losangeles/noi.pdf

[2] City of Long Beach Public Works. (2001). "Geographic Characteristics", Long Beach Stormwater Management Plan. Retrieved June 18, 2014, from http://www.longbeach.gov/civica/filebank/blobdload.asp?BlobID=28574

[3] County of Los Angeles Department of Public Works, Water Resources Division. (2010). "Hydrologic Report 2009-2010". Retrieved July 16, 2014, from http://dpw.lacounty.gov/wrd/report/acrobat/Hydrologic%20Report%202009-2010.pdf

In Corridor District 1, stormwater is collected by a County owned 60″ line at the north-most portion of the Specific Plan along Long Beach Blvd. There is also a City owned 42″ RCP and a County owned 81″ RCP line that run parallel along the eastern edge of Veterans Memorial Park and drain from northwest to southeast. South of the southeastern edge of the park, they confluence into a single 90″ City pipe which turns to flow westward along Willow St.

Corridor District 2 is primarily composed of east to west running lines across Long Beach Boulevard with no significant drainage systems running north to south. There are three main systems that collect runoff and convey flows from east to west including a 93″ RCP within E Eagle St, a 60″ RCP within Hill St and a 54″ RCP within W 20th St.

Corridor District 3 is primarily served by one 48″ LACFCD line running east to west along 16th St.

In Medical District 4, stormwater runoff is collected by a network of drainage facilities that consolidates into a 54″ RCP that ultimately tie into the 90″ RCP that serves Corridor District 1.

Transit Node District 5 generally receives stormwater from Corridor District 1 to the north and Medical District 4 to the northeast and conveys this water southward into the 90″ City line that drains west on Willow St. Additional stormwater is contributed from a sub-area within Transit Node District 5 associated with Pine Ave via a 42″ RCP that ties into the 90″ system.

Transit Node District 6 is composed of a 48″ County line running westward along Pacific Coast Highway with several smaller tributary systems from County and City lines to the north and south.

In Transit Node District 7, stormwater drains north to south and is picked up in some smaller 12″ line distributed along Anaheim St and a slightly larger 24″ line near Anaheim St and Pine Ave.

For the conventional zoning area, the primary storm drain facility includes a 42″ County lines that runs east to west along W. 20th Street.

All runoff from the Midtown study area ultimately discharges into the Los Angeles River via three separate pump stations including the Cerritos Pump Station, Hill Street Pump Station and Willow Pump Station.

Table 2 summarizes the impervious conditions, the primary existing drainage facilities for each Development District and ownership (LB or LACFCD). Impervious conditions were analyzed using GIS infrared tools which can detect pervious and impervious area at a high degree of accuracy. See Figure 6 for Pervious versus impervious areas for the Midtown Project.

Table 2 Existing Drainage Facilities

Development District	*Acreage*	*Existing Imperviousness*	*Existing Drainage Facilities*
1	22	83%	90″ RCP Willow St (LACFCD) 42″ RCP Willow St (LB) 60″ RCP Long Beach Blvd (LACFCD) 30″ RCP (LB)
2	51	88%	93″ RCP E Eagle (LACFCD) 60″ RCP Hill St (LACFCD) 54″ RCP E 20th St (LACFCD)
3	20	83%	48″ RCP E 16th St (LACFCD)
4	63	79%	54″ RCP 28th St (LB)
5	44	87%	90″ RCP Willow St (LB)
6	20	90%	48″ RCP PCH (LACFCD)
7	19	90%	21″ RCP Anaheim St. (LB)
R Zone	4	81%	42″ RCP E. 20th St (LACFCD)

Notes:

a Source: City of Long Beach GIS Utilities Database and As-Builts provided by the City of Long Beach

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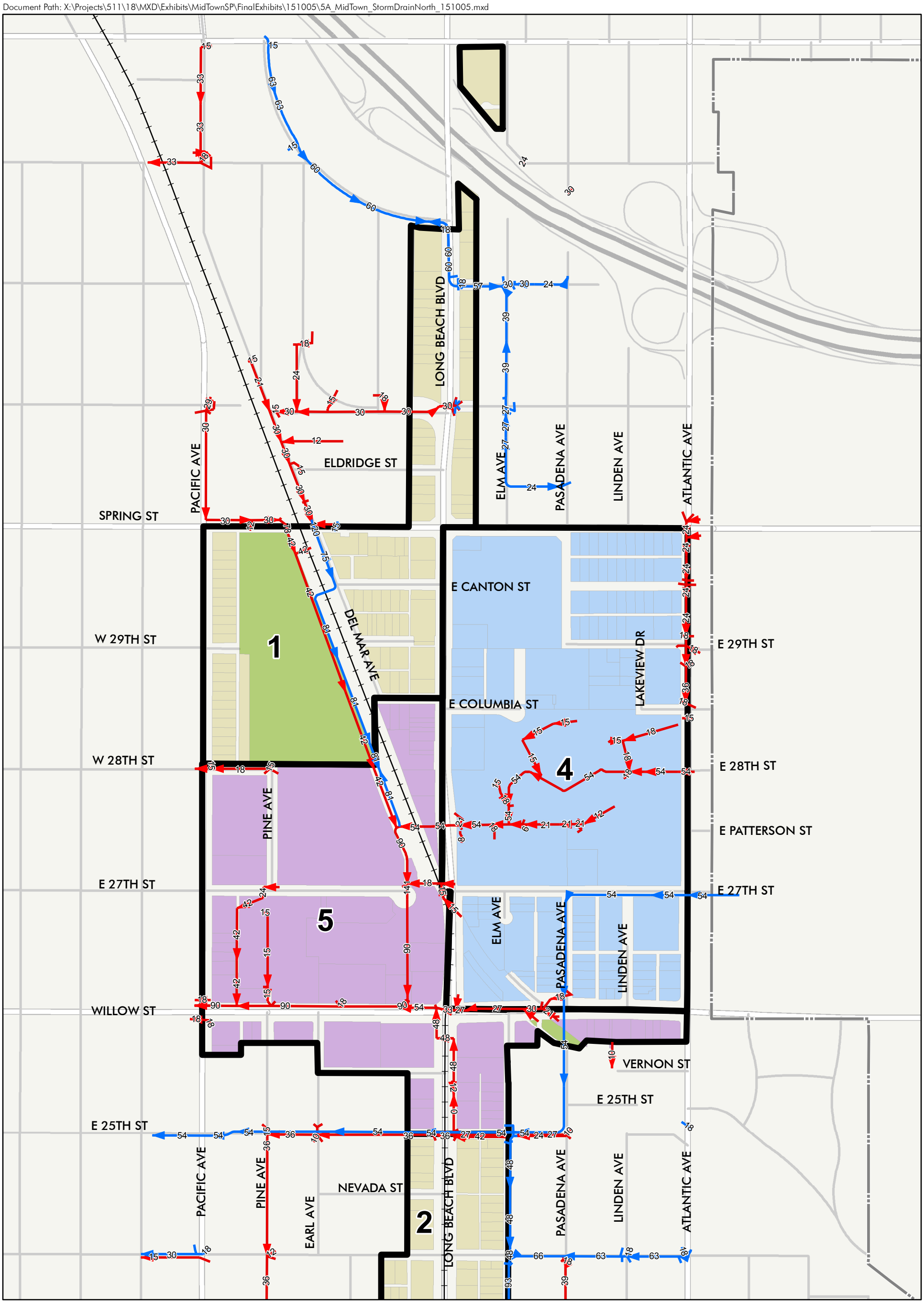

Midtown Specific Plan

City of Long Beach

Exhibit 5A

Existing Storm Drain Facilities North

Date: 10/6/2015

District Boundary

City of Long Beach Storm Drain Line w/ Flow Direction (Size)

LA County Flood Control Dist. Storm Drain Line w/ Flow Direction (Size)

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

0 250 500 1,000 Feet

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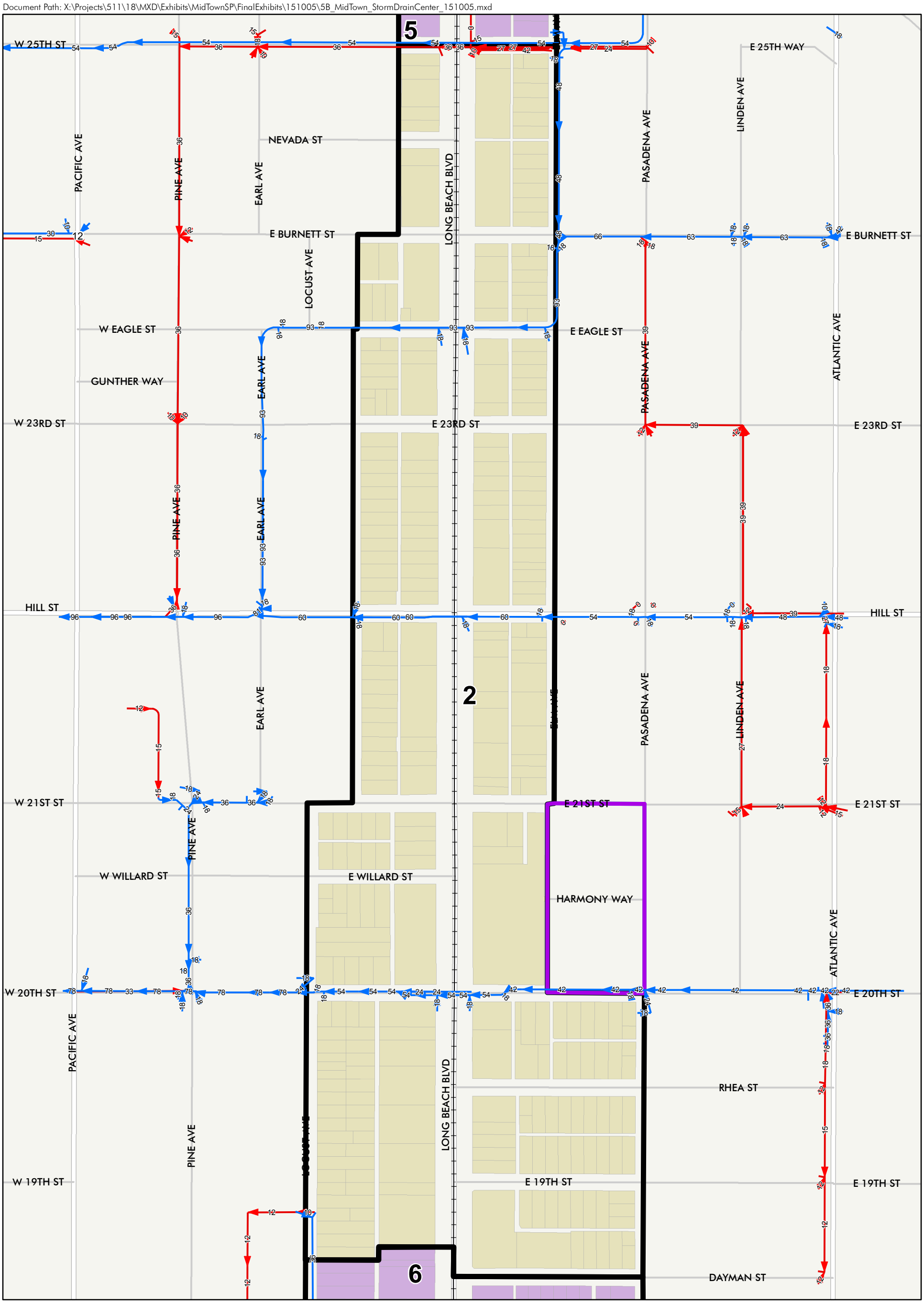

Midtown Specific Plan

City of Long Beach

Exhibit 5B

Existing Storm Drain Facilities Center

Date: 10/6/2015

District Boundary

City of Long Beach Storm Drain Line w/ Flow Direction (Size)

LA County Flood Control Dist. Storm Drain Line w/ Flow Direction (Size)

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

Residential Zoning

0 160 320 640 Feet

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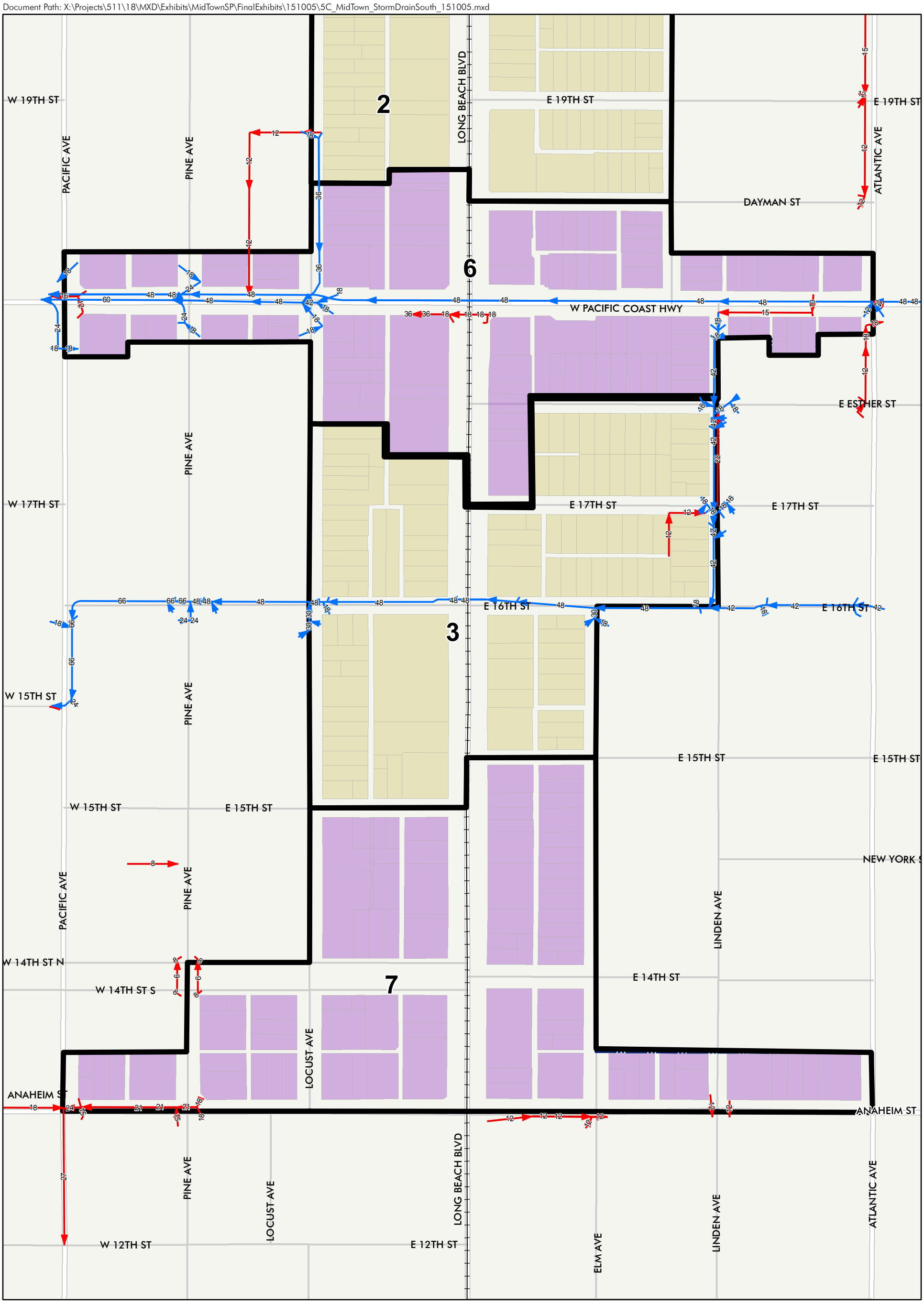

Midtown Specific Plan

City of Long Beach

Exhibit 5C

Existing Storm Drain Facilities South

Date: 10/5/2015

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District Boundary

City of Long Beach Storm Drain Line w/ Flow Direction (Size)

LA County Flood Control Dist. Storm Drain Line w/ Flow Direction (Size)

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

0 150 300 600 Feet

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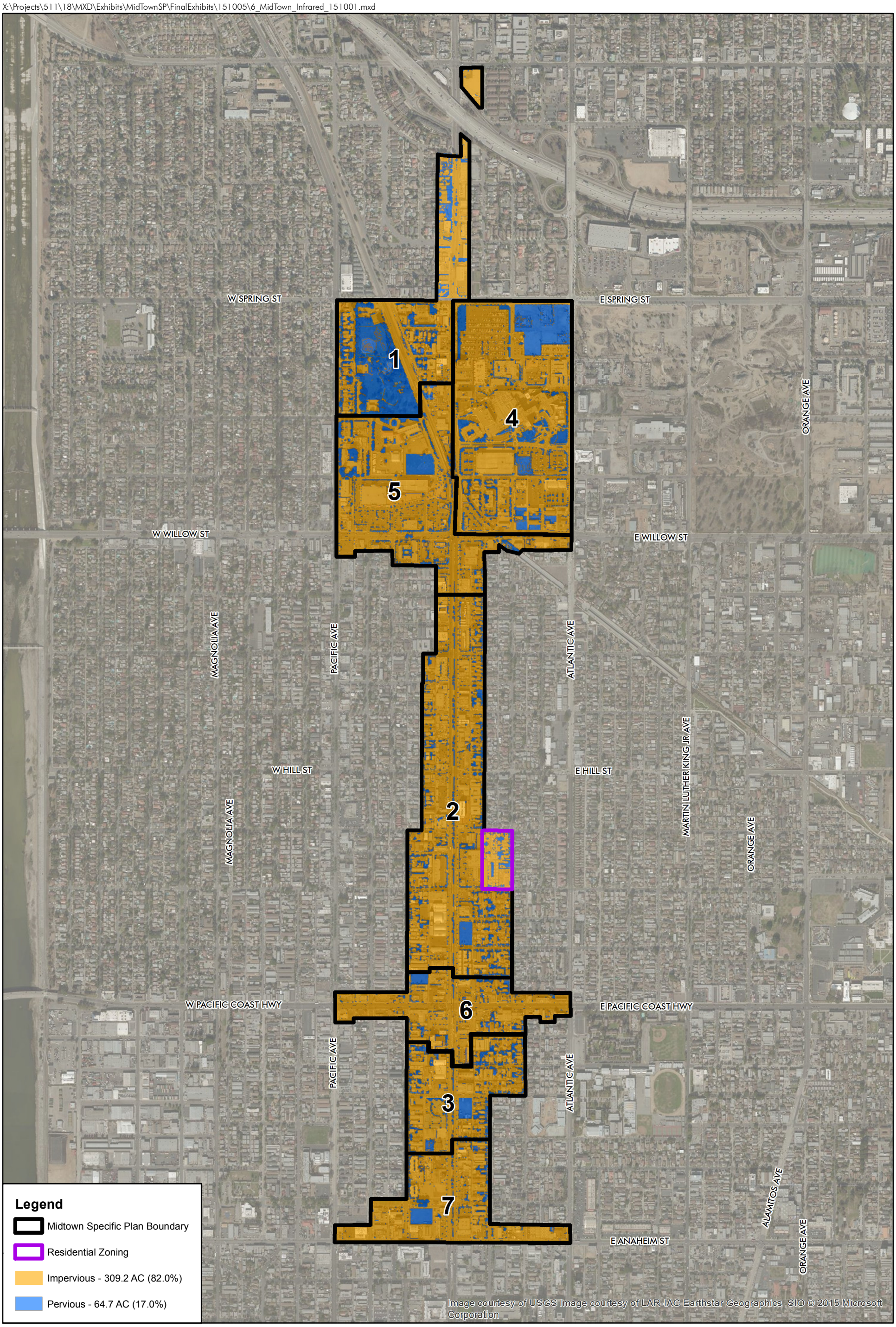

Midtown Specific Plan

City of Long Beach

Figure 6

Infrared Impervious/Pervious Condition

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Date: 10/5/2015

0 400 800 1,600 Feet

2.1.2 2005 City of Long Beach Master Plan of Drainage Update

Long Beach Modeled Stormwater System

The City of Long Beach is divided into thirty (30) major drainage basins. Within each major basin, sub-basins are identified which are served by 36" drainage pipes or larger. Sub-basins are further sub-divided into drainage areas contributing runoff to specific drainage nodes. The entire system is integrated into GIS and provides the City a useful management tool for the operation and maintenance of the storm drain system.

The Midtown Project falls within three of the major basins including Basin 4, 5 and 6. A brief summary of each of these major basins are provided below.

Basin 04 – This Basin is 810 acres and consists of 426 acres of residential, 176 acres of commercial, 140 acres of industrial, 56 acres of institutional and 12 acres of open space. Development Districts 3, 6 and 7 are located within this Basin. The primary drainage pattern is from east to west and includes two major storm drain systems. One of the major systems includes the county owned pump station (LA02) called Cerritos Station which includes drainage from the Midtown area. The pump station is located between 10th Street and 11th Street and has a maximum operating capacity of 117 cfs.

Basin 05 – This Basin is 546 acres and is made up of 434 acres of residential, 97 acres of commercial, 13 acres of institutional and 2 acres of open space. Development District 2 is primarily located within this Basin. The primary drainage pattern is from east to west and there is one major storm drain system within this Basin. All flows from this Basin including Midtown ultimately end up at the Hill Street Pump Station owned by the County (LA03). The pump station has a maximum capacity of 400 cfs.

Basin 06 – This Basin is 695 acres and is made up of 475 acres of residential, 125 acres of commercial, 73 acres of institutional, and 17 acres of open space. Development Districts 1, 4 and 5 are located within this Basin. The major drainage pattern is south and southeast and there are two major storm drain systems within this Basin. Both of these major storm drain systems converge at the City owned and operated Willow Pump Station (SD06) located at San Francisco Avenue and north of Willow Street.

2005 Master Plan of Drainage Update

In 2005, the Master Plan of Drainage was updated to evaluate the hydraulic capacity of the major storm drain systems within the City boundary including LACFCD facilities. The analysis included computation of the 10-year, 25-year and 50-year storm events and the capacity of the existing storm drain systems to determine where improvements are recommended. The analysis utilized a variety of information including invert elevations, ground surface elevations, length, slope, pipe size, type, drainage area and street conveyance capacity. The 10-year conveyance capacity was used as the threshold for determining if the existing drainage pipe needed upsizing. For example, if the 10-year peak flow discharge was determined to be 120 cfs and the capacity of the existing pipe was 100 cfs, the study identified the appropriate pipe size to accommodate 120 cfs.

See Appendix A for Long Beach Modeled Stormwater System Maps 10, 16 and 22 and the corresponding capacity evaluation calculations.

In addition to the 2005 Update, the Long Beach Memorial Medical Center Expansion Project EIR independently confirmed the 54″ City storm drain facility was adequately sized to accommodate the proposed development associated with the Medical Center Expansion and no upsizing of storm drain facilities were required.

Midtown Project Area Improvement Recommendations

Within the Midtown Project, the 2005 Master Plan of Drainage Update identified four areas of deficiency including two city lines within the Medical District 4 and two LACFCD facilities within Corridor District 2. A summary of the remainder of the storm drain system within the study area was deemed sufficient under existing conditions to convey the 10-year event. Table 3 summarizes the deficiencies.

Table 3 2005 Master Plan of Drainage Update Deficiencies

Long Beach Storm Drain Lines					
Segment ID	Pipe Size	Capacity	10-year Peak Flow	Recommended Pipe Size	Location
060220	27″ RCP	17.4 cfs	25 cfs	36″ RCP	Medical District 5
060225	30″ RCP	23.3 cfs	25 cfs	36″ RCP	Medical District 5
Los Angeles County Flood Control District Storm Drain Lines Corridor District 2 & Transit Node District 6 respectively					
Segment ID	Pipe Size	Capacity	10-year Peak Flow	Recommended Pipe Size	Location
040725	24″ RCP	12.9 cfs	18 cfs	36″ RCP	Corridor District 2
040020	48″ RCP	45.5 cfs	82 cfs	60″ RCP	Transit Node District 6

See Figure 7 for a map of the noted deficiencies within the Midtown Project area as identified by the 2005 Master Pan of Drainage Update. The improvements identified in the Update have not been implemented by the City of Long Beach or Los Angeles County Flood Control District (LACFCD) and there are no current plans for implementation.

2.1.3 Existing Floodplain Mapping

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for flood plain management and is designed to minimize flood damage within Special Flood Hazard Areas. The Federal Emergency Management Agency (FEMA) is the agency that administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1 percent change of flooding within a given year, also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

According to the Flood Zone determination covering the Midtown Project area, all of the 373 acres are located within Zone X which is considered outside the 100-year flood boundary and flood insurance is not required within the Midtown Project area. More specifically, approximately half of the area lies within Zone X 0.2 PCT Annual Chance Flood Hazard (500-year storm event) and approximately half lies within Zone X Area of Minimal Flood Hazard. Figure 8 shows the existing Flood Zones for the Midtown Project.

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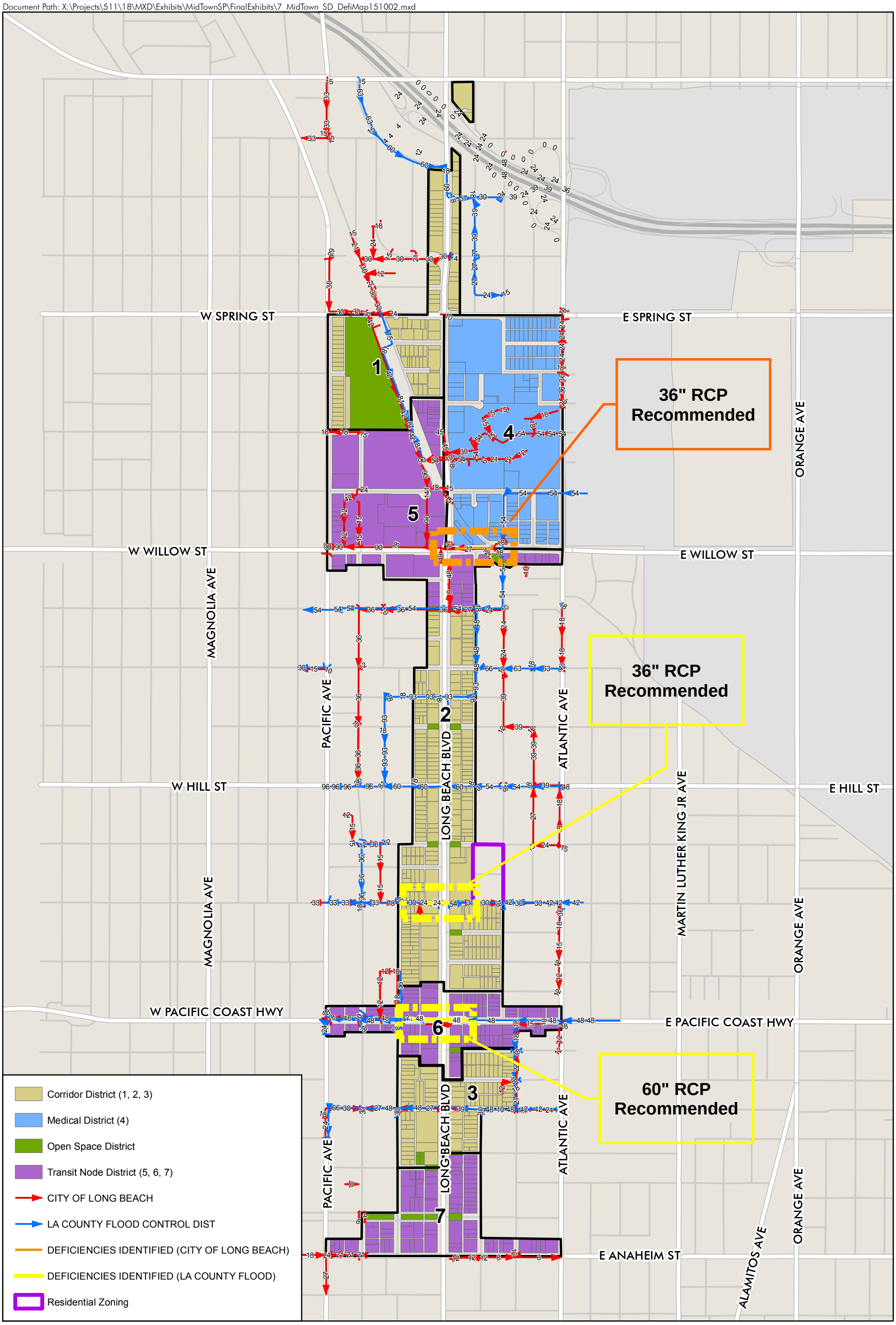

Midtown Specific Plan

City of Long Beach

Figure 7

2005 Master Plan of Drainage Update Deficiency Map

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full circle thinking

Date: 10/5/2015

0 500 1,000 2,000 Feet

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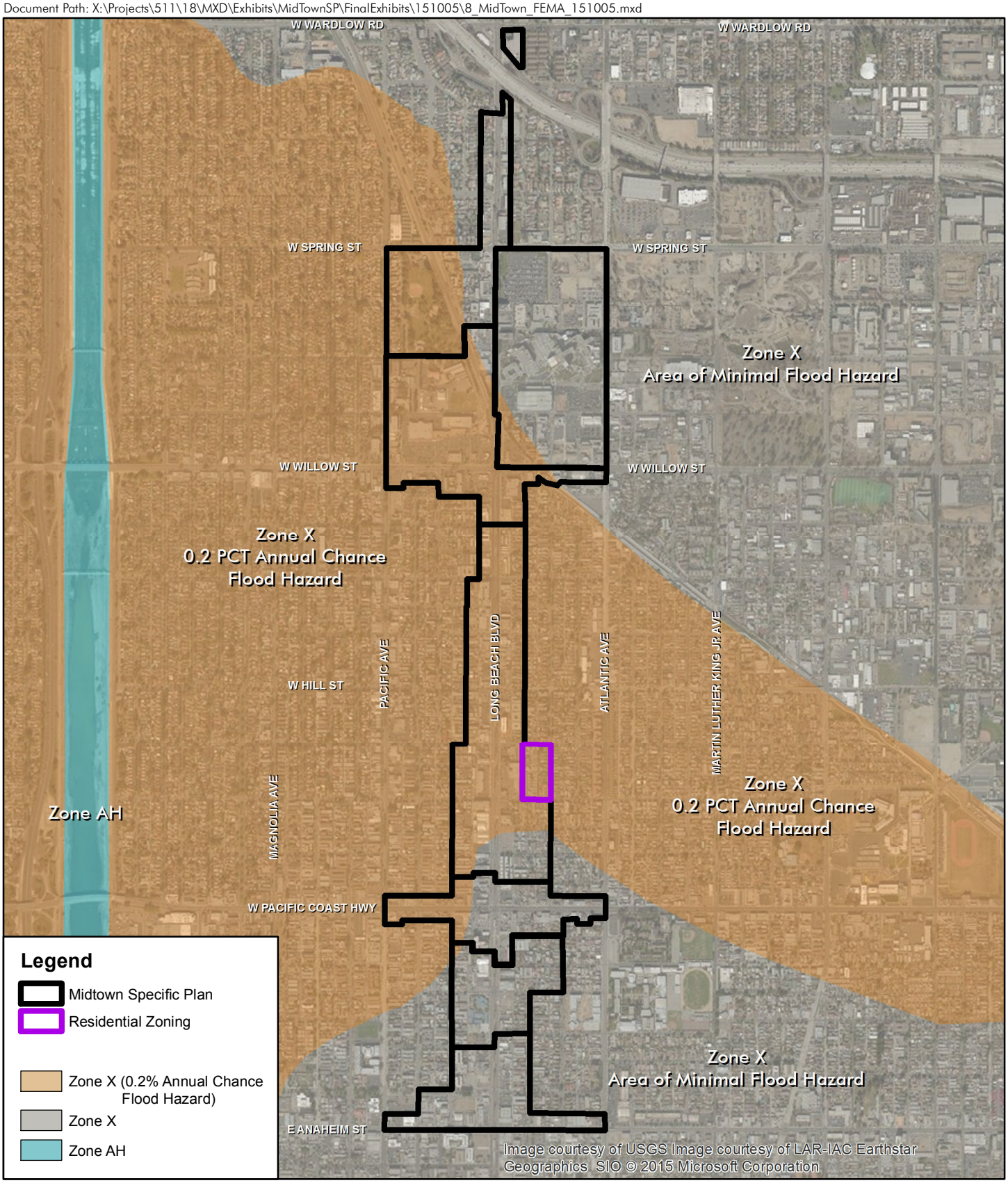

Midtown Specific Plan

City of Long Beach

Figure 8

Midtown Flood Zone Map

Date: 10/6/2015

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full circle thinking

0 800 1,600 3,200 Feet

2.2 SEWER & WASTEWATER INFRASTRUCTURE

The purpose of the sewer/wastewater evaluation is to determine if the existing sewer system can accommodate the proposed land use changes at the Specific Plan level. In order to determine that, an analysis of the existing sewer and water systems are required. The analysis is based on information provided by the City of Long Beach Water Department (LBWD).

2.2.1 Existing Sewer System and Facilities

The City of Long Beach provides sewer/wastewater service to most areas within the city limits. The service area contains approximately 765 miles of gravity sewers. The Midtown site falls within the service area of the Long Beach sewer system. All existing sewer mains within the project area are gravity-driven ranging in size from 4″ to 33″ diameter. All the sewer mains within the area ultimately discharge into a Los Angeles County Sanitation District (LACSD) trunk sewer crossing the Los Angeles River at W 16th St flowing west. This main trunk sewer runs to the Joint Water Pollution Control Plant in Carson, CA for treatment.

Figure 9A-C provide a summary of the existing City of Long Beach and LACSD sewer system facilities within the study area and brief descriptions are provided below.

Corridor District 1 is served by existing sewer lines that are all City owned and drain from north to south including two 8″ lines, a 10″ line and a 15″ line. Ultimately these lines tie into the 24″ LACSD trunk line along W 28th St draining west.

Corridor District 2 is composed primarily of 8″ lines that run north to south or south to north and ultimately tie into the LACSD 24″ trunk line in E 21st St running east to west or into the dual force mains (27″ & 30″) located in Pine Avenue that drain north to south.

Corridor District 3 is primarily served by a large 33″ trunk line that originates from Transit Note District 6. All sewer flows from this District ultimately discharge into the 33″ trunk line.

Medical District 4 is served by an extensive network of sewer systems including several 8″ lines, 15″, 18″ and 21″ line all owned and maintained by the City of Long Beach. All flows from Medical District 4 end up flowing into the 24″ LACSD trunk line within W 28th ST or into the same trunk line slightly further downstream within Pine Ave (30″ LACSD line).

Transit Node District 5 is served by a series of several 8″ lines that tie directly into the 30″ LACSD trunk line with Pine Ave.

Transit Node District 6 is served by a large 33″ LBWD trunk line that runs east to west in PCH and heads south through the District until reaching E 16th where it turns westerly.

Transit Node District 7 is served by a series of 8″ city lines that generally drain either north to Corridor District 3 or westerly towards larger sewer systems west of the project boundary.

The PD-29 / R Zone area is served by a series of city lines including an 8″ line within the northerly area and an 8″ line within the eastern area.

Table 4 summarizes the existing sewer facilities serving the Midtown Project area and Figure 9A –C provide a summary of their locations based on the City's GIS data.

Table 4 Existing Sewer Facilities

Development District	*Acreage*	*Existing Sewer Facilities*
1	22	(2) 8″ (LB) Veterans Park; Del Mar Ave 10″ (LACSD) Veterans Park 15″ (LBWD) Long Beach Blvd
2	51	(4) 8″ (LB) Long Beach Blvd 24″ (LACSD) E. 21st St
3	20	(3) 8″ (LB) 33″ (LB) E. 16th St
4	63	(7) 8″ (LB) Multiple streets 15″ (LB) Pasadena St 18″ (LB) E 27th St 21″ (LB) Columbia St
5	44	(5) 8″ (LB) Multiple streets 24″ (LACSD) Pine Ave 30″ (LACSD) Pine Ave
6	20	30″ (LB) PCH
7	19	(4) 8″ (LB) Multiple streets
R Zone	4	(2) 8″ lines (LBWD)

Notes:
[a] Source: City GIS Data obtained 2014

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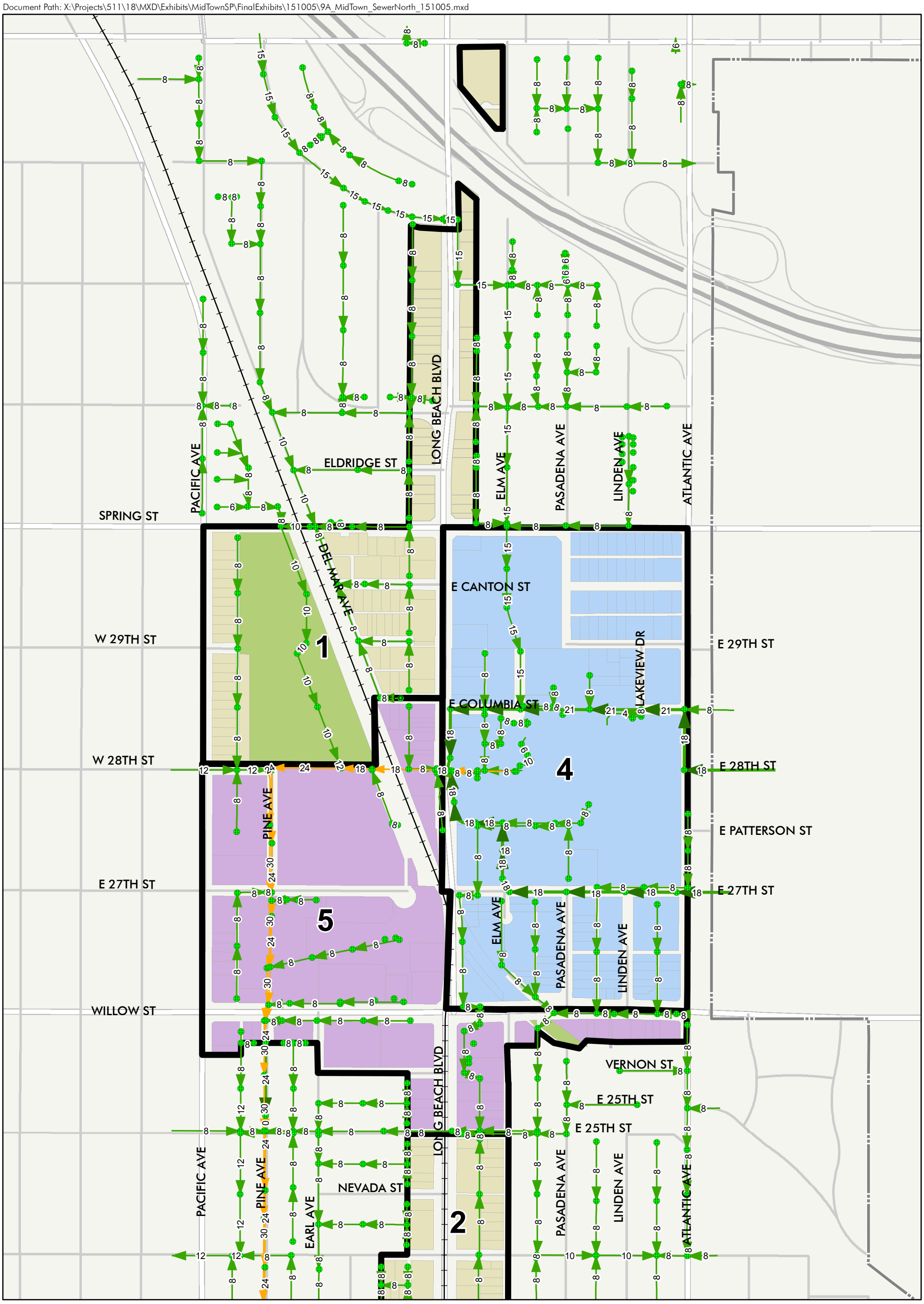

Midtown Specific Plan

City of Long Beach

Exhibit 9A

Existing Sewer Facilities North

Date: 10/6/2015

District Boundary

LBWD Sewer Line w/ Flow Direction (0-15" Diameter)

LBWD Sewer Line w/ Flow Direction (18-24" Diameter)

LACSD Sewer Line w/ Flow Direction

Sewer Manholes

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

0 250 500 1,000 Feet

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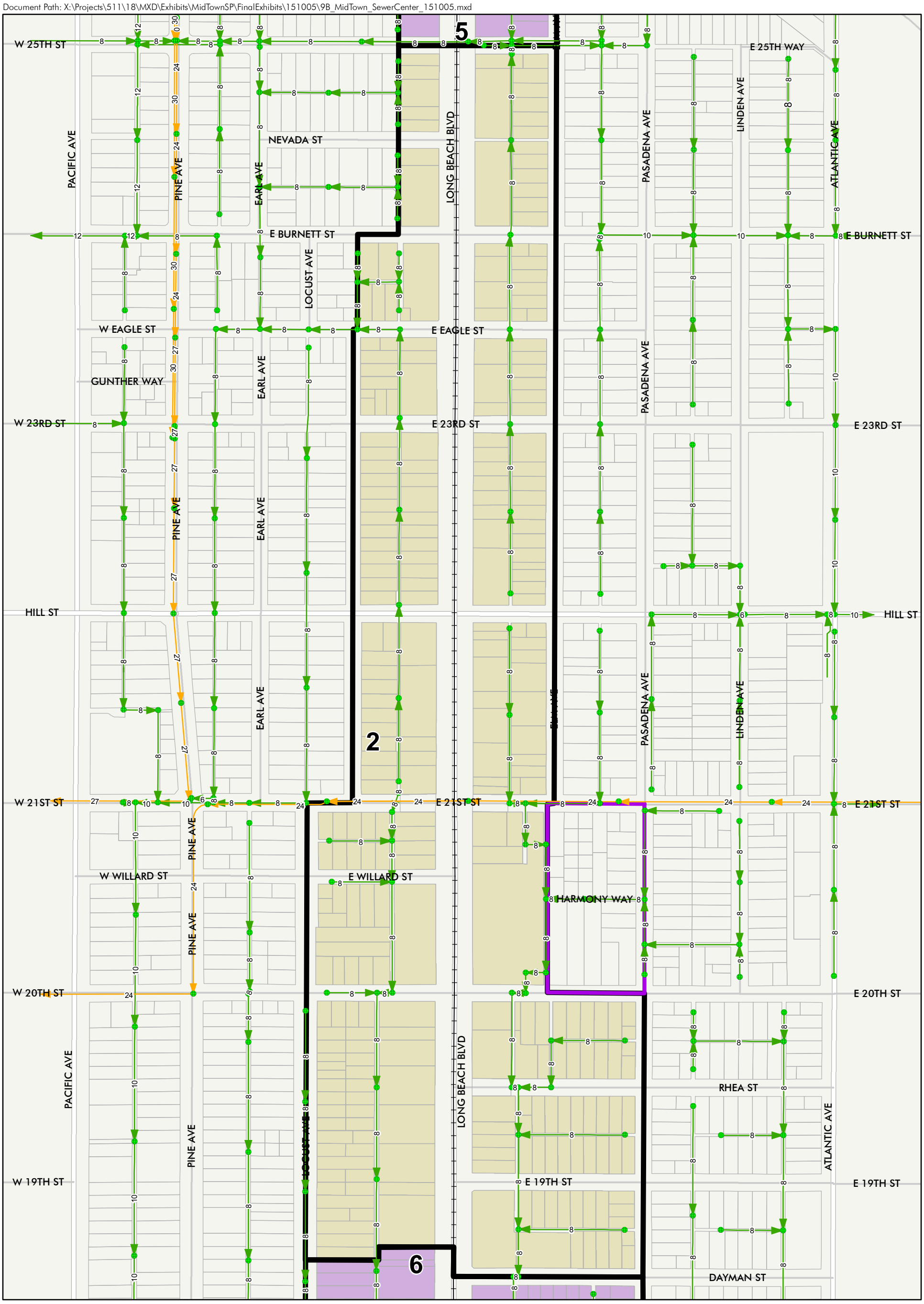

Midtown Specific Plan

City of Long Beach

Exhibit 9B

Existing Sewer Facilities

North

Date: 10/6/2015

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full circle thinking

District Boundary

LBWD Sewer Line w/ Flow Direction (0-15" Diameter)

LBWD Sewer Line w/ Flow Direction (18-24" Diameter)

LACSD Sewer Line w/ Flow Direction

Sewer Manholes

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

Resdiential Zoning

0 160 320 640 Feet

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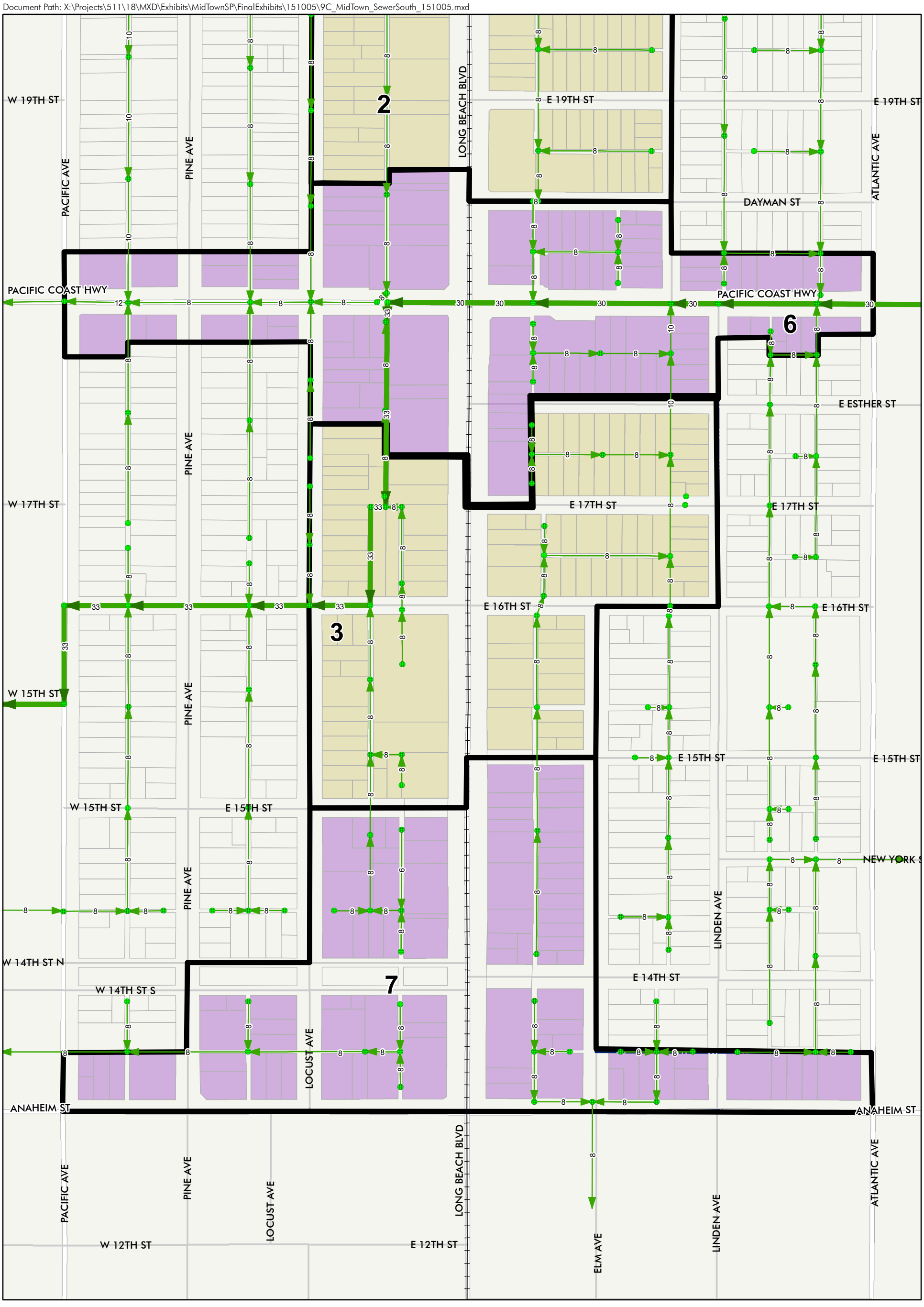

Midtown Specific Plan

City of Long Beach

Exhibit 9C

Existing Sewer Facilities South

Date: 10/6/2015

District Boundary

LBWD Sewer Line w/ Flow Direction (0-15" Diameter)

LBWD Sewer Line w/ Flow Direction (18-24" Diameter)

LACSD Sewer Line w/ Flow Direction

Sewer Manholes

Corridor District (1, 2, 3)

Medical District (4)

Open Space District

Transit Node District (5, 6, 7)

0 150 300 600 Feet

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2.2.2 Existing Sewer Flows per Planning Area

The City of Long Beach's 2010 Urban Water Management Plan and LACSD provide sewer generation factors for estimating existing sewer flows based on existing land use. For each district, sewer generation was estimated to provide a baseline condition and to allow for comparisons against proposed land use changes under the Project. Acreages of the existing development (i.e., residential, commercial, office, medical, etc.) and number of dwelling units were utilized along with their corresponding flow factors to develop existing condition flow rates. The projected flows in Table 5 were compared with the City's sewer system model which is calibrated against measured flow rates collected throughout the sewer system. The projected flows were consistent with the existing sewer model conditions which included all of the medical uses including hospital land uses. Therefore, hospital bed daily water usage was not separated out as a separate generation factor and was already accounted for within the "medical" land uses.

Table 5 provides a summary of the existing wastewater flows for each district. Details are provided in Appendix B.

Table 5 Existing Condition Average Daily Sewer Flows

Development District	*Acreage*	*Number of Dwelling Units*	*Non-Residential SF[1]*	*Average Sewer Flow (GPD)[2]*
1	22	219	64,552	72,958
2	51	827	565,342	293,798
3	20	341	135,686	125,910
4	63	103	456,546	155,630
5	44	34	774,939	172,409
6	20	127	196,575	85,121
7	19	232	233,928	89,23
R Zone	4	76	212,112	38,629
Total	**243**	**1,959**	**2,639,679**	**1,033,728**

1. Non-Residential includes commercial, retail and institutional land uses
2. Accounts for hospital beds & motel rooms within each District as applicable

Notes:
GPD gallons per day SF square feet

Under the existing conditions, average daily sewer flows are estimated at 1.03 million gallons per day (MGD). Development of the existing condition average daily sewer flows will allow for comparison against the proposed land use average daily sewer flows in Section 4.2.1.

2.2.3 2013 Sewer Master Plan Update & Existing Capacity Assessment

The LBWD prepared a 2013 Sewer Master Plan Update with an overview of the sewer service area, the existing conditions of the sewer system lift stations, and an evaluation of the sewer system capacity under existing conditions. The 2013 Update included refinement of a city-wide hydraulic model to evaluate the sewer lift stations and identify any deficiencies within the existing system and focused on 12" lines or larger. For the Midtown Specific Plan, LBWD utilized the updated sewer system model to look specifically at the existing sewer system supporting the Midtown Project and evaluate existing capacity of the system. In addition, the model was expanded to include additional sewer lines specific to the Midtown Project area including specific 8" sewer lines that were not previously analyzed. The model took into account diurnal flow patterns associated with land use and maximum peak flow scenarios. From the modeling results, maximum flow (d) within the pipe over the depth (D) ratio was selected which is a common means to assess the capacity of a pipe (d/D ratio). In accordance with LBWD sewer design criteria, the following d/D design standards are required. This serves as a useful standard for determining existing capacity assessment.

- 8" - 12": d/D = 0.50
- 15" or greater: d/D = 0.75

Overall, the majority of the sewer system serving the Midtown Project is within design capacity (< 0.5 d/D or <0.75 d/D dependent upon size) under existing conditions. There are a few segments identified that are currently flowing above the design capacity as noted by their Manhole ID designation below in Table 6. Such findings do not warrant immediate replacement/upsizing but rather suggest that certain sewer lines require additional study (i.e. project specific flow monitoring). Project specific studies should occur prior to the implementation of redevelopment projects occurring within the tributary area. There are no known segments flowing **significantly** above the design capacity (>0.75 d/D). The results of this existing conditions analysis is consistent with the 2013 Sewer Master Plan Update which did not identify any deficiencies within the main sewer lines of the project area. Table 6 provides a summary of the existing sewer lines above design capacity and Figure 10 identifies the specific locations of these lines.

Table 6 Existing Sewer Capacity Deficiencies with Midtown Project

Development District	*Modeled Sewer Pipes*	*Design Capacity*	*Manhole ID's*	*Sewer Pipe Length*
5	8" parallel lines on E. 25th St	0.5 – 0.75 d/D	H18-SMH-047 H18-SMH-051	151 ft
6	10" line near Pine Ave	0.5 - 0.75 d/D	HI5-SMH-005 H14-SMH-022	404 ft
6	10" line on Pasadena Ave	0.5 – 0.75 d/D	H14-SMH-050 H15-SMH-049	164 ft

Notes: Conventional Zoning Area and Corridor District 2 sewage flows are accounted for in Medical District 4 and Transit Node District 6 respectively. Transit Node District Node 7 consists of only 8" lines not analyzed by LBWD.
Source:

In addition to the City's sewer hydraulic model evaluation, there are also areas of Midtown that connect directly into LACSD trunk lines. More specifically, Transit Node District 5 contains a

series of 8″ pipes that tie directly into the LACSD 24″ and 30″ trunk lines that flow south in Pine Ave. As part of the Midtown analysis, LACSD was contacted to identify if there are known deficiencies within the existing trunk lines in Pine Avenue. LACSD provided 2013 maximum flow rates (gpd) and design capacity (gpd) for the trunk lines in Pine Avenue. Based on the data, the design capacity well exceeds the maximum flow rates demonstrating the current trunk lines are sufficiently sized for existing conditions and no deficiencies exist.

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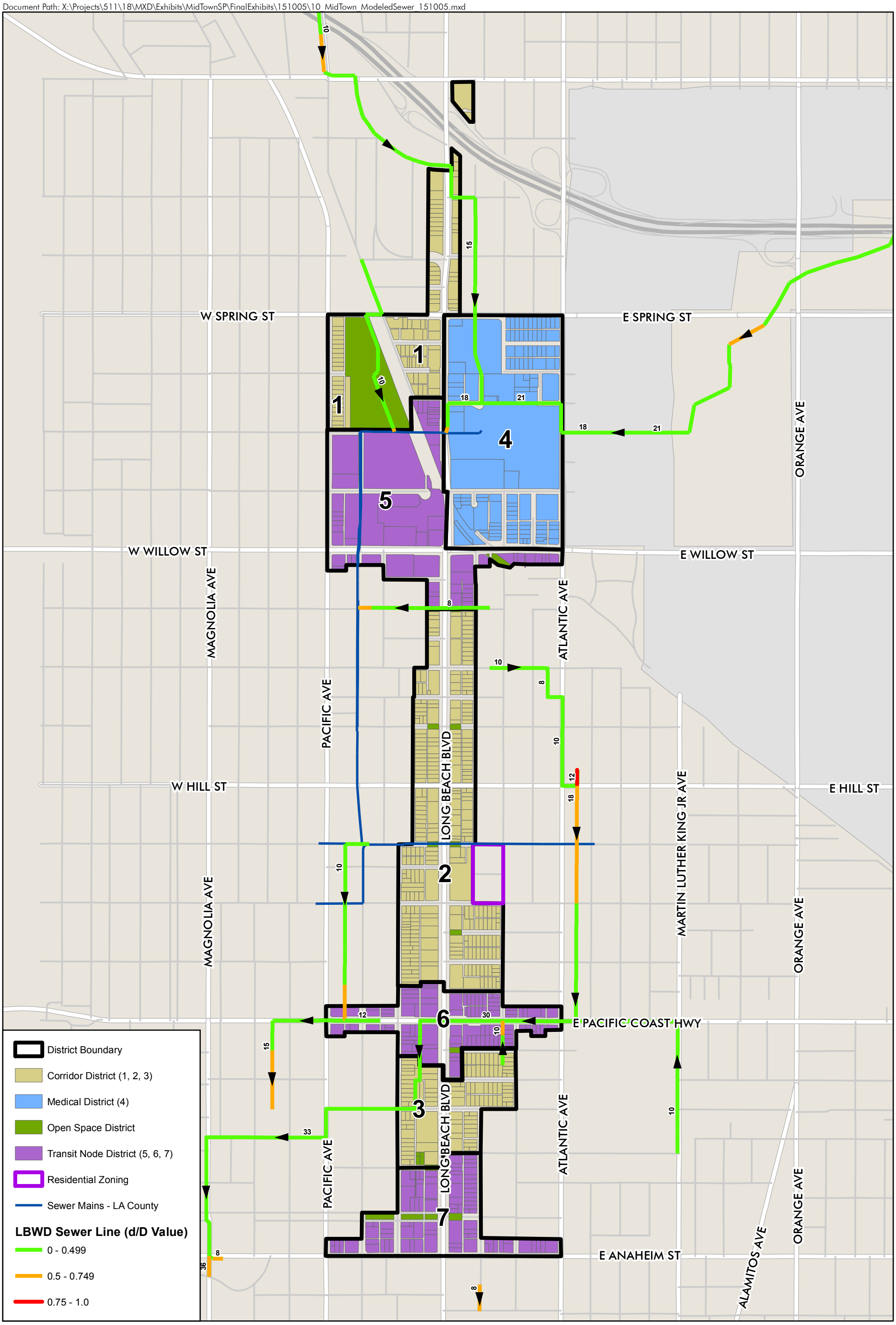

Midtown Specific Plan

City of Long Beach

Figure 10

Existing Sewer Capacity (d/D Evaluation for City Sewer Model)

Date: 10/6/2015

0 500 1,000 2,000 Feet

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2.3 WATER DISTRIBUTION SYSTEM

The purpose of the water system evaluation is to describe and evaluate the existing status of the water distribution system and identify any known deficiencies or improvements required to support existing uses. The analysis is based on information provided by the City of Long Beach.

2.3.1 Existing Water System

The City of Long Beach is the water service provider and distributes water to the City's residents and businesses. LBWD receives water from three main sources: imported water from Metropolitan Water District (MWD), groundwater pumped and treated from city wells, and recycled water. LBWD operates the largest groundwater treatment plant in the United States and has the capability to treat up to 62.5 million gallons per day. MWD is Long Beach's wholesale supplier and the primary source of imported water originates from the Colorado River and the State Water Project.[4] Wastewater for reuse in Long Beach is treated to tertiary levels at the Long Beach Water Reclamation Plant which produces 18-25 MGD. There are no recycled water delivery lines in the Midtown Project area.

Under the existing conditions, the Development Districts are served by a variety of 2" to 30" lines (e.g., cast iron, ductile iron, and asbestos cement) located in the public streets, alley ways, parks, and parking lots. A summary of the primary water lines within each Development District are provided below.

Table 7 Existing Water Facilities

Development District	*Acreage*	*Existing Water Facilities*
1	22	(3) 6":Veterans Park; Canton St, E 29th 12" : Long Beach Blvd
2	51	(2)12": Hill St, E Burnett St 8": E 21st St.
3	20	8": E 16th St
4	63	(4)8": E 29th St, E Columbia St, E Patterson St, E 27th St.
5	44	6": Pine Ave 8": Albertson's Shopping Center Access Road
6	20	20": PCH
7	19	(2) 8": Alamo Court, N Palmer Court
R Zone	4	(2) 8" lines

Notes:
b Source: City GIS Data obtained 2014

See Figure 11A –C for locations of the existing water facilities.

[4] Long Beach Water Department. (2011, June). 2010 Urban Water Management Plan.

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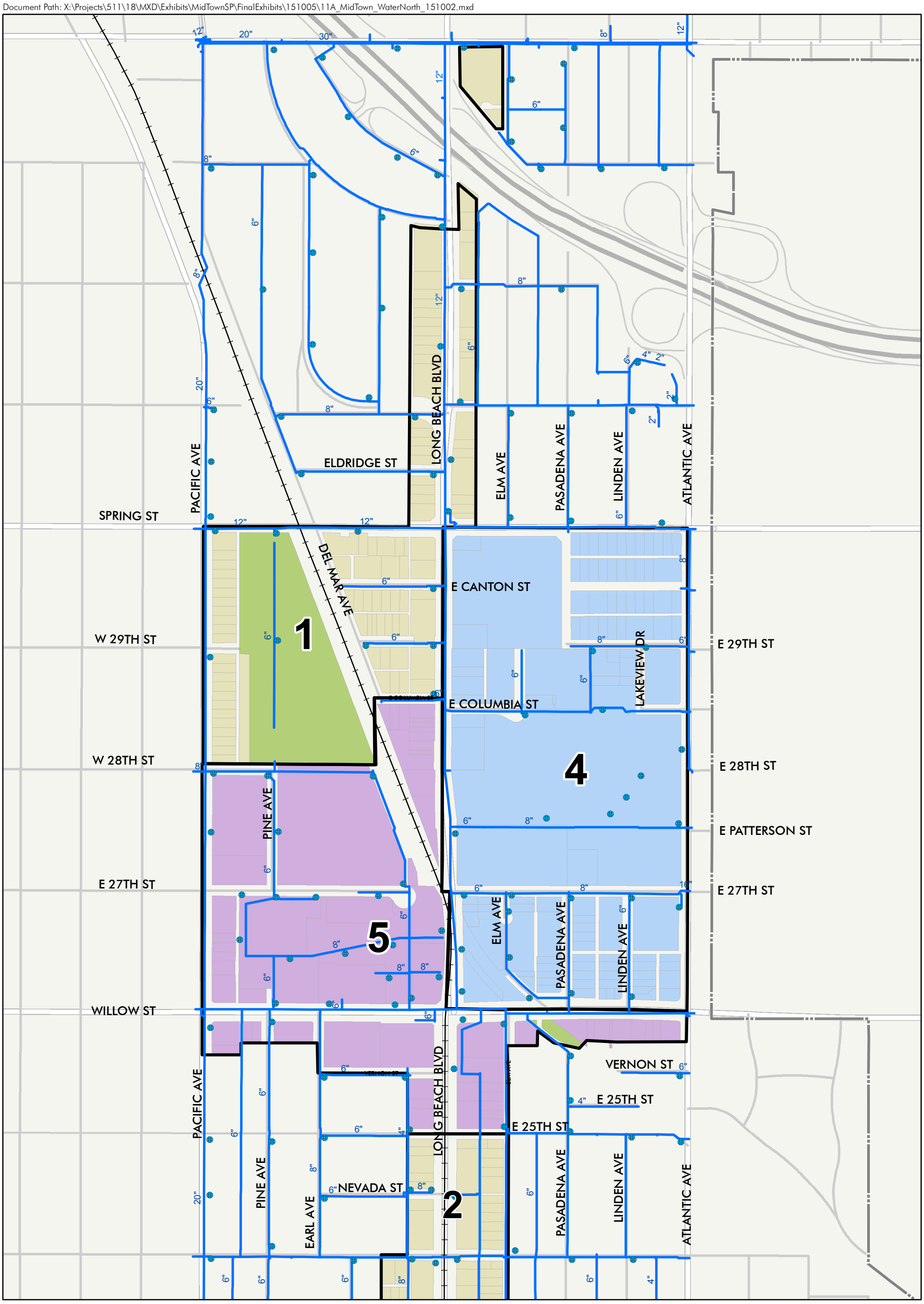

Midtown Specific Plan

City of Long Beach

Exhibit 11A
Existing Water Facilities
North

Date: 10/6/2015

District Boundary
Water Main (Size)
Water Hydrants
Corridor District (1, 2, 3)
Medical District (4)
Open Space District
Transit Node District (5, 6, 7)

0 250 500 1,000 Feet

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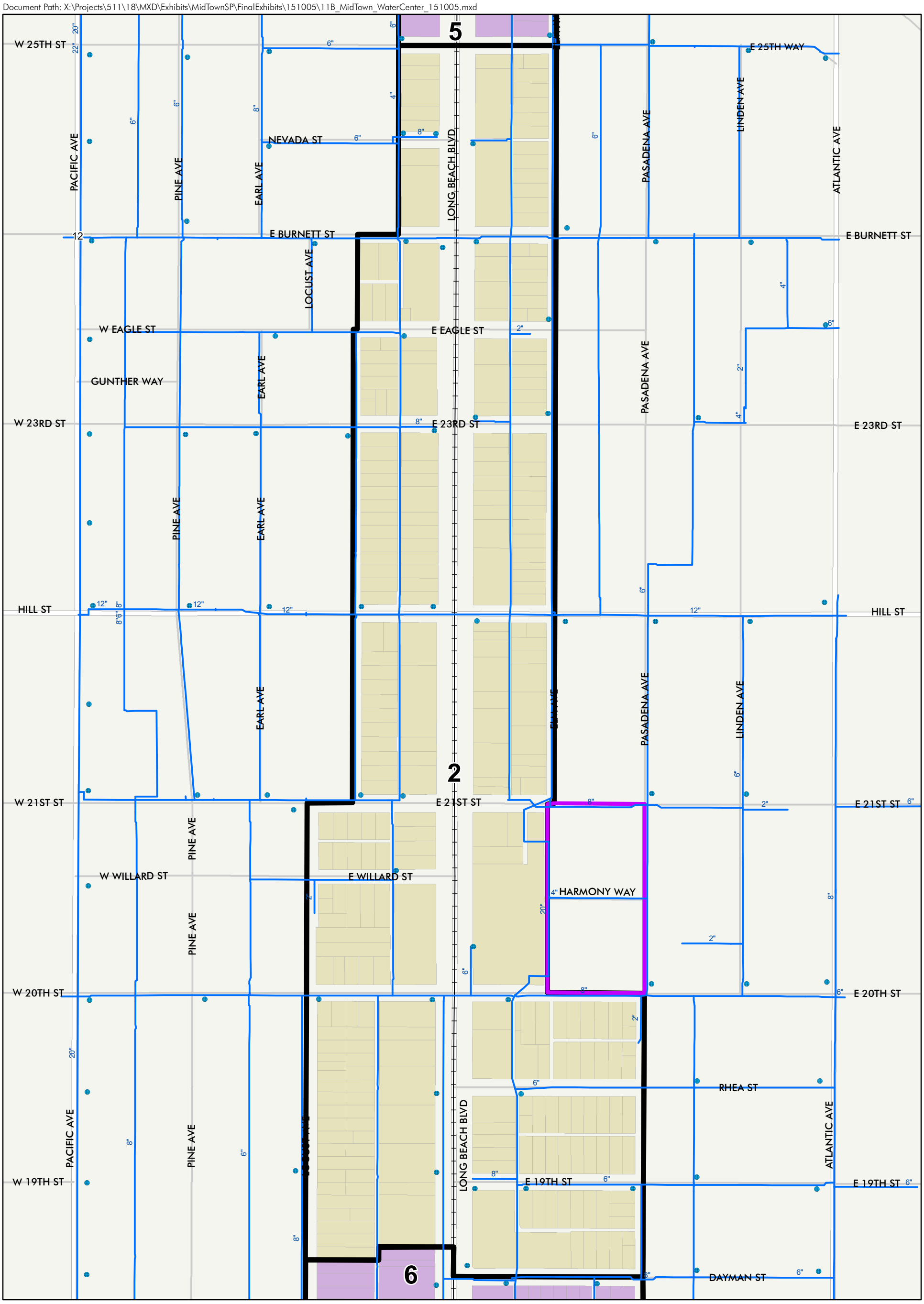

Midtown Specific Plan

City of Long Beach

Exhibit 11B
Existing Water Facilities
Center

Date: 10/6/2015

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District Boundary
Residential Zoning
Water Main (Size)
Water Hydrants
Corridor District (1, 2, 3)
Medical District (4)
Open Space District
Transit Node District (5, 6, 7)

0 160 320 640 Feet

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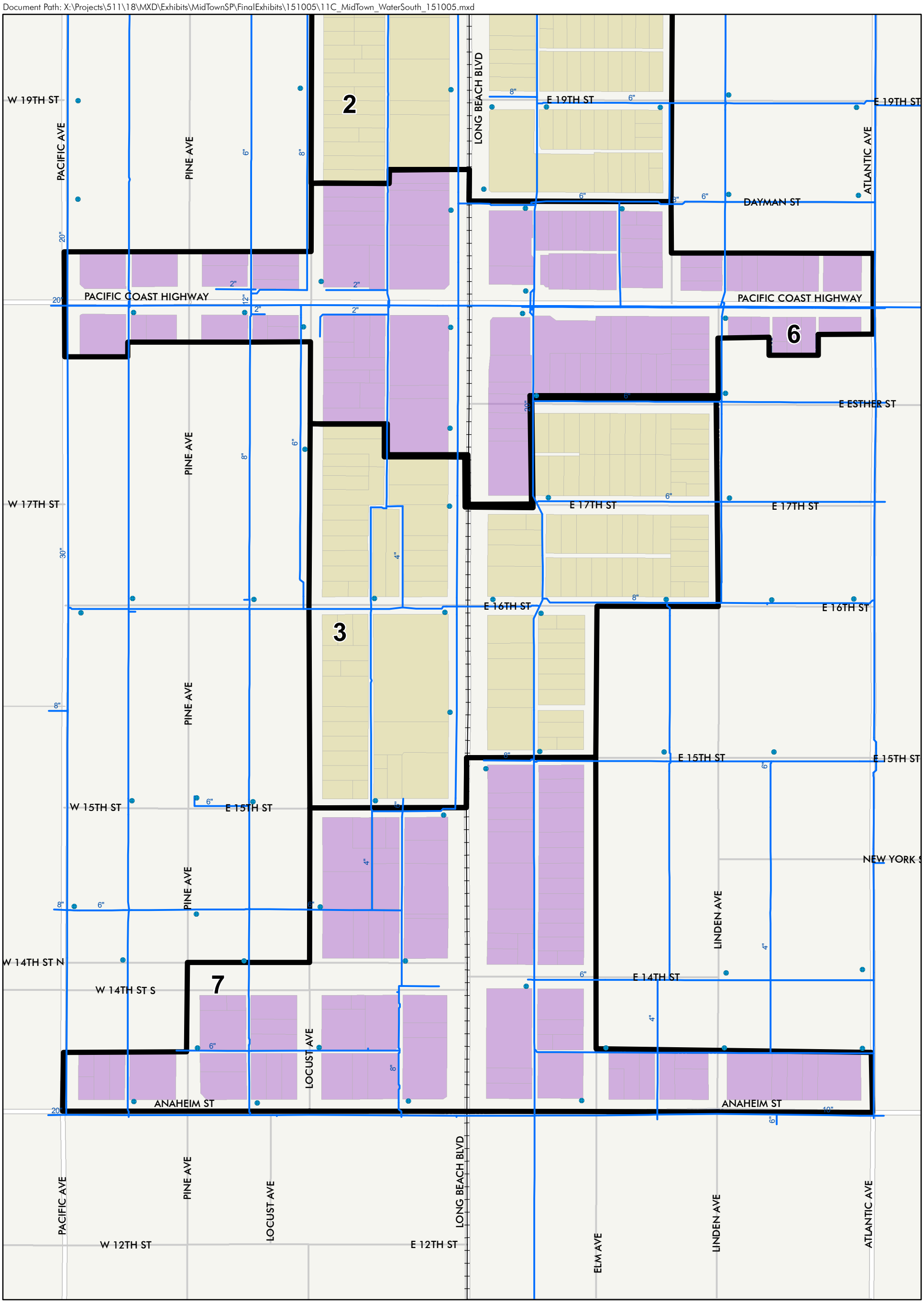

Midtown Specific Plan

City of Long Beach

Exhibit 11C

Existing Water Facilities South

Date: 10/6/2015

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District Boundary
Water Main (Size)
Water Hydrants
Corridor District (1, 2, 3)
Medical District (4)
Open Space District
Transit Node District (5, 6, 7)

0 150 300 600 Feet

The LBWD Water Capital Improvement Plan includes an ongoing water line maintenance program to replace longstanding or deteriorated water pipes and continue its replacement of aging cast iron mains with ductile iron pipe. The criteria for replacing water mains are based on their age, flow, pressure and main break history. In the Midtown study area, there is a total of 13 projects that have been completed within the last 15 years or are scheduled to be replaced within the next 2-3 years. A brief summary of the upgrades are provided in Table 8 below.

Table 8 Recent and Planned Water Line Upgrades Midtown Area

Development District	*Water Line Size*	*Year Implemented*
1	6″ (2)	Planned within 2-3 years
2	20″	Completed in 2000
3	N/A	N/A
4	6″ (4), 8″ (2)	6″ (2) Completed in 2013/2014 8″ (1) Completed in 2009 6″ (2) Planned within 2-3 years 8″ (1) Planned within 2-3 years
5	6″ (1), 8″ (1)	Planned within 2-3 years
6	6″ (1), 8″ (1)	Completed in 2011
7	N/A	N/A
R Zone	N/A	N/A
Total	13 Projects	

Source: Long Beach Water Department

2.3.2 Existing Water Demand per District

For each district, water demand estimates were developed to provide a baseline condition and to allow for comparisons against proposed land use changes. Similar to the sewer/wastewater analysis, acreages of development (i.e., commercial, industrial, etc.) and number of dwelling units for existing and proposed conditions were utilized along with their corresponding flow factors to identify changes in water demand. The 2010 Urban Water Management Plan (June 2011) was used to calculate the most up to date water demands and supplemented by Los Angeles County data if specific land use water generation numbers were not available. Table 9 provides a summary of the existing conditions water demand for each planning district. The projected flows in Table 9 were compared with the City's water system model which is calibrated against measured flows and measured pressure collected throughout the water system. The projected flows were consistent with the existing water model conditions which included all of the medical uses including hospital land uses. Therefore, hospital bed daily water usage was not separated out as a separate generation factor and was already accounted for within the "medical" land uses. Detailed calculations are provided in Appendix C.

Table 9 Existing Condition Average Daily Water Demand

Development District	*Acreage*	*Number of Dwelling Units*	*Non-Residential SF*[1]	*Average Water Demand (GPD)*[2]
1	22	219	64,552	73,851
2	51	827	565,342	292,500
3	20	341	135,686	125,983
4	63	103	456,546	178,866
5	44	34	774,939	200,826
6	20	127	196,575	92,528
7	19	232	233,928	88,827
R Zone	4	76	212,112	41,286
Total	243	*1,959*	2,639,679	1,094,667

1. Non-Residential includes commercial, retail and institutional land uses
2. Accounts for hospital beds & motel rooms within each District as applicable

Notes:
GPD gallons per day SF square feet

Under the existing conditions, average daily flows are estimated at 1.095 MGD.

As part of the existing conditions analysis, LBWD reviewed their existing hydraulic water model specific to the Midtown Project area. The model did not identify any deficiencies or fire flow issues within or around the Midtown area. In addition, no major water infrastructure improvements are planned for the area beyond the standard maintenance and replacement program currently being implemented.

2.3.3 2010 Urban Water Management Plan and Recycled Water Master Plan

The 2010 Urban Water Management Plan was produced as a result of an ongoing 5-year comprehensive planning process that produces reports every 5 years that estimate water supplies and demand for 25 years into the future. The 2010 Urban Water Management Plan evaluates the status of the existing water supply system, future growth conditions, and identifies opportunities to expand recycled water service areas.

In the Midtown Project area, Veterans Park Community Center (within Veterans Park) and Memorial Medical Center are identified as two large potential recycled water customers, along with about 20 other small potential recycled water customers, by the Long Beach Recycled Water Master Plan (2010). There are no existing recycled water pipelines near the Midtown Project area, although a 6" line that would service only Memorial Medical Center is proposed under

the “Alternate Development and Evaluation” section of the Recycled Water Master Plan. This project is not listed under a list of “Most Probable Projects”.

2.4 WATER QUALITY

2.4.1 Regulatory Framework

Clean Water Act

Controlling pollution of the nation's receiving water bodies has been a major environmental concern for more than three decades. Growing public awareness of the impacts of water pollution in the United States culminated in the establishment of the federal Clean Water Act[5] (CWA) in 1972, which provided the regulatory framework for surface water quality protection.

The United States Congress amended the CWA in 1987 to specifically regulate discharges to waters of the US from public storm drain systems and storm water flows from industrial facilities, including construction sites, and require such discharges be regulated through permits under the National Pollutant Discharge Elimination System (NPDES).[6] Rather than setting numeric effluent limitations for storm water and urban runoff, CWA regulation calls for the implementation of Best Management Practices (BMPs) to reduce or prevent the discharge of pollutants from these activities to the Maximum Extent Practicable (MEP) for urban runoff and meeting the Best Available Technology Economically achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) standards for construction storm water. Regulations and permits have been implemented at the federal, state, and local level to form a comprehensive regulatory framework to serve and protect the quality of the nation's surface water resources.

In addition to reducing pollution with the regulations described above, the CWA also seeks to maintain the integrity of clean waters of the United States – in other words, to keep clean waters clean and to prevent undue degradation of others. As part of the CWA, the Federal Antidegradation Policy [40 CFR Section 131.12] states that each state "shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy…" [40 CFR Section 131.12(a)]. Three levels of protection are defined by the federal regulations:

1. Existing uses must be protected in all of the Nation's receiving waters, prohibiting any degradation that would compromise those existing uses;
2. Where existing uses are better than those needed to support propagation of aquatic wildlife and water recreation, those uses shall be maintained, unless the state finds that degradation is "…necessary to accommodate important economic or social development" [40 CFR Section 131.12(a)(2)]. Degradation, however, is not allowed to fall below the existing use of the receiving water; and
3. States must prohibit the degradation of Outstanding National Resource Waters, such as waters of National and State parks, wildlife refuges, and waters of exceptional recreation or ecological significance.

Porter-Cologne Water Quality Act

In the State of California, the State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Boards (RWQCBs) have assumed the responsibility of implementing US EPA's NPDES Program and other programs under the CWA such as the Impaired Waters

[5] Also referred to as the Federal Water Pollution Control Act of 1972.
[6] CWA Section 402(p).

Program and the Antidegradation Policy. The primary quality control law in California is the Porter-Cologne Water Quality Act (Water Code Sections 13000 et seq.). Under Porter-Cologne, the SWRCB issues joint federal NPDES Storm Water permits and state Waste Discharge Requirements (WDRs) to operators of municipal separate storm sewer systems (MS4s), industrial facilities, and construction sites to obtain coverage for the storm water discharges from these operations.

Basin Plan for the Los Angeles Region

In addition to its permitting programs, the SWRCB, through its nine RWQCBs, developed Regional Water Quality Control Plans (or Basin Plans) that designate beneficial uses and water quality objectives for California's surface waters and groundwater basins, as mandated by both the CWA and the state's Porter-Cologne Water Quality Control Act. Water quality standards are thus established in these Basin Plans and provide the foundation for the regulatory programs implemented by the state. The Los Angeles RWQCB's Basin Plan, which covers the Midtown Project area, specifically designates beneficial uses for surface waters and ground waters, (ii) sets narrative and numerical objectives that must be met in order to protect the beneficial uses and conform to the state's antidegradation policy, and (iii) describes implementation programs to protect all waters in the Region.[7] In other words, the Los Angeles RWQCB Basin Plan provides all relevant information necessary to carry out federal mandates for the antidegradation policy, 303(d) listing of impaired waters, and related Total Maximum Daily Loads (TMDLs), and provides information relative to NPDES and WDR permit limits.

CWA 303(d) List of Water Quality Limited Segments

Under Section 303(d) of the CWA, states are required to identify water bodies that do not meet their water quality standards. Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL.

Storm water runoff from the Midtown Project area ultimately discharges into the Los Angeles River to the west of the project site. The Los Angeles River ultimately outlets into the Los Angeles River Estuary (Queensway Bay) about 3-4 miles south of Midtown discharge points and ultimately to the Pacific Ocean. According to the 2010 303(d) list of Water Quality Limited Segments published by the SWRCB, the Los Angeles River Reach 1 is listed as impaired for ammonia, cadmium, coliform bacteria, dissolved copper, cyanide, diazinon, lead, nutrients, trash, dissolved zinc, and pH. In addition, the Los Angeles River estuary receiving water is listed as impaired for Chlordane, DDT, PCBs, and toxicity in sediments as well as trash.[8] See Figure 12 for the Los Angeles River Watershed.

[7] California Regional Water Quality Control Board, Los Angeles Region. (1994, June). *Water Quality Control Plan for the Los Angeles Region*. Retrieved July 7, 2014, from http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.shtm

[8] California State Water Resources Control Board (SWRCB). (2010, April 19). 2010 Integrated Report Clean Water Act Sections 303(d) and 305(b). Staff Report. Approved by SWRCB Resolution No. 2010-0040, August 4, 2010.

Total Maximum Daily Loads (TMDLs)

Once a water body has been listed as impaired on the 303(d) list, a TMDL for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL. In general terms, municipal, small MS4, and other dischargers within each watershed are collectively responsible for meeting the required reductions and other TMDL requirements by the assigned deadline.

For the Los Angeles River Reach 1, the Los Angeles RWQCB has adopted wet-weather TMDLs for cadmium and zinc and both wet- and dry-weather TMDLs for copper, lead, and trash. TMDLs for cyanide, Diazinon, and pH have not been determined.

For the Los Angeles River Estuary (Queensway Bay), only the TMDL for trash in the overall watershed applies. TMDLs for the impairment of Chlordane, DDT, PCBs, and toxicity in sediments are not yet written. Table 10 summarizes the numeric targets and loading capacities selected in order to meet the water quality objectives (WQOs) for the protection of beneficial uses in impaired waters as part of the TMDLs. Table 11 provides the waste load allocations for Reach 1.

Table 10 TMDLs for Los Angeles River Reach 1

	Wet Weather		*Dry Weather*	
Constituent	*Numeric Target*	*Loading Capacities*	*Numeric Target*	*Loading Capacities*
Ammonia	1-hr average: 8.7 mg/L 30-day average: 2.4mg/L	-	1-hr average: 8.7 mg/L 30-day average: 2.4mg/L	-
Nutrients (nitrate (nitrogen)	30-day average: 8 mg/L	-	30-day average: 8 mg/L	-
Nutrients (nitrite-nitrogen)	30-day average: 1 mg/L	-	30-day average: 1 mg/L	-
Nitrate-N + Nitrite-N	30-day average: 8 mg/L	-	30-day average: 8 mg/L	-
Cadmium	2.9 μg/L [a]	Daily storm volume 3.1 μg/L [b]	-	-
E.Coli	126/100mL E.Coli density geometric mean 235/100mL E.Coli density single sample	-	126/100mL E.Coli density geometric mean 235/100mL E.Coli density single sample	-
Copper	44 μg/L [a]	Daily storm volume 17 μg/L [b]	73 μg/L [a]	0.55 kg/day [b]
Lead	51 μg/L [a]	Daily storm volume 62 μg/L [b]	9.5 μg/L [a]	0.075 kg/day [b]
Trash	0 trash		0 trash	
Zinc	97 μg/L [a]	Daily storm volume 159 μg/L [b]	-	-

Notes: Total coliform shall not exceed 1,000/100 mL, if the ratio of fecal to total coliform exceeds 0.1 (this is an additional single sample limit for REC-1 marine waters; presented in the Basin Plan).

Dry-weather targets apply to days when maximum daily flow in the River is less than 500 cfs, while wet-weather targets are for more than 500 cfs.

[a] In μg/L total recoverable metals. Numeric targets for the TMDL are based on California Toxics Rule (CTR) criteria.

[b] In kg/day total recoverable metals. Wet-weather load allocations for direct atmospheric deposition are equal to the percent area of surface water multiplied by the loading capacities.

Sources:

-Metals: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Revise the Los Angeles River and Tributaries Metals TMDL (2010, May); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. R10-003. http://63.199.216.6/larwqcb_new/bpa/docs/R10-003/R10-003_RB_BPA.pdf

-Bacteria: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Revise the Los Angeles River Watershed Bacteria TMDL (2010, July); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. R10-007. http://63.199.216.6/larwqcb_new/bpa/docs/R10-007/R10-007_RB_BPA1.pdf

-Trash: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to incorporate the TMDL for Trash in the Los Angeles River Watershed (2007, August). California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. 07-012. http://63.199.216.6/larwqcb_new/bpa/docs/2007-012/2007-012_RB_BPA.pdf

-Ammonia: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Incorporate the Los Angeles River Nitrogen Compounds and Related Effects TMDL (2003, July); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. 03-009.

http://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=61420

Table 11 Waste Load Allocations for Los Angeles River Reach 1

	Wet Weather	*Dry Weather*	
Constituent	*WLA*	*Critical flow*	*WLA*
Ammonia	One-hour average WLA: 8.7 mg/L 30-day average WLA: 2.4 mg/L	One-hour average WLA: 8.7 mg/L 30-day average WLA: 2.4 mg/L	
Cadmium	3.1×10^{-9} * daily volume (L) – 1.95	-	-
E.Coli	10 exceedance days of numeric targets (daily sampling) or 2 exceedance days (weekly sampling)	5 exceedance days of numeric targets (daily sampling) or 1 exceedance day (weekly sampling)	
Copper	1.7×10^{-8} kg/day * daily volume (L) – 10	2.58 cfs	0.14 *kg/day*
Lead	6.2×10^{-8} kg/day * daily volume (L) – 4.2	2.58 cfs	0.07 kg/*day*
Trash	0	0	
Nutrients (nitrate (nitrogen)	30-day average WLA: 8.0 mg/L	30-day average WLA: 8.0 mg/L	
Nutrients (nitrite-nitrogen)	30-day average WLA: 1.0 mg/L	30-day average WLA: 1.0 mg/L	
Nitrate-N + Nitrite-N	30-day average WLA: 8.0 mg/L	30-day average WLA: 8.0 mg/L	
Zinc	1.6×10^{-7} kg/day * daily volume (L) – 90	-	-

Notes: Wet-weather WLAs for grouped storm water permittees are equal to the total loading capacity minus the load allocations for open space and direct air deposition and the waste load allocations for POTWs.

Sources:
-Metals: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Revise the Los Angeles River and Tributaries Metals TMDL (2010, May); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. R10-003. http://63.199.216.6/larwqcb_new/bpa/docs/R10-003/R10-003_RB_BPA.pdf
-Bacteria: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Revise the Los Angeles River Watershed Bacteria TMDL (2010, July); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. R10-007. http://63.199.216.6/larwqcb_new/bpa/docs/R10-007/R10-007_RB_BPA1.pdf
-Trash: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to incorporate the TMDL for Trash in the Los Angeles River Watershed (2007, August). California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. 07-012. http://63.199.216.6/larwqcb_new/bpa/docs/2007-012/2007-012_RB_BPA.pdf
-Ammonia: Amendment to the *Water Quality Control Plan for the Los Angeles Region* to Incorporate the Los Angeles River Nitrogen Compounds and Related Effects TMDL (2003, July); California Regional Water Quality Control Board, Los Angeles Region; Attachment A to Resolution No. 03-009.
http://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=61420

[a] In μg/L total recoverable metals. Numeric targets for the TMDL are based on California Toxics Rule (CTR) criteria.
[b] In kg/day total recoverable metals. Wet-weather load allocations for direct atmospheric deposition are equal to the percent area of surface water multiplied by the loading capacities.

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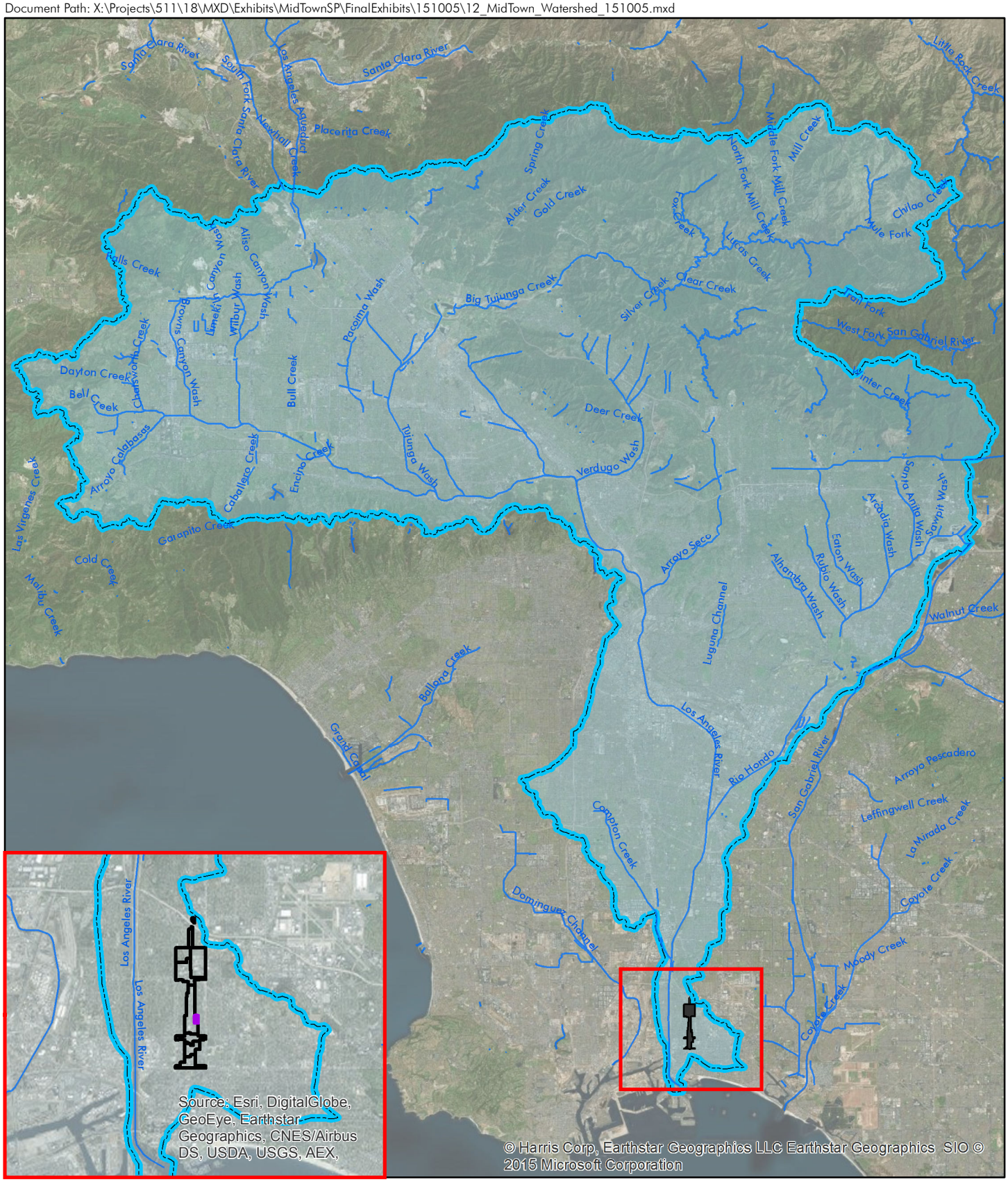

Midtown Specific Plan

City of Long Beach

FUSCOE ENGINEERING
full circle thinking

Midtown Specific Plan

Residential Zoning

Los Angeles River Watershed

Figure 12
LA River Watershed

Date: 10/5/2015

0 3 6 12 Miles

General Construction Permit and Storm Water Pollution Prevention Plans (SWPPPs)

The General Construction Permit (GCP), Order No. 2012-0006-DWQ, NPDES Permit No. CAS000002, last updated by the SWRCB in July 2012, regulates storm water and non-storm water discharges associated with construction activities disturbing 1 acre or greater of soil. Construction sites that qualify must submit a Notice of Intent (NOI) to gain permit coverage or otherwise be in violation of the CWA and California Water Code.

The GCP requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for each individual construction project greater than or equal to 1 acre of disturbed soil area (regardless of the site's Risk Level). The SWPPP must list Best Management Practices (BMPs) that the discharger will use to control sediment and other pollutants in storm water and non-storm water runoff; the BMPs must meet the BAT and BCT performance standards. Additionally, the SWPPP must contain a visual monitoring inspection program; a chemical monitoring program for sediment and other "non-visible" pollutants to be implemented based on the Risk Level of the site, as well as inspection, reporting, training and record-keeping requirements. Section XVI of the GCP describes the elements that must be contained in a SWPPP.[9]

In addition to the requirements above, Order No. 2012-0006-DWQ contains requirements for construction sites based on the sites risk of discharging construction-related pollutants, as well as additional monitoring and reporting requirements. Each construction project must complete a Risk Assessment prior to commencement of construction activities, which assigns a Risk Level to the site and determines the level of water quality protection/requirements the site must comply with. The Permit also includes provisions for meeting specific Numerical Effluent Limits and Action Levels for pollutants based on the sites' Risk Level.

Since the Midtown Project will allow for redevelopment activities that will disturb greater than 1 acre of land area, construction projects within the Midtown Project area will be subject to the storm water discharge requirements of the GCP. The projects will require submittal of an NOI, SWPPP, Risk Assessment, and other Project Registration Documents (PRDs) required by the GCP prior to the commencement of soil disturbing activities. In the Los Angeles Region, the SWRCB is the permitting authority, while the Los Angeles RWQCB provides local oversight and enforcement of the GCP.

General WDR Permit for Groundwater Discharges

The Los Angeles RWQCB requires a permit for discharging wastes to surface waters from activities involving de minimus or temporary groundwater related discharges. Under Order No. R4-2013-0095 (NPDES No. CAG994004), Permittees shall be required to monitor their discharges from groundwater extraction waste from construction and dewatering activities to ensure that proposed effluent limitations for constituents are not exceeded.

During the design phase, each project will be evaluated with site-specific boring tests to determine exact location and potential for groundwater during construction activities. Sites that require dewatering activities due to groundwater shall either obtain permission to discharge to

[9] California State Water Resources Control Board. (2008). Storm Water Program: Construction Program. Retrieved January 27, 2009, from http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

the sanitary sewer system through the local sewer agency or file for this general WDR permit to discharge to the MS4.

City of Long Beach MS4 Permit and Long Beach Stormwater Management Plan

In March 2014, the Los Angeles RWQCB re-issued the City of Long Beach MS4 Storm Water Permit as WDR Order R4-2014-0024 (NPDES Permit No. CAS004003). Pursuant to this MS4 Permit, the City is required to develop and implement Minimum Control Measures as part of a Stormwater Management Program. The Long Beach Stormwater Management Plan was last revised in August 2001 and was built upon Regional Board WDR Order No. 99-060.

In order to comply with the updated MS4 Permit, a "Low Impact Development (LID) Best Management Practices (BMP) Design Manual" was developed (2013) in advance of the final permit which details actions for compliance with the LID regulations adopted in City Ordinance No. ORD-10-035, such as land development policies pertaining to LID and hydromodification for new development and significant redevelopment projects. The term "hydromodification" refers to the changes in runoff characteristics from a watershed caused by changes in land use condition. More specifically, hydromodification refers to "the change in the natural watershed hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow, and groundwater flow) caused by urbanization or other land use changes that result in increased stream flows and sediment transport." The use of LID Best Management Practices (BMPs) in project planning and design is to preserve a site's predevelopment hydrology by minimizing the loss of natural hydrologic processes such as infiltration, evapotranspiration, and runoff detention. LID BMPs try to offset these losses by introducing structural and non-structural design components that restore these water quality functions into the project's land plan.

City of Long Beach LID/SUSMP/MS4 Plan

One component of the New Development/Significant Redevelopment Section of the City's Stormwater Management Plan is the provision to prepare a project-specific LID Plan to infiltrate, evapotranspire, and/or capture and use stormwater runoff to prevent pollutants from leaving the site. If partial or complete onsite compliance is infeasible, the LID Plan is required to comply with, at a minimum, all applicable Standard Urban Stormwater Management Plan (SUSMP) requirements. This includes operation and maintenance requirements for all structural or treatment control BMPs required for specific categories of developments to reduce pollutants in post-development runoff to the Maximum Extent Practicable (MEP).

All development and redevelopment in the City are subject to LID requirements of the City of Long Beach Department of Development Services Low Impact Development (LID) Best Management Practices (BMP) Design Manual (November 12, 2013), except for the following projects:

- A development or redevelopment that does not require a building permit;
- A development or redevelopment creating, adding, or replacing less than 500 square feet of impervious surface area;
- A development or redevelopment involving only emergency construction activity required to immediately protect public health and safety;

- A development or redevelopment involving the grinding/overlaying and replacement of existing parking lots;
- A development or redevelopment involving only re-striping of permitted parking lots;
- A redevelopment resulting in land disturbing activities or replacement of 50% or less of an existing building, structure, or impervious surface area;
- An infrastructure project within the public right-of-way;
- A development or redevelopment involving only activity related to gas, water, cable, or electricity services on private property;
- A project involving only exterior movie and television production sets, or facades on existing developed site; or
- A development or redevelopment where LID requirements are technically infeasible.

As required by the City of Long Beach's LID Ordinance on storm water quality management, all development or redevelopment that do not meet the above-listed exemptions must submit an LID Plan to the City for approval prior to the City issuing any building or grading permits. Since the Midtown Project includes multiple land owners with multiple projects, the individual projects will be subject to the requirements of the City of Long Beach LID Ordinance, requiring the development of a project-specific LID Plan. Project-specific LID Plans within the Specific Plan area will be required to ensure all of the requirements of the City's LID Ordinance on storm water quality are addressed for that project. This includes meeting any new requirements associated with development projects, as well as the requirements of the MS4 permit (or subsequent MS4 Permits), which includes LID features and/or hydromodification controls.

2.4.2 Existing Surface Water Conditions

Regional Drainage

According to the Los Angeles Region Basin Plan, the Midtown Project area is located within the lower portion of the Los Angeles River Watershed (see Figure 12).[10] More specifically, it is part of the coastal plain that drains directly into the main stem of the Los Angeles River. General urban runoff is the source of most of the dry-season flow in many of the tributaries and channels of the lower watershed. Approximately 100 million gallons of runoff from landscape irrigation, car washing, and other inadvertent sources flows through the Los Angeles County storm drain system daily and into the flood control channels, including the Los Angeles River and its tributaries (Council for Watershed Health, 2012). The typical wet period spans October through April and flows can get up to 1,592 cfs at the estuary, with occasional storms and flows during storm events potentially increasing runoff volume to 10 billion gallons (Council for Watershed Health, 2012). The project site discharges into the Los Angeles River Reach 1, 3 to 4 miles north from the Los Angeles Estuary and Pacific Ocean.

Beneficial Uses

The existing beneficial uses of Los Angeles River Reach 1, as outlined in the Basin Plan, are:

- GWR – Ground Water Recharge

[10] California Regional Water Quality Control Board, Los Angeles Region. (1994, June). *Water Quality Control Plan for the Los Angeles Region*. Retrieved July 7, 2014, from http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.shtm

- WARM – Warm Freshwater Habitat
- MAR – Marine Habitat
- WILD – Wildlife Habitat
- RARE – Rare, Threatened, or Endangered Species

Water Quality Objectives

General water quality objectives have been prescribed in the Basin Plan for all surface waters within the Los Angeles Region. In order to maintain the beneficial uses listed in the previous section, surface waters must achieve these water quality objectives. Qualitative and quantitative objectives have been set in the Basin Plan for the following constituents:

- ammonia
- boron
- chlorine
- floatables
- metals
- dissolved oxygen
- radioactive substances
- taste & odor
- turbidity
- bacteria/coliform
- biochemical oxygen demand
- color
- mineral quality
- pesticides
- PCBs
- total dissolved solids
- temperature
- methylene blue-activated substances (MBAS)
- bioaccumulation
- biostimulatory substances
- exotic vegetation
- nitrogen (nitrate, nitrite)
- oil & grease
- pH
- solid, suspended, or settleable solids
- toxicity

In addition to the general water quality objectives, specific objectives have been set for the Los Angeles River between Figueroa St and Willow St, summarized in Table 12.

Table 12 – Surface Water Quality Objectives for LA River (Figueroa St to Willow St)

TDS (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Nitrogen (mg/L)
1500	350	150	8

2.4.3 Existing Groundwater Conditions

Regional Drainage

Geographically, the proposed project site is located within the southeast end of the Los Angeles West Coast Basin, which is one of five major groundwater basins in the Los Angeles River Watershed. The other four groundwater basins are San Fernando Basin, Raymond Basin, Main San Gabriel Basin, and the Central Basin. Much of the Los Angeles River Watershed is underlain with extensive clay layers and the most important spreading basins for groundwater recharge are in the San Fernando Basin, far to the northwest, where the underlying soils are permeable (Council for Watershed Health, 2012). Unlike the other four groundwater basins with notable spreading grounds, groundwater recharge for the West Coast Basin is primarily through direct injection, along with lateral flow from the adjacent Central Basin to the northeast.

In general, historical activities and practices have degraded groundwater quality in the County over the past century. Causes include seepage of fertilizers and pesticides into the subsurface from past agricultural uses, nitrogen and pathogenic bacteria from poorly sited and maintained septic tanks, and various hazardous substances from leaking aboveground and underground storage tanks and industrial operations. Overdraft of groundwater from coastal aquifers in the first half of the 20th Century resulted in not only a decline in groundwater levels, but also the intrusion of seawater into the aquifers (Council for Watershed Health, 2012).

Beneficial Uses

The Basin Plan identifies Coastal Plain of Los Angeles West Coast Basin groundwater management zone in the Lower Los Angeles River as having four beneficial uses. They are:

- MUN – Municipal and Domestic Supply;
- AGR – Agricultural Supply;
- IND – Industrial Service Supply; and
- PROC – Industrial Process Supply.

Water Quality Objectives

Specific water quality objectives have been established for the Coastal Plain of Los Angles West Coast Basin to maintain its beneficial uses, and are summarized in Table 13.

Table 13 Groundwater Quality Objectives for the Coastal Plain of Los Angeles West Coast Basin

TDS (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Boron (mg/L)
800	250	250	1.5

In addition to specific numeric water quality objectives, narrative objectives for all groundwaters in the Los Angeles Region also apply to the Coastal Plain of Los Angles West Coast Basin.[11] Narrative objectives have been established for the following constituents:

- Bacteria
- Nitrogen (nitrate, nitrite)
- Chemical constituents
- Mineral quality
- Radioactivity
- Taste and odor

Current Groundwater Quality Conditions

The Water Replenishment District of Southern California (WRD) conducts a Regional Groundwater Monitoring Program for the Central and West Coast groundwater basins. One of the monitoring wells in the program is about 1.3 miles west and 0.4 miles north from the northwest corner of Midtown and provides some information on the regional groundwater quality conditions. Well 42/13W-23D is an active WRD monitoring well that has been

[11] California Regional Water Quality Control Board, Los Angeles Region. (1994, June). *Water Quality Control Plan for the Los Angeles Region*. Retrieved July 7, 2014, from http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.shtm

recording data since 2000. It has been sampled about 1-2 times per year at four depths ranging from 430 feet to 1390 feet below ground surface. The monitoring program does not include boron, one of the LA Basin Plan Groundwater Quality Objectives. Water quality monitoring data from Well 42/13W-23D is shown in Table 14 and Table 15 at depths of 1390 feet and 430 feet, respectively.

Table 14 Water Quality Monitoring Data for West Coast Basin ID 42/13W-23D04S: Deepest sample at 1390 feet

Constituent	*No. of Events Sampled* [a]	*Range*	*Mean*	*Basin Plan Criteria*
Total Dissolved Solids (mg/L)	25	416 - 480	455	800
Sulfate (mg/L)	25	0-2.69	0.11	250
Chloride (mg/L)	25	15.8-19	17.6	250
Boron (mg/L)	-	-	-	-

Notes:
Bold typeface denotes exceedance of basin plan objective or outside tolerance limit.
a. Water Replenishment District Interactive Well Search application, accessed at http://gis.wrd.org/wrdmap/login.asp

Table 15 Water Quality Monitoring Data for West Coast Basin ID 42/13W-23D08S: Shallow sample at 430 feet

Constituent	*No. of Events Sampled* [a]	*Range*	*Mean*	*Basin Plan Criteria*
Total Dissolved Solids (mg/L)	25	**1380-3170**	**2067**	800
Sulfate (mg/L)	26	61-75	68.8	250
Chloride (mg/L)	25	**606-1000**	**871**	250
Boron (mg/L)	-	-	-	-

Notes:
Bold typeface denotes exceedance of basin plan objective or outside tolerance limit.
a. Water Replenishment District Interactive Well Search application, accessed at http://gis.wrd.org/wrdmap/login.asp

In general, exceedances of Basin Plan water quality objectives were observed consistently for total dissolved solids and chloride at the shallow observation well; no exceedances were observed at the deeper well.

3. THRESHOLDS OF SIGNIFICANCE

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as hydrology and water quality. According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would impact any of the items listed below.

3.1 HYDROLOGY & WATER QUALITY THRESHOLDS (CEQA CHECKLIST SECTION IX)

Would the Project:

A. Violate any water quality standards or waste discharge requirements?

B. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table? (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)

C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site?

D. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?

E. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

F. Otherwise substantially degrade water quality?

G. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

H. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

I. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

J. Be subject to inundation by seiche, tsunami, or mudflow?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold. Impacts B, G, H and J were studied in the Initial Study and found to be No Impact. Therefore, no additional analyses will be provided for these impacts. Impacts C, D and E are associated with hydrology and will be analyzed within Section 4.1.2 of this report. Impacts A and F are associated with water quality and will be analyzed within Section 4.4.3.

3.2 UTILITIES AND SERVICE SYSTEMS THRESHOLDS (CEQA CHECKLIST SECTION XVII)

Would the Project:

A. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

B. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

C. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

D. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

E. Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

F. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

G. Comply with federal, state, and local statutes and regulations related to solid waste?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold. Impacts A, B, and E are associated with sewer and wastewater systems and are analyzed within Section 4.2.3 of this report. Impact B is associated with water systems, and water impacts are analyzed in Section 4.3.3 of this report. Impact B is also associated with drainage systems and hydrology, and will be analyzed within Section 4.1.2 of this report.

Impacts D, F and G are associated with water supply assessment and solid waste disposal, and are not discussed in this report and are evaluated separately in the EIR.

4. ENVIRONMENTAL IMPACTS

The purpose of the proposed conditions evaluation is to determine potential impacts related to the proposed land use zoning associated with the Midtown Project. The proposed Specific Plan consists of land use changes that will largely increase intensify existing land uses including multi-family homes, town homes and medical offices. Based on the proposed land use changes, runoff is anticipated to decrease overall while sewer and water demands are anticipated to increase. Additional details are provided below for hydrology, sewer and water.

4.1 HYDROLOGY

The purpose of the proposed conditions evaluation is to evaluate impacts associated with the proposed land use changes at a program-level EIR, characterize changes as compared to the existing runoff conditions and identify where additional storm drain facilities are recommended to improve runoff conditions.

4.1.1 Proposed Drainage Conditions

In order to evaluate impacts to the existing storm drain system, a summary of proposed land use changes within each Development District is required. Table 16 provides a breakdown of the major land use changes within each District including the primary land uses that would be ultimately removed and the corresponding land use that would replace it. In addition, the average runoff coefficient for each land use (based on infrared analysis, Figure 6) is also identified to determine if the proposed land use would result in less or more anticipated runoff as compared to the existing condition.

Table 16 Existing and Proposed Land Uses and Associated Runoff Coefficients

District ID	*Acreage*	*Residential Dwelling Units*	*Retail, Service, Office/Medical Square Footage (SF)*	*Industrial & Institutional Square Footage (SF)*	*Findings*
Corridor District #1	22 ac	Single Family (C=0.50): –30 Multifamily (C=0.85): +69 Townhomes (C=0.80): +189 **Net Change: +189 units**	Retail (C=0.9): –1,252 Service (C=0.9): –4,300 Office/Medical (C=0.9): –5,000 **Net Change: –10,552 SF**	Industrial (C=0.9): 0 Institutional (C=0.75): 0 **Net Change: 0**	Net Increase in Residential / Net decrease in Non-Residential / No net change in impervious conditions
Corridor District #2	51 ac	Single Family (C=0.50): –70 Multifamily (C=0.85): –58 Townhomes (C=0.80): +225 **Net Change: +97 units**	Retail (C=0.9): –20,970 Service (C=0.9): –12,757 Office/Medical (C=0.9): –50,822 **Net Change: –84,549 SF**	Industrial (C=0.9): –148,959 Institutional (C=0.75): 0 **Net Change: –148,959 SF**	Net Reduction in Impervious Area / Runoff Coefficient
Corridor District #3	20 ac	Single Family (C=0.50): -28 Multifamily (C=0.85): +8 Townhomes (C=0.80): +125 **Net Change: +109 units**	Retail (C=0.9): -23,835 Service (C=0.9): -9,188 Office/Medical (C=0.9): -10,000 **Net Change: -43,023 SF**	Industrial (C=0.9): 0 Institutional (C=0.75): 0 **Net Change: 0**	Net Reduction in Impervious Area / Runoff Coefficient
Medical District #4	63 ac	Single Family (C=0.50): -4 Multifamily (C=0.85): +201 Townhomes (C=0.80): 0 **Net Change: +197 units**	Retail (C=0.9): +20,229 Service (C=0.9): +31,600 Office/Medical (C=0.9): +249,225 **Net Change: +301,054 SF**	Industrial (C=0.9): 0 Institutional (C=0.75): 0 **Net Change: 0**	Net Increase in Residential & Non-Residential / No net change in impervious conditions
Transit District #5	44 ac	Single Family (C=0.50): -1 Multifamily (C=0.85): +774 Townhomes (C=0.80): -33	Retail (C=0.9): +52,448 Service (C=0.9):-36,360 Office/Medical (C=0.9): +99,548	Industrial (C=0.9): -4,506 Institutional (C=0.75): 0	Net Increase in Residential & Non-Residential /

District ID	*Acreage*	*Residential Dwelling Units*	*Retail, Service, Office/Medical Square Footage (SF)*	*Industrial & Institutional Square Footage (SF)*	*Findings*
		Net Change: +740 units	Net Change: +149,357 SF	Net Change: -4,506 SF	No net change in impervious conditions
Transit #6	20 ac	Single Family (C=0.50): -20 Multifamily (C=0.85): +255 Townhomes (C=0.80):0 Net Change: +235 units	Retail (C=0.9): -11,729 Service (C=0.9): -1,960 Office/Medical (C=0.9): +114,239 Net Change: +100,550 SF	Industrial (C=0.9): 0 Institutional (C=0.75): 0 Net Change: 0	Net Increase in Residential & Multi-story Office & Retail / No net change in impervious conditions
Transit #7	19 ac	Single Family (C=0.50): -6 Multifamily (C=0.85): +175 Townhomes (C=0.80): 0 Net Change: +169	Retail (C=0.9): 0 Service (C=0.9): +20,531 Office/Medical (C=0.9): +65,000 Net Change: +85,072 SF	Industrial (C=0.9): Institutional (C=0.75): Net Change: 0	Net Increase in Residential & Non-Residential / No net change in impervious conditions
Zone R	4 ac	Single Family (C=0.65): 11 Multifamily (C=0.85): 65 Townhomes (C=0.80): 0 Net Change: +0 Units	Retail (C=0.9): 79,588 Service (C=0.9): 8,008 Office/Medical (C=0.9): 62,847 Net Change: +0 SF	Industrial (C=0.9): 124,703 Institutional (C=0.75): Net Change: 0	No change

District ID	Acreage	Residential Dwelling Units	Retail, Service, Office/Medical Square Footage (SF)	Industrial & Institutional Square Footage (SF)	Findings

Notes:

Land Use Assumptions and Requirements:

1. Increases in square footage in proposed condition due to increased multi-story development.
2. Midtown Projects requires conformance with LID BMP requirements which require 5-8% of the site plus traditional landscaping requirements thereby resulting in lower runoff coefficient as compared to existing condition.

Based on the relatively high existing impervious conditions and proposed land uses which generally are equal to or less than existing impervious conditions, project runoff is not anticipated to increase over existing conditions. The existing City and County storm drain systems are not anticipated to change as a result of the Midtown Project, thereby making the 2005 Master Plan of Drainage Update applicable to the proposed conditions. In addition to the 2005 storm drain improvement recommendations, Long Beach Public Works also identified the upsizing of all storm drain facilities less than 24" to a minimum of 24" within the Midtown Project area. The upsizing would occur as development projects consistent with the Midtown Project are implemented. Figure 13 highlights all storm drain improvements as identified in the 2005 Master Plan Update and the upsizing of all pipes to a minimum 24" or greater. This will impact a variety of facilities within Development Districts 2, 3, 4, 5, 6 & 7.

However, there is one exception within the proposed land use that would result in an increase in impervious conditions as compared to existing conditions. One of the proposed land uses includes the potential for removal of single family residential uses and conversion to multi-family which would increase imperviousness (0.50 and 0.85 respectively) at the project specific scale. This could cause an impact dependent upon the location of the residential conversions within the project area. A review of all the existing single family units indicated they are typically clustered but broken up within the District itself and highly scattered when viewed from the perspective of the entire Midtown Project area. Two of the Districts contain no single family residential while the remaining Districts range from 6% to 13% of the total land use within the District. In addition, a review of the 2005 Master Plan of Drainage Update indicated the specific storm drain lines closest to the residential clusters have sufficient capacity to accommodate minor increases in storm water runoff while still conveying the 10-year storm event.

Storm Drain Improvement Requirements for Midtown Project Area

In order for the proposed Midtown Project to be implemented in a responsible manner on the existing storm drain system, the following improvements and conditions will be required:

- Per City of Long Beach Public Works requirements, all storm drain facilities within the Midtown Project area less than 24" (public and private) will be required to be upsized to a minimum 24" pipe size or greater dependent upon the location and size of the project. The increase in pipe size will serve to reduce localized surface ponding and flooding. As redevelopment projects consistent with the Specific Plan come forward, all storm drain facilities impacted by the specific project will be required to meet this upsizing requirement.

- All individual projects will require site specific hydrology and hydraulic studies of the on-site and immediate off-site storm drain systems to determine capacity and integrity of the existing systems prior to approval by Long Beach Public Works.

- The two city storm drain improvements identified within the 2005 Master Plan Update will be required as individual projects within the approved Specific Plan impact these specific segments of storm drain.

- Conformance with site specific "allowable discharge rates" as identified by Los Angeles County Public Works which limits peak flow discharges as compared to existing

conditions based on regional flood control constraints. Each individual project must request the "allowable discharge rate" from Los Angeles County Public Works.

- Incorporation of LID BMPs within each project will be required to provide water quality treatment and runoff reduction and/or detention in accordance with local stormwater permit requirements. Implementation of LID will also serve to minimize increase in runoff and will reduce runoff as compared to existing conditions.

4.1.2 Hydrology Impacts

The following impact assessments are based on the significance criteria established in Section 3.1 for hydrology.

Impact B: Would the Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Impact Analysis: Under the existing conditions, the Midtown Project site is entirely built out with an average impervious condition of over 85% excluding Open Space with Development District 1. Opportunities for groundwater recharge are extremely limited and infiltration occurs on a limited basis. Under the proposed condition, on-site storm drain systems will be upgraded to include water quality LID features which will likely increase infiltration opportunities and the amount of infiltration as compared to existing conditions. The project site does not rely on on-site water supply sources and therefore will have no impact on the local groundwater table.

Impact C: Would the Project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site?

Impact Analysis: Under the existing conditions and proposed conditions, drainage patterns will largely be maintained and will utilize the existing drainage facilities within the public right of way. Under the existing conditions, flows generally drain south and westerly into the existing streets and are collected by a series of catch basins and storm drain facilities owned and operated by the City of Long Beach and Los Angeles County Public Works. Ultimately all flows discharge to the Los Angeles River through hard lined systems not susceptible to erosion or scour. Under the proposed condition, overall drainage patterns, flow rates and flow volumes will be maintained based on the high level of impervious condition under the existing condition and will not increase and thereby increase the opportunity to erosion or scour downstream. On-site storm drain systems will likely change with the individual project components but will still utilize the existing city and county facilities within the public right of way. Implementation of the project will not result in erosion or siltation on or off-site.

Impact D: Would the Project substantially alter the existing drainage pattern of the site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?

Impact Analysis: See Impact Assessment C for alteration of existing drainage patterns. The proposed project will not result in an increase of peak flow runoff or volume based on the redevelopment of the project area. The on-site storm drain systems will be designed to safely collect and convey the 10-year flood within the on-site storm drain system while protecting all proposed buildings, structures and public safety from the 50-year capital event. Further flow rate restrictions may apply based on site specific discharge limits issued by Los Angeles County Public Works. Impacts related to increases in rate and volume of runoff are less than significant.

Impact E: Would the Project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

Impact Analysis: The majority of the existing storm drain system is adequately sized to accommodate the existing and proposed condition runoff. Based on the 2005 Master Plan of Drainage Update, two city storm drain improvements were identified and two County of Los Angeles were identified. Implementation of the proposed upgrades for the City storm drain facilities within E Willow Street should be tied to the redevelopment projects within the Medical District. Implementation of the Los Angeles County storm drain deficiencies is not anticipated and impacts to the system will be controlled by "allowable peak flow discharges" issued by the County per individual project. These allowable discharges often result in a reduction of peak flow discharges as compared to existing conditions.

The project is not anticipated to produce substantial additional sources of polluted runoff based on the proposed water quality management strategy of infiltration and/or biotreatment. A full discussion of water quality impacts including specific pollutants is provided in Impact Assessment A under Section 4.4.3 of this report.

Impact G: Would the Project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

Impact Analysis: The proposed project does not lie within the 100-year floodplain (refer to Section 2.1.3). Therefore, there are no impacts related to residential housing or proposed structures within the floodplain.

Impact H: Would the Project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Impact Analysis: See Impact Assessment G.

Impact I: Would the Project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Impact Analysis: The proposed project does not lie within an area downstream of a dam or within a levee.

Impact J: Would the Project be subject to inundation by seiche, tsunami, or mudflow?

Impact Analysis: The Midtown project is not located in an area susceptible to tsunami or mudflows based on its upstream location from the Pacific Ocean and downstream location within a highly developed watershed.

4.2 SEWER & WASTEWATER INFRASTRUCTURE

4.2.1 Proposed Wastewater System Flows per Development District

Under the proposed condition, sewer flows will increase significantly due to the increase in multi-family residential, commercial, office and institutional uses. A total of 3,695 dwelling units and 3,008,611 square feet of non-residential uses are proposed under the ultimate build out condition. The projected flow rates also account for the increases in hotel rooms (81 rooms) and hospital beds (27 beds). National hospital data was used to estimate daily sewer generation per hospital bed since local data was not available. Using the same methodology as the existing conditions (Section 2.2.2), proposed sewer demand flows are provided below in Table 17. See Appendix B for additional details.

Table 17 Proposed Condition Average Daily Sewer Flows

Development District	*Number of Dwelling Units*	*Non-Residential SF[1]*	*Proposed Average Daily Flow (GPD)[2]*	*Existing Average Daily Flow (GPD)*	*Change in Sewer Flows (GPD)*	*% Increase*
Corridor 1	408	54,000	123,936	72,958	+50978	+70%
Corridor 2	924	331,815	306,105	293,798	+12,306	+4%
Corridor 3	450	92,663	145,733	125,910	+19,823	+16%
Medical 4	300	757,600	311,200	155,630	+155,570	+100%
Transit 5	774	924,296	426,158	172,409	+253,750	+147%
Transit 6	362	297,125	184,112	85,121	+98,991	+116%
Transit 7	401	319,000	170,676	89,273	+81,403	+91%
R Zone	76	212,112	38,629	38,629	0	No change
Total	**3,695**	**3,008,611**	**1,697,941**	**1,033,728**	**+664,273**	**+64%**

1. Non-Residential includes commercial, retail and institutional land uses
2. Accounts for hospital beds & motel rooms within each District as applicable

Notes:
GPD gallons per day SF square feet

Full implementation of the land use changes has the potential to increase sewer flows by 0.664 MGD within the project area. The increase in flows will be generally spread out among the various Development Districts, thereby potentially impacting numerous city sewer lines. In order to evaluate the impact of the proposed land uses, the City's sewer hydraulic model was updated to account for the increases in sewer flows.

4.2.2 Proposed Sewer/Wastewater System

In order to evaluate the impact of the increased sewer flows to the sewer system, the hydraulic model utilized for the existing condition capacity assessment was updated to account for the ultimate build out condition associated with proposed land use designations. Since the site specific locations of each project are not known, the total increase in sewer and predominant land use for each Development District was proportioned out to specific sewer manholes that were spatially representative of the Development District. For example, the Medical District 4 is projected to increase sewer flows by approximately 155,570 gpd through the increase of medical office and residential uses. 1/3 of the increased flows (52,000 gpd / Medical Office) was assumed to end up in E Columbia St, 1/3 of the increased flows (52,000 gpd / Medical Office) assumed to end up in W 28th St and the remaining third (52,000 gpd/ Residential) would drain to Willow Street. This land use sewer proportioning was done for all the Development Districts to best anticipate and simulate which sewer lines within the Midtown Project would be subject to increases in sewer flows.

Based on the updated sewer hydraulic model, several changes occurred. The existing 8" lines in District 5 which were above the design capacity under existing conditions were further exacerbated by the proposed project with their d/D value going above 0.75. In addition, the 8" line associated with District 7 located just west of the Midtown Project boundary went from under design capacity (< 0.50 d/D) to well above the design capacity (>0.75 d/D). Based on these results, upsizing of these pipes would be required as part of the full implementation of the Midtown Project. The specific size upgrade would be based on more detailed analysis associated with the future redevelopment projects but anticipated sizes are noted below in Table 18 and are identified in Figure 14.

Table 18 Proposed Sewer Capacity Deficiencies with Midtown Project

District	*Modeled Sewer Pipes*	*Design Capacity*	*Manhole ID's*	*Anticipated Pipe Size*	*Sewer Pipe Length*
5	8" parallel lines on E. 25th St	0.75 – 1.0 d/D	H18-SMH-029 H18-SMH-051	10" - 12"	1,168 ft
6	10" line near Pine Ave	0.5 - 0.75 d/D	HI5-SMH-005 H14-SMH-022	12"- 15"	404 ft
6	10" line on Pasadena Ave	0.5 – 0.75 d/D	H14-SMH-050 H15-SMH-049	12"- 15"	164 ft
7	8" line in E Anaheim St	0.75 – 1.0 d/D	G12-SMH-073 G12-SMH-065	10" – 12"	1,111 ft

Notes: Conventional Zoning Area and Corridor District 2 sewage flows are accounted for in Medical District 4 and Transit Node District 6 respectively.
Source: Long Beach Water Department Post-Post Project Sewer Model (received February 2015)

In addition to the City's updating of their sewer model, an analysis of the increased flows from Transit District 5 into the LACSD trunk lines (24" and 30" in parallel) was performed. LACSD provided 2013 maximum flow rates for 24 segments of the main trunk lines that serve Transit District 5 among other areas of the City. Their analysis identified that for 23 of the 24 segments, all peak flows were significantly below the design capacity with the exception of one 24"

segment (specific location not identified by LACSD). Therefore, the additional 0.46 MGD of proposed sewer increases from Development Districts 1, 4 and 5 is not anticipated to cause any impacts as there is sufficient capacity within the 30" line to accommodate project flows within standard design parameters. All individual projects from Development Districts 1, 4 & 5 will require "Will Serve" letters from LACSD where project specific flows will be further evaluated.

It should be noted that the 2005 Long Beach Memorial Medical Center Expansion Project EIR indicated that the existing 15" city sewer line that runs north to south on the east side of the Todd Cancer Institute building required additional analysis to determine existing and future capacity. The above analysis confirms that the 15" line has sufficient capacity under existing and proposed conditions to accommodate the updated Medical Center Expansion associated with the Midtown Project.

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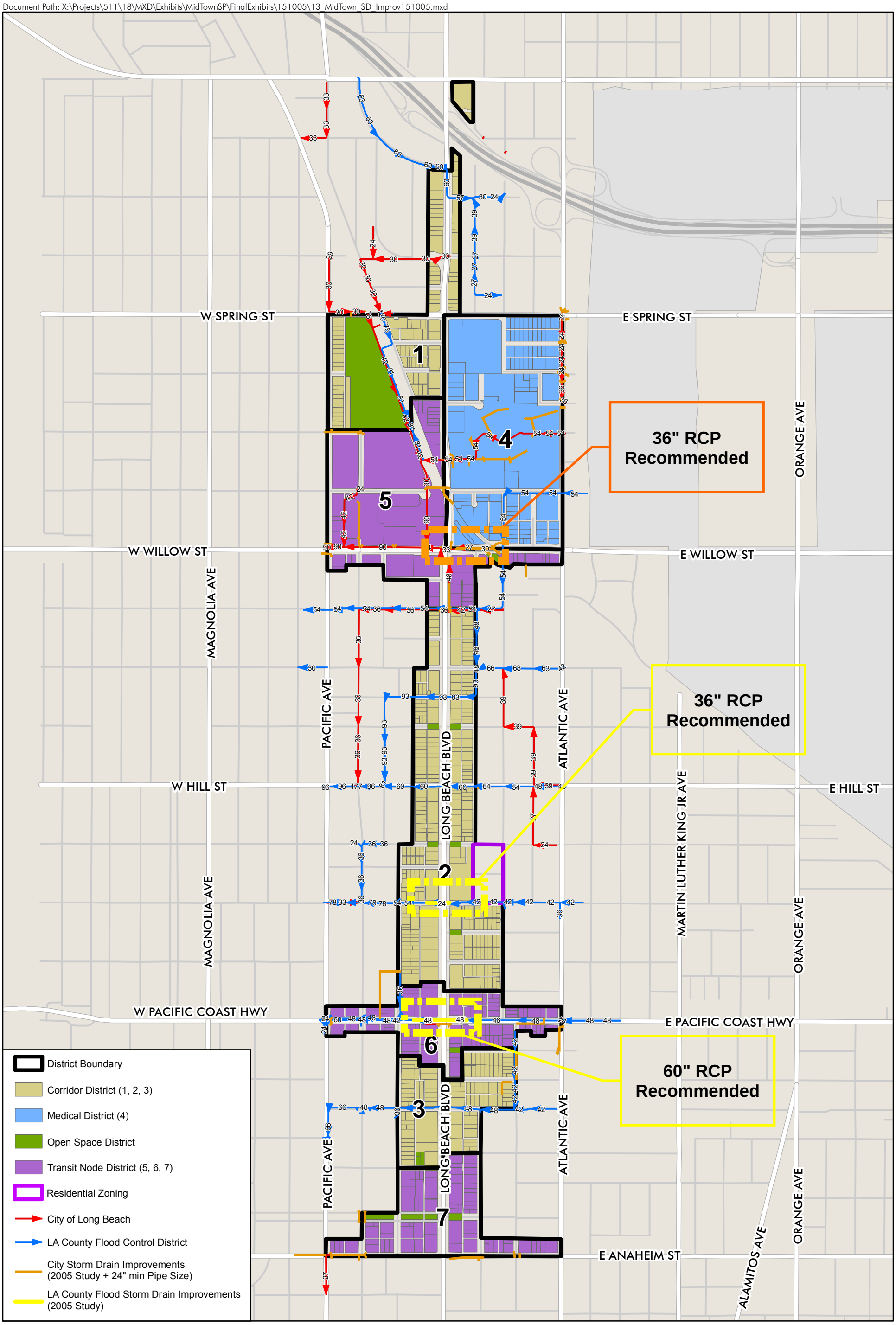

Midtown Specific Plan

City of Long Beach

Figure 13

Midtown Project Area Storm Drain Improvements

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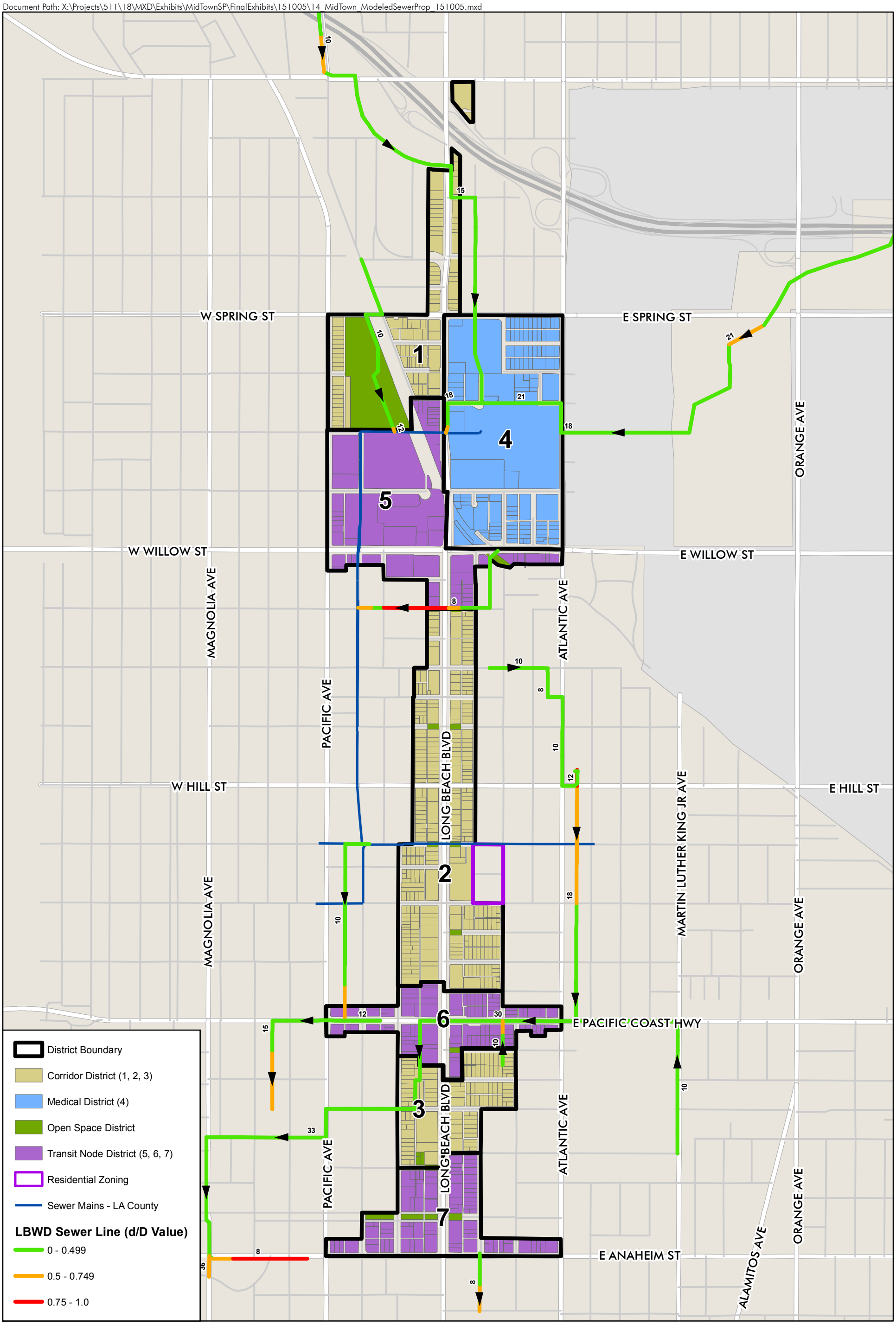

Midtown Specific Plan

City of Long Beach

Figure 14

Proposed Sewer Capacity (d/D Evaluation for City Sewer Model)

Date: 10/5/2015

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4.2.3 Sewer/Wastewater Impacts

The following impact assessments are based on the significance criteria established in Section 3.2 for wastewater.

Impact A. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Impact Analysis: The proposed land use changes associated with the Midtown Project including residential, office and medical and the increase in proposed sewer flows will not exceed the treatment requirements of the Los Angeles RWQCB. Therefore, no impacts related to treatment requirements are anticipated.

Impact B. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Impact Analysis: Implementation of the project will require the reconfiguration of the on-site private sewer system to support the redevelopment projects within each Development District and will require upsizing of several key sewer lines within the Midtown Project area to maintain required conformance with sewer design criteria. These include the 8" lines associated with District 5 (E 25th St), the 10" lines associated with District 6 (Pine Ave & Pasadena) and the 8" line associated with District 7 (E Anaheim). Alternatively, site specific flow monitoring may be implemented in lieu of upsizing the pipes to provide a more detailed analysis of the true flow depths over time to determine if the potential for surcharge conditions will occur. More site specific studies may indicate sufficient capacity for those pipes identified as well above the design criteria (>0.75 d/D). If implementation of upgrades is required, conformance with the General Construction Permit for Linear Projects would be followed which serves to reduce the impacts of construction through the use of sediment and erosion based BMPs. Implementation of the Midtown Project would not require upsizing of the LACSD treatment plant facilities as the trunk lines serving the site are designed to accommodate on average over 5 MGD and the maximum flow rates for 2013 averaged approximately 3.2 MGD or less. The addition of the 0.5 MGD to the existing trunk lines would not increase the flows beyond the total design capacity of these larger trunk lines. To ensure sufficient capacity within the trunk sewer lines in lieu of project specific developments within the Midtown site boundary, LACSD should review individual developments in order to determine whether or not sufficient trunk sewer capacity exists to serve each project and if LACSD facilities will be affected by the project. This can be accomplished through the LACSD "Will Serve" process.

4.3 WATER INFRASTRUCTURE

4.3.1 Proposed Water Demand per Development District

Under the proposed condition, water demands will increase due to the increase in high-density residential and commercial, office and institutional uses. A total of 3,695 dwelling units and 3,008,611 square feet of non-residential uses are proposed which represents an increase of 1,736 residential units and 368,935 sf over existing conditions. Table 19 shows the changes in water demands based on the proposed land use changes for each Planning Area, using the same methodology as for the existing conditions. The projected flow rates also account for the

Impact J: Would the Project be subject to inundation by seiche, tsunami, or mudflow?

Impact Analysis: The Midtown project is not located in an area susceptible to tsunami or mudflows based on its upstream location from the Pacific Ocean and downstream location within a highly developed watershed.

4.2 SEWER & WASTEWATER INFRASTRUCTURE

4.2.1 Proposed Wastewater System Flows per Development District

Under the proposed condition, sewer flows will increase significantly due to the increase in multi-family residential, commercial, office and institutional uses. A total of 3,695 dwelling units and 3,008,611 square feet of non-residential uses are proposed under the ultimate build out condition. The projected flow rates also account for the increases in hotel rooms (81 rooms) and hospital beds (27 beds). National hospital data was used to estimate daily sewer generation per hospital bed since local data was not available. Using the same methodology as the existing conditions (Section 2.2.2), proposed sewer demand flows are provided below in Table 17. See Appendix B for additional details.

Table 17 Proposed Condition Average Daily Sewer Flows

Development District	*Number of Dwelling Units*	*Non-Residential SF[1]*	*Proposed Average Daily Flow (GPD)[2]*	*Existing Average Daily Flow (GPD)*	*Change in Sewer Flows (GPD)*	*% Increase*
Corridor 1	408	54,000	123,936	72,958	+50978	+70%
Corridor 2	924	331,815	306,105	293,798	+12,306	+4%
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Medical 4	300	757,600	311,200	155,630	+155,570	+100%
Transit 5	774	924,296	426,158	172,409	+253,750	+147%
Transit 6	362	297,125	184,112	85,121	+98,991	+116%
Transit 7	401	319,000	170,676	89,273	+81,403	+91%
R Zone	76	212,112	38,629	38,629	0	No change
Total	**3,695**	**3,008,611**	**1,706,549**	**1,033,728**	**+664,273**	**+64%**

1. Non-Residential includes commercial, retail and institutional land uses
2. Accounts for hospital beds & motel rooms within each District as applicable

Notes:
GPD gallons per day SF square feet

Full implementation of the land use changes has the potential to increase sewer flows by 0.664 MGD within the project area. The increase in flows will be generally spread out among the various Development Districts, thereby potentially impacting numerous city sewer lines. In order to evaluate the impact of the proposed land uses, the City's sewer hydraulic model was updated to account for the increases in sewer flows.

maintained with the proposed land use. Projected water demands plus estimated fire flow requirements based on the predominant land use were incorporated into the model to look at regional impacts.

The results indicated that water pressure remains between 60-80 psi on average and that flow velocities remain under the desired maximum velocity of 8.0 fps with the exception of one line. Within District 6, an 8" water main running north to south from Pacific Coast Highway to E 16th Street demonstrated velocities above 8.0 fps (8.8 fps) and this particular line may require upsizing dependent upon the ultimate build out configuration with District 2 and District 6. The results are provided in Appendix C.

Based on these results, the existing water system has sufficient capacity and fire pressure to service the projected build out of the Midtown Project with the exception of the 8" line in District 6. No major infrastructure improvements are anticipated and the increases in water demand can be adequately served by the existing infrastructure. In addition, routine maintenance and replacement of older water lines will continue throughout the Midtown Project area consistent with the Capital Improvement Program established by the Long Beach Water Department.

Under the proposed conditions, the majority of the existing on-site water lines within private parcels will be removed and replaced based on the proposed building configuration. In addition, existing water lines with the public right of way may require relocation, upsizing and new lines dependent upon the specific development intensity of the site specific projects within each Development District.

As part of each specific project approved within the Midtown project, fire flow pressure tests will be required in order to confirm adequate supply and pressure for each project. Additional fire flow tests based on future projects within District 6 may indicate the existing 8" line is sufficient for ultimate build out related to the Midtown Project.

4.3.3 Water Impacts

The following impact assessments are based on the significance criteria established in Section 3.2 for water systems.

Impact B **Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?**

Impact Analysis: Implementation of the project will require the construction of on-site new water lines to better serve the individual proposed projects. Based on the proposed water model, an existing 8" line with District 6 may require upsizing dependent upon the final development scenario within District 3 & 6. Additional fire flow and pressure tests are required for projects serviced by this 8" line. For all projects involving water infrastructure construction, a site-specific Storm Water Pollution Prevention Plan (SWPPP) will be required thereby minimizing construction impacts to water quality. See also Section 4.4.1 and Section 4.4.2 for additional details on construction activities and associated impact discussions.

Impact D *Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?*

Impact Analysis: A separate water supply assessment is being prepared for the Midtown Project and impacts related to water supply will be covered separately.

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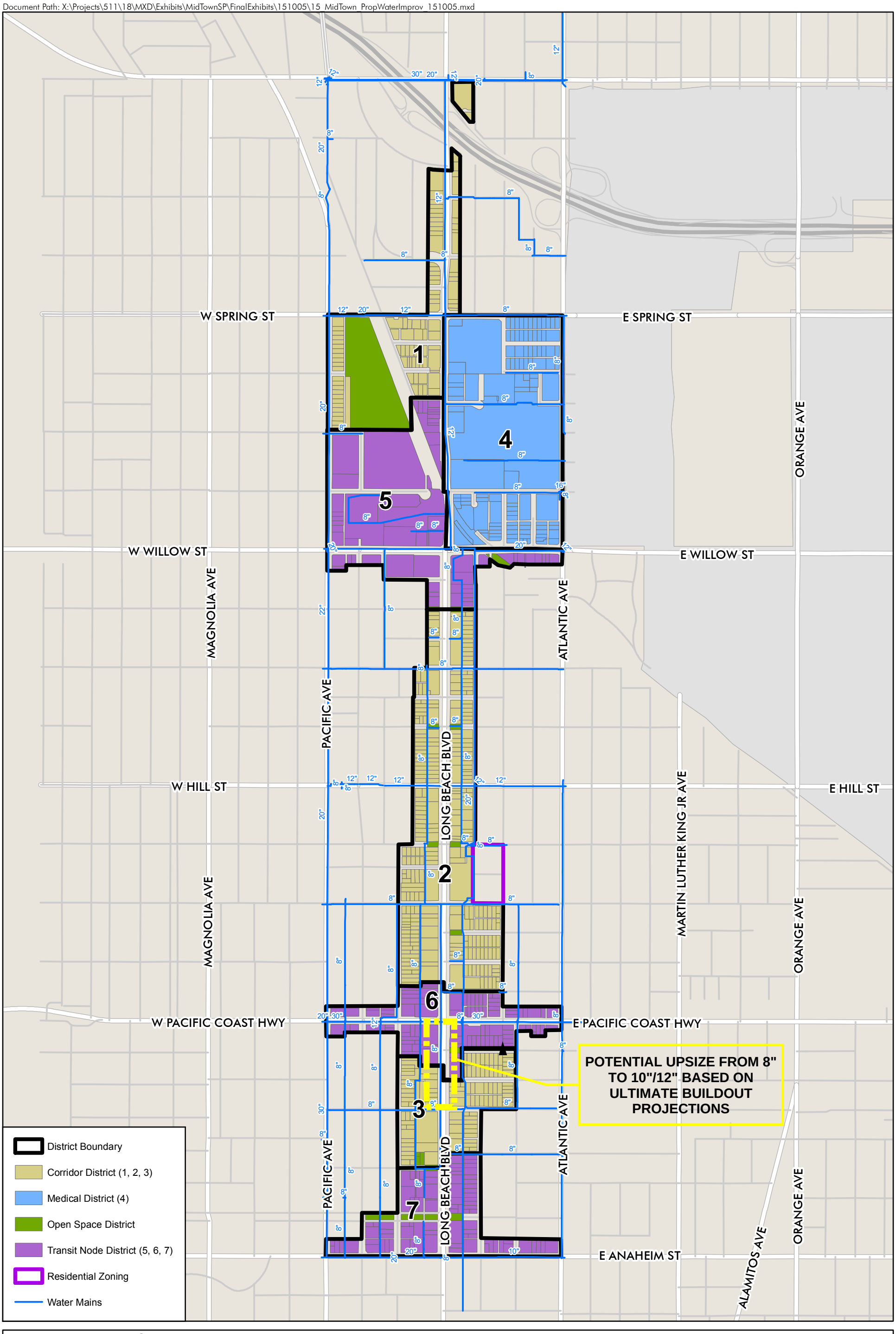

Midtown Specific Plan

City of Long Beach

Figure 15

Proposed Water Improvement Recommendation

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full circle thinking

Date: 10/6/2015

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4.4 WATER QUALITY

4.4.1 Construction Activities

Clearing, grading, excavation and construction activities associated with the proposed project may impact water quality due to sheet erosion of exposed soils and subsequent deposition of particulates in local drainages. Grading activities, in particular, lead to exposed areas of loose soil, as well as sediment stockpiles, that are susceptible to uncontrolled sheet flow. Although erosion occurs naturally in the environment, primarily from weathering by water and wind action, improperly managed construction activities can lead to substantially accelerated rates of erosion that are considered detrimental to the environment.

General Construction Permit

Prior to the issuance of grading permits, the project applicants shall provide evidence that the development of the projects one acre or greater of soil disturbance shall comply with the most current General Construction Permit (GCP) and associated local NPDES regulations to ensure that the potential for soil erosion is minimized on a project-by-project basis. In accordance with the updated GCP (Order No. 2009-0009-DWQ), the following Permit Registration Documents (PRDs) are required to be submitted to the SWRCB prior to commencement of construction activities:

- Notice of Intent (NOI)
- Risk Assessment (Standard or Site-Specific)
- Particle Size Analysis (if site-specific risk assessment is performed)
- Site Map
- SWPPP
- Post-Construction Water Balance Calculator (not required – project is covered under the Long Beach MS4 permit Order No. R4-2014-0024)
- Active Treatment System (ATS) Design Documentation (if ATS is determined necessary)
- Annual Fee & Certification

The updated GCP, Order No. 2009-0009-DWQ, uses a risk-based approach for controlling erosion and sediment discharges from construction sites, since the rates of erosion and sedimentation can vary from site to site depending on factors such as duration of construction activities, climate, topography, soil condition, and proximity to receiving water bodies. The updated GCP identifies three levels of risk with differing requirements, designated as Risk Levels 1, 2 and 3, with Risk Level 1 having the fewest permit requirements and Risk Level 3 having the most-stringent requirements.

The Risk Assessment incorporates two risk factors for a project site: sediment risk (general amount of sediment potentially discharged from the site) and receiving water risk (the risk sediment discharges can pose to receiving waters). Sediment risk from a project site is determined utilizing a derivative of the Revised Universal Soil Loss Equation (RUSLE), a model developed by the US Department of Agriculture (USDA) and is utilized by the US EPA for

estimating rates of soil loss at construction sites during rain events. Utilizing RUSLE, the sediment risk for the project site is thus determined by the following equation:

$$\boldsymbol{A = R \times K \times LS \times C \times P}$$

Where:

A = rate of sheet and rill erosion, in tons/acre
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor (erosion controls)
P = management operations & support practices (sediment controls)

The GCP provides the following procedure for determining the RUSLE equation factors for construction sites:

- R-Factor: Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30).[12] The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R-values calculated for more than 1,000 locations in the Western U.S. The maps may be utilized to determine the Standard Risk Assessment, and have been included in Appendix 1 of the GCP. A hand-calculation may also be utilized to determine the site's R-Factor, either by utilizing the methodology described in USDA's Agricultural Handbook 703, *Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE),* or the EPA's R-value Risk Calculator (available at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm).
- K-Factor: The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. The site-specific K-factor may be determined using the nomograph method as shown in Appendix 1 of the GCP based on a particle-size analysis (ASTM D-422) performed for the soils at the project site.
- LS Factor: The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. The weighted average LS factor may be determined using the LS Table located in Appendix 1 of the GCP.

[12] United States Department of Agriculture (USDA). Predicting Rainfall Erosion Losses A Guide to Conservation Planning. Agriculture Handbook 537. December 1978.

Alternatively, K and LS factors can be derived from regional maps developed by the SWRCB (termed "GIS Map Method"). For the Midtown Project, regional K-Factors are shown on Figure 16, and LS Factors are shown on Figure 17.

Figure 16 GIS Map Method for Determining K-Factor

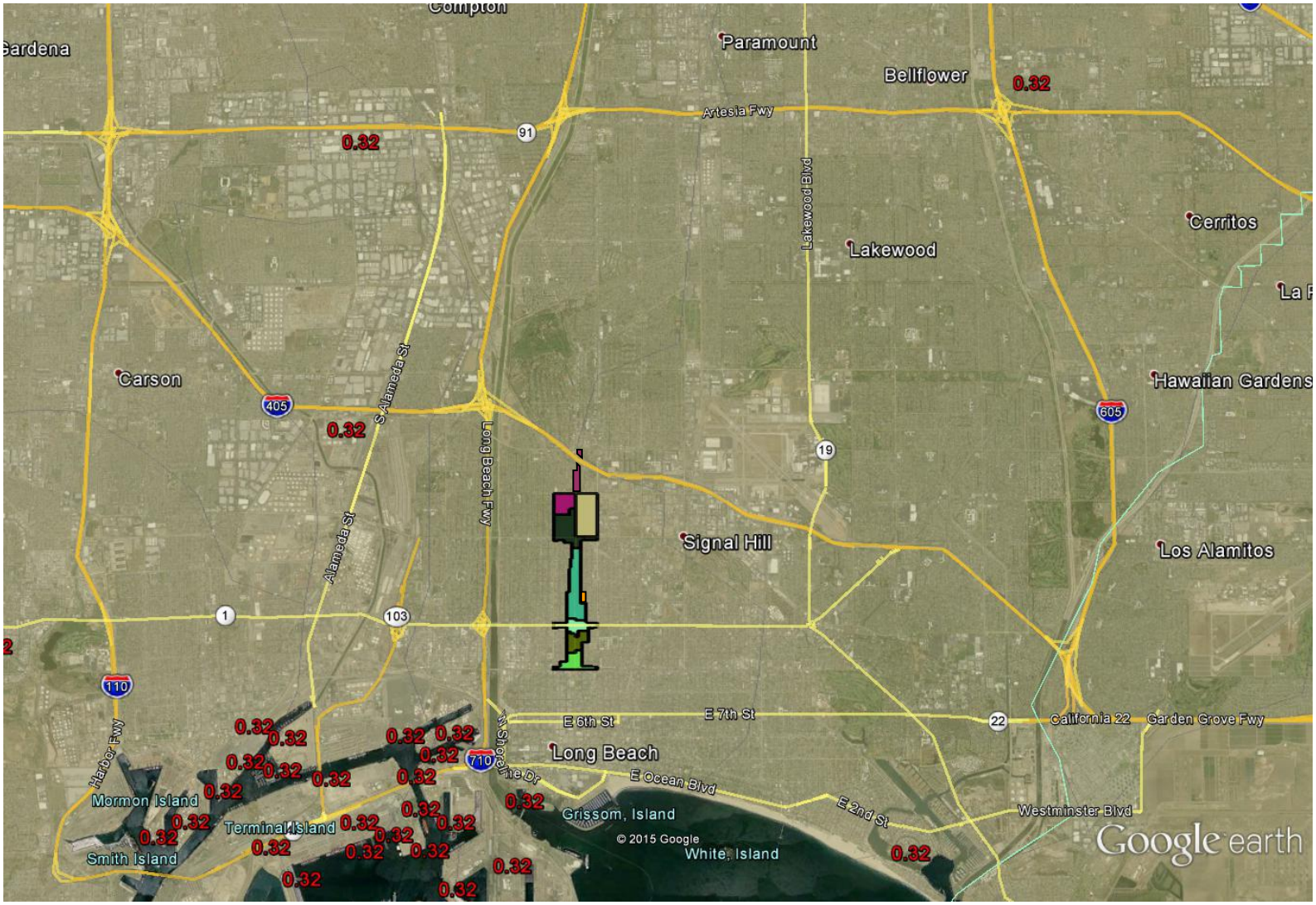
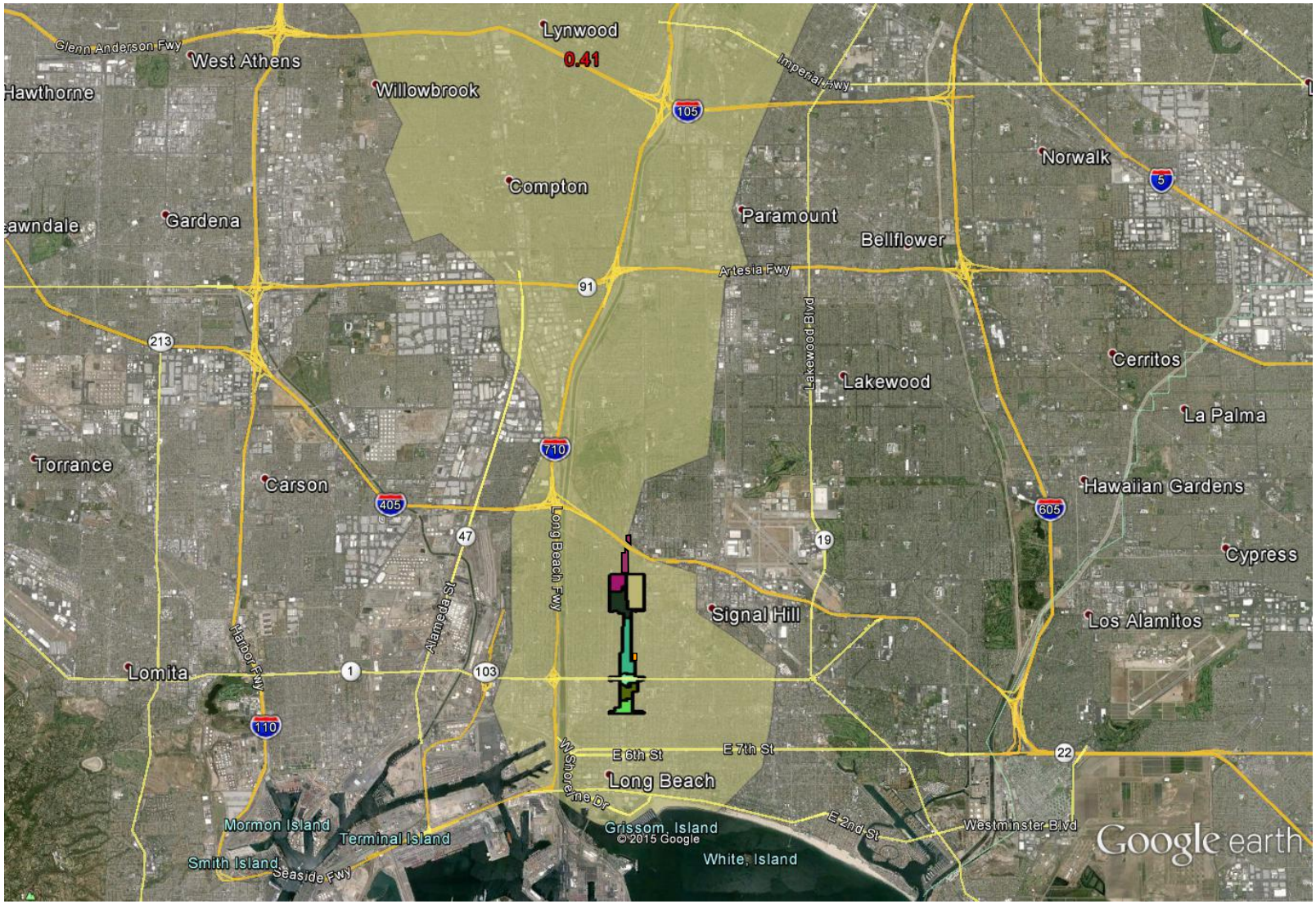


Figure 17 GIS Map Method for Determining LS Factor



- C-Factor: Cover factor based on erosion controls. Assumed to equal 1.0 to simulate bare ground conditions. The implementation of erosion control measures for the proposed project during construction will reduce the C-Factor to less than 1.0, thereby reducing the erosion potential.
- P-Factor: Management operations and support practices for sediment controls. Assumed to equal 1.0 to simulate bare ground conditions. The implementation of sediment control measures for the proposed project during construction will reduce the P-factor to less than 1.0, thereby reducing the sediment loss potential.

With both the C-Factor and P-Factor set at 1.0 to simulate bare ground conditions rather than utilizing values to simulate conditions where construction is taking place, sediment risk is condensed to multiplying R, K, and LS factors from the RUSLE equation. The resultant risk of soil loss (A), measured in tons per acre, is then categorized as Low, Medium, or High based on the following breakdown:

A < 15 tons/acre = Low Sediment Risk

A > 15 and < 75 tons/acre = Medium Sediment Risk

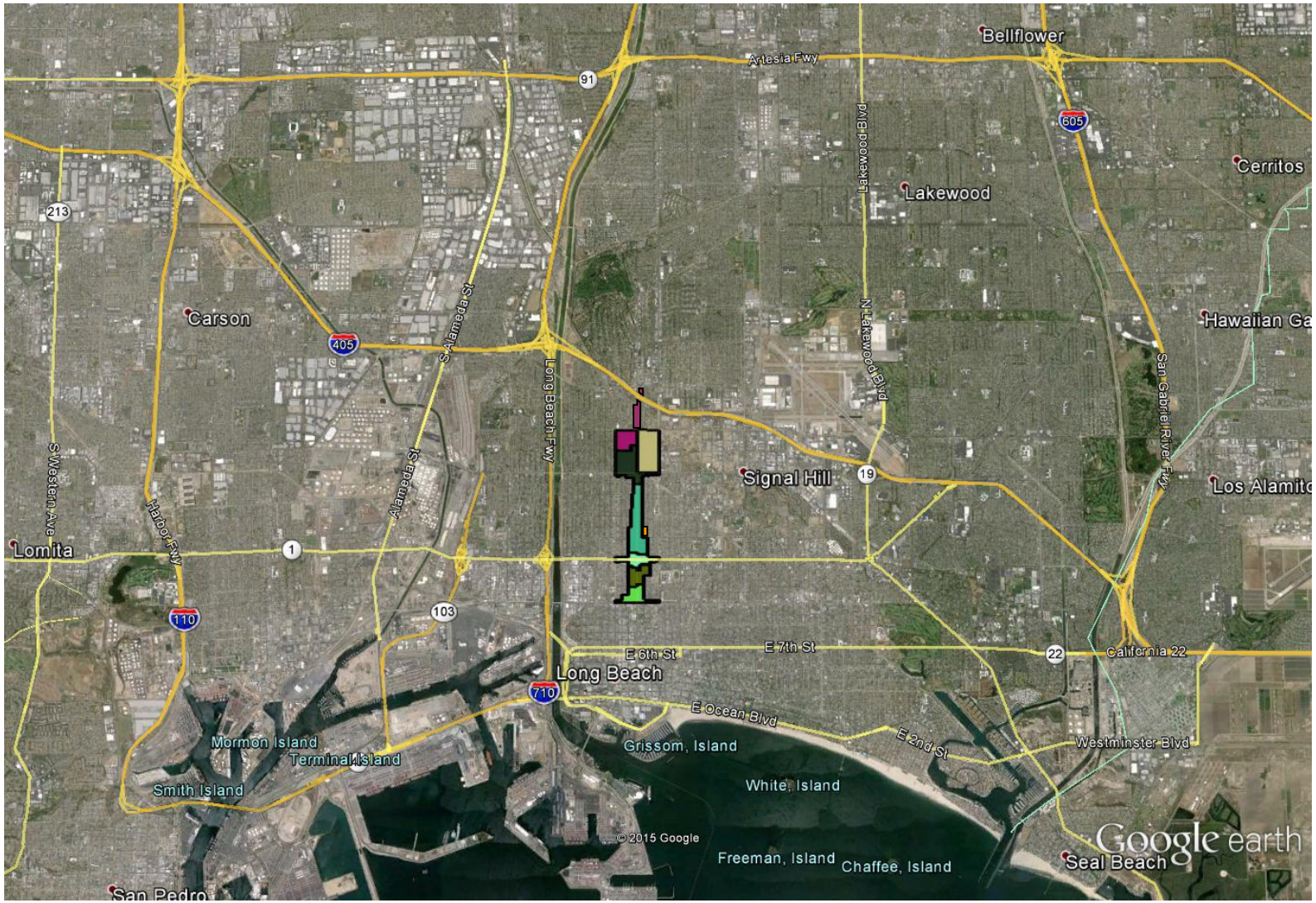
A > 75 tons/acre = High Sediment Risk

The second risk factor in performing a Risk Assessment is Receiving Water Risk. The Receiving Water Risk is based on whether or not the project site drains to a sediment-sensitive water body or a water body with spawning, reproduction, and development (SPAWN), cold freshwater habitat (COLD), and fish migration (MIGRATORY) beneficial uses as designated in the region's Basin Plan. The GCP identifies a High Receiving Water Risk if the project's receiving water meets at least one of the above characteristics. If the project does not discharge to a water body that meets one of the above categories, it is considered a Low Receiving Water Risk. The receiving water conditions that result in a High Receiving Water Risk is summarized below:

- The disturbed area discharges (either directly or indirectly) to a 303(d)-listed water body impaired by sediment.
- The disturbed area discharges to a water body that has a US EPA-approved TMDL implementation plan for sediment.
- The disturbed area discharges to a water body with designated beneficial uses of SPAWN, COLD, & MIGRATORY per the region's Basin Plan (see Section 2.4.2 for beneficial uses related to the Project).

Similar to K and LS Factors for sediment risk, the SWRCB developed regional maps for determining receiving water risk. Figure 18 identifies the project site location with respect to areas identified as a High Receiving Water Risk (shown in red), which there are none downstream of the project site. The project site is outside of a High Receiving Water Risk area and, therefore, does not meet any of the above-listed categories and is considered a Low Receiving Water Risk.

Figure 18 GIS Map Method for Determining Receiving Water Risk



The resultant risk levels for Sediment Risk and Receiving Water Risk is then assessed in a matrix to determine the combined risk level, based on a scale of 1 to 3. The combined risk level matrix is presented as Table 20.

Table 20 Construction Site Risk Level Matrix

	Sediment Risk		
Receiving Water Risk	*Low*	*Medium*	*High*
Low	Risk Level 1	Risk Level 2	Risk Level 2
High	Risk Level 2	Risk Level 2	Risk Level 3

Based on the Risk Level a project falls under, different sets of regulatory requirements are applied to the site. The main difference between Risk Levels 1, 2, and 3 are the numeric effluent standards. In Risk Level 1, there are no numeric effluent standard requirements, as it is considered a low Sediment Risk and low Receiving Water Risk (see matrix above). Instead, narrative effluent limits are prescribed. In Risk Level 2, Numeric Action Levels (NALs) of pH between 6.5-8.5 and turbidity below 250 NTU are prescribed in addition to the narrative effluent limitations found in Risk Level 1 requirements. Should the NAL be exceeded during a storm event, the discharger is required to immediately determine the source associated with the exceedance and to implement corrective actions if necessary to mitigate the exceedance. Prior to December 2011, for a Risk Level 3 site, Numeric Effluent Limits (NELs) are applied in addition to the narrative and numeric effluent standards prescribed for a Risk Level 2 site. Risk Level 3 dischargers are subject to a pH NEL of 6.0-9.0 and turbidity NEL of 500 NTU. Once an NEL is exceeded, the construction site is considered in violation of the GCP. Since December 2011, however, the Supreme Court issued a judgment and peremptory writ of mandate to remove requirements for NELs and to amend the GCP. Proposed revisions to the GCP requires Risk Level 3 dischargers to comply with Risk Level 2 requirements for NALs in addition to more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment should NALs be exceeded.

Since the proposed Project is a Specific Plan in the City of Long Beach, a detailed, site-specific Risk Assessment cannot be performed at this time. However, since the project site resides in a watershed considered to be a low-risk receiving water body, it is anticipated that construction projects subject to the GCP will not be greater than Risk Level 2.

Construction Best Management Practices (BMPs)

In accordance with the existing and updated GCP, a construction SWPPP must be prepared and implemented at all construction projects with 1 acre or greater of soil disturbance, and revised as necessary, as administrative or physical conditions change. The SWPPP must be made available for review upon request, shall describe construction BMPs that address pollutant source reduction, and provide measures/controls necessary to mitigate potential pollutant sources. These include, but are not limited to: erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good

housekeeping practices.[13] The above-mentioned BMPs for construction activities are briefly discussed below.

- Erosion control BMPs, such as hydraulic mulch, soil binders, and geotextiles and mats, protect the soil surface by covering and/or binding the soil particles. Temporary earth dikes or drainage swales may also be employed to divert runoff away from exposed areas and into more suitable locations. If implemented correctly, erosion controls can effectively reduce the sediment loads entrained in storm water runoff from construction sites.
- Sediment controls are designed to intercept and filter out soil particles that have been detached and transported by the force of water. All storm drain inlets on the project site or within the project vicinity (i.e., along streets immediately adjacent to the project boundary) should be adequately protected with an impoundment (i.e., gravel bags) around the inlet and equipped with a sediment filter (i.e., fiber roll). They should also be placed around areas of soil disturbing activities, such as grading or clearing.
- Stabilize all construction entrance/exit points to reduce the tracking of sediments onto adjacent streets. Wind erosion controls should be employed in conjunction with tracking controls.
- Non-storm water management BMPs prohibit the discharge of materials other than storm water, as well as reduce the potential for pollutants from discharging at their source. Examples include avoiding paving and grinding operations during the wet season where feasible, and performing any vehicle equipment cleaning, fueling and maintenance in designated areas that are adequately protected and contained.
- Waste management consists of implementing procedural and structural BMPs for collecting, handling, storing and disposing of wastes generated by a construction project to prevent the release of waste materials into storm water discharges.

Prior to commencement of construction activities within the Midtown Project area, the project-specific SWPPP(s) will be prepared in accordance with the site specific sediment risk analyses based on the grading plans, with erosion and sediment controls proposed for each phase of construction for the individual project. The phases of construction will define the maximum amount of soil disturbed, the appropriate sized sediment basins and other control measures to accommodate all active soil disturbance areas and the appropriate monitoring and sampling plans.

SWPPPs will require projects to plan BMPs for four general phases of construction: (1) grading and land development (e.g., mass grade & rough grade), (2) utility and road installation, (3) vertical construction, and (4) final stabilization and landscaping. Therefore, BMP implementation for new construction can be evaluated in this general context. Site specific details on individual BMPs will be dependent on the scope and breadth of each future project, which are not known at this time.

[13] California Stormwater Quality Association. (2003, January). *Stormwater Best Management Practices Handbook for New Development and Redevelopment*. Retrieved January 27, 2009, from http://www.cabmphandbooks.com

Mass Grade & Rough Grade

During mass and/or rough grading, a substantial amount of soil disturbing activities or earthwork will occur. As a consequence, soil loss potential will be at its highest risk to exceed NALs/NELs specified in the GCP. Therefore, an effective combination of erosion and sediment controls must be implemented during this phase of construction. Active exposed areas need to have sufficient supply of standby erosion and sediment control BMPs stored on-site to protect all active exposed areas to reduce or prevent sediment discharges. The total active exposed area shall not exceed that which can be adequately protected by deploying these BMPs prior to a predicted rain event. Inactive exposed areas not being actively worked on shall be protected from erosion with temporary or permanent erosion and sediment control BMPs. The ability to deploy standby BMPs is not sufficient for these areas – BMPs must actually be deployed.

Utility and Road Installation

In addition to the erosion and sediment control BMP requirements for the grading phase, the utility and road installation phase will introduce materials to the Project that may cause or contribute to exceedances of NALs specified in the GCP. Materials include, but are not limited to hydrated lime, concrete, mortar, Portland cement treated base, and fly ash. For this reason, pH levels must be controlled at this stage through non-storm water management and waste and materials management BMPs. Stockpile management will also be important due to the trenching activities involved in utility installation. Should NALs/NELs be exceeded at any point in time, additional site management or "good housekeeping" BMPs shall be implemented and the source of pollution controlled.

Vertical Construction

Once utilities and roads are in place, sediment controls (such as sediment/desilting basins) found in the rough grade phase may no longer be applicable as previously designed, due to the installment of curb and gutter, catch basins, and storm drain infrastructure to convey runoff off-site per the post-construction condition. BMPs at this stage will thus be more focused on on-lot sediment control BMPs and at discharge points (i.e., catch basin inlet protection). During vertical construction, a substantial amount of construction materials will be delivered to the site, and wastes generated from the site have the potential to negatively impact pH levels. Therefore, non-storm water management and waste and materials management BMPs will be employed regularly.

Final Stabilization and Landscaping

During final stabilization and landscaping, minimal construction will be taking place and the majority of the project site will be stabilized. The majority of activities will involve planting and landscaping lots and common areas. Sediment control at discharge locations and stockpile management will be of primary concern. Good housekeeping practices will continue in this phase of construction.

4.4.2 Post-Construction Activities

With the proposed land use changes, development of the Midtown Project may result in long-term impacts to the quality of storm water and urban runoff, subsequently impacting downstream water quality. It can potentially create new sources for runoff contamination through changing

land uses. As a consequence, the Project may have the potential to increase the post-construction pollutant loadings of certain constituent pollutants associated with the proposed land uses and their associated features.

Bacteria/Pathogens. Elevated pathogens are typically caused by the transport of human or animal fecal wastes from the watershed. Runoff that flows over land such as urban runoff can mobilize pathogens, including bacteria and viruses. Even runoff from natural areas can contain pathogens (e.g., from wildlife, plant matter, and soils). Other sources of pathogens in urban areas include pets and leaky sanitary sewer pipes. The presence of pathogens in runoff can impair receiving waters. Total and fecal coliform, enterococcus bacteria, and *E. coli* bacteria are commonly used as indicators for pathogens due to the difficulty of monitoring pathogens directly.

Metals. The primary sources of trace metals in storm water are metals typically used in transportation, buildings and infrastructure and also paints, fuels, adhesives and coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, mercury are typically not detected in urban runoff or are detected at very low levels.[14] Trace metals have the potential to cause toxic effects on aquatic life and are a potential source of groundwater contamination.

Nutrients. Nutrients are inorganic forms of phosphorous and nitrogen. The main sources of nutrients in urban areas include fertilizers in lawns, pet wastes, failing septic systems, and atmospheric deposition from automobiles and industrial operations. The most common impact of excessive nutrient input is eutrophication of the receiving water body, resulting in excessive algal production, hypoxia or anoxia, fish kills and potential releases of toxins from sediment due to changes in water chemistry profiles.

Oil and Grease. The most common sources of oil and grease in urban runoff stem from spilled fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff can contain leachate from roads, breakdown of tires/rubber and deposition of automobile exhaust. Some petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can bioaccumulate in aquatic organisms and are toxic at low concentrations. Hydrocarbons can be measured in a variety of ways including petroleum hydrocarbons, oil and grease, or as individual groups such as PAHs. Hydrocarbons can persist in sediment for long periods of time in the environment and can result in adverse impacts on the diversity and abundance of benthic communities.

Organic Compounds. Organic compounds are carbon-based, and are typically found in pesticides, solvents, and hydrocarbons. Dirt, grease, and other particulates can also adsorb organic compounds in rinse water from cleaning objects, and can be harmful or hazardous to aquatic life either indirectly or directly.

Oxygen Demanding Substances. Oxygen-demanding substances include biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other

[14] Los Angeles County, Department of Public Works. (2000, September). Los Angeles County 1994–2000 Integrated Receiving Water Impacts Report. Retrieved January 27, 2009, from http://ladpw.org/WMD/npdes/IntTC.cfm

compounds, such as proteins, carbohydrates, fats, as well as ammonia and hydrogen sulfide. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions, resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds.

Pesticides. Pesticides (including herbicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide or impractical application of pesticides (i.e., right before rain events) may result in runoff containing toxic levels to receiving water bodies and microorganisms.

Sediment. Sheet erosion and the transport and deposition of sediment in surface waters can be a significant form of pollution that may result in water quality problems. Increases in runoff velocities and volumes can cause excessive stream erosion and sediment transport altering the sediment equilibrium of a stream or channel. Excessive fine sediment, such as total suspended solids, can impair aquatic life through changes to the physical characteristics of the stream (light reduction, temperature changes, etc.).

Trash and Debris. Improperly disposed or handled trash such as paper, plastics and debris including the biodegradable organic matter such as leaves, grass cuttings, and food waste can accumulate on the ground surface where it can be entrained in urban runoff. The large amount of trash and debris can have significant negative impacts on the recreational value of water body. Excessive organic matter can create a high biochemical oxygen demand in a stream and lower its water quality.

To help prevent long-term impacts associated with land use changes and in accordance with the requirements of the City of Long Beach and its MS4 permit (Order No. R4-2014-0024), new development and significant redevelopment projects must incorporate LID/site design and source control BMPs to address post-construction storm water runoff management. In addition, projects that are identified as Priority Projects are required to implement site design/LID and source control BMPs applicable to their specific priority project categories, as well as implement treatment control BMPs where necessary. Selection of LID and additional treatment control BMPs is based on the pollutants of concern for the specific project site and the BMP's ability to effectively treat those pollutants, in consideration of site conditions and constraints. Further, projects must develop a project-specific SUSMP or LID Design Plans that describes the menu of BMPs chosen for the project, as well as include operation and maintenance requirements for all structural and any treatment control BMPs.

Since the Midtown Project does not include a specific or detailed development plan, project-specific SUSMP's will not be developed for the project at this time. Future project-specific reports, preliminary and/or final, will be prepared consistent with the prevailing terms and conditions of the City's LID Ordinance (Ordinance No. ORD-2013-0024) and LID BMP Design Manual (2013) at the time of project application. Moreover, LID and water quality treatment solutions prescribed in project-specific reports shall be designed to support or enhance the regional BMPs and efforts implemented by the City as part of their City-wide efforts to improve water quality.

SUSMP / LID Design Approach

The overall approach to water quality treatment for the individual projects within the Midtown Project and individual Development Districts will include incorporation of site design/LID strategies and source control measures throughout the sites in a systematic manner that maximizes the use of LID features to provide treatment of storm water and reduce runoff. In accordance with the MS4 Permit for the City of Long Beach, the use of LID features will be consistent with the prescribed hierarchy of treatment provided in the Permit: infiltration, evapotranspiration, harvest/reuse and biotreatment. For those areas of the site where LID features are not feasible or do not meet the feasibility criteria, treatment control BMPs with biotreatment enhancement design features will be utilized to provide treatment. Where applicable, LID features will be analyzed to demonstrate their ability to treat portions of the required design capture volume (DCV) and reduce the size of downstream on-site treatment control BMPs.

Consistent with regulatory requirements and design guidelines for water quality protection, the following principles are being followed for the project and will be supported by construction level documents in the final SUSMP plan prior to grading permit(s) issuance by the City of Long Beach:

- Where feasible, LID features will be sized for water quality treatment credit according to local Regional Board sizing criteria as defined in the 2014 MS4 Permit for either flow-based or volume-based BMPs. There will be a significant effort to integrate LID techniques within the internal development areas (site design objectives), thereby providing treatment of low-flow runoff directly at the source and runoff reduction of small (i.e., more frequent) storm event runoff (first-flush). In most instances, LID features will be sized by volume-based analyses to demonstrate compliance with the required design capture volume for the project.
- Detailed field investigations, drainage calculations, grading, and BMP sizing to occur during the detailed design phase and future project-specific SUSMP documentation.
- Where feasible, LID features will be designed to infiltrate and/or reuse treated runoff on-site in accordance with feasibility criteria as defined in the 2013 LID BMP Design Manual (City of Long Beach Development Services)
- For those areas of the project where infiltration is not recommended or acceptable and harvest/reuse landscaping demands are insufficient, biotreatment LID features will be designed to treat runoff and discharge controlled effluent flows to downstream receiving waters.

Unlike flood control measures that are designed to handle peak storm flows, LID BMPs and treatment control BMPs are designed to retain, filter or treat more frequent, low-flow runoff or the "first-flush" runoff from storm events. In accordance with the 2014 MS4 Permit for the City of Long Beach, the LID BMPs shall be sized and designed to ensure on-site retention of the volume of runoff produced from a 24-hour 85th percentile storm event, as determined from the Los Angeles County's 85th Percentile Precipitation Map.[15] This is termed the "design capture volume", or DCV. The 85th Percentile for the northern half of the Midtown Project is 0.7" while

[15] Los Angeles County Department of Public Works Hydrology Map. http://dpw.lacounty.gov/wrd/hydrologygis/ (Accessed March 2015)

the 85th Percentile event for the southern half of the project area is 0.6". The City's LID BMP Design Manual provides design criteria, hydrologic methods and calculations for combining use of infiltration, retention, and biofiltration BMPs to meet on-site volume retention requirements.

Midtown Project Water Quality Opportunities

In an effort to create enhanced mobility and complete streets as one of the Midtown Specific Plan's guiding principles, the design elements (termed "catalysts") specified in the Plan to accomplish this goal also creates potential opportunities to incorporate LID practices into public spaces and right-of-ways. By redesigning corridors such as Long Beach Boulevard to prioritize walking, bicycling, and other non-vehicular modes of transportation, this will create opportunities for implementing pervious pavement as hardscape within areas with low vehicular traffic and light traffic loads, such as the widened sidewalks, enhanced crosswalks, and separated bike lanes proposed. The introduction of canopy trees and potted plants for the design of small streetscape elements can be re-envisioned as storm water planter areas for biofiltration opportunities.

The reclaiming of unused or very low volume segments of roadways to convert to streetlets (small public plazas) and parks provides opportunities to create significant (e.g. quarter of an acre) areas or zones for storm water retention and runoff reduction. This can be accomplished by removing existing impervious surfaces and replacing with permeable pavers, grading hardscape to drain to landscaped parks for infiltration and evapotranspiration, and utilizing proposed landscape buffer zones for biofiltration benefits.

It should be noted that with public improvements, especially within the right-of-way, biofiltration BMPs are generally more feasible to integrate than infiltration LID BMPs due to infrastructure constraints such as existing underground utilities to remain in place and the limited footprint with which to incorporate such features without detrimentally impacting other design elements. Therefore, these opportunities to incorporate water quality features should not be look at as regional treatment facilities but, instead, as small-scale hydrologic source control LID measures.

4.4.3 Water Quality Impacts

The impact assessments are based on the significance criteria established in Section 3 for water quality.

Impact A *Would the Project violate any water quality standards or waste discharge requirements?*

Impact Analysis: In terms of construction related impacts, the proposed General Plan Amendment for the Midtown Specific Plan would not increase nor decrease the potential to violate water quality standards or waste discharge requirements as construction activities will happen within the project area regardless. Nevertheless, construction activities related to the build-out of the Specific Plan to support approximately 1,736 additional dwelling units, and approximately 370,000 additional square feet of commercial/employment would potentially

result in soil erosion and temporary adverse impacts to surface water quality from construction materials and wastes if left unregulated or unmitigated.

Both State and Local regulations will effectively mitigate construction storm water runoff impacts from the build-out of the Midtown Specific Plan. The City of Long Beach Municipal Code requires standard erosion control practices to be implemented for all construction within the City. Additionally, construction sites will be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the requirements of the Statewide General Construction Permit and subject to the oversight of the Los Angeles Regional Water Quality Control Board. The SWPPP must include BMPs to reduce or eliminate erosion and sedimentation from soil disturbing activities, as well as proper materials and waste management. Implementation of these State and Local requirements would effectively protect projects from violating any water quality standards or waste discharge requirements from construction activities.

In terms of post-construction related impacts, the incorporation of site design, LID features and BMPs as required under the City of Long Beach SUSMP/LID design requirements, the individual development and redevelopment projects within the Midtown Specific Plan will effectively retain or treat the 85th percentile 24-hour storm water runoff for pollutants such as bacteria, metals, nutrients, oil & grease, organics, pesticides, sediment, trash, and oxygen demanding substances prior to discharge off their property. As more and more properties within the Midtown Specific Plan area undergo development and redevelopment as part of the Specific Plan build-out, properties not previously subject to the current land development provisions will be required to incorporate SUSMP/LID standards. Therefore, long-term surface water quality of runoff from the Midtown Specific Plan area would be expected to improve over existing conditions as more LID BMPs are implemented throughout the project. This is considered an overall beneficial effect of the project.

Impact F Would the Project otherwise substantially degrade water quality?

Impact Analysis: As a result of the construction-related, site design, LID and source control BMPs, water quality exceedances are not anticipated and pollutant loads in Project runoff are not expected to adversely affect beneficial uses in downstream receiving waters, such as the Los Angeles River. See Impact Analysis to Impact A for additional details.

5. CONCLUSION

The proposed land use changes under the Midtown Project will increase the demand of potable water and sewer flows over existing conditions while largely maintaining existing runoff conditions. The report identifies several sewer improvements upgrades are required to provide sufficient capacity for the proposed land plan. In addition, the report identifies a variety of storm drain improvements to improve existing condition runoff collection and improve conditions for the proposed land plan. In all cases, project specific analyses will be required during final design to evaluate individual storm drain, water and sewer facilities related to the individual projects to ensure impacts are less than significant.

Based on the existing built out condition and the proposed land use changes under the Midtown Project including the implementation of low impact development features, no substantial additional sources of pollutants or significant increases in Project runoff for the 85th percentile storm event are anticipated. Based on the findings of this technical study, the incorporation of site design/LID features, and infiltration/biotreatment BMPs as required under the MS4 Permit and local LID requirements, the individual projects will adequately reduce project related impacts to hydrology and water quality to a level less than significant.

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7. TECHNICAL APPENDICES

Appendix A Hydrology

Appendix B Sewer Demand Calculations

Appendix C Water Demand Calculations

APPENDIX A

HYDROLOGY

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 04																
040005	10	County	US	11.00	3.27	757	0.0029	0.013	72" Dia Pipe	210	Hydrology (cfs)	119.0	145.0	164.0	227.6	
	F12		DS	10.90	5.46						Depth in Street (ft)	-NA-	-NA-	-NA-		
040010	10	County	US	9.00	2.08	844	0.0014	0.013	60" Dia Pipe	174	Hydrology (cfs)	85.0	110.0	128.0	97.7	
	G12		DS	11.00	3.27						Depth in Street (ft)	-NA-	-NA-	-NA-		
040015	10	County	US	15.00	2.80	4,894	0.0010	0.013	48" Dia Pipe	138	Hydrology (cfs)	88.0	115.0	135.0	45.3	66" Dia RCP
	G13		DS	9.00	2.08						Depth in Street (ft)	-NA-	-NA-	-NA-		
040020	10	County	US	28.00	4.65	1,842	0.0010	0.013	48" Dia Pipe	117	Hydrology (cfs)	82.0	108.0	126.0	45.5	60" Dia RCP
	H14		DS	15.00	2.80						Depth in Street (ft)	0.50	0.60	0.60		
040025	10	County	US	24.00	6.00	1,330	0.0010	0.013	48" Dia Pipe	111	Hydrology (cfs)	81.0	106.0	124.0	45.7	60" Dia RCP
	J14		DS	28.00	4.65						Depth in Street (ft)	0.40	0.60	0.60		
040030	11	County	US	21.00	7.30	1,304	0.0010	0.013	48" Dia Pipe	17	Hydrology (cfs)	14.0	18.0	21.0	45.3	
	J14		DS	24.00	6.00						Depth in Street (ft)	-	-	-		
040105	10	County	US	15.00	16.65	288	0.0006	0.015	17.00'H x 7.00'W Box	610	Hydrology (cfs)	370.0	465.0	554.0	525.0	
	F14		DS	16.00	16.82						Depth in Street (ft)	-	-	0.40		
040110	10	County	US	9.00	15.82	754	0.0011	0.013	108" Dia Pipe	258	Hydrology (cfs)	168.0	211.0	244.0	409.1	
	F14		DS	15.00	16.63						Depth in Street (ft)	-	-	-		
040115	10	County	US	9.00	15.21	685	0.0009	0.015	6.00'H x 9.00'W Box	236	Hydrology (cfs)	160.0	201.0	231.0	236.2	
	F14		DS	8.90	15.82						Depth in Street (ft)	-	-	-		
040120	10	County	US	11.00	13.94	1,284	0.0010	0.015	4.00'H x 10.08'W Box	138	Hydrology (cfs)	93.0	117.0	135.0	159.6	
	G15		DS	9.00	15.21						Depth in Street (ft)	-	-	-		
040125	16	County	US	13.00	10.74	1,752	0.0014	0.013	84" Dia Pipe	107	Hydrology (cfs)	83.0	103.0	118.0	237.7	
	G15		DS	11.00	13.17						Depth in Street (ft)	-	-	-		
040130	16	County	US	13.00	6.58	730	0.0057	0.013	78" Dia Pipe	89	Hydrology (cfs)	68.0	85.0	98.0	395.4	
	G15		DS	12.90	10.74						Depth in Street (ft)	-	-	-		
040135	16	County	US	14.00	3.62	397	0.0071	0.013	78" Dia Pipe	53	Hydrology (cfs)	39.0	49.0	57.0	442.3	
	H15		DS	13.00	6.45						Depth in Street (ft)	-	-	-		

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 04																
040140	16	County	US	27.00	6.00	724	0.0133	0.013	54" Dia Pipe	53	Hydrology (cfs)	39.0	50.0	57.0	226.5	
	H15		DS	14.00	3.62						Depth in Street (ft)	-	-	-		
040145	16	County	US	25.00	10.08	1,128	0.0036	0.013	42" Dia Pipe	22	Hydrology (cfs)	15.0	20.0	23.0	60.5	
	H15		DS	27.00	6.00						Depth in Street (ft)	-	-	-		
040150	16	County	US	24.00	10.30	347	0.0006	0.013	42" Dia Pipe	4	Hydrology (cfs)	3.0	4.0	5.0	25.3	
	J15		DS	25.00	10.08						Depth in Street (ft)	-	-	-		
040155	16	County	US	24.00	11.09	382	0.0021	0.013	30" Dia Pipe	4	Hydrology (cfs)	4.0	5.0	6.0	18.6	
	J15		DS	23.90	10.30						Depth in Street (ft)	-	-	-		
040205	10	County	US	14.00	16.55	115	0.0009	0.015	7.00'H x 9.00'W Box	347	Hydrology (cfs)	235.0	294.0	350.0	288.9	
	F14		DS	15.00	16.65						Depth in Street (ft)	-	0.20	0.50		
040210	10	County	US	13.00	9.76	138	0.0494	0.013	84" Dia Pipe	347	Hydrology (cfs)	235.0	294.0	350.0	1,418.6	
	F14		DS	14.00	16.55						Depth in Street (ft)	-	-	-		
040215	10	County	US	12.00	8.37	141	0.0098	0.013	84" Dia Pipe	342	Hydrology (cfs)	233.0	292.0	347.0	633.1	
	F14		DS	13.00	9.76						Depth in Street (ft)	-	-	-		
040220	10	County	US	12.00	6.38	627	0.0032	0.013	84" Dia Pipe	325	Hydrology (cfs)	215.0	269.0	322.0	359.7	
	G14		DS	11.90	8.37						Depth in Street (ft)	-	-	-		
040225	10	County	US	12.00	6.38	484	0.0041	0.013	84" Dia Pipe	219	Hydrology (cfs)	178.0	220.0	252.0	409.2	
	G14		DS	11.90	8.37						Depth in Street (ft)	-	-	-		
040230	10	County	US	12.00	6.27	36	0.0030	0.013	84" Dia Pipe	156	Hydrology (cfs)	118.0	146.0	168.0	351.0	
	G14		DS	11.90	6.38						Depth in Street (ft)	-	-	-		
040235	10	County	US	10.00	5.35	367	0.0012	0.013	78" Dia Pipe	156	Hydrology (cfs)	118.0	146.0	168.0	177.3	
	G14		DS	12.00	5.77						Depth in Street (ft)	-	-	-		
040240	10	County	US	11.00	5.06	312	0.0009	0.013	78" Dia Pipe	154	Hydrology (cfs)	117.0	145.0	167.0	159.9	
	G13		DS	10.00	5.35						Depth in Street (ft)	-	-	0.30		
040245	10	County	US	11.00	5.03	23	0.0009	0.015	20.50'H x 4.50'W Box	154	Hydrology (cfs)	117.0	146.0	167.0	408.1	
	G13		DS	10.90	5.05						Depth in Street (ft)	-	-	-		

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 04																
040250	10	County	US	14.00	3.09	422	0.0046	0.013	72" Dia Pipe	154	Hydrology (cfs)	117.0	146.0	168.0	286.4	
	G13		DS	11.00	5.02						Depth in Street (ft)	-	-	-		
040255	10	County	US	19.00	.72	833	0.0029	0.013	66" Dia Pipe	124	Hydrology (cfs)	88.0	111.0	128.0	179.0	
	G13		DS	14.00	3.09						Depth in Street (ft)	-	-	-		
040260	10	County	US	16.00	1.26	699	0.0028	0.013	66" Dia Pipe	74	Hydrology (cfs)	55.0	71.0	82.0	178.5	
	G14		DS	19.00	.72						Depth in Street (ft)	-	-	-		
040265	10	County	US	32.00	19.98	1,663	0.0113	0.013	48" Dia Pipe	50	Hydrology (cfs)	41.0	52.0	60.0	152.3	
	H14		DS	16.00	1.26						Depth in Street (ft)	-	-	-		
040270	10	County	US	32.00	20.05	29	0.0024	0.013	42" Dia Pipe	44	Hydrology (cfs)	38.0	48.0	55.0	49.2	
	H14		DS	31.90	19.98						Depth in Street (ft)	-	-	0.30		
040275	10	County	US	31.00	21.80	577	0.0022	0.013	42" Dia Pipe	22	Hydrology (cfs)	19.0	23.0	27.0	46.8	
	H14		DS	32.00	20.55						Depth in Street (ft)	-	-	-		
040405	10	County	US	9.00	2.60	839	0.0055	0.013	36" Dia Pipe	17	Hydrology (cfs)	21.0	25.0	28.0	49.3	
	F13		DS	12.00	7.20						Depth in Street (ft)	-	-	-		
040505	10	City	US	10.00	1.25	1,205	0.0016	0.026	51" Dia Pipe	97	Hydrology (cfs)	57.0	71.0	83.0	34.0	48" Dia RCP
	G14		DS	12.00	3.21						Depth in Street (ft)	0.70	0.80	0.90		
040510	10	City	US	10.00	1.84	1,663	0.0012	0.013	36" Dia Pipe	42	Hydrology (cfs)	42.0	51.0	59.0	22.8	48" Dia RCP
	G14		DS	9.90	.10						Depth in Street (ft)	0.90	1.10	1.20		
040515	10	City	US	10.00	2.31	398	0.0012	0.013	33" Dia Pipe	42	Hydrology (cfs)	43.0	53.0	59.0	18.2	48" Dia RCP
	G14		DS	9.90	1.84						Depth in Street (ft)	0.80	0.90	0.90		
040605	10	County	US	12.00	4.25	1,179	0.0018	0.013	48" Dia Pipe	13	Hydrology (cfs)	16.0	19.0	21.0	61.0	
	G13		DS	11.90	6.38						Depth in Street (ft)	-	-	-		
040705	10	City	US	11.00	1.58	1,356	0.0014	0.013	42" Dia Pipe	55	Hydrology (cfs)	24.0	30.0	34.0	37.4	
	G15		DS	10.00	.30						Depth in Street (ft)	-	-	-		
040710	16	City	US	14.00	3.09	769	0.0016	0.013	39" Dia Pipe	55	Hydrology (cfs)	25.0	30.0	35.0	33.1	
	G15		DS	11.00	1.85						Depth in Street (ft)	-	-	0.20		

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 04																
040715	16	City	US	14.00	4.29	599	0.0016	0.013	36" Dia Pipe	26	Hydrology (cfs)	13.0	18.0	21.0	26.5	
	G15		DS	13.90	3.34						Depth in Street (ft)	-	-	-		
040720	16	City	US	14.00	8.27	1,513	0.0025	0.013	33" Dia Pipe	26	Hydrology (cfs)	14.0	19.0	22.0	26.3	
	H15		DS	13.90	4.52						Depth in Street (ft)	-	-	-		
040725	16	City	US	25.00	10.09	1,822	0.0010	0.013	30" Dia Pipe	26	Hydrology (cfs)	18.0	23.0	27.0	12.9	36" Dia RCP
	H15		DS	14.00	8.27						Depth in Street (ft)	0.20	0.30	0.30		
040805	10	County	US	9.00	11.84	1,633	0.0021	0.013	72" Dia Pipe	75	Hydrology (cfs)	71.0	89.0	102.0	192.3	
	G14		DS	8.90	15.21						Depth in Street (ft)	-	-	-		
040810	10	County	US	12.00	9.23	821	0.0010	0.013	60" Dia Pipe	47	Hydrology (cfs)	51.0	64.0	73.0	83.3	
	G14		DS	9.00	10.07						Depth in Street (ft)	-	-	-		
040815	10	County	US	15.00	4.61	423	0.0109	0.013	48" Dia Pipe	47	Hydrology (cfs)	51.0	64.0	74.0	150.1	
	H14		DS	12.00	9.23						Depth in Street (ft)	-	-	-		
040820	10	County	US	14.00	.70	563	0.0056	0.013	36" Dia Pipe	12	Hydrology (cfs)	12.0	15.0	18.0	49.9	
	H15		DS	15.00	3.86						Depth in Street (ft)	-	-	-		
040905	10	County	US	29.00	21.45	885	0.0014	0.013	42" Dia Pipe	22	Hydrology (cfs)	22.0	27.0	32.0	37.6	
	H14		DS	32.00	20.21						Depth in Street (ft)	-	-	-		
041105	10	City	US	12.00	2.62	370	0.0022	0.013	30" Dia Pipe	9	Hydrology (cfs)	13.0	16.0	18.0	19.2	
	G13		DS	11.90	1.81						Depth in Street (ft)	-	-	-		
041205	16	County	US	11.00	7.84	939	0.0036	0.013	24" Dia Pipe	31	Hydrology (cfs)	15.0	21.0	24.0	13.6	30" Dia RCP
	G15		DS	10.90	11.25						Depth in Street (ft)	0.30	0.50	0.60		
041305	16	County	US	12.00	.46	651	0.0039	0.013	30" Dia Pipe	4	Hydrology (cfs)	6.0	7.0	8.0	25.6	
	G16		DS	13.00	3.00						Depth in Street (ft)	-	-	-		
041310	16	County	US	13.00	.20	166	0.0024	0.013	24" Dia Pipe	4	Hydrology (cfs)	6.0	7.0	8.0	10.9	
	G16		DS	12.00	.19						Depth in Street (ft)	-	-	-		
041405	16	County	US	12.00	2.65	644	0.0027	0.013	36" Dia Pipe	16	Hydrology (cfs)	14.0	17.0	20.0	34.3	
	H16		DS	13.00	4.36						Depth in Street (ft)	-	-	-		

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 04																
041410	16	County	US	14.00	1.85	298	0.0026	0.013	36" Dia Pipe	16	Hydrology (cfs)	14.0	17.0	20.0	34.1	
	H16		DS	12.00	2.63						Depth in Street (ft)	-	-	-		
041505	10	County	US	16.00	2.00	127	0.0138	0.013	42" Dia Pipe	35	Hydrology (cfs)	41.0	51.0	59.0	118.0	
	H14		DS	15.00	3.75						Depth in Street (ft)	-	-	-		
041605	16	County	US	25.00	11.00	186	0.0049	0.013	36" Dia Pipe	18	Hydrology (cfs)	14.0	18.0	21.0	46.8	
	H15		DS	24.90	10.08						Depth in Street (ft)	-	-	-		
041705	10	County	US	10.00	4.25	70	0.0302	0.013	48" Dia Pipe	2	Hydrology (cfs)	3.0	4.0	5.0	249.5	
	G14		DS	9.90	6.38						Depth in Street (ft)	-	-	-		

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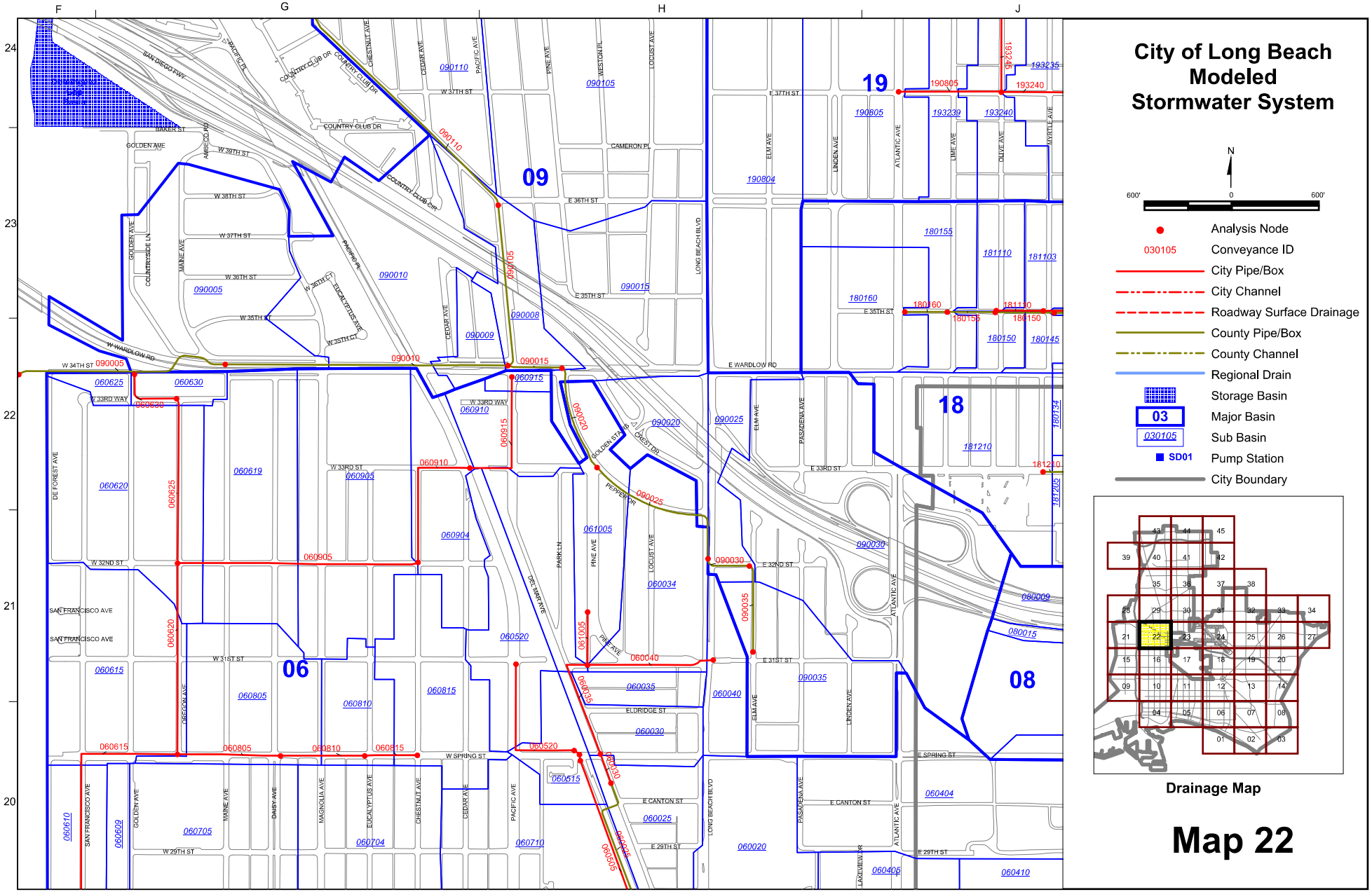
Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 05																
050005	16	County	US	13.00	8.47	218	0.0009	0.015	5.75'H x 8.00'W Box	553	Hydrology (cfs)	384.0	492.0	573.0	194.6	2-5.75'H x 8.00'W Box
	F16		DS	12.00	8.67						Depth in Street (ft)	0.80	1.00	1.10		
050010	16	County	US	13.00	7.77	703	0.0010	0.015	5.75'H x 8.00'W Box	496	Hydrology (cfs)	364.0	464.0	540.0	202.6	2-5.75'H x 7.50'W Box
	F16		DS	12.90	8.47						Depth in Street (ft)	2.00	2.70	3.10		
050015	16	County	US	13.00	6.80	953	0.0010	0.015	5.75'H x 8.00'W Box	433	Hydrology (cfs)	334.0	423.0	492.0	204.9	2-5.75'H x 7.00'W Box
	G16		DS	12.90	7.77						Depth in Street (ft)	2.00	2.60	3.10		
050020	16	County	US	13.00	6.12	676	0.0010	0.015	5.75'H x 8.00'W Box	385	Hydrology (cfs)	303.0	382.0	446.0	203.8	2-5.75'H x 6.50'W Box
	G16		DS	12.90	6.80						Depth in Street (ft)	1.60	2.10	2.50		
050025	16	County	US	14.00	5.12	1,009	0.0010	0.015	5.75'H x 8.00'W Box	323	Hydrology (cfs)	262.0	331.0	388.0	202.2	5.75'H x 10.00'W Box
	G16		DS	13.00	6.12						Depth in Street (ft)	0.80	1.20	1.30		
050030	16	County	US	14.00	4.82	307	0.0010	0.015	5.75'H x 8.00'W Box	271	Hydrology (cfs)	225.0	285.0	334.0	200.7	5.75'H x 9.00'W Box
	H16		DS	13.90	5.12						Depth in Street (ft)	0.70	1.20	1.50		
050035	16	County	US	21.00	.76	2,304	0.0017	0.013	93" Dia Pipe	139	Hydrology (cfs)	132.0	166.0	193.0	347.2	
	H17		DS	14.00	3.20						Depth in Street (ft)	-	-	-		
050040	16	County	US	21.00	2.30	296	0.0010	0.013	66" Dia Pipe	119	Hydrology (cfs)	115.0	145.0	167.0	106.8	72" Dia RCP
	H17		DS	20.90	2.00						Depth in Street (ft)	0.50	0.90	1.10		
050045	16	County	US	21.00	9.33	649	0.0101	0.013	63" Dia Pipe	80	Hydrology (cfs)	83.0	104.0	120.0	297.3	
	H17		DS	20.90	2.80						Depth in Street (ft)	-	-	-		
050050	16	County	US	30.00	17.10	780	0.0099	0.013	42" Dia Pipe	54	Hydrology (cfs)	53.0	66.0	77.0	99.9	
	H18		DS	21.00	9.40						Depth in Street (ft)	-	-	-		
050105	16	City	US	15.00	1.73	1,990	0.0043	0.013	30" Dia Pipe	40	Hydrology (cfs)	38.0	47.0	53.0	26.8	36" Dia RCP
	G17		DS	13.00	6.80						Depth in Street (ft)	0.40	0.50	0.60		
050205	16	County	US	14.00	.26	709	0.0059	0.013	39" Dia Pipe	52	Hydrology (cfs)	44.0	54.0	61.0	63.6	
	G16		DS	13.00	4.47						Depth in Street (ft)	-	-	-		
050210	16	County	US	15.00	1.73	632	0.0023	0.013	33" Dia Pipe	36	Hydrology (cfs)	32.0	39.0	44.0	25.5	36" Dia RCP
	G17		DS	14.00	.26						Depth in Street (ft)	0.30	0.40	0.50		

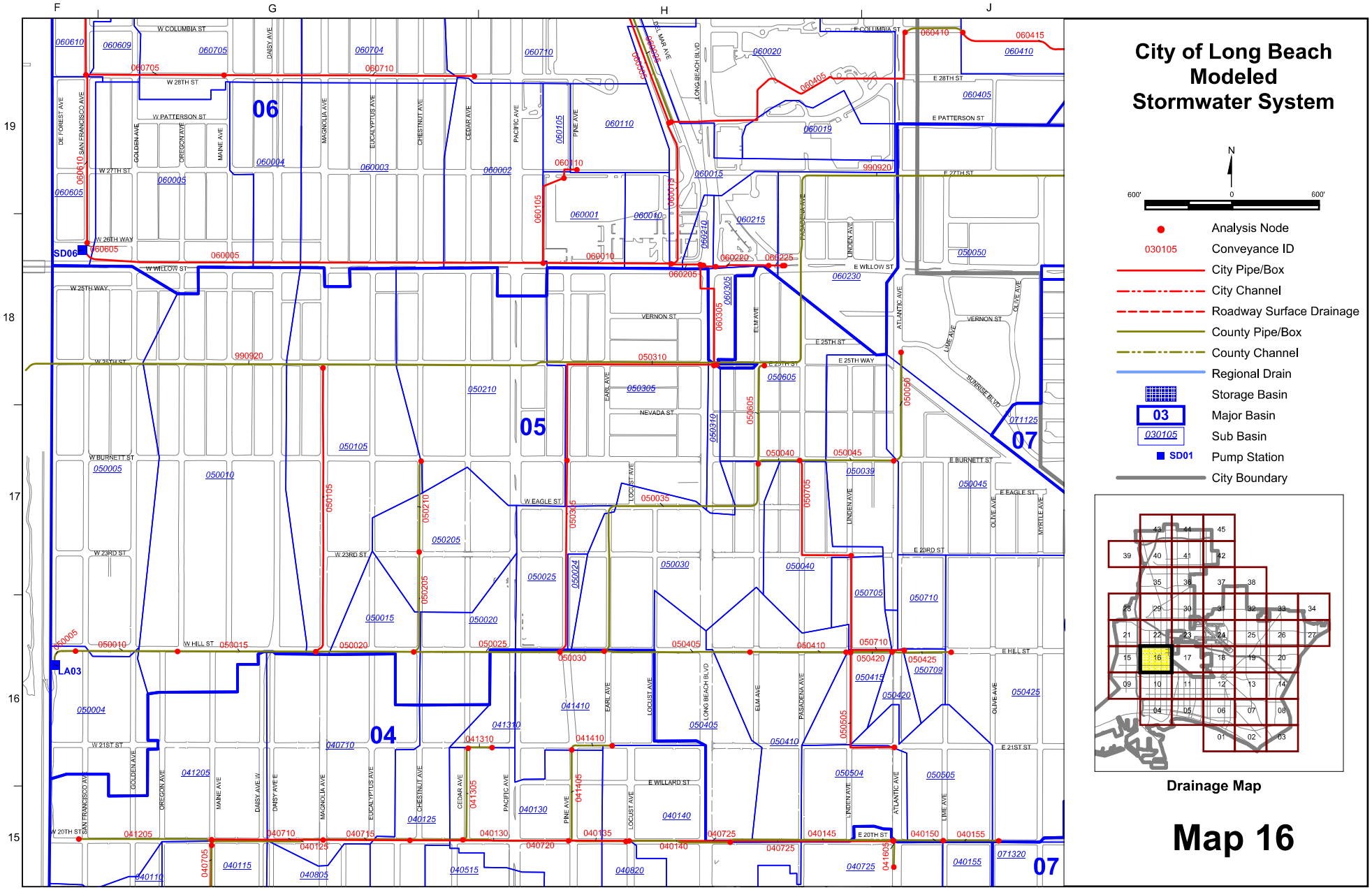
Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 05																
050305	16	City	US	16.00	12.62	1,345	0.0064	0.013	36" Dia Pipe	41	Hydrology (cfs)	37.0	45.0	51.0	53.4	
	H17		DS	14.00	4.00						Depth in Street (ft)	-	-	-		
050310	16	City	US	20.00	14.73	1,695	0.0013	0.013	36" Dia Pipe	3	Hydrology (cfs)	3.0	4.0	4.0	23.5	
	H18		DS	16.00	12.62						Depth in Street (ft)	-	-	-		
050405	16	County	US	25.00	7.65	1,006	0.0096	0.013	60" Dia Pipe	106	Hydrology (cfs)	93.0	119.0	138.0	254.6	
	H16		DS	14.00	1.98						Depth in Street (ft)	-	-	-		
050410	16	County	US	22.00	8.71	663	0.0010	0.013	54" Dia Pipe	90	Hydrology (cfs)	80.0	102.0	119.0	61.1	60" Dia RCP
	H16		DS	25.00	8.07						Depth in Street (ft)	0.40	0.50	0.60		
050415	16	County	US	22.00	8.74	32	0.0009	0.013	48" Dia Pipe	70	Hydrology (cfs)	63.0	81.0	94.0	44.1	60" Dia RCP
	H16		DS	21.90	8.71						Depth in Street (ft)	-NA-	-NA-	-NA-		
050420	16	County	US	22.00	10.19	287	0.0034	0.013	48" Dia Pipe	41	Hydrology (cfs)	30.0	39.0	46.0	83.1	
	H16		DS	21.90	9.23						Depth in Street (ft)	-	-	-		
050425	16	County	US	22.00	11.40	407	0.0030	0.013	48" Dia Pipe	38	Hydrology (cfs)	27.0	36.0	42.0	78.2	
	H16		DS	21.90	10.19						Depth in Street (ft)	-	-	-		
050505	16	City	US	24.00	19.50	965	0.0106	0.013	27" Dia Pipe	23	Hydrology (cfs)	30.0	37.0	43.0	31.9	
	H16		DS	22.00	9.23						Depth in Street (ft)	-	0.30	0.40		
050605	16	County	US	19.00	7.85	708	0.0081	0.013	48" Dia Pipe	20	Hydrology (cfs)	18.0	23.0	27.0	129.1	
	H18		DS	21.00	2.12						Depth in Street (ft)	-	-	-		
050705	16	City	US	21.00	13.47	1,002	0.0020	0.013	39" Dia Pipe	12	Hydrology (cfs)	10.0	13.0	14.0	36.8	
	H17		DS	20.90	11.48						Depth in Street (ft)	-	-	-		
050710	16	City	US	22.00	14.68	1,023	0.0012	0.013	39" Dia Pipe	7	Hydrology (cfs)	8.0	10.0	11.0	28.4	
	H16		DS	21.00	13.47						Depth in Street (ft)	-	-	-		

Conv. ID	Map Atlas No	Ownership		Elevations Ground	Elevations Invert	Existing Section Length (ft)	Slope	Man N	Size	Dge Area (acres)		Return Period (Years) 10	25	50	Capacity (cfs)	Replacement Size
Major Basin: 06																
060220	16	City	US	26.00	9.32	368	0.0032	0.013	27" Dia Pipe	19	Hydrology (cfs)	25.0	31.0	35.0	17.4	36" Dia RCP
	H18		DS	21.00	8.15						Depth in Street (ft)	0.40	0.40	0.50		
060225	16	City	US	27.00	10.81	96	0.0032	0.013	30" Dia Pipe	19	Hydrology (cfs)	25.0	31.0	35.0	23.3	36" Dia RCP
	H18		DS	26.00	10.50						Depth in Street (ft)	0.20	0.40	0.40		
060230	16	City	US	28.00	10.86	14	0.0037	0.013	27" Dia Pipe	19	Hydrology (cfs)	25.0	31.0	35.0	18.7	36" Dia RCP
	H18		DS	27.00	10.81						Depth in Street (ft)	0.30	0.30	0.40		
060305	16	City	US	20.00	8.71	793	0.0010	0.013	48" Dia Pipe	3	Hydrology (cfs)	4.0	5.0	6.0	45.3	
	H18		DS	19.90	7.92						Depth in Street (ft)	-	-	-		
060405	16	City	US	35.00	20.09	2,226	0.0052	0.013	54" Dia Pipe	69	Hydrology (cfs)	81.0	100.0	115.0	141.7	
	H19		DS	20.00	8.51						Depth in Street (ft)	-	-	-		
060410	16	County	US	30.00	22.29	414	0.0053	0.013	39" Dia Pipe	14	Hydrology (cfs)	19.0	23.0	27.0	60.2	
	J20		DS	35.00	20.09						Depth in Street (ft)	-	-	-		
060415	16	City	US	49.00	27.05	865	0.0055	0.013	33" Dia Pipe	2	Hydrology (cfs)	3.0	4.0	4.0	39.2	
	J20		DS	30.00	22.29						Depth in Street (ft)	-NA-	-NA-	-NA-		
060505	22	City	US	20.00	12.38	1,716	0.0004	0.013	42" Dia Pipe	21	Hydrology (cfs)	10.0	13.0	15.0	20.7	
	H20		DS	19.90	11.65						Depth in Street (ft)	-	-	-		
060510	22	City	US	20.00	12.40	43	0.0005	0.015	6.50'H x 1.50'W Box	21	Hydrology (cfs)	10.0	13.0	15.0	15.0	
	H20		DS	19.90	12.38						Depth in Street (ft)	-NA-	-NA-	-NA-		
060515	22	City	US	20.00	12.45	46	0.0011	0.013	36" Dia Pipe	21	Hydrology (cfs)	10.0	13.0	15.0	22.0	
	H20		DS	19.90	12.40						Depth in Street (ft)	-NA-	-NA-	-NA-		
060520	22	City	US	19.50	12.77	998	0.0003	0.013	30" Dia Pipe	14	Hydrology (cfs)	11.0	13.0	16.0	7.3	36" Dia RCP
	H20		DS	20.00	12.45						Depth in Street (ft)	0.30	0.30	0.40		
060605	16	City	US	20.00	3.93	60	0.0012	0.013	63" Dia Pipe	321	Hydrology (cfs)	138.0	177.0	207.0	101.2	72" Dia RCP
	F19		DS	19.90	3.86						Depth in Street (ft)	0.60	0.80	0.90		
060610	16	City	US	20.00	5.12	1,166	0.0010	0.013	78" Dia Pipe	312	Hydrology (cfs)	138.0	177.0	207.0	162.4	
	F19		DS	19.90	4.00						Depth in Street (ft)	-	0.80	1.30		



KVL Consultants, Inc.
Modelmap22.wor

City of Long Beach Stormwater Master Plan



KVL Consultants, Inc.
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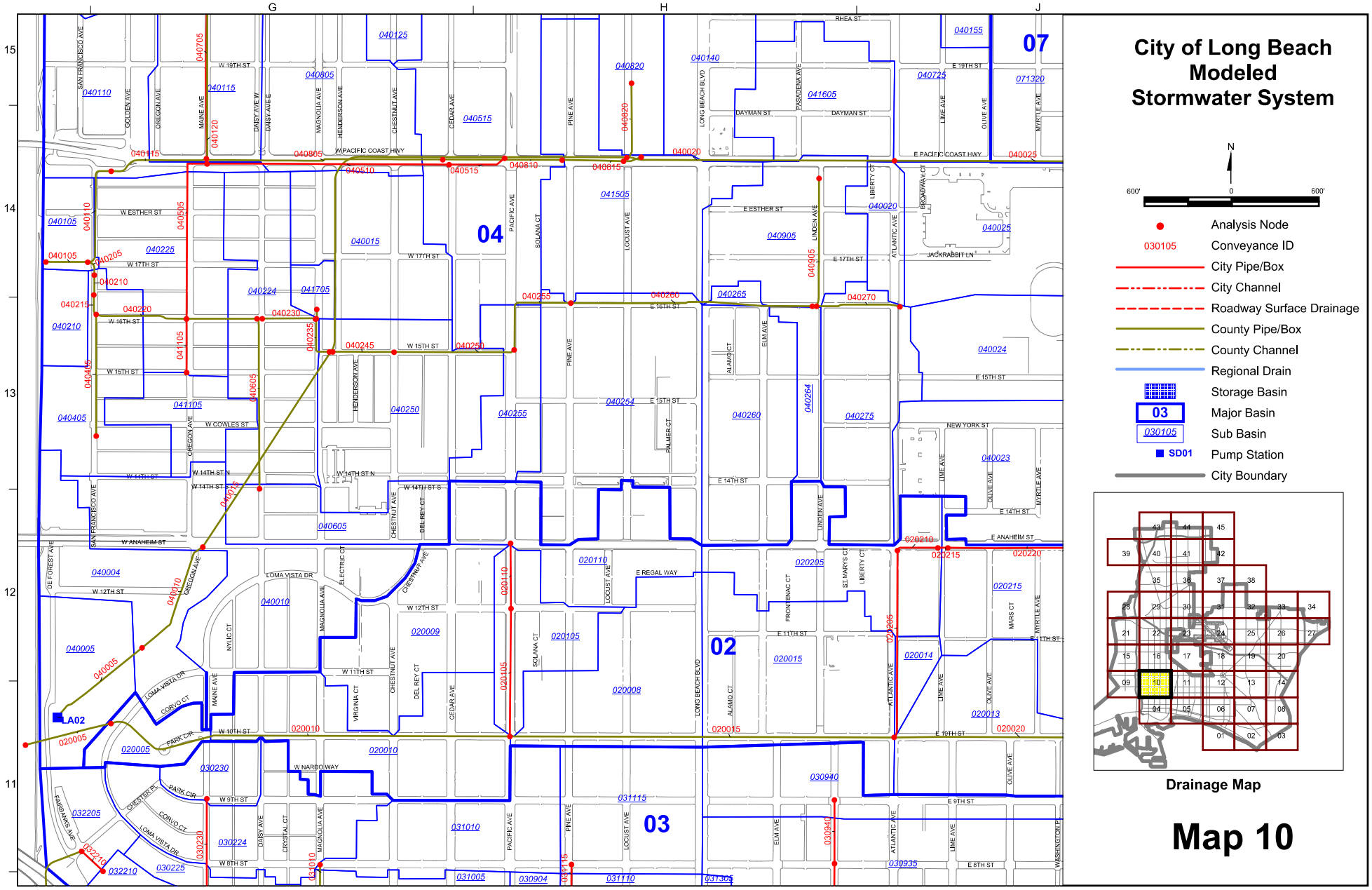
City of Long Beach Stormwater Master Plan



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City of Long Beach Stormwater Master Plan

APPENDIX B

SEWER DEMAND CALCULATIONS

Long Beach Mid Town

Sewer Analysis

Updated October 8, 2015

Existing and Proposed Development Intensities Per Specific Plan

Non-Residential Generation Factors Per LACSD

Residendial Generation Factors Per City of Long Beach

District	DISTRICT ACRES	EXISTING LANDUSE	TOTAL EXISTING RESIDENTIAL DUS & NON RESIDENTIAL SF	EXISTING SEWER GENERATION FACTORS AND FLOWS USING CITY AND LACSD FACTORS						PROPOSED LANDUSE				PROPOSED SEWER GENERATION FACTORS AND FLOWS						DIFFERENCE BETWEEN EXISTING AND PROPOSED SEWER FLOW (gpd)
				GENERATION FACTOR RESIDENTIAL (gpd/du)	SEWER FLOW RESIDENTIAL (gpd)	GENERATION FACTOR COMMERCIAL / OFFICE (gpd/sf)	GENERATION FACTOR INSTITUTIONAL (gpd/sf)	SEWER FLOW NON-RESIDENTIAL (gpd)	EXISTING SEWER FLOW (gpd)	RESIDENTIAL DUs	COMMERCIAL (sf)	OFFICE (sf)	INSTITUTIONAL (sf)	GENERATION FACTOR RESIDENTIAL (gpd/du)	SEWER FLOW RESIDENTIAL (gpd)	GENERATION FACTOR COMMERCIAL / OFFICE (gpd/sf)	GENERATION FACTOR INSTITUTIONAL (gpd/sf)	SEWER FLOW NON-RESIDENTIAL (gpd)	PROPOSED SEWER FLOW TOTAL (gpd)	
Corridor 1		Single Family	38	324	12,312				12,312	8				324	2,592					-12,312
Corridor 1		Multi Family	181	276	49,956				49,956	211				276	58,236				58,236	8,280
Corridor 1		Town House	-	300	-				0	189				300	56,700				56,700	56,700
Corridor 1		General Retail	51,252			100		5,125	5,125		50,000					100		5,000	5,000	-125
Corridor 1		Restaurant Non Fast Food	2,075			1,000		2,075	2,075							1,000				-2,075
Corridor 1		Restaurant Fast Food	2,075			1,000		2,075	2,075		4,000					1,000		4,000	4,000	1,925
Corridor 1		Auto Repair	1,660			100		166	166							100				-166
Corridor 1		Other	2,490			100		249	249							100				-249
Corridor 1		Office Non Medical	5,000			200		1,000	1,000							200				-1,000
			219.00																	
TOTAL	22								**72,958**										**123,936**	**50,978**
Corridor 2		Single Family	70	324	22,680				22,680					324	0					-22,680
Corridor 2		Multi Family	757	276	208,932				208,932	699				276	192,924				192,924	-16,008
Corridor 2		Town House	-	300	-				0	225				300	67,500				67,500	67,500
Corridor 2		General Retail	320,970			100		32,097	32,097		250,000					100		25,000	25,000	-7,097
Corridor 2		Supper Market	-						0		50,000					150		7,500	7,500	7,500
Corridor 2		Restaurant Non Fast Food	5,967			1,000		5,967	5,967		10,000					1,000		10,000	10,000	4,033
Corridor 2		Restaurant Fast Food	5,967			1,000		5,967	5,967		1,110					1,000		1,110	1,110	-4,857
Corridor 2		Auto Repair	4,773			100		477	477											-477
Corridor 2		Other	7,160			100		716	716											-716
Corridor 2		Office Non Medical	68,711			200		13,742	13,742			20,705				100		2,071	2,071	-11,672
Corridor 2		Office Medical	2,816			300		845	845											-845
Corridor 2		Motel Rooms	19			125		2,375	2,375											-2,375
			827																	
TOTAL	51								**293,798**										**306,105**	**12,306**
Corridor 3		Single Family	28	324	9,072				9,072	0				324	0					-9,072
Corridor 3		Multi Family	313	276	86,388				86,388	325				276	89,700				89,700	3,312
Corridor 3		Town House	-	300	-				0	125				300	37,500				37,500	37,500
Corridor 3		General Retail	23,835			100		2,384	2,384											-2,384
Corridor 3		Restaurant Non Fast Food	5,053			1,000		5,053	5,053											-5,053
Corridor 3		Restaurant Fast Food	2,297			1,000		2,297	2,297											-2,297
Corridor 3		Auto Repair	1,838			100		184	184											-184
Corridor 3		Office Non Medical	10,000			200		2,000	2,000											-2,000
Corridor 3		University	35,167				200	7,033	7,033				35,167				200	7,033	7,033	0
Corridor 3		High School	29,120				200	5,824	5,824				29,120				200	5,824	5,824	0
Corridor 3		K-8 School	28,376				200	5,675	5,675				28,376				200	5,675	5,675	0
			341																	
TOTAL	20								**125,910**										**145,733**	**19,823**
Medical 4		Single Family	4	324	1,296				1,296											-1,296
Medical 4		Multi Family	99	276	27,324				27,324	300				276	82,800				82,800	55,476
Medical 4		General Retail	49,771			100		4,977	4,977		70000									-4,977
Medical 4		Restaurant Non Fast Food	0			1,000		0	0		31,600					1,000		31,600	31,600	31,600
Medical 4		Office Medical	406,775			300		122,033	122,033			656,000				300		196,800	196,800	74,768
			103.00																	
TOTAL	63								**155,630**										**311,200**	**155,570**

Transit 5		Single Family	1	324	324				324											-324
Transit 5		Multi Family	33	276	9,108				9,108	774				276	213,624				213,624	204,516
Transit 5		General Retail	392,552			100		39,255	39,255		400,000					100		40,000	40,000	745
Transit 5		Super Market	-			100		0	0		25,000					100		2,500	2,500	2,500
Transit 5		Convenience Pharmacy	-			100		-	0		15,000					100		1,500	1,500	1,500
Transit 5		Bank	-			100		-	0		5,000					100		500	500	500
Transit 5		Restaurant Non Fast Food	14,218			1,000		14,218	14,218		24,000					1,000		24,000	24,000	9,782
Transit 5		Restaurant Fast Food	20,000			1,000		20,000	20,000		4,000					1,000		4,000	4,000	-16,000
Transit 5		Auto Repair	34,142			100		3,414	3,414											-3,414
Transit 5		Other	-			100		-	0		2,000					100		200	200	200
Transit 5		Office Non Medical	103,546			200		20,709	20,709			150,000				200		30,000	30,000	9,291
Transit 5		Office Medical	146,933			300		44,080	44,080			200,000				300		60,000	60,000	15,920
Transit 5		Light Industrial	4,506			25		113	113											-113
Transit 5		K-8 School	59,062				200	11,812	11,812				99,296				200	19,859	19,859	8,047
Transit 5		Motel Rooms	75			125		9,375	9,375		175					125		21,875	21,875	12,500
		Hospital Beds									27					300		8,100	8,100	8,100
TOTAL	44								**172,409**										**426,158**	**253,750**
Transit 6		Single Family	20	324	6,480				6,480											-6,480
Transit 6		Multi Family	107	276	29,532				29,532	362				276	99,912				99,912	70,380
Transit 6		General Retail	146,667			100		14,667	14,667		112,438					100		11,244	11,244	-3,423
Transit 6		Bank	-			300		-	0		2,500					100		250	250	250
Transit 6		Health Club	-			300		-	0		20,000					300		6,000	6,000	6,000
Transit 6		Restaurant Non Fast Food	8,365			1,000		8,365	8,365		20,000					1,000		20,000	20,000	11,635
Transit 6		Restaurant Fast Food	8,365			1,000		8,365	8,365		4,000					1,000		4,000	4,000	-4,365
Transit 6		Gas Station	5,000			100		500	500		5,000					100		500	500	0
Transit 6		Auto Repair	6,692			100		669	669							100			0	-669
Transit 6		Other	5,038			100		504	504		2,500					100		250	250	-254
Transit 6		Office Non Medical	16,448			200		3,290	3,290			100,000				200		20,000	20,000	16,710
Transit 6		Office Medical	-			300		-	0			30,687				300		9,206	9,206	9,206
Transit 6		Motel Rooms	102			125		12,750	12,750		102					125		12,750	12,750	0
			127																	
TOTAL	20								**85,121**										**184,112**	**98,991**
Transit 7		Single Family	6	324	1,944				1,944											-1,944
Transit 7		Multi Family	226	276	62,376				62,376	401				276	110,676				110,676	48,300
Transit 7		General Retail	230,459			100		23,046	23,046		230,000					100		23,000	23,000	-46
Transit 7		Restaurant Non Fast Food	867			1,000		867	867		20,000					1,000		20,000	20,000	19,133
Transit 7		Restaurant Fast Food	867			1,000		867	867		4,000					1,000		4,000	4,000	3,133
Transit 7		Auto Repair	694			100		69	69											-69
Transit 7		Other	1,041			100		104	104											-104
Transit 7		Office Non Medical	0			200		0	0			65,000				200		13,000	13,000	13,000
			232.00																	
TOTAL	19								**89,273**										**170,676**	**81,403**
Conventional		Single Family	11	324	3,564				3,564	11				324	3,564				3,564	0
Conventional		Multi Family	65	276	17,940				17,940	65				276	17,940				17,940	0
Conventional		General Retail	33,665			100		3,367	3,367		33665					100		3,367	3,367	0
Conventional		Restaurant Non Fast Food	1,992			1,000		1,992	1,992		1992					1,000		1,992	1,992	0
Conventional		Office Non Medical	40,406			200		8,081	8,081		40406					200		0	8,081	0
Conventional		Office Medical	-			300		0	0		-					300		0	0	0
Conventional		Light Industrial	124,703			25		3,118	3,118		124703								3,118	0
Conventional		Church	11,346				50	567	567				11346				50	567	567	0
			76																	
TOTAL	4								**38,629**										**38,629**	**0**
OS	18								0											
ROW (Including Conventional)	106								0											
TOTALS	**367**		**1,959**		**527,724**			**467,375**	**1,033,728**	**3695**					**1,033,668**			**664,273**	**1,697,941**	
TOTAL EXISTING SEWER FLOW GPD									**1,033,728**									**TOTAL FLOW INCREASE DUE TO PROJECT**		**664,213**

GENERATION FACTORS

95.1 gpcd Per City

Single Family Residential (3.41 persons per DU per City UWMP)= 324 gpd/du

Multi Family Residential (2.9 persons per DU per City UWMP)= 276 gpd/du

Town Home Residential (3.16 persons per DU per City UWMP)= 300 gpd/du

Commercial Office 200 gpd/ 1,000 sf (LACSD)

Medical Office 300 gpd/ 1,000 sf (LACSD)

APPENDIX C

WATER DEMAND CALCULATIONS

Long Beach Mid Town

Sewer Analysis

Updated October 8, 2015

Existing and Proposed Development Intensities Per Specific Plan

Non-Residential Generation Factors Per LACSD

Residendial Generation Factors Per City of Long Beach

				EXISTING SEWER GENERATION FACTORS AND FLOWS USING CITY AND LACSD FACTORS						PROPOSED LANDUSE				PROPOSED SEWER GENERATION FACTORS AND FLOWS						
District	DISTRICT ACRES	EXISTING LANDUSE	TOTAL EXISTING RESIDENTIAL DUS & NON RESIDENTIAL SF	GENERATION FACTOR RESIDENTIAL (gpd/du)	SEWER FLOW RESIDENTIAL (gpd)	GENERATION FACTOR COMMERCIAL / OFFICE (gpd/sf)	GENERATION FACTOR INSTITUTIONAL (gpd/sf)	SEWER FLOW NON-RESIDENTIAL (gpd)	EXISTING SEWER FLOW (gpd)	RESIDENTIAL DUs	COMMERCIAL (sf)	OFFICE (sf)	INSTITUTIONAL (sf)	GENERATION FACTOR RESIDENTIAL (gpd/du)	SEWER FLOW RESIDENTIAL (gpd)	GENERATION FACTOR COMMERCIAL / OFFICE (gpd/sf)	GENERATION FACTOR INSTITUTIONAL (gpd/sf)	SEWER FLOW NON-RESIDENTIAL (gpd)	PROPOSED SEWER FLOW TOTAL (gpd)	DIFFERENCE BETWEEN EXISTING AND PROPOSED SEWER FLOW (gpd)
Corridor 1		Single Family	38	324	12,312				12,312	8				324	2,592					-12,312
Corridor 1		Multi Family	181	276	49,956				49,956	211				276	58,236				58,236	8,280
Corridor 1		Town House	-	300	-				0	189				300	56,700				56,700	56,700
Corridor 1		General Retail	51,252			100		5,125	5,125		50,000					100		5,000	5,000	-125
Corridor 1		Restaurant Non Fast Food	2,075			1,000		2,075	2,075							1,000				-2,075
Corridor 1		Restaurant Fast Food	2,075			1,000		2,075	2,075		4,000					1,000		4,000	4,000	1,925
Corridor 1		Auto Repair	1,660			100		166	166							100				-166
Corridor 1		Other	2,490			100		249	249							100				-249
Corridor 1		Office Non Medical	5,000			200		1,000	1,000							200				-1,000
			219.00																	
TOTAL	22								**72,958**										**123,936**	**50,978**
Corridor 2		Single Family	70	324	22,680				22,680					324	0					-22,680
Corridor 2		Multi Family	757	276	208,932				208,932	699				276	192,924				192,924	-16,008
Corridor 2		Town House	-	300	-				0	225				300	67,500				67,500	67,500
Corridor 2		General Retail	320,970			100		32,097	32,097		250,000					100		25,000	25,000	-7,097
Corridor 2		Supper Market	-						0		50,000					150		7,500	7,500	7,500
Corridor 2		Restaurant Non Fast Food	5,967			1,000		5,967	5,967		10,000					1,000		10,000	10,000	4,033
Corridor 2		Restaurant Fast Food	5,967			1,000		5,967	5,967		1,110					1,000		1,110	1,110	-4,857
Corridor 2		Auto Repair	4,773			100		477	477											-477
Corridor 2		Other	7,160			100		716	716											-716
Corridor 2		Office Non Medical	68,711			200		13,742	13,742			20,705				100		2,071	2,071	-11,672
Corridor 2		Office Medical	2,816			300		845	845											-845
Corridor 2		Motel Rooms	19			125		2,375	2,375											-2,375
			827																	
TOTAL	51								**293,798**										**306,105**	**12,306**
Corridor 3		Single Family	28	324	9,072				9,072	0				324	0					-9,072
Corridor 3		Multi Family	313	276	86,388				86,388	325				276	89,700				89,700	3,312
Corridor 3		Town House	-	300	-				0	125				300	37,500				37,500	37,500
Corridor 3		General Retail	23,835			100		2,384	2,384											-2,384
Corridor 3		Restaurant Non Fast Food	5,053			1,000		5,053	5,053											-5,053
Corridor 3		Restaurant Fast Food	2,297			1,000		2,297	2,297											-2,297
Corridor 3		Auto Repair	1,838			100		184	184											-184
Corridor 3		Office Non Medical	10,000			200		2,000	2,000											-2,000
Corridor 3		University	35,167				200	7,033	7,033				35,167				200	7,033	7,033	0
Corridor 3		High School	29,120				200	5,824	5,824				29,120				200	5,824	5,824	0
Corridor 3		K-8 School	28,376				200	5,675	5,675				28,376				200	5,675	5,675	0
			341																	
TOTAL	20								**125,910**										**145,733**	**19,823**
Medical 4		Single Family	4	324	1,296				1,296											-1,296
Medical 4		Multi Family	99	276	27,324				27,324	300				276	82,800				82,800	55,476
Medical 4		General Retail	49,771			100		4,977	4,977		70000									-4,977
Medical 4		Restaurant Non Fast Food	0			1,000		0	0		31,600					1,000		31,600	31,600	31,600
Medical 4		Office Medical	406,775			300		122,033	122,033			656,000				300		196,800	196,800	74,768
			103.00																	
TOTAL	63								**155,630**										**311,200**	**155,570**

Transit 5		Single Family	1	324	324				324											-324
Transit 5		Multi Family	33	276	9,108				9,108	774				276	213,624				213,624	204,516
Transit 5		General Retail	392,552			100		39,255	39,255		400,000					100		40,000	40,000	745
Transit 5		Super Market	-			100		0	0		25,000					100		2,500	2,500	2,500
Transit 5		Convenience Pharmacy	-			100		-	0		15,000					100		1,500	1,500	1,500
Transit 5		Bank	-			100		-	0		5,000					100		500	500	500
Transit 5		Restaurant Non Fast Food	14,218			1,000		14,218	14,218		24,000					1,000		24,000	24,000	9,782
Transit 5		Restaurant Fast Food	20,000			1,000		20,000	20,000		4,000					1,000		4,000	4,000	-16,000
Transit 5		Auto Repair	34,142			100		3,414	3,414											-3,414
Transit 5		Other	-			100		-	0		2,000					100		200	200	200
Transit 5		Office Non Medical	103,546			200		20,709	20,709			150,000				200		30,000	30,000	9,291
Transit 5		Office Medical	146,933			300		44,080	44,080			200,000				300		60,000	60,000	15,920
Transit 5		Light Industrial	4,506			25		113	113											-113
Transit 5		K-8 School	59,062				200	11,812	11,812				99,296				200	19,859	19,859	8,047
Transit 5		Motel Rooms	75			125		9,375	9,375		175					125		21,875	21,875	12,500
		Hospital Beds									27					300		8,100	8,100	8,100
TOTAL	44								**172,409**										**426,158**	**253,750**
Transit 6		Single Family	20	324	6,480				6,480											-6,480
Transit 6		Multi Family	107	276	29,532				29,532	362				276	99,912				99,912	70,380
Transit 6		General Retail	146,667			100		14,667	14,667		112,438					100		11,244	11,244	-3,423
Transit 6		Bank	-			300		-	0		2,500					100		250	250	250
Transit 6		Health Club	-			300		-	0		20,000					300		6,000	6,000	6,000
Transit 6		Restaurant Non Fast Food	8,365			1,000		8,365	8,365		20,000					1,000		20,000	20,000	11,635
Transit 6		Restaurant Fast Food	8,365			1,000		8,365	8,365		4,000					1,000		4,000	4,000	-4,365
Transit 6		Gas Station	5,000			100		500	500		5,000					100		500	500	0
Transit 6		Auto Repair	6,692			100		669	669							100			0	-669
Transit 6		Other	5,038			100		504	504		2,500					100		250	250	-254
Transit 6		Office Non Medical	16,448			200		3,290	3,290			100,000				200		20,000	20,000	16,710
Transit 6		Office Medical	-			300		-	0			30,687				300		9,206	9,206	9,206
Transit 6		Motel Rooms	102			125		12,750	12,750		102					125		12,750	12,750	0
			127																	
TOTAL	20								**85,121**										**184,112**	**98,991**
Transit 7		Single Family	6	324	1,944				1,944											-1,944
Transit 7		Multi Family	226	276	62,376				62,376	401				276	110,676				110,676	48,300
Transit 7		General Retail	230,459			100		23,046	23,046		230,000					100		23,000	23,000	-46
Transit 7		Restaurant Non Fast Food	867			1,000		867	867		20,000					1,000		20,000	20,000	19,133
Transit 7		Restaurant Fast Food	867			1,000		867	867		4,000					1,000		4,000	4,000	3,133
Transit 7		Auto Repair	694			100		69	69											-69
Transit 7		Other	1,041			100		104	104											-104
Transit 7		Office Non Medical	0			200		0	0			65,000				200		13,000	13,000	13,000
			232.00																	
TOTAL	19								**89,273**										**170,676**	**81,403**
Conventional		Single Family	11	324	3,564				3,564	11				324	3,564				3,564	0
Conventional		Multi Family	65	276	17,940				17,940	65				276	17,940				17,940	0
Conventional		General Retail	33,665			100		3,367	3,367		33665					100		3,367	3,367	0
Conventional		Restaurant Non Fast Food	1,992			1,000		1,992	1,992		1992					1,000		1,992	1,992	0
Conventional		Office Non Medical	40,406			200		8,081	8,081		40406					200		0	8,081	0
Conventional		Office Medical	-			300		0	0		-					300		0	0	0
Conventional		Light Industrial	124,703			25		3,118	3,118		124703								3,118	0
Conventional		Church	11,346				50	567	567				11346				50	567	567	0
			76																	
TOTAL	4								**38,629**										**38,629**	**0**
OS	18								0											
ROW (Including Conventional)	106								0											
TOTALS	**367**		**1,959**		**527,724**			**467,375**	**1,033,728**	**3695**					**1,033,668**			**664,273**	**1,697,941**	
TOTAL EXISTING SEWER FLOW GPD									**1,033,728**									**TOTAL FLOW INCREASE DUE TO PROJECT**		**664,213**

GENERATION FACTORS

95.1 gpcd Per City

Single Family Residential (3.41 persons per DU per City UWMP)= 324 gpd/du

Multi Family Residential (2.9 persons per DU per City UWMP)= 276 gpd/du

Town Home Residential (3.16 persons per DU per City UWMP)= 300 gpd/du

Commercial Office 200 gpd/ 1,000 sf (LACSD)

Medical Office 300 gpd/ 1,000 sf (LACSD)