Appendix H:

Trip Generation and VMT Assessment

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MEMORANDUM

From: Frederik Venter, P.E., and Anthony Nuti, P.E. Kimley-Horn and Associates

To: Elizabeth Johnson, First Carbon Solutions

Date: December 13, 2023

Re: **South San Francisco Fire Station #63 – Traffic Engineering Review**

Introduction

This memorandum presents a review of transportation and traffic engineering services for the relocation of South San Francisco Fire Station #63 (the "Project"). The existing fire station site is located within the South San Francisco Municipal Building located at 33 Arroyo Dr. The Project proposes to relocate the fire station to 71 Camaritas Avenue located across the street from the existing fire station driveway.

The Project location and site plan are provided in **Figure 1**.

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December 2023

Figure 1

Project Location and Site Plan

South San Fransico Fire Station #63 - Traffic Engineering Review

Trip Generation

Trip generation for existing condition and proposed Project was calculated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition (2021) for daily, AM peak hour and PM peak hour trips. The following land use code (LUC) best represents the Project's existing and proposed land uses:

- LUC 712 – Small Office Building
- LUC 932 – High-Turnover (Sit-Down) Restaurant

Fire Station Trip Generation

The trips generated by the fire station were calculated based on number of employees and number of incidents which were provided by the fire station. It is anticipated that with the relocation of the existing fire station, operations will remain the same as existing conditions.

The following information was provided by the fire station:

- Number of staff: 7 employees maximum during the daytime (includes fire response teams and ambulance staff)
- The fire station currently has one ambulance and one engine on-site.
- Call types:
    - Service calls – require one unit
    - Medical calls – require two units (engine and ambulance)
    - Vehicle accident calls: required four units (9engine, ambulance, truck, and BC)
        - Additional vehicles beyond the two on-site units (ambulance and engine) required come from other neighboring stations.

The number of trips generated by the 7 employees is calculated based on Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition (2021) Land Use Code (LUC) 712 – Small Office Building. Since shift times were not provided, it was determined that LUC 712 is a slightly conservative equivalent land use that is most reflective of the site operations for the fire station offices.

The fire station provided Kimley-Horn with vehicle incident and response data for 2022 and this information has been provided in **Figure 2**. In 2022, the fire station received 2,037 calls and provided 3,628 responses. Per the fire station, 70% of the calls received in 2022 were medical calls which require two vehicles, an ambulance and an engine. Therefore, 30% of calls are service calls (one unit) or vehicle accident calls (which require an engine and an ambulance from fire station #63).

To determine the average number of responses per incident, the peak hours from **Figure 2** were reviewed and presented in **Table 1**. From the data it was determined that approximately two vehicles would be needed for each response.

Table 1 – Fire Station #63 Average Number of Response Vehicles per Incident

Time	# of Incidents	# of Vehicle Responses	Average # of Vehicles/Incident
7 AM	66	115	1.74
8 AM	92	164	1.78
4 PM	125	245	1.96
5 PM	100	195	1.95

To determine the Daily trips based on incident responses, the total number of incidents in 2022 (2037 incidents/Year 2022) were converted to incidents per day, then multiplied by two vehicles per incident, and then multiplied again by 2 because each incident produces an in and an out trip to the Project site.

To determine AM and PM peak hour trips based on incidents responses, the maximum number of incidents that occur in one hour during the AM peak period (7am to 9am) and one hour during the PM peak period (4pm to 6pm) were utilized. This was determined to be 9am during the AM peak period and 4pm during the PM peak period. These were then converted to incidents per day, then multiplied by two vehicles per incident, and then multiplied again by 2 because each incident produces an in and an out trip to the Project site. From this calculation, it was determined that less than one incident per day occurs during the AM and PM peak hours. Therefore, to be conservative it was assumed that one incident would occur during the peak hours which requires two vehicles.

Based on the information provided by the fire department, it is anticipated that the fire station generates a total of 78 daily trips, 11 AM Peak hour trips (8 IN / 3 OUT) and 12 PM peak hour trips (5 IN / 7 OUT). **Table 1** provides the estimated trip generation for proposed fire station #63.

Table 2 – Trip Generation for Fire Station #63

Land Use Type	ITE Land Use Code	Size	Daily	AM Peak Hour				PM Peak Hour			
				Rate	IN	/	OUT	Rate	IN	/	OUT
Small Office Building	712	- Employees	7.86	1.05	85%	/	15%	1.08	33%	/	67%
Propose Fire Station #63											
Small Office Building		7 Employees	55	7	6	/	1	8	3	/	5
Incident Responses			23	4	2	/	2	4	2	/	2
Total			***78***	***11***	***8***	***/***	***3***	***12***	***5***	***/***	***7***

Notes:

1. Weekday trip generation average rates used from the Institute of Transportation Engineers (ITE), "Trip Generation Manual", 11th Edition, 2021
2. Trips generated per responses are calculated based on incident/responses data received for the existing fire station #63 in a year.

Figure 2 – Fire Station #63 - 2022 Incident & Response Data

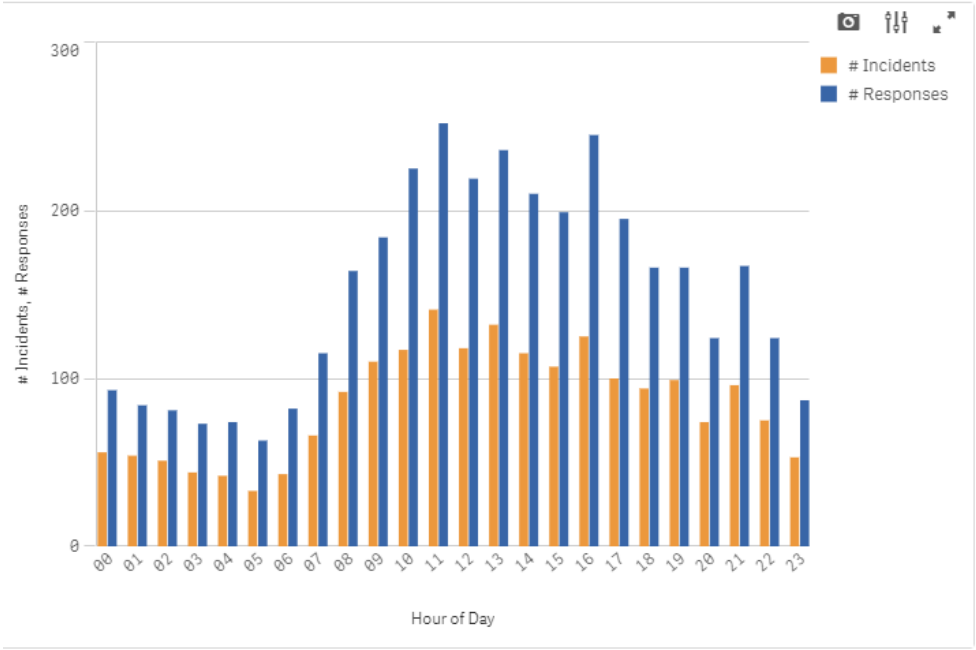
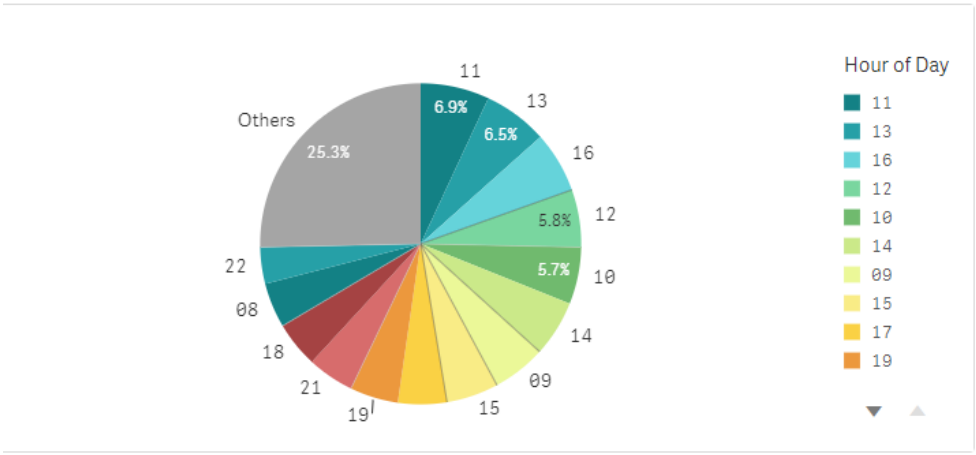


Table View

Hour of Day	# Incidents	# Responses
Totals	**2 037**	**3 628**
00	56	93
01	54	84
02	51	81
03	44	73
04	42	74
05	33	63
06	43	82
07	66	115
08	92	164
09	110	184
10	117	225
11	141	252
12	118	219
13	132	236
14	115	210
15	107	199
16	125	245
17	100	195
18	94	166
19	99	166
20	74	124
21	96	167
22	75	124
23	53	87



The following trip credits were applied to the Project:

- Existing restaurant land use (Ongpin restaurant)
- Existing fire station operations (operations remain the same between existing and the Project)

As shown in **Table 2**, when considering existing trip credits and proposed fire station trips, the Project is anticipated to generate a total of -966 daily trips, -86 AM Peak hour trips (-47 IN / -39 OUT) and -82 PM Peak hour trips (-50 IN / -32 OUT).

Table 2 – Project Trip Generation

Land Use Type	ITE Land Use Code	Size	Daily	AM Peak Hour				PM Peak Hour			
				Rate	IN	/	OUT	Rate	IN	/	OUT
High-Turnover (Sit-Down) Restaurant	932	- KSF	107.20	9.57	55%	/	45%	9.05	61%	/	39%
Existing Trip Credits											
Existing Fire Station			-78	-11	-8	/	-3	-12	-5	/	-7
Ongpin Restaurant		9.01 KSF	-966	-86	-47	/	-39	-82	-50	/	-32
Total			**-1,044**	**-97**	**-55**	**/**	**-42**	**-94**	**-55**	**/**	**-39**
Project											
Proposed Fire Station			78	11	8	/	3	12	5	/	7
Total			***-966***	***-86***	***-47***	**/**	***-39***	***-82***	***-50***	**/**	***-32***

Notes:
1. Weekday trip generation average rates used from the Institute of Transportation Engineers (ITE), "Trip Generation Manual", 11th Edition, 2021.
2. Fire Station operations will remain the same between the existing and proposed scenario.

Site Plan Engineering Review

This section reviews site operations and compliance with local and state design standards. The following was reviewed:

- Driveway access
- Internal circulation review
- Frontage and Off-Site Review

Driveway Access Internal Circulation Review

The purpose of this section is to review and provide comments on the driveway access proposed by the Project.

The Project is accessed by the following side street driveways along Arroyo Drive and Camaritas Avenue:

- Driveway A: Proposed full access driveway along Camaritas Avenue (Fire Station #63 - Emergency vehicles only) – 52-foot width.
- Driveway B: Proposed full access driveway along Camaritas Avenue – 26-foot width.
- Driveway C: Proposed full access driveway along Arroyo Avenue – 32-foot width.

It should be noted that per City of South San Francisco Standard (R-4A, Note 5) all driveways in excess of 30-feet require approval from planning division and City Engineer.

Figure 3 illustrated the Project's driveway spacing on Camaritas Avenue and Arroyo Avenue. It should be noted that along Camaritas there are two driveways for the existing restaurant. These existing driveways will be relocated from implementation of the proposed Project.

- Driveway A is located 93 feet west of Camaritas Ave and Westborough intersection.
- Driveway B is located 168 feet east of Camaritas Ave and Arroyo Dr intersection.
- Driveway C is located 115 feet south of Camaritas Ave and Arroyo Dr intersection.

Per the City of South San Francisco Standards (R-4A, Note 4), driveway edge minimum clearance to curb returns is 15 ft. All three driveways meet this standard.

As shown in **Figure 3 ,** the spacing between the proposed driveway A and B along Camaritas Avenue is 18 feet. Per the City of South San Francisco Standards (R-4A, Note 4) the proposed spacing does not meet the minimum 22 feet of clearance required for driveways on the same parcel.

The following improvements are recommended for Driveway B

- Recommend moving Driveway B 4 feet to the west to provide 22 feet between Driveway A and B.

Figure 3 provides an illustration of the driveway review.

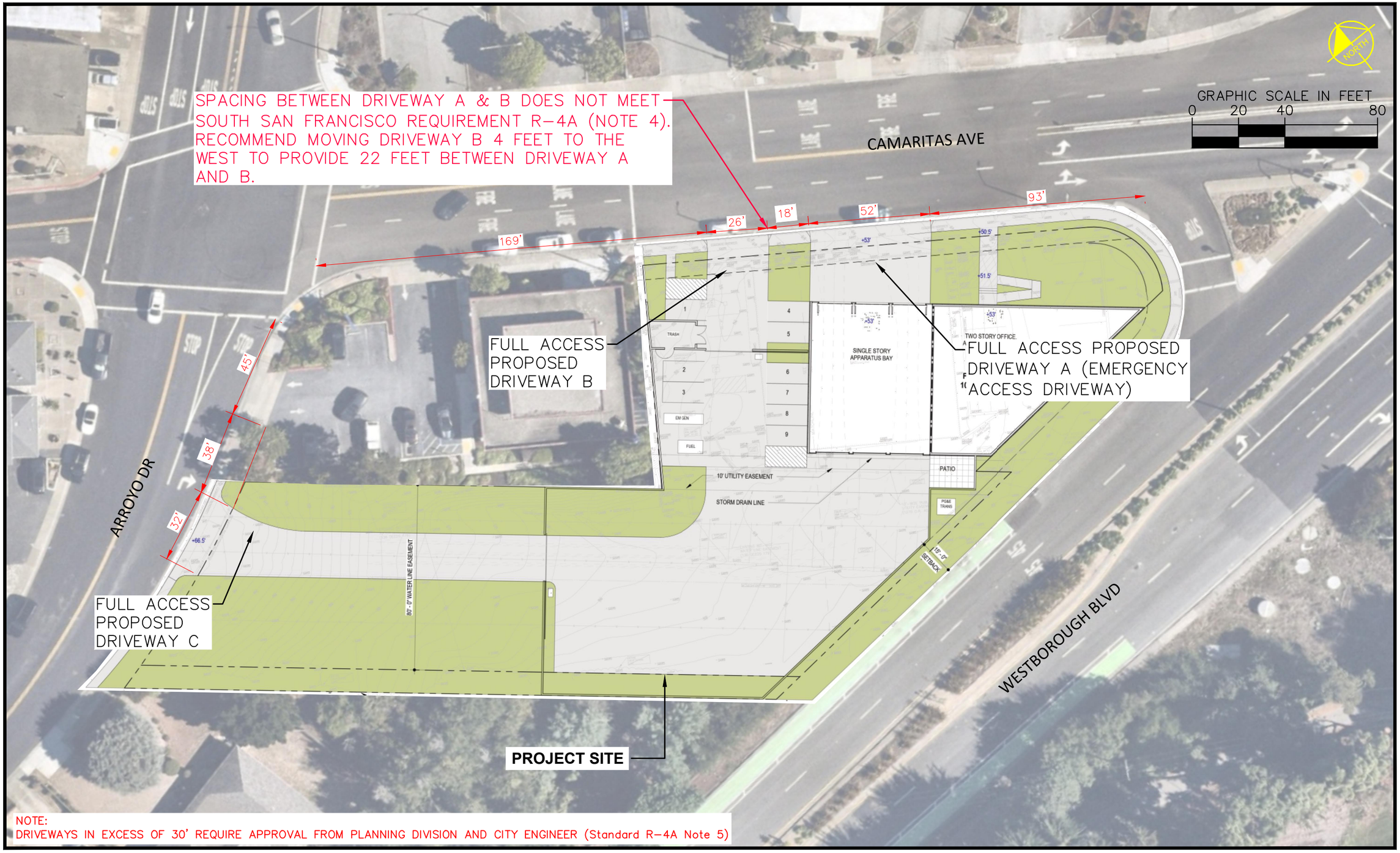


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Figure 3

Driveway Spacing

Internal Circulation Review

The purpose of this section is to review and provide comments for the internal circulation proposed by the Project.

It is anticipated that emergency response vehicles will circulate the site by entering Arroyo Drive (Driveway C) and exiting on Camaritas Avenue (Driveway A). No emergency response vehicles are anticipated to utilize Driveway B on Camaritas Avenue.

Two gates are proposed at Driveway B and Driveway C. The following provides the storage at the gates:

- Driveway B Gate: Approximately 50-feet of storage (approximately 2 vehicles of storage)
- Driveway C Gate: Approximately 150-feet of storage (approximately 6 vehicles of storage)

Per the Fire Station a maximum of seven employees will be on the site. If employees utilize both Driveway B and C a total of eight vehicle can be stored on the Project site. Therefore, it was determined that adequate storage has been provided and vehicles are not anticipated to queue onto Arroyo Drive or Camaritas Avenue.

Figure 4 illustrates the circulation and storage calculations provided in this section.

Frontage and Off-Site Review

The purpose of this section is to provide improvement recommendations per the California Manual on Uniform Traffic Control (CAMUTCD) and City of South San Francisco Standards for the Project.

The following improvements are recommended on Camaritas Avenue

- Install W11-8 sign 100 ft from clear zone on both approaches along Camaritas Avenue.
- Install SR46 (CA) sign on both ends of the keep clear area on both approaches along Camaritas Avenue.
- Provide keep clear zone pavement markings on both approaches along Camaritas Avenue.
- Modify existing centerline and traffic lane markings.
- Remove existing fire lane pavement markings.

No improvements are required on Arroyo Drive.

Figure 5 Figure 4 illustrates the frontage and off-site recommendations provided in this section.

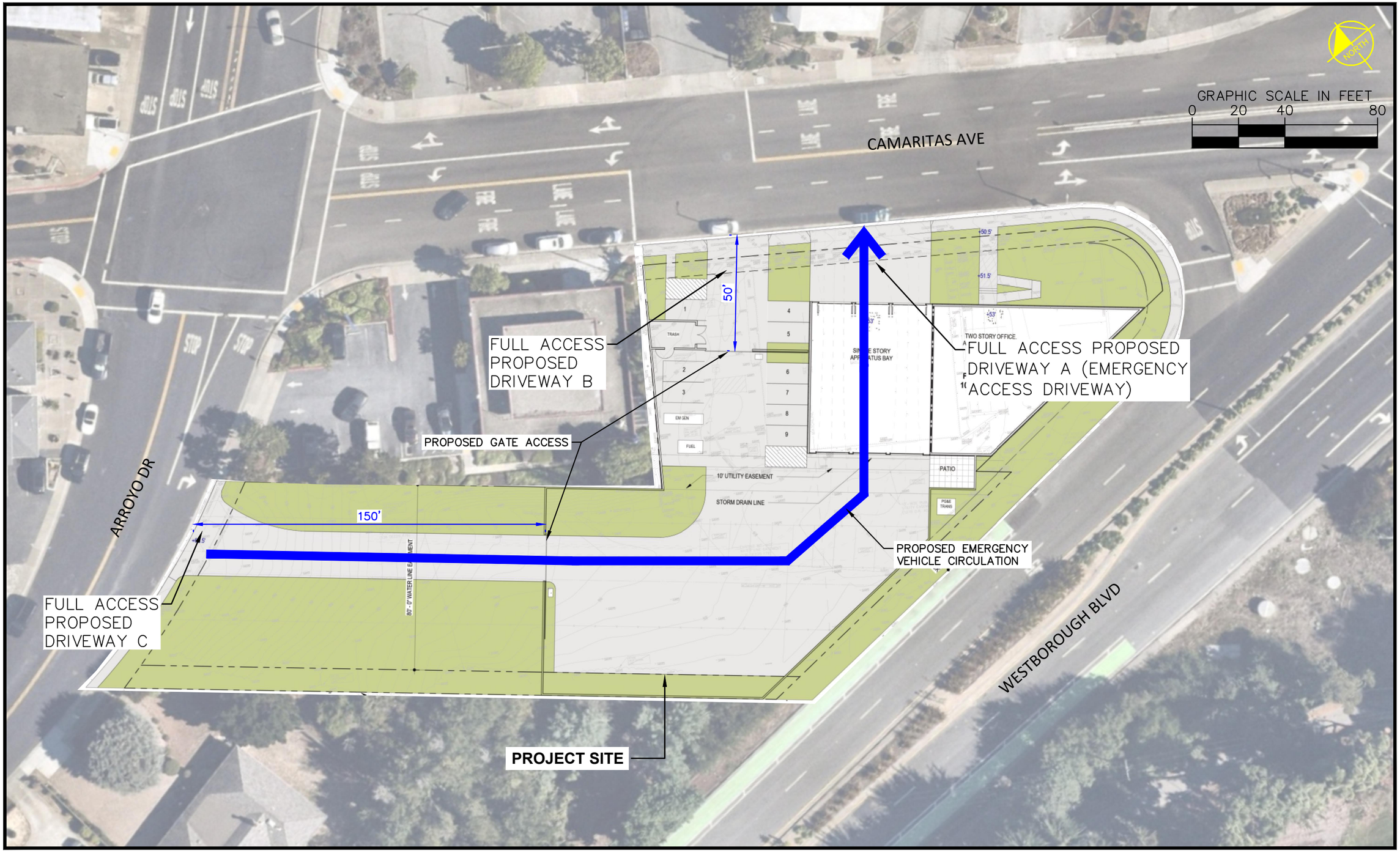

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Figure 3

Driveway Spacing

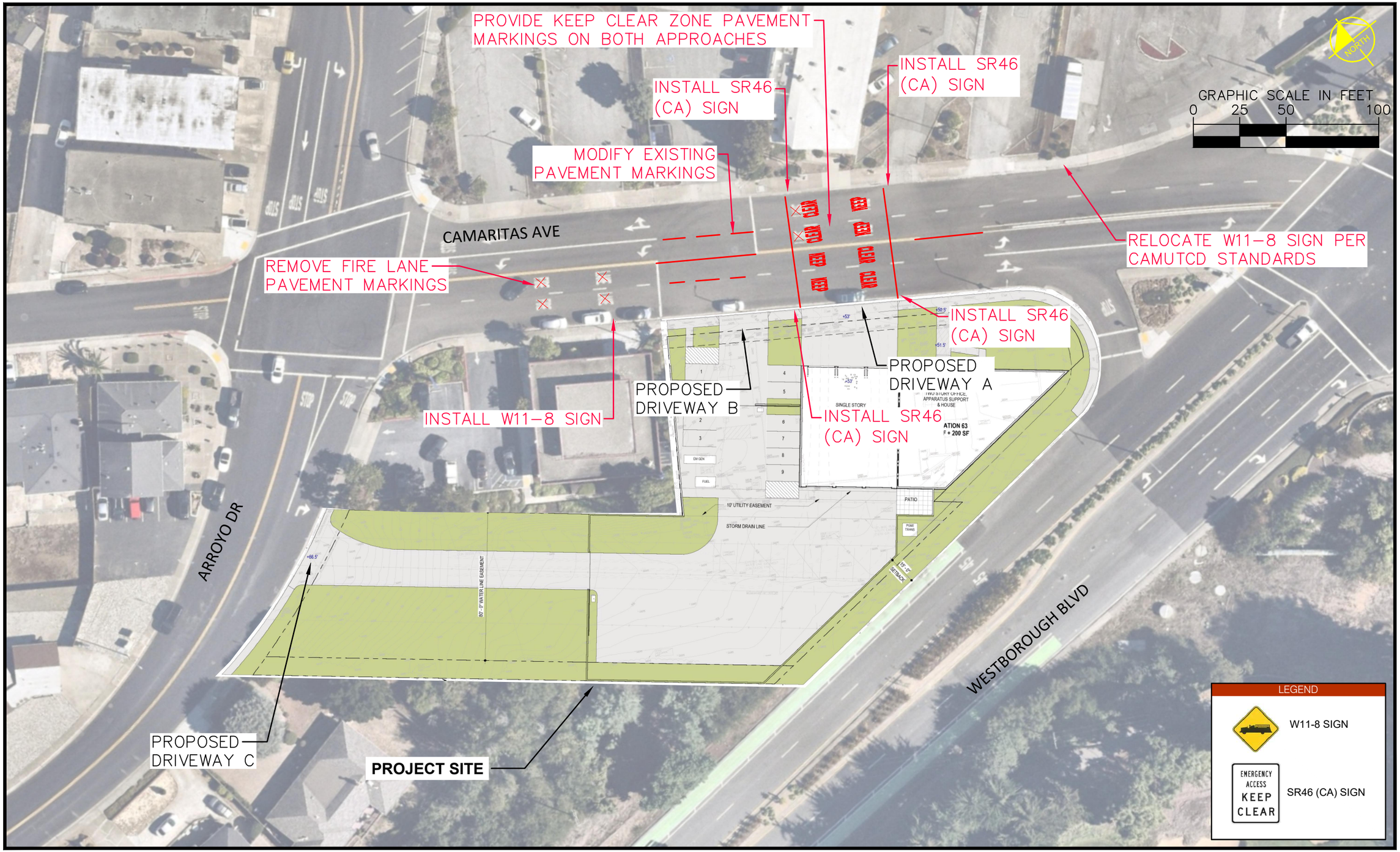

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Figure 4

Frontage and Off-Street Review

Appendix

Appendix A – Project Site Plan

Appendix B – Standard Plan R-4A

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Appendix A - Project Site Plan

Source: City of South San Francisco, SHAH Kawasaki Architects.

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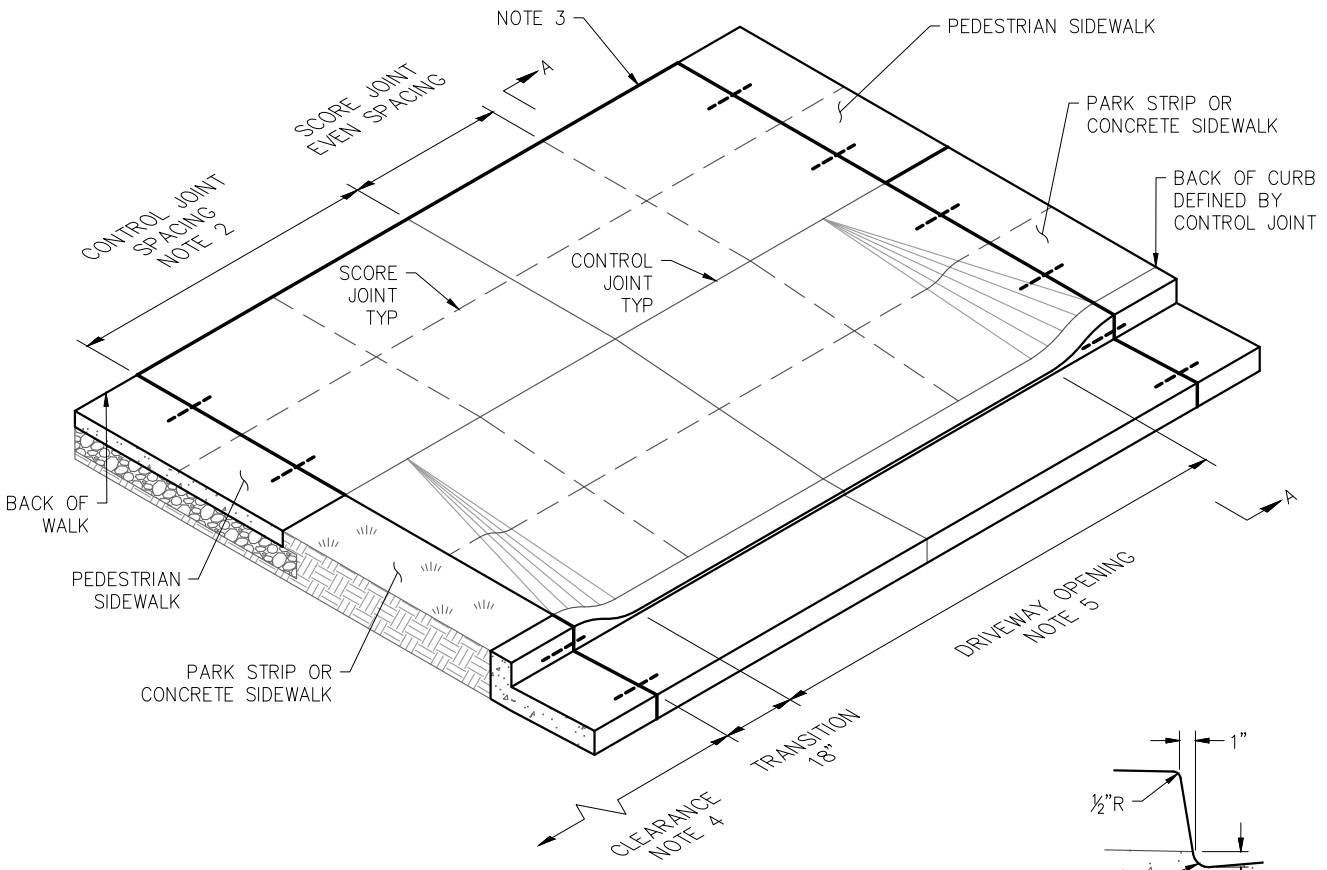
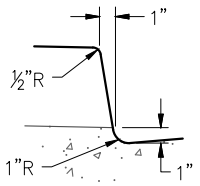
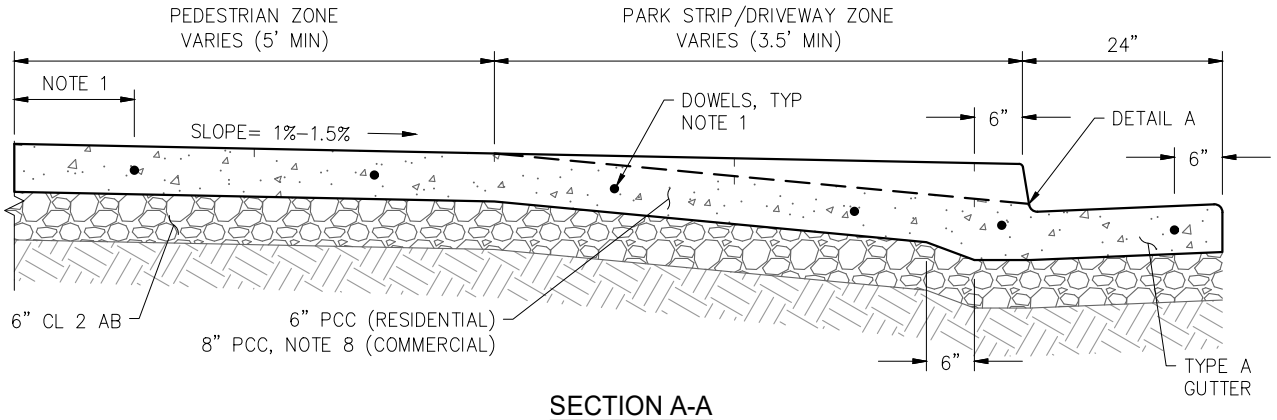
Exhibit 3
Site Plan (Option 1)

Appendix B - Standard Plan R-4A





DETAIL A



SECTION A-A

NOTES:

1. EXPANSION JOINTS SHALL BE PLACED AT DRIVEWAY EDGES WITH ½"X12" SLIP DOWELS (CENTER DOWELS BETWEEN CONTROL AND SCORE JOINTS FOR 3' OR SMALLER PANELS, OR TWO EVEN–SPACED DOWELS FOR 3' TO 5' PANELS).
2. CONTROL JOINTS SHALL BE PLACED AT THE CENTERLINE OF THE DRIVEWAY OR 10' MAX INTERVALS.
3. PROVIDE EXPANSION JOINT BETWEEN PUBLIC R.O.W. AND PRIVATE DRIVEWAY.
4. DRIVEWAY EDGE MINIMUM CLEARANCES ARE 1' TO PARCEL LINE AND CURB INLETS, 5' TO FIRE HYDRANTS, 15' TO CURB RETURNS, AND 22' TO THE NEAREST DRIVEWAY ON SAME PARCEL.
5. RESIDENTIAL DRIVEWAY OPENINGS SHALL BE 10' TO 12'. RESIDENTIAL DOUBLE CAR DRIVEWAYS REQUIRE PLANNING DIVISION APPROVAL AND SHALL BE 24' MAX. COMMERCIAL DRIVEWAYS SHALL BE 16' TO 30'. DRIVEWAYS IN EXCESS OF 30' REQUIRE APPROVAL FROM PLANNING DIVISION AND CITY ENGINEER.
6. DRIVEWAY SHALL BE POURED MONOLITHIC WITH THE GUTTER.
7. NEW CONCRETE SHALL CONFORM TO EXISTING AT THE NEAREST JOINT.
8. COMMERCIAL DRIVEWAYS SHALL BE 8" THICK PCC AND INCLUDE REINFORCEMENT CONSISTING OF #4 REBAR AT 18" ON CENTER EACH WAY OR 6"X6" METAL WIRE MESH.

SOUTH SAN FRANCISCO
PUBLIC WORKS
ENGINEERING

STANDARD DRIVEWAY

DEC 2021

R-4A