

# SEWER STUDY REPORT

FOR THE

## BISHOP'S SCHOOL PROPOSED IMPROVEMENTS 7607 LA JOLLA BLVD LA JOLLA, CA 92037

June 23, 2023

**Prepared by:**

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Signature

06/23/2023

Date



## I. SUMMARY

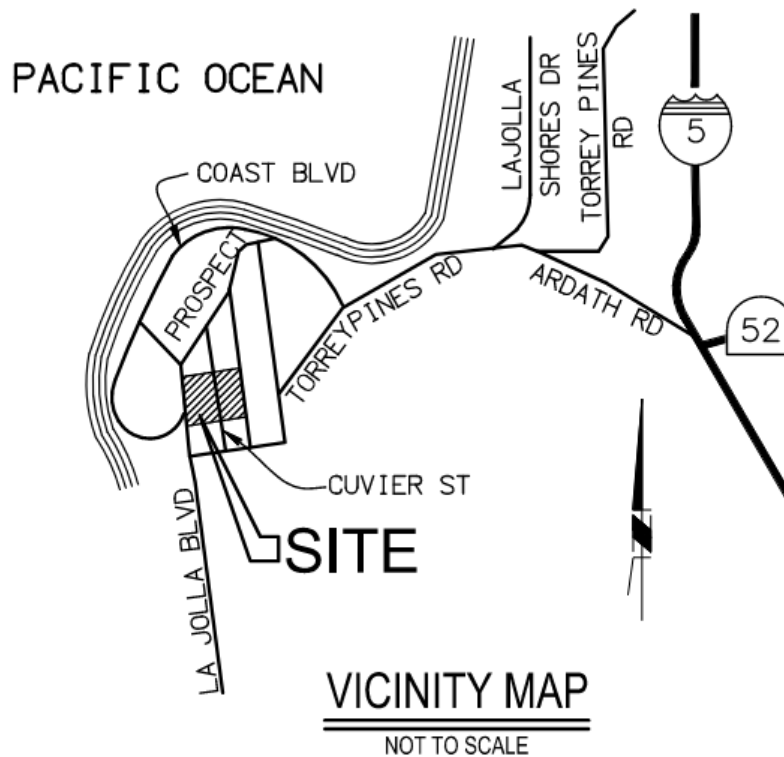
The purpose of the study is to provide an assessment of the Bishop's School proposed improvement project's sewer flow into the City of San Diego's sewer distribution system. All proposed sewer mains, based on projected wastewater flows, experience a depth to diameter ratio (d/D) of less than 0.5 (50%). The sewer mains were designed to meet a minimum 2 feet per second (fps) cleansing velocity or minimum slope of 1% as recommended by the City of San Diego Sewer Design Guide (2015).

## II. PROJECT DESCRIPTION

### Project Location

The Bishop's School proposed project site comprises approximately 2.41 acres and is located along the west side of Draper Street at the intersection of Draper St. and Silver St., in the City of San Diego, California. The project site (APN number 350-420-05) is roughly 0.2 miles from the Pacific Ocean. The approximate location of the project site is shown in Figure 1 – Vicinity Map. Refer to Appendix B for proposed site improvements layout and location.

Figure 1 - Vicinity Map



## **Project Description**

The Bishop’s School proposed project improvements include demolition of existing tennis courts, portions of the northern surface lot and surrounding hardscape/landscape areas. Development proposed at the site is an athletic center, tennis pavilion, creative science, visual art and social innovation building. In addition, the school will acquire the residential property on Draper Avenue and is proposing to redevelop that parcel by constructing new athletics building. Refer to Appendix B for proposed site improvements layout.

## **Sewer Study**

A hydraulic analysis summary was performed using the Sewer Study Summary from the City of San Diego Sewer Design Guide, Figure 1-2. The spreadsheet calculates the capacity for each of the proposed pipe segments, as well as investigate the capacity of the new flows produced to the existing sewer. Since building inverts are not yet known, 1% slope is used for all proposed mains.

## **III. WASTEWATER GENERATION**

### **Average Dry Weather Flow Generation**

The average dry weather flow (ADWF) is generated by calculating the equivalent population based on zoning information. The following equation was used to calculate the ADWF.

$$\text{Average Dry Weather Flow} = 80 \text{ gpcd} \times \text{Equivalent Population}$$

**Table III-1 Density Conversions<sup>1</sup>**

<b>Zone</b>	<b>Maximum Density (DU/Net Ac)</b>	<b>Population Per DU</b>	<b>Equivalent Population (Pop/Net AC)<sup>2</sup></b>
Schools/Public	8.9	3.5	31.2
Offices	10.9	3.5	38.2
Commercial/Hotels	12.5	3.5	43.7
Industrial	17.5	3.5	62.5
Hospital	42.9	3.5	150.0

Notes:

1. Excerpt from Table 1-1 *City of San Diego Sewer Design Guide Density Conversions*
2. These values represent equivalent population per floor of the building

Equivalent population was calculated by taking the net square feet of the buildings and converting it to acres and then multiplying the acreage by a 43.7 factor of population/net acres for commercial zones from Table 1-1 of the Sewer Design guide. After multiplying it by 43.7, the new value is multiplied by the number of floors (Table 1-1 of Sewer Design guide) which gives us an equivalent population of the different buildings. Multiplying the equivalent population by the planning number of 80 gallons per capita day (gpcd) then gives you the ADWF.

### **Peak Dry Weather Flow Generation**

Peak Dry Weather Flow (PDWF) represents the highest (peak) hour flow that will occur during the day. The City of San Diego Sewer Design Guide, Section 1.3.2.2 provides the approach on how to develop the PDWF for the Project. The peaking factor (PF) was calculated using the Homes & Narver 1960 equation (see below) displayed in Figure 1-1 of the City of San Diego Sewer Design Guide.

Halmes & Narver 1960 → Peaking Factor (PF) =  $6.2945 \times (\text{pop})^{-0.1342}$

Peak Dry Weather Flow (PDWF) Generation = Peaking Factor (PF) x Average Dry Weather Flow (ADWF)

#### **Example of PDWF calculation for proposed building:**

$$\text{Peaking Factor (PF)} = 6.2945 \times (211)^{-0.1342} = \mathbf{3.07}$$

$$\mathbf{PWDF} = 11.7 \text{ gpm (ADWF)} \times 3.07 \text{ (PF)} = \mathbf{36 \text{ gpm}}$$

### **Peak Wet Weather Flow Generation**

Peak Wet Weather Flows (PWWF) per the City of San Diego Sewer Design Guide are determined by multiplying PDWF by a peak wet weather (PWW) factor. In this case, the recommended PWW factor provided by the City is 1.0. Peak wet weather flow is the design flow used for the hydraulic analysis of this report.

$$\text{PWWF} = \text{PDWF} \times 1.0 \text{ (per City PWW factor)}$$

#### **Example of PDWF calculation for proposed building:**

$$\mathbf{PWWF} = 36 \text{ gpm(PWDF)} \times 1.0 \text{ (PWW Fator)} = \mathbf{36 \text{ gpm}}$$

## **IV. METHODOLOGY**

### **Pipe Sizing**

The proposed sewer laterals are 4-inch diameter PVC. Using the PDWF calculated above and manning's equation, the proposed pipeline can accurately be sized.

Three (3) new sewer laterals will connect to the existing 8-inch sewer main in Draper Ave. Other than the laterals going directly from the buildings, there are no other onsite proposed sewer mains. Using the Peak Wet Weather Flow, calculated in Section III of this report, the pipe size was designed using Manning's equation.

$$Q = k / n * [ A * (R_h)^{2/3} * S^{1/2} ]$$

For Manning's equation, the following values and variables are defined.

K (unit conversion factor) = 1.49  
n (Manning's coefficient) = 0.013 (Section 1.3.3.1 Sewer Design)  
S (slope) = 0.5%, 0.8%, and ≥ 1% where needed  
A (Area) = varies with diameter  
R<sub>h</sub> (hydraulic radius) = varies with depth of flow

Area and hydraulic radius were calculated based on diameter, wetted perimeter, and wetted area of the flow in the pipe. All sewer laterals were designed to a minimum 2% slope. OpenFlows FlowMaster was used to calculate the flows and d/D for each of the pipe laterals.

### **Impact to Existing Sewer System**

According to Section 1.7.1 of the City of San Diego Sewer Design Guide 2015, "the downstream shall be studied to the point in the system where the projected peak wet weather flow from the proposed new development is less than 10% of the total flow. "

## **V. HYDRAULIC ANALYSIS**

### **Wastewater Generation per Building**

The compiled table of the flow rates for each of the proposed buildings is listed in Table V-1 and Appendix A. These calculations were based on the equations presented in Section III of this report. It should be noted that although there are proposed flows from the buildings, the overall number of students at the school will increase to more than the current maximum of 800 students therefore there will be no overall increase in flows from the school.

**Table V-1 Wastewater Generation per building**

BUILDING	Building Size Square Feet	Net Acres <sup>1</sup>	Population per DU <sup>2</sup>	Average Dry Weather flow GPD <sup>3</sup>	Average Dry Weather Flow GPM	Peaking factor <sup>4</sup>	Peak Dry Weather Flow GPM	Wet Weather Flow Factor <sup>5</sup>	Peak Wet Weather Flow GPM
<b>Proposed</b>									
Athletics Center	30,343	0.7	22	1,747	1.2	4	5.0	1	5.0
CS, VS, SI	27,762	0.6	20	1,591	1.1	4	4.7	1	4.7
C	13,120	0.3	9	752	0.5	5	2.4	1	2.4
<b>Total</b>	*	*	*	4,090	2.8	*	12.1	*	12.1

Notes:

- 1) Net Acre here is of the buildings not the drainage basin, streets, or lots.
- 2) Conversion factor from City of San Diego Sewer Design Guideline May 2015 Table 1-1 " City of San Diego Sewer Design Guide Density conversions"
- 3) 80 gpcd based on City of San Diego Sewer Design Guideline section 1.3.2.2
- 4) Peaking factor (PF) was calculated using the formula found on Figure 1-1 of the sewer design guide. The equation is derived from Holmes & Narver, 1960.
- 5) City of San Diego recommended a peak Wet Weather Factor of 1.0

**Off-Site Analysis**

This additional study is meant to observe the flows in the offsite 8-inch sewer main on Draper Ave that the proposed development ties into. Per the City of San Diego Sewer Design Guideline the downstream system shall be studied to the point where the proposed new development flow is less than 10 percent of the total flow. To calculate this, several areas upstream and downstream of the Bishop School sewer connections were studied and flows were added to the Draper 8-inch main. Since existing flows were not known, a zoning map was used to determine the type and size of the parcels that connect to the Draper 8-inch main. There are four (4) different parcel types that connect to the main, RM-1-1, LJP-4, OP-1-1, and LJP-6. Since there aren't available wastewater generation rates for these parcel types a conservative rate of 111.8 pop/net acre for zone RM-3-7 was used from the City of San Diego Sewer Design Guide Density Conversion table 1-1. The area calculation map is show in Appendix C.

**Table V-2 Offsite Wastewater Generation**

BUILDING	Building Size Square Feet	Net Acres <sup>1</sup>	Population per DU <sup>2</sup>	Average Dry Weather flow GPD <sup>3</sup>	Average Dry Weather Flow GPM	Peaking factor <sup>4</sup>	Peak Dry Weather Flow GPM	Wet Weather Flow Factor <sup>5</sup>	Peak Wet Weather Flow GPM
<b>Proposed</b>									
Area 1	69,898	2	179	14,352	10	3	31	1	31
Area 2	51,656	1	133	10,606	7	3	24	1	24
Area 3	104,008	2	267	21,355	15	3	44	1	44
Area 4	110,336	3	283	22,655	16	3	46	1	46
Area 5	70,720	2	182	14,521	10	3	32	1	32
<b>Total</b>	*	*	*	<b>83,489</b>	58	*	177	*	177

Notes:

- 1) Net Acre here is of the buildings not the drainage basin, streets, or lots.
- 2) Conversion factor from City of San Diego Sewer Design Guideline May 2015 Table 1-1 " City of San Diego Sewer Design Guide Density conversions"
- 3) 80 gpcd based on City of San Diego Sewer Design Guideline section 1.3.2.2
- 4) Peaking factor (PF) was calculated using the formula found on Figure 1-1 of the sewer design guide. The equation is derived from Holmes & Narver, 1960.
- 5) City of San Diego recommended a peak Wet Weather Factor of 1.0

The peak wet weather flow from the calculated offsite area is 177 gpm and from the onsite proposed site is 12.1 gpm based on Tables V-2 and V-1 respectively. This shows the proposed site is less than 10 percent of the total flows in the main on Draper Ave.





**APPENDIX A – Wastewater Generation,  
SEWER STUDY SUMMARY**

**Bishops School - Sewer Study Summary**

Sheet **1** of **1**  
Date **8/11/2022**

For:

By:

WBS NO.

Line	From	To	Average Dry Weather Flow (GPD)	Dry Weather Peaking Factor	Wet Weather Peaking Factor	Peak Wet Weather (Design Flow)		In-Line Diameter (D) (in)	Design Slope (%)	dn (in)	dn (ft)	Ratio (dn/D)	Velocity (ft/s)	Remarks
						( mgd )	( cfs )							
A	ATHLETIC CENTER	DRAPER	1747	4.00	1.0	0.01	0.011	4	2.0%	0.50	0.04	0.13	1.82	
B	CS, VS, SI	DRAPER	1591	4.00	1.0	0.01	0.010	4	2.0%	0.50	0.04	0.13	1.77	
C	ATHLETICS BUILDING	DRAPER	752	4.00	1.0	0.00	0.005	4	2.0%	0.30	0.03	0.08	1.44	

Notes

### Bishops School - Offsite Sewer Study Summary

Sheet **1** of **1**

For:

By:

WBS NO.

Line	From	To	Average Dry Weather Flow (GPD)	Dry Weather Peaking Factor	Wet Weather Peaking Factor	Peak Wet Weather (Design Flow)		In-Line Diameter (D) (in)	Upstream Invert	Downstream invert	Pipe Length (ft)	Design Slope (%)	dn (in)	Ratio (dn/D)	Velocity (ft/s)	Remarks
						( mgd )	( cfs )									
346	412	533	14352	3.14	1.0	0.05	0.070	8	83.30	76.50	335.00	2.0%	1.30	0.16	2.40	
393	533	402	24958	2.91	1.0	0.07	0.112	8	76.50	75.40	375.00	0.3%	2.20	0.28	1.44	
387	402	530	29198	2.85	1.0	0.08	0.129	8	75.40	73.90	515.00	0.3%	2.40	0.30	1.46	Incl Bishops School
390	530	529	50554	2.65	1.0	0.13	0.207	8	73.90	71.80	47.00	4.5%	1.50	0.19	4.40	
389	529	528	50554	2.65	1.0	0.13	0.207	10	71.80	71.60	160.00	0.1%	3.70	0.37	1.13	
388	528	365	73208	2.52	1.0	0.18	0.286	10	71.60	70.60	388.00	1.5%	2.20	0.22	3.21	
405	365	353	87729	2.46	1.0	0.22	0.334	10	71.60	65.00	383.00	0.3%	3.60	0.36	1.89	

Notes

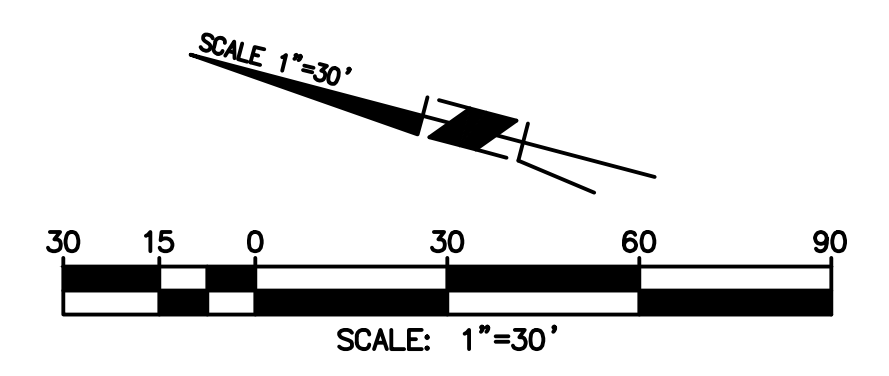
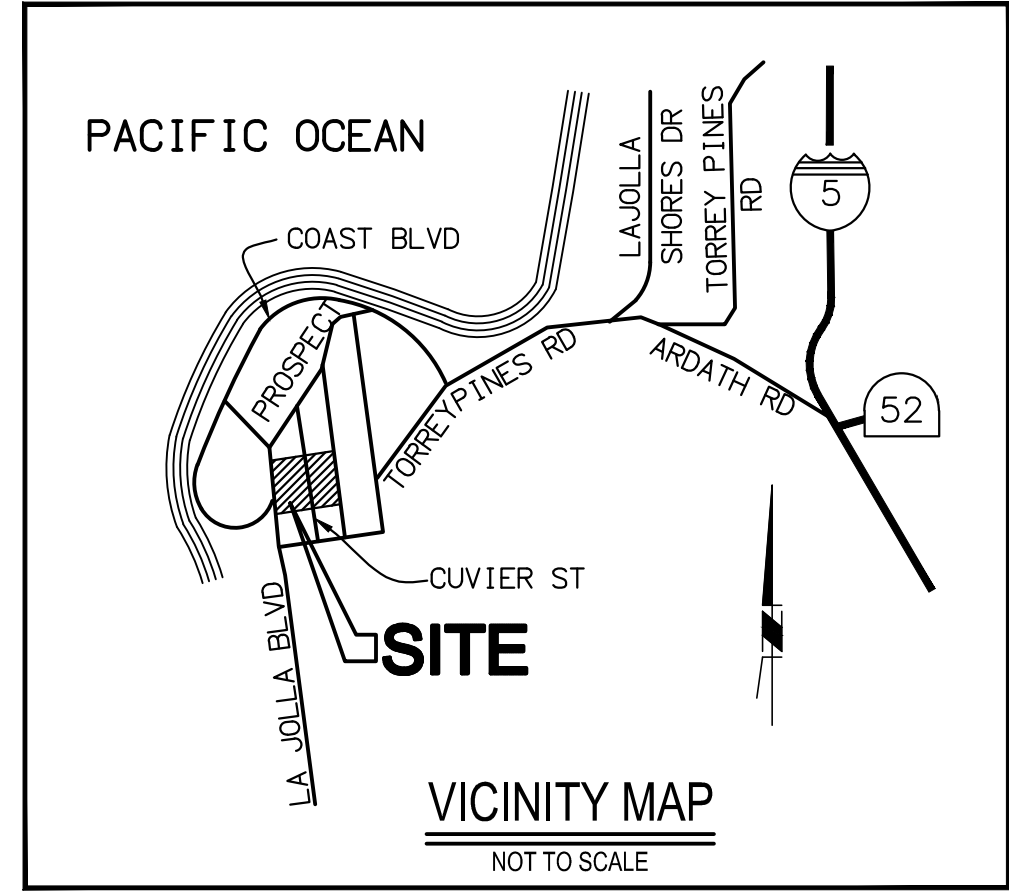
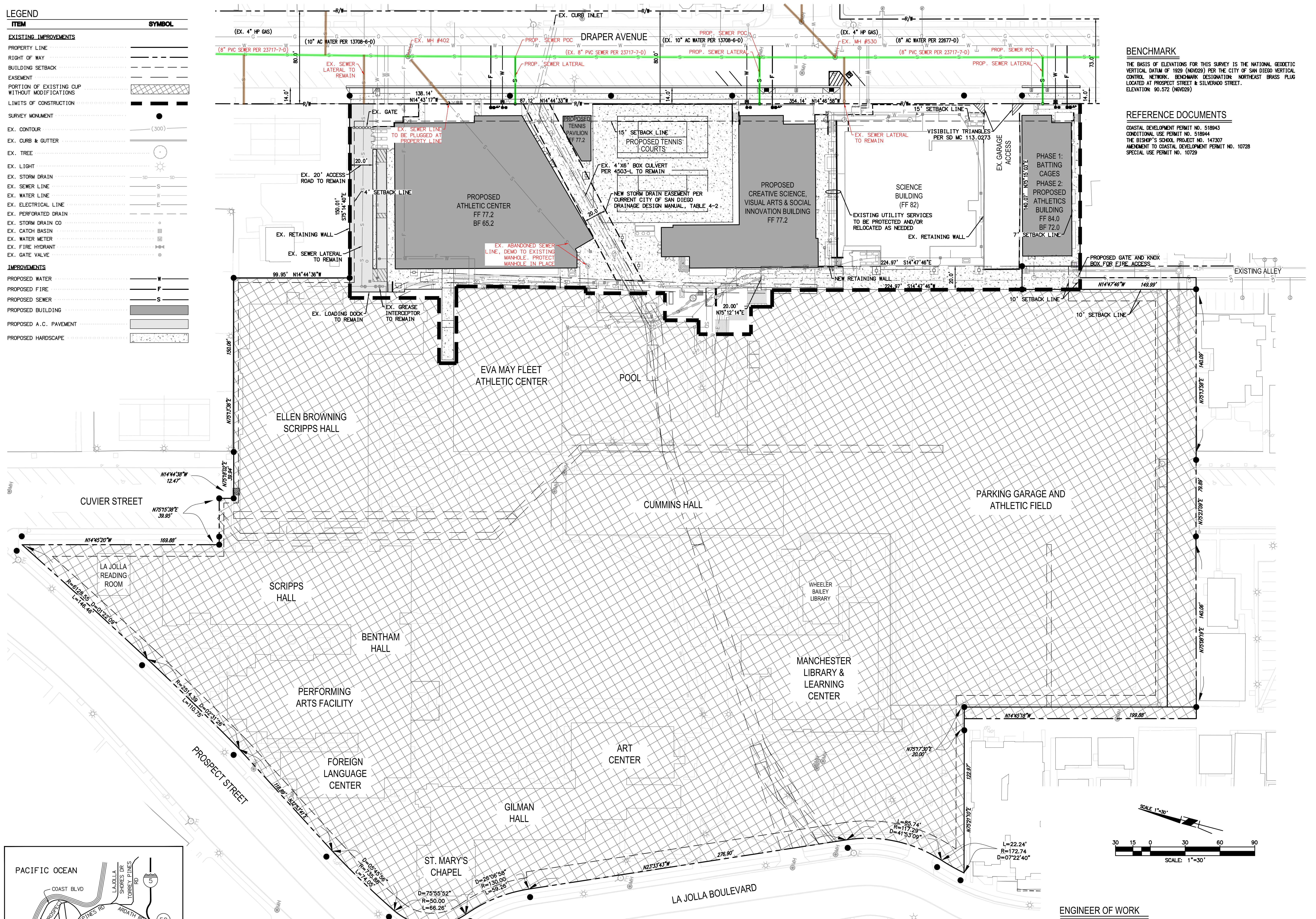
## **APPENDIX B – SITE MASTER PLAN**



ITEM	SYMBOL
<b>EXISTING IMPROVEMENTS</b>	
PROPERTY LINE	---
RIGHT OF WAY	---
BUILDING SETBACK	---
EASEMENT	---
PORTION OF EXISTING CUP WITHOUT MODIFICATIONS	---
LIMITS OF CONSTRUCTION	---
<b>SURVEY MONUMENT</b>	
EX. CONTOUR	(300)
EX. CURB & GUTTER	---
EX. TREE	---
EX. LIGHT	---
EX. STORM DRAIN	---
EX. SEWER LINE	---
EX. WATER LINE	---
EX. ELECTRICAL LINE	---
EX. PERFORATED DRAIN	---
EX. STORM DRAIN CO	---
EX. CATCH BASIN	---
EX. WATER METER	---
EX. FIRE HYDRANT	---
EX. GATE VALVE	---
<b>IMPROVEMENTS</b>	
PROPOSED WATER	---
PROPOSED FIRE	---
PROPOSED SEWER	---
PROPOSED BUILDING	---
PROPOSED A.C. PAVEMENT	---
PROPOSED HARDSCAPE	---

**BENCHMARK**  
 THE BASIS OF ELEVATIONS FOR THIS SURVEY IS THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) PER THE CITY OF SAN DIEGO VERTICAL CONTROL NETWORK. BENCHMARK DESIGNATION: NORTHEAST BRASS PLUG LOCATED AT PROSPECT STREET & SILVERADO STREET. ELEVATION: 90.572 (NGVD29)

**REFERENCE DOCUMENTS**  
 COASTAL DEVELOPMENT PERMIT NO. 518943  
 CONDITIONAL USE PERMIT NO. 518944  
 THE BISHOP'S SCHOOL PROJECT NO. 147307  
 AMENDMENT TO COASTAL DEVELOPMENT PERMIT NO. 10728  
 SPECIAL USE PERMIT NO. 10729



# SEWER EXHIBIT THE BISHOP'S SCHOOL CIVIL SITE PLAN

**ENGINEER OF WORK**  
**Michael Baker INTERNATIONAL**  
 9750 Clairemont Mesa Blvd., San Diego, CA 92124  
 Phone: (619) 614-6000; MBIAK@MBI.COM

*Scott A. Davis*  
 SCOTT A. DAVIS RCE 72281 EXP. 6/30/24



DATE: 07/18/2023

The Bishop's School  
 7607 La Jolla Blvd  
 La Jolla, CA 92037

Civil Site Plan

Revision Schedule	No. Revision	Issue Date

Description	Issue Date
Amendment	26 May 2023
Submitted 03	

C1.1  
 Sheet 2 of 18

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**APPENDIX C – OFFSITE SEWER GENERATION AREA CALCULATION  
MAP**



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SEWER STUDY OFFSITE ANALYSIS  
LA JOLLA, CA

**Michael Baker**  
INTERNATIONAL



0 100 200  
US Feet

Source:

**Bishop School**



# Official Zoning Map

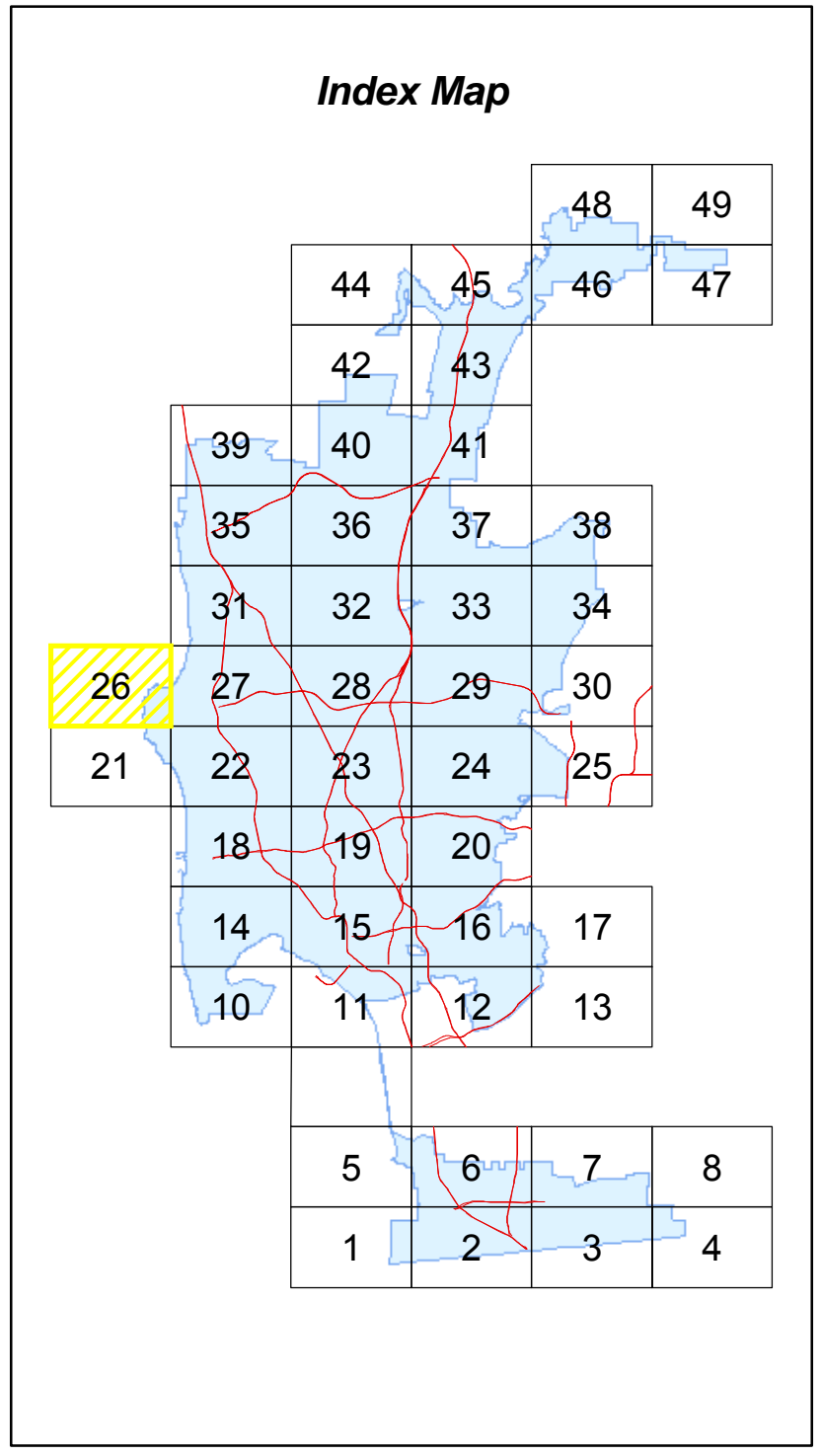
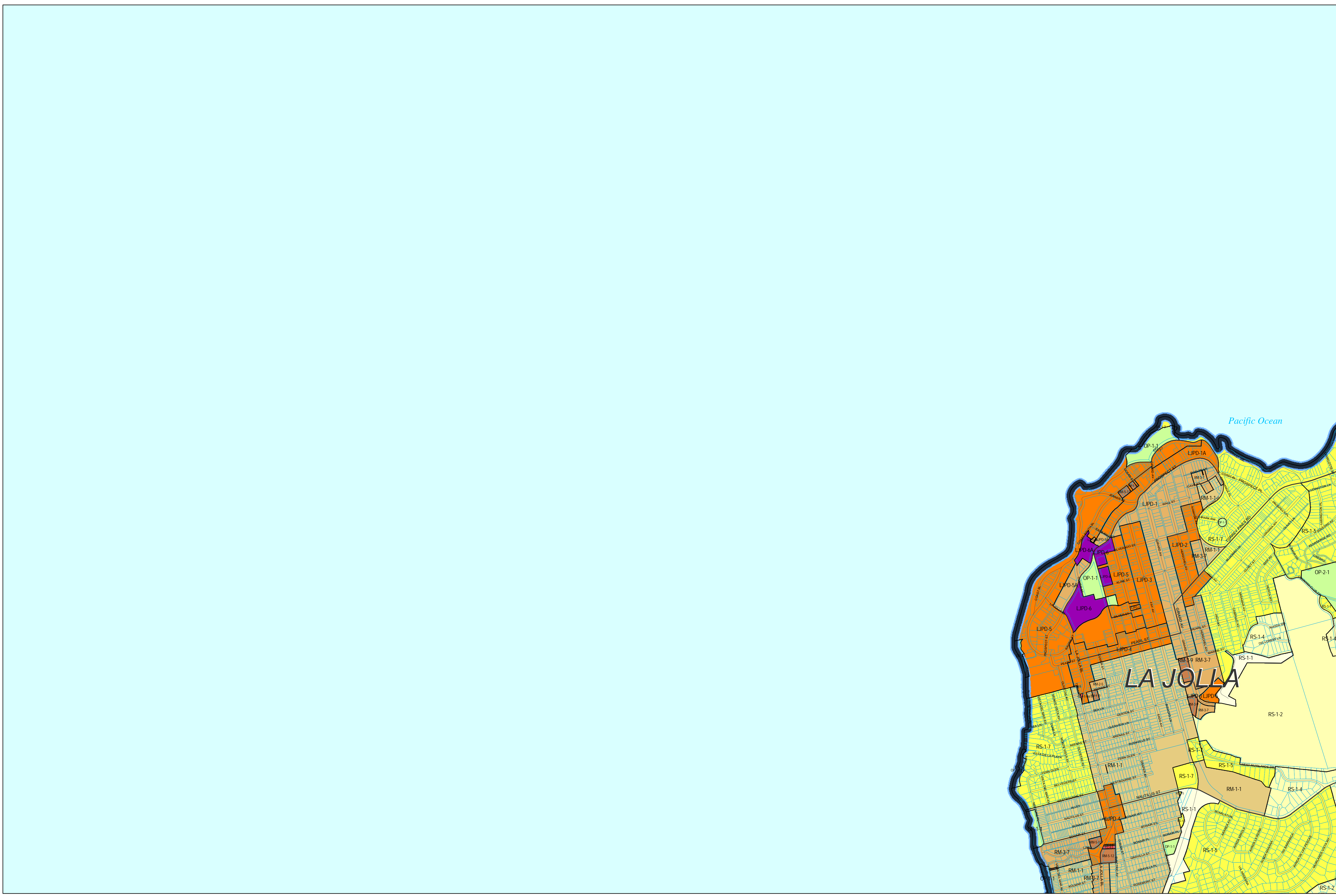
**Legend**

- City of San Diego Boundary
- Community Plan Areas
- Parcels

**Zoning**

**ZONE\_NAME**

- CC-3-5
- CC-4-5
- LJPD-1
- LJPD-1A
- LJPD-2
- LJPD-3
- LJPD-4
- LJPD-5
- LJPD-5A
- LJPD-6
- LJPD-6A
- OP-1-1
- OP-2-1
- RM-1-1
- RM-2-5
- RM-3-7
- RM-3-9
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- RS-1-2
- RS-1-4
- RS-1-5
- RS-1-7

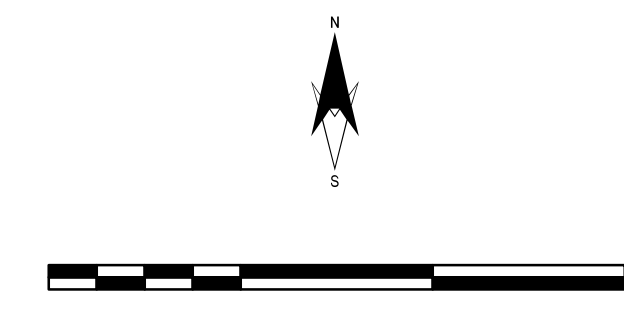


SanGIS Basemap Accuracy  
 SanGIS Land (Lot) basemap data for the City of San Diego tested 20.7  
 horizontal accuracy at the 95% confidence level.

SanGIS  
 Every reasonable effort has been made to assure the  
 accuracy of this map. However, neither the SanGIS  
 participants nor SanGIS Data Processing Corporation  
 assume any liability arising from its use.  
 THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND.



**City of San Diego**  
**Development Services Department**



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