FEHR PEERS

Memorandum

Date: February 22, 2023

To: Olivia Ervin, M-Group

From: Sam Tabibnia and Ken Der, Fehr & Peers

Subject: Pinole Shores Project – Transportation Impact Analysis

OK22-0492

This memorandum summarizes the Transportation Impact Analysis conducted by Fehr & Peers for the proposed Pinole Shores Project (the project) in Pinole, CA.

Based on our evaluation:

- The project does not meet any of the Contra Costa Transportation Authority's (CCTA) screening criteria for Vehicles Miles Traveled (VMT) impact. However, based on a detailed analysis, the project would have a less than significant impact on VMT.
- The project would generate approximately 1,310 daily, 121 AM peak hour and 116 PM peak hour net new automobile trips.
- The San Pablo Avenue/Meadow Avenue/Project Driveway intersection may meet the peak hour signal warrant with the addition of the traffic generated by the proposed project; therefore, the following are recommended:
    - **Recommendation 1:** Prior to the occupancy of the project, convert the Project Driveway and the Meadow Avenue approaches at the San Pablo Avenue/Meadow Avenue/Project Driveway intersection to right-turns only by prohibiting left-turns and through movements via signage and striping. The Project Driveway approach at the intersection shall also be narrowed from two lanes to one lane..
    - **Recommendation 2:** Lengthen the eastbound left turn pocket on San Pablo Avenue from 60 to 130 feet, increasing the queue storage for large trucks. The current 60-foot left-turn pocket can accommodate only one WB-67 truck and other vehicles queuing on the eastbound left-turn pocket would spill back onto the through travel lanes on San Pablo Avenue.
    - **Recommendation 3:** Relocate the existing crosswalk across the project driveway closer to the intersection to align with the existing sidewalk along the north side of

San Pablo Avenue, which would provide additional queue storage for vehicles exiting the project site and improve pedestrian circulation along the project frontage.

- **Recommendation 4:** Install a new stop sign with pavement markings at the private parking lot intersection immediately north of the intersection with San Pablo Avenue, which would minimize queuing within the project site, maintain access to the drive aisle just north of the project driveway, and minimize the inbound project queues spilling back onto San Pablo Avenue.
- **Recommendation 5:** Within one year after the full occupancy of the project, install a traffic signal at the San Pablo Avenue/Meadow Avenue/Project Driveway intersection, unless a full signal warrant study has been completed for the intersection that shows a signal is not needed. If a signal is installed at the intersection, the right-turn only restrictions at the Project Driveway and the Meadow Avenue approaches of the intersection shall be removed and the Project Driveway approach at the intersection shall be widened to two lanes.

The remainder of this memorandum provides more detail on our assumptions and findings on these topics.

Project Description

The project site is located at 830 San Pablo Avenue and is currently a 7.4-acre vacant lot. Based on the site plan dated March 2022 and provided in **Appendix A**, the project would provide approximately 117,940 square feet of space in two buildings (37,480 square feet in Building 1 and 80,460 square feet in Building 2). Although the exact use is not yet determined, it is expected to be warehouse and/or research and development (R&D). The project site is about 700 feet north of San Pablo Avenue.

The project would provide 139 passenger vehicle parking spaces and 9 loading docks (2 loading docks in Building 1 and 7 loading docks in Building 2). Access to the site would be provided through one existing driveway on San Pablo Avenue which is shared with other uses located between the project site and San Pablo Avenue. The driveway is located opposite of Meadow Avenue with all movements allowed at the intersection and stop signs on the minor northbound and southbound approaches.

VMT Assessment

This section presents the effects of the project on VMT using guidelines, thresholds of significance, and screening criteria for evaluating VMT in CEQA documents as recommended by CCTA.

California Senate Bill 743

On September 27, 2013, California Governor Jerry Brown signed SB 743 into law and started a process that changed the way transportation impact analysis is conducted as part of CEQA compliance. These changes include elimination of automobile delay, LOS, and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts under CEQA. According to SB 743, these changes are intended to "more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions."

In December 2018, the State Office of Planning and Research (OPR) completed an update to the CEQA Guidelines to implement the requirements of SB 743. The Guidelines state that VMT must be the metric used to determine significant transportation impacts. The Guidelines require all lead agencies in California to use VMT-based thresholds of significance in CEQA documents published after July 2020.

The OPR Guidelines recommend developing screening criteria for development projects that meet certain criteria that can readily lead to the conclusion that they would not cause a significant impact on VMT. The OPR Guidelines also recommend evaluating VMT impacts using an efficiency-based version of the metric, such as VMT per resident for residential developments and/or VMT per worker for office or other employment-based developments.

While the City of Pinole has not developed their screening criteria or thresholds of significance for VMT assessment, the CCTA, which supports travel demand modeling for all jurisdictions in the county, has developed VMT screening criteria, analysis methodologies, and thresholds of significance. Therefore, this analysis uses the screening criteria, analysis methodologies, and the thresholds of significance recommended by CCTA as described in the *VMT Analysis Methodology for Land Use Projects in Contra Costa Technical Memorandum* (CCTA VMT Methodology Memorandum, July 2020).

VMT Definitions

Terms used for VMT screening and estimation are defined below:

- **Home-work VMT –** VMT associated with commute trips between a residence and an employment-generating use, also referred to as home-based-work or commute trips. Home-work VMT per worker is defined as the total VMT generated by workers in a geographic area commuting between home and work and tracked throughout the regional network on a typical weekday divided by the number of workers in that geographic area.
- **Local Serving Uses –** Land uses that are expected to draw users from a local area, typically no more than a 2- to 3-mile radius. The definition of local-serving uses may vary

by jurisdiction. These uses may generally include local-serving public facilities such as a branch library, a police or fire station, neighborhood-based schools, and local-serving retail businesses such as grocery stores, coffee shops or dry cleaners.

- **Transit Priority Areas (TPAs) –** TPAs are areas of close proximity to a significant transit mode, defined as one-half mile area around an existing major transit stop or an existing stop along a high-quality transit corridor. Public Resources Code, § 21064.3 defines "major transit stop" as a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of 15 minutes or less during the morning and afternoon peak commute periods. Public Resources Code, § 21155 defines a "high-quality transit corridor" as a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.

VMT Screening

According to the CCTA *VMT Methodology Memorandum,* screening thresholds can be used to quickly identify projects that can be expected to cause a less than significant impact without conducting a detailed study. The CCTA *VMT Methodology Memorandum* recommended screening thresholds and their applicability to the project are described below.

- **Small Projects –** Projects that have fewer than 10,000 square feet of non-residential space or 20 residential units or less may be assumed to cause a less than significant VMT impact. The project would have over 10,000 square feet of non-residential space, therefore it would not meet this screening threshold.
- **Local-Serving Uses –** Projects that consist of local-serving uses can be presumed to have a less than significant impact, since they would primarily draw users and customers from a relatively small geographical area. The project would likely not include any local-serving public facilities and a warehouse or R&D use would draw users from an area greater than a 2- to 3-mile radius. It would not meet this screening threshold.
- **Located in TPAs –** Projects located within a TPA can be presumed to have a less than significant impact, unless the project meets one or more of the following:

    1. Has a Floor Area Ratio (FAR) of less than 0.75;
    2. Includes more parking for use by residents, customers, or employees than required by the lead agency (if the agency allows but does not require the project to supply a certain amount of parking);
    3. Is inconsistent with the applicable Sustainable Communities Strategy (SCS) (as determined by the lead agency, with input from the Metropolitan Transportation Commission (MTC)); or
    4. Results in a net reduction in multi-family housing units.

WestCAT, the bus service provider in western Contra Costa County, operates Routes C3 and JL/JR along San Pablo Avenue with connections to Contra Costa College, Hercules Transit Center, and the El Cerrito del Norte BART station with combined weekday headways of 15 minutes during the weekday peak commute periods. Service frequency has been reduced due to the ongoing COVID-19 pandemic, but buses operated at headways of 10 minutes pre-pandemic. The nearest Route C3 and JL/JR bus stops to the project site are located on both directions of San Pablo Avenue at Meadow Avenue and the access driveway to the site. Thus, this segment of San Pablo Avenue is classified as a high-quality transit corridor, and the project is located in a TPA. However, the project cannot be presumed to have a less than significant impact as it would not satisfy the first condition for this screening threshold as described below:

1. It would have an FAR of 0.37, which is less than 0.75;
2. The project would include 139 parking spaces. City of Pinole Municipal Code Section 17.48.050 requires one parking space per 1,000 square feet of space plus one parking space per four employees for warehousing, wholesaling, research, and other industrial uses. The use with the highest potential employee count at the site would be research and development which typically has 2.5 employees per 1,000 square feet. Thus, the project would be required to provide up to 192 parking space. Since the project would provide fewer parking spaces than required by the Code, it would not include more parking for use by customers or employees than required by the lead agency;
3. The project is located in the Pinole Old Town San Pablo Avenue Priority Development Area (PDA) and is therefore, not inconsistent with the applicable SCS; and
4. The project would not demolish any existing housing units and would therefore not result in a net reduction in multi-family housing units.

- **Located in Low VMT Areas –**Employment-generating projects located within a low VMT-generating area can be presumed to have a less than significant impact. CCTA defines Low VMT areas as follows:
    - For employment-generating projects: Cities and unincorporated portions of CCTA's five subregions that have existing home-work VMT per worker that is 85% or less of the existing regional average. Based on the data developed by CCTA using the Countywide Travel Demand Model (CCTA Model), the City where the project is located (Pinole) has an existing home-work VMT per worker of 13.6, which is not less than 85% of the regional average home-work VMT per worker of 13.2 (the existing regional home-work VMT per worker is 15.6). Therefore, the project would not meet this screening threshold.

Since the project does not meet any of the screening thresholds, a more detailed evaluation of the project's VMT impact is required.

Detailed VMT Analysis

The detailed VMT evaluation for the project is conducted using the CCTA Travel Demand Model. The CCTA Model is a is a regional travel demand model that uses socio-economic data and roadway and transit network assumptions to forecast traffic volumes, transit ridership, and VMT using a four-step modeling process that includes trip generation, trip distribution, mode split, and trip assignment. This process accounts for changes in travel patterns due to future growth and expected changes in the transportation network. The CCTA Model, which encompasses the entire nine-county Bay Area region, with additional zonal and network detail within Contra Costa County, is based on the Metropolitan Transportation Commission (MTC) Plan Bay Area 2040 (i.e., Sustainable Communities Strategy) transportation network and land uses for 2020 and 2040.

As a regional planning tool, the CCTA Model was developed through an extensive model validation process and is intended to replicate existing vehicular travel behavior. Therefore, it can provide a reasonable estimate of the VMT generated in various geographic areas on a typical weekday, as well as estimate future VMT that reflects planned local and regional land use and transportation system changes.

Since the project would be an "employment-generating project," the home-work VMT per worker metric is used to generate VMT estimates. As recommended in the CCTA *VMT Methodology Memorandum*, the project is added to the baseline land use database in the Model to estimate the home-work VMT per worker for the project.

According to the CCTA, the project generated home-work VMT per worker constitutes a significant impact if it exceeds the following significance thresholds, whichever is less stringent: 1) 85% of the home-work VMT per worker in the subject municipality (i.e., City of Pinole), or 2) 85% of the existing Bay Area region-wide average home-work VMT per worker. Since the existing average home-work VMT per worker is 13.6 for the City of Pinole and 15.6 for the Bay Area region, this analysis uses the 85% of the existing Bay Area region-wide average home-work VMT per worker as the significance threshold.

Table 1 summarizes the 2020 home-work VMT as estimated by the CCTA Model. The table also compares the home-work VMT per worker for the project with the region-wide average and 85% of the region-wide average, which is the significance threshold used to determine the significance of the VMT impact.

The 2020 home-work VMT per worker for the project is estimated to be 12.8. The 2020 home-work VMT per worker for the project would be below 85% of the region-wide Bay Area average. This VMT estimate does not account for the TDM Plan that the project would be required to implement. The project impact on VMT is less than significant under CEQA, and no mitigation is required.

Table 1: Daily Vehicle Miles Traveled Summary

Geography	2020 Home-Work VMT per Worker
Region-wide Average	15.6
85% of the Region-wide Average (i.e., Significance Threshold)	13.2
Project (TAZ 10215)	12.8
Below Threshold?	Yes

Source: CCTA Model, 2021; Fehr & Peers, 2022.

Trip Generation

Trip generation is the process of estimating the number of vehicles that would likely access the project site. Fehr & Peers estimated the trip generation for the project using the data and methodology published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual*, *Eleventh Edition*.

The specific tenants for the project have not been selected. The ITE *Trip Generation Manual* provides several different land use types that may be applicable to the proposed R&D or warehouse uses. **Table 2** summarizes the trip generation rates for these potential uses. To present the most conservative results, this analysis assumes that the project would be research and development (ITE Land Use Code 760), which is the highest trip generating use in the *Trip Generation Manual* that could occupy the project site.

Table 1: Automobile Trip Generation Rate Comparison for Industrial Uses

Land Use Type	ITE Land Use Code	Daily	Weekday AM Peak Hour[1]	Weekday PM Peak Hour[2]
Warehousing	150	1.71	0.17	0.18
High-Cube Transload and Short-Term Storage Warehouse	154	1.40	0.08	0.10
High-Cube Fulfillment Center Warehouse – Non-Sort	155	1.81	0.15	0.16
High-Cube Parcel Hub Warehouse	156	4.63	0.70	0.64
Research and Development Center	760	11.08	1.03	0.98

Notes:
1. Peak hour of adjacent street traffic one hour between 7:00 and 9:00 AM.
2. Peak hour of adjacent street traffic one hour between 4:00 and 6:00 PM.

Source: ITE *Trip Generation Manual,* 2021.

Table 3 summarizes the trip generation for the project based on the ITE methodology. It is estimated that the project would generate about 1,310 daily, and 121 AM and 116 PM peak hour net new trips.

Table 2: Project Automobile Trip Generation

Land Use	Size[1]	Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
R&D[2]	117.9 KSF	1,310	99	22	121	18	98	116

Notes:
1. KSF = 1,000 square feet.
2. ITE *Trip Generation Manual, Eleventh Edition* land use category 760 (Research and Development Center) in General Urban/Suburban Setting:
   Daily: T = 11.08 * X
   AM Peak Hour: T = 1.03 * X (82% in, 18% out)
   PM Peak Hour: T = 0.98 * X (16% in, 84% out)

Source: Fehr & Peers, 2022.

CCTA's Growth Management Program *Implementation Guide* (February 2021) requires the preparation of a traffic study that evaluates the impacts of a proposed development on traffic operations at nearby intersections for projects that would generate more than 100 net new peak hour trips and require a general plan amendment (GPA) and/or preparation of a detailed environmental study (i.e., negative declaration or EIR). Although the project would generate more than 100 net new peak hour trips, preparation of a traffic study is not required because the project would require a GPA or a detailed environmental document. However, the next section of this memorandum summarizes the focused traffic operations analysis completed for the project.

Traffic Operations Analysis

This section presents the traffic operations analysis completed for the project. Consistent with OPR guidelines which prohibit the use of delay-based metrics in environmental documents, the traffic operations analysis is conducted outside of the CEQA process. This section starts by describing trip distribution and trip assignment for the project, describing the methodologies used to evaluate traffic operations, followed by selection of study intersections, summary of traffic operations under Existing and Existing Plus Project conditions, and summary of project effects on delay and level of service (LOS) at the study intersections, signal warrants at the unsignalized study intersection, and recommended improvements.

Trip Distribution, Trip Assignment, and Study Intersection Selection

The trip distribution and assignment process estimates how the vehicle trips generated by the project would distribute across the roadway network. **Figure 1** shows the trip distribution and trip

assignment at the study intersections. The directions of approach and departure for the project account for the project location, the street network serving the project site, location of complementary land uses, and consider the expected traffic congestion and travel times in the area. This analysis assumes that about 50% of trips would use I-80 and Appian Way, about 20% would use San Pablo Avenue from the north, and about 30% would use San Pablo Avenue from the south.

This analysis evaluates the AM and PM peak hour intersection operations at the following two study intersections under Existing and Existing Plus Project conditions:

1. San Pablo Avenue/Meadow Avenue/Project Driveway
2. San Pablo Avenue/Appian Way/Pinon Avenue

These intersections were selected for analysis because the proposed project would add 50 or more peak hour trips, and they are most likely to be affected by the proposed project.

Analysis Methodology and Tools

Intersection operations are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on factors such as speed, travel time, delay, and freedom to maneuver. Letter grades range from LOS A, with no congestion and little delay, to LOS F, which represents over-capacity conditions with excessive vehicle delay. The Transportation Research Board's *Highway Capacity Manual (HCM)* provides a methodology to calculate LOS at intersections based on average vehicle delay. **Appendix B** describes the various LOS and the corresponding ranges of delays for both signalized and unsignalized intersections based on HCM 2010 methodology. The Pinole General Plan does not outline any specific LOS goals, only a broad guideline to maintain acceptable LOS standards (generally LOS A to LOS D) for traffic operations outside of Old Town Pinole.

The Synchro 11 Software is used to estimate delay and the corresponding LOS. Synchro uses the equations provided in the 2010 HCM to calculate control delay. These equations use intersection characteristics, such as vehicle and pedestrian volumes, lane geometry, and signal phasings, as inputs in estimating control delay. At intersections that could not be evaluated using the 2010 HCM, the 2000 HCM is used.

Traffic Volumes

Existing traffic volumes at both study intersections were collected on Tuesday, November 15, 2022. **Appendix C** presents the detailed volume data for the study intersections. **Figure 2** shows the existing AM and PM peak hour intersection vehicle volumes (7:30 to 8:30 AM and 5:00 to 6:00 PM), lane configurations, and signal controls at the study intersections. **Figure 2** also shows the Existing Plus Project traffic volumes, which consists of traffic volumes under Existing No Project

conditions plus traffic generated by the project (Figure 1). This analysis assumes no other roadway modifications at the study intersections under the Existing Plus Project conditions.

Intersection LOS Analysis

Based on the volumes, intersection controls, and roadway configurations presented on Figure 2, and the signal timings at the signalized study intersection provided by the City of Pinole, Fehr & Peers calculated the AM and PM peak hour LOS at the study intersections using the methodologies presented above under Existing and Existing Plus Project conditions. **Table 4** summarizes the weekday AM and PM peak hour intersection LOS analysis results. **Appendix D** provides the detailed calculation worksheets.

As shown in Table 4, the signalized San Pablo Avenue/Appian Way/Pinon Avenue intersection operates at LOS D or better during the AM and PM peak hours under both the Existing and Existing Plus Project conditions. Thus, the intersection would be consistent with the City's LOS goal for signalized intersections outside of Old Town Pinole.

The unsignalized San Pablo Avenue/Meadow Avenue/Project Driveway intersection operates at an overall LOS A with the side-street stop-controlled approaches operating at LOS D during the AM peak hour and LOS E during the PM peak hour under Existing conditions. Under Existing Plus Project conditions, the intersection would continue to operate at an overall LOS A, but the side-street stop-controlled approach would operate at LOS E during the AM peak hour and LOS F during the PM peak hour. The application of the peak hour signal warrant to the unsignalized study intersection is described in the next subsection of this memorandum.

Table 4: Intersection LOS Summary

#	Intersection	Traffic Control	Peak Hour	Existing No Project		Existing Plus Project	
				Delay (Seconds) [1]	LOS [1]	Delay (Seconds) [1]	LOS [1]
1	San Pablo Avenue/Meadow Avenue/Project Driveway	Side-Street Stop	AM	1 (28)	A (D)	1 (37)	A (E)
			PM	1 (39)	A (E)	5 (97)	A (F)
2	San Pablo Avenue/Appian Way/Pinon Avenue[2]	Signal	AM	20	B	22	C
			PM	39	D	47	D

Notes
1. Average intersection delay and LOS based on the 2010 HCM method, unless noted. Average delay is reported for signalized intersections. Average delay and delay for the movement with the highest delay is reported for unsignalized intersections.
2. Average intersection delay and LOS based on the HCM 2000 method because the intersection cannot be evaluated in the 2010 HCM.

Source: Fehr & Peers, 2022.

Signal Warrants Analysis

To assess the need for signalization of stop-controlled intersections, the *California Manual on Uniform Traffic Control Devices* (MUTCD) includes eight signal warrants. Generally, meeting one or more of the signal warrants could justify signalization of an intersection. This analysis evaluates the California MUTCD peak hour vehicular volume warrants (Warrants 3A and 3B) for urban conditions for the stop-controlled San Pablo Avenue/Meadow Avenue/Project Driveway intersection. Satisfying one or more of these warrants could justify the installation of a signal at an intersection. However, satisfying one or more of these warrants does not necessarily require the installation of a traffic signal at the intersection. **Appendix E** provides the detailed signal warrant worksheets.

The San Pablo Avenue/Meadow Avenue/Project Driveway intersection would meet Warrant 3B (peak-hour volume) primarily due to the traffic volume on the Project Driveway approach of the intersection during the PM peak hour under Existing Plus Project conditions. As shown in Table 4, the stop-controlled southbound Project Driveway approach at this intersection would operate at LOS F during the PM peak hour, primarily due to the left-turns out of the Project Driveway.

Recommended Improvements

In order to improve access and circulation at the intersection, the following improvements, as shown on **Figure 3**, are recommended:

- **Recommendation 1:** Prior to the occupancy of the project, convert the Project Driveway and the Meadow Avenue approaches at the San Pablo Avenue/Meadow Avenue/Project Driveway intersection to right-turns only by prohibiting left-turns and through movements via signage and striping. The Project Driveway approach at the intersection shall also be narrowed from two lanes to one lane..
- **Recommendation 2:** Lengthen the eastbound left turn pocket on San Pablo Avenue from 60 to 130 feet, increasing the queue storage for large trucks (e.g., WB-40 and WB-67). The current 60-foot left-turn pocket can accommodate only one WB-67 truck and any other vehicles queuing on the eastbound left-turn pocket would spill back onto the through travel lanes on San Pablo Avenue.
- **Recommendation 3:** Relocate the existing crosswalk across the project driveway closer to the intersection to align with the existing sidewalk along the north side of San Pablo Avenue, which would provide additional queue storage for vehicles exiting the project site and improve pedestrian circulation along the project frontage.
- **Recommendation 4:** Install a new stop sign with pavement markings at the private parking lot intersection immediately north of the intersection with San Pablo Avenue, which would minimize queuing within the project site, maintain access to the drive aisle just north of the project driveway, and minimize the inbound project queues spilling back onto San Pablo Avenue.

Since the specific project tenants have not been determined, the following improvement, as shown on **Figure 4**, is recommended due to the uncertainty in forecasting future traffic volumes at the project driveway:

- **Recommendation 5:** Within one year after the full occupancy of the project, install a traffic signal at the San Pablo Avenue/Meadow Avenue/Project Driveway intersection, unless a full signal warrant study has been completed for the intersection that shows a signal is not needed. If a signal is installed at the intersection, the right-turn only restrictions at the Project Driveway and the Meadow Avenue approaches of the intersection shall be removed and the Project Driveway approach at the intersection shall be widened to two lanes.

Table 5 summarizes the weekday AM and PM peak hour intersection LOS analysis for this intersection under Existing Plus Project conditions with the installation of a signal per Recommendation 5. The intersection would operate at LOS B or better during both AM and PM peak hours after signalization, meeting the City's LOS guidelines.

Table 5: Intersection LOS Summary with Improvements

#	Intersection	Peak Hour	Existing Plus Project			Existing Plus Project with Improvements		
			Traffic Control	Delay (Seconds)	LOS	Traffic Control	Delay (Seconds)	LOS
1	San Pablo Avenue/ Meadow Avenue/ Project Driveway	AM	Side-Street Stop	1 (37)	A (E)	Signal	10	A
		PM		5 (97)	A (F)		11	B

Notes
1. Average intersection delay and LOS based on the 2000 HCM method. Average delay is reported for signalized intersections. Average delay and delay for the movement or approach with the highest delay is reported for unsignalized intersections.

Source: Fehr & Peers, 2022.

Please contact Sam (stabibnia@fehrandpeers.com, 510-835-1943) with questions or comments.

Attachments:

Figure 1 – Project Trip Assignment and Distribution

Figure 2 – Peak Hour Intersection Traffic Volumes, Lane Configurations, and Traffic Controls

Figure 3 – San Pablo Avenue/Meadow Avenue/Project Driveway Conceptual Improvement Plans (Short-Term)

Figure 4 – San Pablo Avenue/Meadow Avenue/Project Driveway Conceptual Improvement Plans (Long-Term)

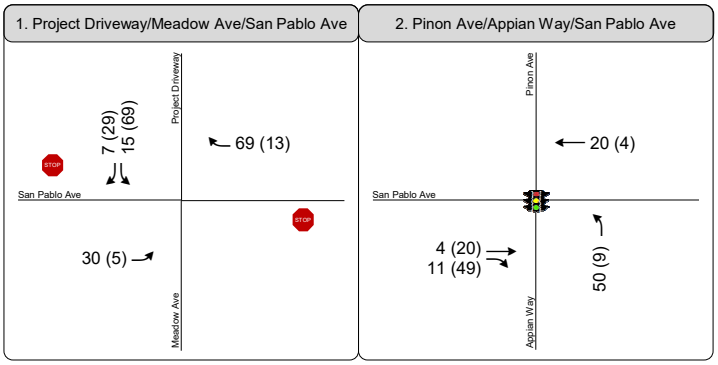
Appendix A – Project Site Plan

Appendix B – LOS Evaluation Criteria

Appendix C – Intersection Volumes

Appendix D – Intersection LOS worksheets

Appendix E – Signal Warrant worksheets



Project Site

Study Intersection

Signalized Intersection

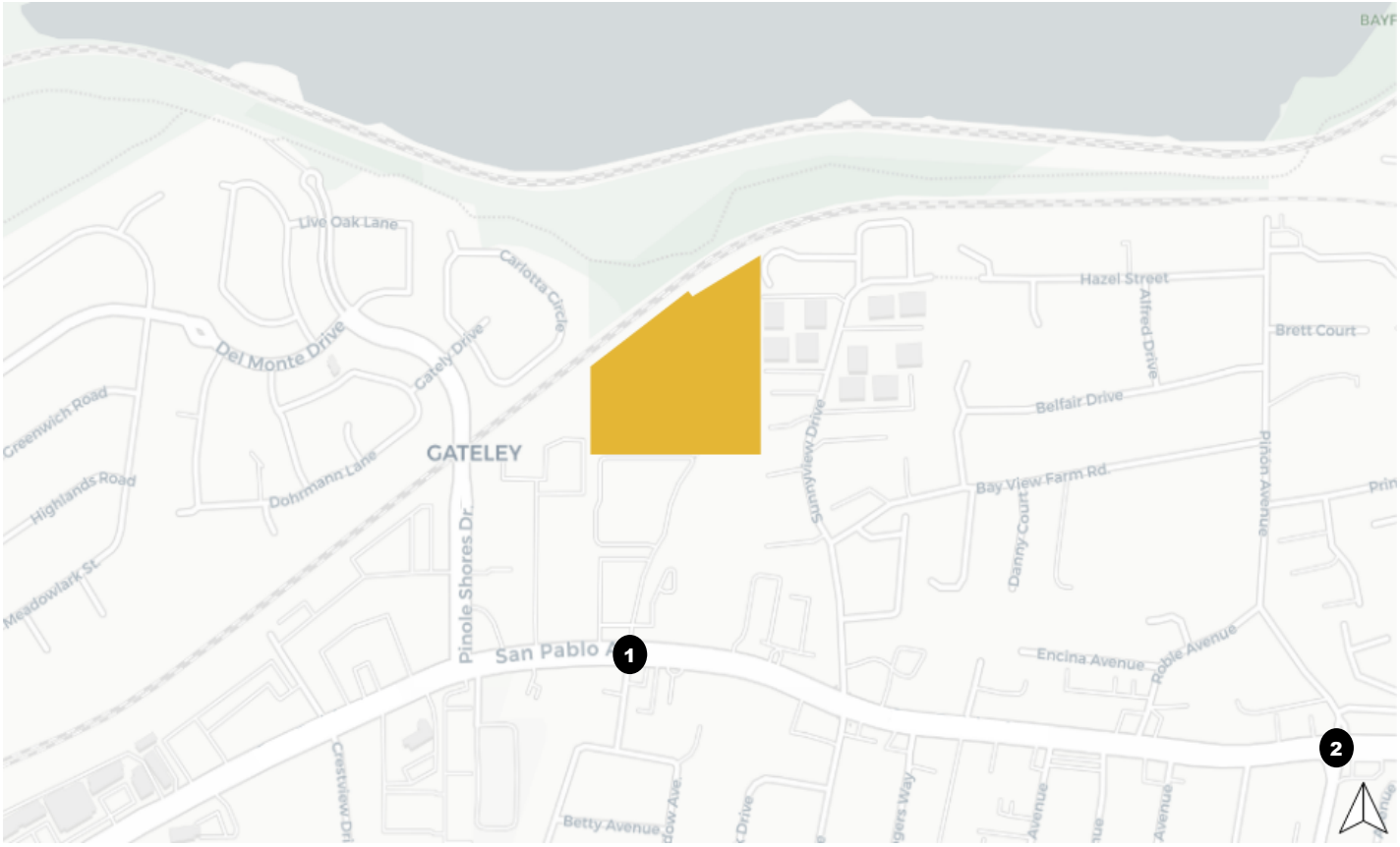
Stop Sign

XX (YY) AM (PM) Peak Hour Traffic Volumes

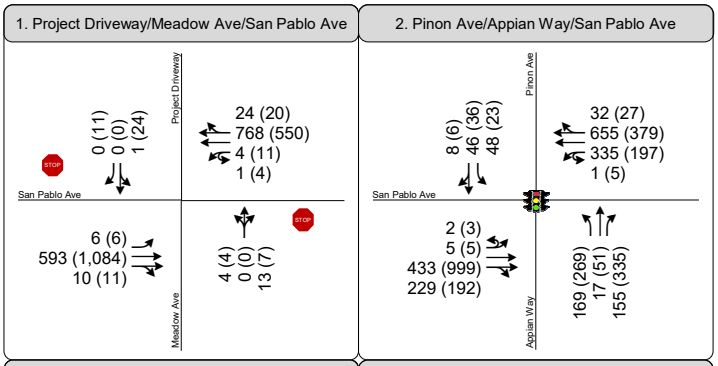
XX% Project Trip Distribution

Figure 1

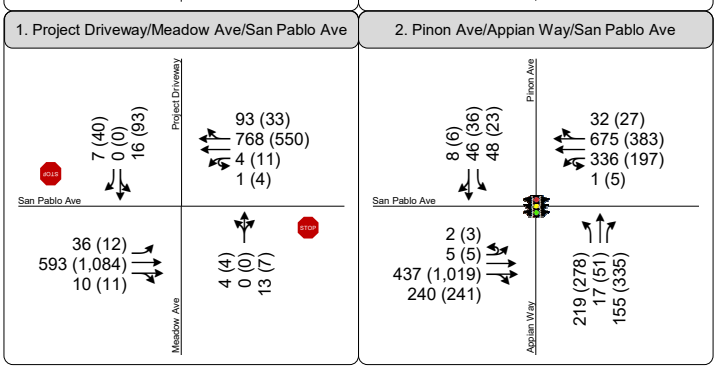
Project Trip Distribution and Assignment



Existing Conditions



Existing Plus Project Conditions



Project Site

Study Intersection

Signalized Intersection

Stop Sign

XX (YY) AM (PM) Peak Hour Traffic Volumes

Lane Configurations

Figure 2

Peak Hour Intersection Traffic Volumes, Lane Configurations, and Traffic Controls

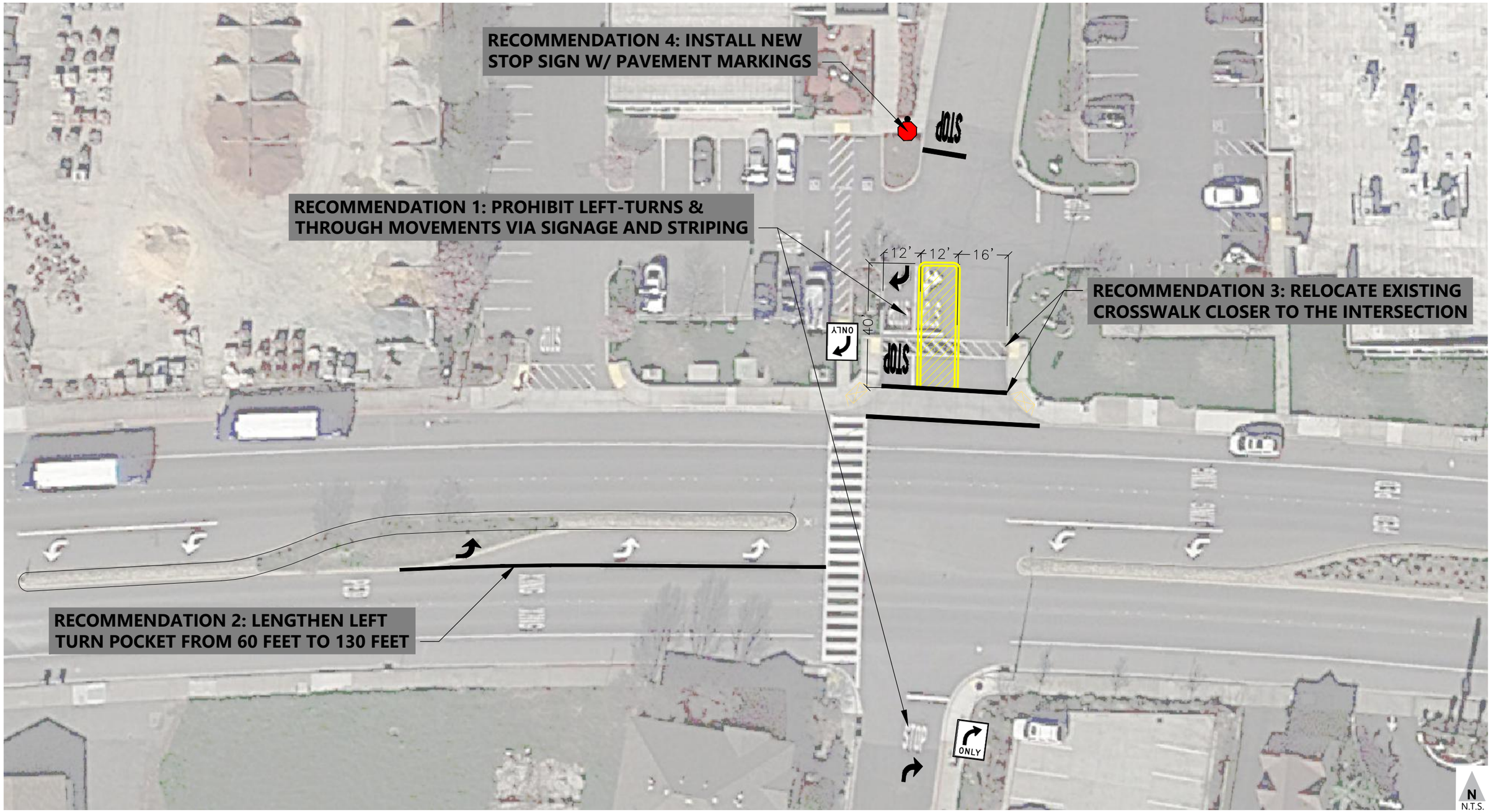


Figure 3

San Pablo Avenue/Meadow Avenue/Project Driveway Conceptual Improvements Plan (Short-Term)

CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

CADD FILE: N:\Projects\2022\OK22-0492.00_Pinole_Shores_Project\Graphics\CAD\PS_Concept_Short-Term.dwg
Feb 21, 2023

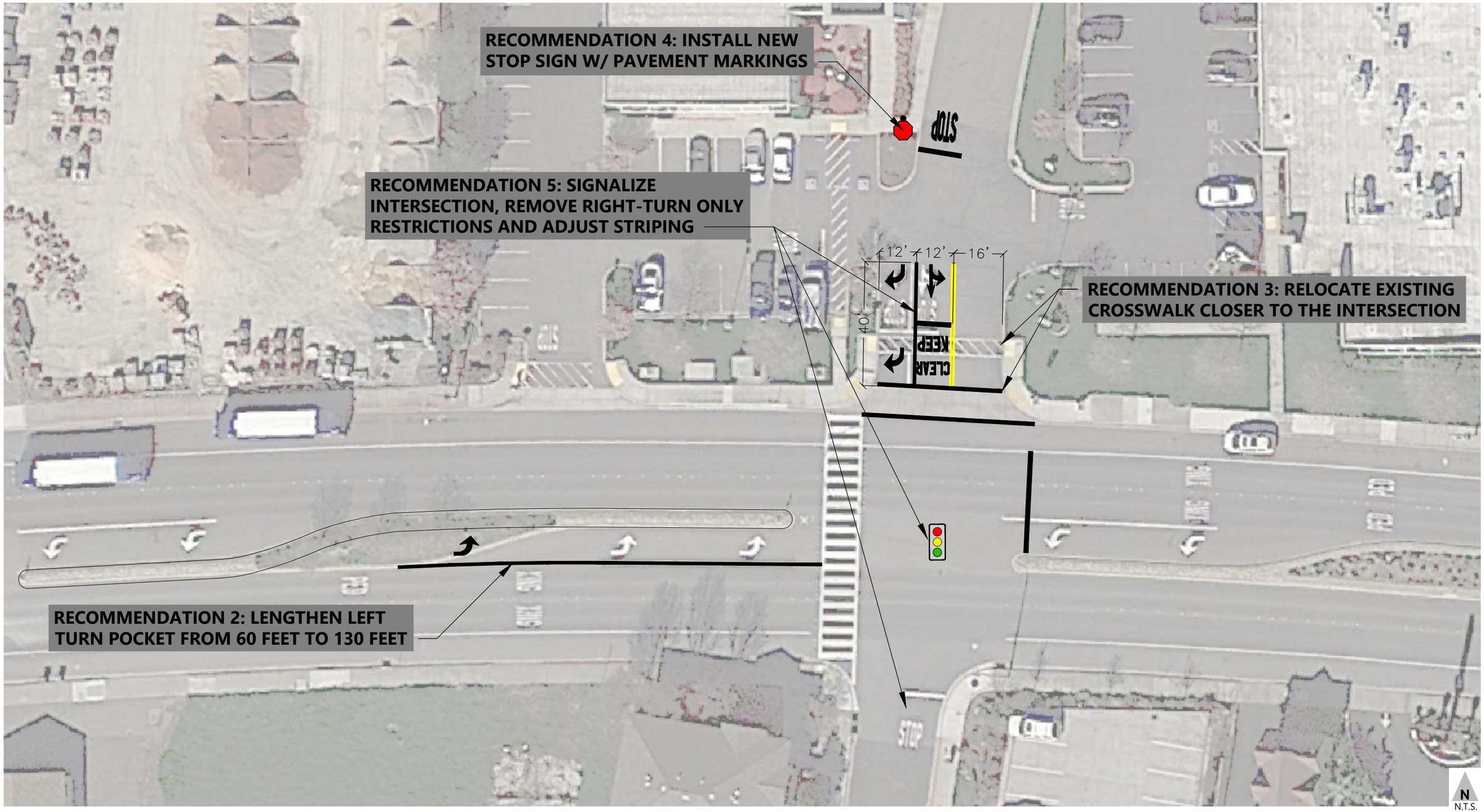


Figure 4

San Pablo Avenue/Meadow Avenue/Project Driveway Conceptual Improvements Plan (Long-Term)

CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

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Feb 21, 2023

Appendix A: Project Site Plan

A TRUCK MOVEMENTS AND FIRE LANE SITE PLAN
SCALE: 1" = 30'

SITE LEGEND

- LANDSCAPE AREA
- CONCRETE PAVING
- BUILDING AREA
- VEGETATED FLOW-THRU PLANTER BIOSWALE - SEE CIVIL DRAWINGS
- FIRE LANE / 20' — 20 FT WIDE x 14 FT HIGH FIRE DEPARTMENT ACCESS LANE
- PATH OF TRAVEL
- PROPERTY LINE
- DOCK HIGH DOOR
- DRIVE THRU. DOOR

KEYNOTES

102 PROPOSED DRIVEWAY, PER JURISDICTIONAL STANDARDS.
105 CONCRETE PAVING.
106 PROPOSED LANDSCAPED AREA. SEE LANDSCAPING PLANS.
107 (N) SIDEWALK. SEE LANDSCAPING PLANS FOR DECORATIVE TREATMENT WHERE OCCURS.
114 ACCESSIBLE SITE ENTRANCE SIGN.
124 EXETRIOR CONCRETE LANDING.
127 CONCRETE STAIR ON GRADE TYPE "C".
135 PAINTED CONCRETE TILT-UP SCREEN WALL OR TRASH ENCLOSURE WALL. PAINT BOTH SIDES AND TOP OF WALL. SEE ARCHITECTURAL DRAWINGS FOR COLOR SCHEDULE.
140 TRASH ENCLOSURE w/ ROOF COVERING.
146 2 POSITION BIKE RACK BY "DERO ROUNDRACK"
149 CONCRETE TRUCK RAMP w/ 42" HIGH CONCRETE TILT-UP GUARD ON OPEN SIDE(S). PAINT ALL SIDES OF GUARD WALLS AND HANDRAILS.SEE ARCHITECTURAL DRAWINGS FOR COLOR SCHEDULE.
STEEL PIPE BOLLARD PROTECTION POST.
150 STEEL PIPE PROTECTION POST

FIRE DEPT. CONDITIONS OF APPROVAL

Preliminary Fire Plan Review Comments:
PL21-0090/DR21-19 830-848 San Pablo Ave. Pinole, CA
Preliminary Fire Department Comments and Conditions of Approval

Comments below reflect a general and specific preliminary fire review of the subdevelopment project.

1. Compliance with the 2019 CFC (California Fire Code), 2019 CBC (California Building Code the 2019 NFPA 13 standard), the NFPA 72 standards and all local ordinances as they apply to the occupancy and use of the proposed structure shall apply and be enforced for the scope of work and occupancies of the project subdevelopment plan.

   CBC: 2019 California Building Code
   CFC: 2019 California Fire Code
   NFPA 13: 2016 Edition of the National Fire Protection Association 13: Standard for the installation of Sprinkler Systems.
   NFPA 14: 2016 Edition of the National Fire Protection Association 14: Standard for the installation of Standpipe, Private Hydrant, and Hose Systems
   NFPA 20: 2016 Edition of the National Fire Protection Association 20: Standard for Stationary Pumps for Fire Protection.
   NFPA 22: 2018 Edition of the National Fire Protection Association 22: Standard for Water Tanks for Private Fire Protection.
   NFPA 24: 2016 Edition of the National Fire Protection Association 24: Standard for the installation of Private Fire Service Mains and Their Appurtenances.
   NFPA 72: 2016 Edition of the National Fire Protection Association 72: National

2. Fire apparatus turning radius shall be in compliance with the Contra Costa County Standard to accommodate the largest fire truck apparatus. (Found on the CCCF Website)

3. Fire Department access shall be a minimum of 20' wide and 14 high and shall not be limited to the painting of red fire lanes and posting of No Parking Fire Lane signage. (TBD with the full site plan review)

-1-

Preliminary Fire Plan Review Comments and Conditions of Approval:
PL21-0090/DR21-19 830-848 San Pablo Ave. Pinole, CA

4. Address shall be a minimum of 6" on a contrasting background visible from the street. Exterior elevated corners of structure shall have 12" numbers.

5. A Knox Box shall be required located at the main front entrance door. A Knox Switch shall be required for all electronic gates. Knox Padlocks shall be allowed for any auxiliary purposes.

6. Fire department water supply, identify all fire hydrants private and public in the area. A Fire Control room and identification of such shall be required per the NFPA Standards.

7. Prior to the issuance of a building permit, the applicant is required to submit a full set of plans for review. Separate plans submitted shall be required for all Fire and Life Safety components.

8. Remove and/or cutting back of vegetation around the property, structures and adjacent hill shall be required prior, during and after construction.

9. During construction: Temporary address signage clearly with 12" numbers shall be maintained throughout all phases of construction in addition to a Fire Department Emergency Access gate identified for emergency access throughout the project with a Fire Department Knox Padlock.

This is preliminary review of the fire and life safety comments which shall be required for publication. Additional may be required with submittal of the full scope of work.

R. Lautenbach, DFM – Pinole Fire Department

CYCLE 2
GRP SHORES, LLC
PINOLE, CA

830 SAN PABLO AVE
PROJECT
2ND PLANNING SUBMITTAL

PL21-0090 & DR21-19

HERDMAN
ARCHITECTURE + DESIGN

A20-2041
3.29.2022

NORTH

TRUCK MOVEMENT AND FIRE LANE SITE PLAN

A1.1

11/23/2021 10:31:18 AM

Appendix B: LOS Evaluation Criteria

Appendix B – Intersection Level of Service Analysis Criteria

Intersection operations are evaluated using the methods provided in the 2010 Highway Capacity Manual (HCM). These methods use intersection characteristics to estimate average control delay and then assigns a Level of Service (LOS) value. Control delay is defined as the delay associated with deceleration, stopping, moving up in the queue, and acceleration experienced by drivers at a signalized intersection. **Tables A-1** and **A-2** describe the various LOS and the corresponding ranges of delays for signalized and unsignalized intersections.

TABLE A-1: SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service Grade	Average Control Vehicle Delay (Seconds)	Description
A	≤10.0	Free Flow or Insignificant Delays: Operations with very low delay, when signal progression is extremely favorable and most vehicles arrive during the green light phase. Most vehicles do not stop at all.
B	>10.0 and ≤20.0	Stable Operation or Minimal Delays: Generally occurs with good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average delay. An occasional approach phase is fully utilized.
C	>20.0 and ≤35.0	Stable Operation or Acceptable Delays: Higher delays resulting from fair signal progression and/ or longer cycle lengths. Drivers begin having to wait through more than one red light. Most drivers feel somewhat restricted.
D	>35.0 and ≤55.0	Approaching Unstable or Tolerable Delays: Influence of congestion becomes more noticeable. Longer delays result from unfavorable signal progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop. Drivers may have to wait through more than one red light. Queues may develop, but dissipate rapidly, without excessive delays.
E	>55.0 and ≤80.0	Unstable Operation or Significant Delays: Considered to be the limit of acceptable delay. High delays indicate poor signal progression, long cycle lengths and high volume to capacity ratios. Individual cycle failures are frequent occurrences. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
F	>80.0	Forced Flow or Excessive Delays: Occurs with oversaturation when flows exceed the intersection capacity. Represents jammed conditions. Many cycle failures. Queues may block upstream intersections.

Source: Highway Capacity Manual, Transportation Research Board, 2010.

TABLE A-2: UNSIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service Grade	Average Control Vehicle Delay (Seconds)	Description
A	≤10.0	Little or No Delays
B	>10.0 and 15.0	Short Traffic Delays
C	>15.0 and 25.0	Average Traffic Delays
D	>25.0 and 35.0	Long Traffic Delays
E	>35.0 and 50.0	Very Long Traffic Delays
F	>50.0	Extreme Traffic Delays with Intersection Capacity Exceeded

Source: Highway Capacity Manual, Transportation Research Board, 2010.

Appendix C: Intersection Volumes

National Data & Surveying Services Intersection Turning Movement Count

Location: Meadow Ave & San Pablo Ave
City: Pinole
Control: 2-Way Stop(NB/SB)

Project ID: 22-080341-001
Date: 11/15/2022

Data - Total

NS/EW Streets:	Meadow Ave				Meadow Ave				San Pablo Ave				San Pablo Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0.5	0.5	1	0	1	2	0	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	1	0	2	0	0	0	0	0	0	67	1	0	3	110	2	1	187
7:15 AM	1	0	7	0	0	0	0	0	0	101	2	0	0	163	0	2	276
7:30 AM	0	0	3	0	0	0	0	0	0	132	0	0	1	194	2	0	332
7:45 AM	1	0	2	0	0	0	0	0	1	146	2	0	0	208	1	1	362
8:00 AM	2	0	5	0	1	0	0	0	2	172	6	0	2	170	2	0	362
8:15 AM	1	0	3	0	0	0	0	0	3	143	2	0	1	196	19	0	368
8:30 AM	2	0	2	0	0	0	0	0	2	129	0	1	2	184	8	0	330
8:45 AM	3	1	0	0	3	0	2	0	8	96	2	1	1	225	10	1	353
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	11	1	24	0	4	0	2	0	16	986	15	2	10	1450	44	5	2570
APPROACH %'s :	30.56%	2.78%	66.67%	0.00%	66.67%	0.00%	33.33%	0.00%	1.57%	96.76%	1.47%	0.20%	0.66%	96.09%	2.92%	0.33%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	4	0	13	0	1	0	0	0	6	593	10	0	4	768	24	1	1424
PEAK HR FACTOR :	0.500	0.000	0.650	0.000	0.250	0.000	0.000	0.000	0.500	0.862	0.417	0.000	0.500	0.923	0.316	0.250	0.967
	0.607				0.250				0.846				0.922				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0.5	0.5	1	0	1	2	0	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	1	0	1	0	3	0	2	0	2	245	2	0	1	140	3	0	400
4:15 PM	2	0	1	0	4	0	1	0	2	236	2	0	1	120	3	3	375
4:30 PM	0	0	0	0	7	0	6	0	0	301	0	2	1	134	4	2	457
4:45 PM	1	0	2	0	3	0	2	0	2	290	1	0	1	109	6	1	418
5:00 PM	1	0	3	0	14	0	4	0	0	288	1	0	6	131	0	2	450
5:15 PM	1	0	1	0	3	0	4	0	2	262	0	1	2	123	7	1	407
5:30 PM	1	0	2	0	3	0	2	0	1	247	3	0	2	152	8	0	421
5:45 PM	1	0	1	0	4	0	1	0	2	287	7	0	1	144	5	1	454
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	8	0	11	0	41	0	22	0	11	2156	16	3	15	1053	36	10	3382
APPROACH %'s :	42.11%	0.00%	57.89%	0.00%	65.08%	0.00%	34.92%	0.00%	0.50%	98.63%	0.73%	0.14%	1.35%	94.52%	3.23%	0.90%	
PEAK HR :	05:00 PM - 06:00 PM																TOTAL
PEAK HR VOL :	4	0	7	0	24	0	11	0	5	1084	11	1	11	550	20	4	1732
PEAK HR FACTOR :	1.000	0.000	0.583	0.000	0.429	0.000	0.688	0.000	0.625	0.941	0.393	0.250	0.458	0.905	0.625	0.500	0.954
	0.688				0.486				0.930				0.903				

National Data & Surveying Services Intersection Turning Movement Count

Location: Appian Way/Pinon Ave & San Pablo Ave
City: Pinole
Control: Signalized

Project ID: 22-080341-002
Date: 11/15/2022

Data - Total

NS/EW Streets:	Appian Way/Pinon Ave				Appian Way/Pinon Ave				San Pablo Ave				San Pablo Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	1	1	0	1	0.5	0.5	0	1	2	1	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	18	3	15	0	3	9	2	0	0	40	42	0	43	100	2	0	277
7:15 AM	24	4	18	0	10	18	2	0	1	91	38	0	56	142	2	0	406
7:30 AM	24	1	12	0	6	7	3	0	0	80	61	0	66	160	4	0	424
7:45 AM	37	3	21	0	11	14	1	0	1	98	65	1	98	192	8	0	550
8:00 AM	29	2	41	0	15	14	2	0	0	133	54	0	88	148	4	0	530
8:15 AM	50	9	54	0	20	14	2	0	1	114	56	1	90	155	7	0	573
8:30 AM	53	3	39	0	2	4	3	0	3	88	54	0	59	160	13	1	482
8:45 AM	64	3	28	0	8	7	4	0	0	89	40	0	44	177	7	1	472
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	299	28	228	0	75	87	19	0	6	733	410	2	544	1234	47	2	3714
APPROACH %'s :	53.87%	5.05%	41.08%	0.00%	41.44%	48.07%	10.50%	0.00%	0.52%	63.68%	35.62%	0.17%	29.78%	67.54%	2.57%	0.11%	
PEAK HR :	07:45 AM - 08:45 AM																TOTAL
PEAK HR VOL :	169	17	155	0	48	46	8	0	5	433	229	2	335	655	32	1	2135
PEAK HR FACTOR :	0.797	0.472	0.718	0.000	0.600	0.821	0.667	0.000	0.417	0.814	0.881	0.500	0.855	0.853	0.615	0.250	0.932
	0.754				0.708				0.894				0.858				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	1	1	0	1	0.5	0.5	0	1	2	1	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	88	15	96	0	4	7	3	0	1	274	54	1	61	127	13	0	744
4:15 PM	55	8	84	0	5	12	0	0	0	224	42	0	46	87	5	0	568
4:30 PM	70	12	74	0	5	8	2	0	4	251	49	1	44	80	4	4	608
4:45 PM	56	16	81	0	9	9	1	0	0	250	47	1	46	85	5	1	607
5:00 PM	56	15	86	0	8	11	1	0	2	258	63	1	39	86	6	0	632
5:15 PM	50	10	80	0	5	12	3	0	3	221	53	0	70	107	9	1	624
5:30 PM	64	20	70	0	10	7	0	0	1	221	48	1	38	111	4	1	596
5:45 PM	62	15	75	0	3	5	0	0	0	253	37	0	41	109	6	0	606
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	501	111	646	0	49	71	10	0	11	1952	393	5	385	792	52	7	4985
APPROACH %'s :	39.83%	8.82%	51.35%	0.00%	37.69%	54.62%	7.69%	0.00%	0.47%	82.68%	16.65%	0.21%	31.15%	64.08%	4.21%	0.57%	
PEAK HR :	04:00 PM - 05:00 PM																TOTAL
PEAK HR VOL :	269	51	335	0	23	36	6	0	5	999	192	3	197	379	27	5	2527
PEAK HR FACTOR :	0.764	0.797	0.872	0.000	0.639	0.750	0.500	0.000	0.313	0.911	0.889	0.750	0.807	0.746	0.519	0.313	0.849
	0.823				0.855				0.908				0.756				

Appendix D: Intersection LOS Worksheets

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	6	593	10	1	4	768	24	4	0	13	1	0	0
Future Vol, veh/h	6	593	10	1	4	768	24	4	0	13	1	0	0
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	70	-	-	-	-	-	-	-	20
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	4	2	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	6	611	10	1	4	792	25	4	0	13	1	0	0

Major/Minor	Major1			Major2				Minor1			Minor2		
Conflicting Flow All	818	0	0	622	621	0	0	1035	1456	311	1134	1449	411
Stage 1	-	-	-	-	-	-	-	628	628	-	816	816	-
Stage 2	-	-	-	-	-	-	-	407	828	-	318	633	-
Critical Hdwy	4.1	-	-	6.4	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.5	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	819	-	-	587	969	-	-	189	131	691	160	132	596
Stage 1	-	-	-	-	-	-	-	442	479	-	341	393	-
Stage 2	-	-	-	-	-	-	-	597	389	-	673	476	-
Platoon blocked, %		-	-			-	-						
Mov Cap-1 Maneuver	818	-	-	853	853	-	-	187	129	691	155	130	595
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	187	129	-	155	130	-
Stage 1	-	-	-	-	-	-	-	439	476	-	338	390	-
Stage 2	-	-	-	-	-	-	-	593	386	-	655	473	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	13.9	28.4
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	423	818	-	-	853	-	-	155	-
HCM Lane V/C Ratio	0.041	0.008	-	-	0.006	-	-	0.007	-
HCM Control Delay (s)	13.9	9.4	-	-	9.2	-	-	28.4	0
HCM Lane LOS	B	A	-	-	A	-	-	D	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0	-

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	2	5	433	229	1	335	655	32	169	17	155	48
Future Volume (vph)	2	5	433	229	1	335	655	32	169	17	155	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	12	12	12	11	11	11	11
Total Lost time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Lane Util. Factor		1.00	0.95			1.00	0.95		1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	0.99			1.00	1.00		1.00	1.00	0.99	1.00
Flpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Frt		1.00	0.95			1.00	0.99		1.00	1.00	0.85	1.00
Flt Protected		0.95	1.00			0.95	1.00		0.95	1.00	1.00	0.95
Satd. Flow (prot)		1745	3149			1753	3449		1711	1837	1510	1742
Flt Permitted		0.95	1.00			0.95	1.00		0.72	1.00	1.00	0.75
Satd. Flow (perm)		1745	3149			1753	3449		1295	1837	1510	1367
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	2	5	466	246	1	360	704	34	182	18	167	52
RTOR Reduction (vph)	0	0	73	0	0	0	2	0	0	0	132	0
Lane Group Flow (vph)	0	7	639	0	0	361	736	0	182	18	35	52
Confl. Peds. (#/hr)				7		1					2	2
Confl. Bikes (#/hr)				3								
Heavy Vehicles (%)	0%	0%	4%	5%	0%	3%	4%	3%	2%	0%	2%	0%
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	custom
Protected Phases	5	5	2		1	1	6					
Permitted Phases									4	4	4	8
Actuated Green, G (s)		0.9	24.3			20.4	43.8		15.4	15.4	15.4	15.4
Effective Green, g (s)		0.9	24.3			20.4	43.8		15.4	15.4	15.4	15.4
Actuated g/C Ratio		0.01	0.33			0.28	0.59		0.21	0.21	0.21	0.21
Clearance Time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Vehicle Extension (s)		2.0	2.5			2.0	2.5		2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		21	1038			485	2049		270	383	315	285
v/s Ratio Prot		0.00	c0.20			c0.21	0.21					
v/s Ratio Perm									c0.14	0.01	0.02	0.04
v/c Ratio		0.33	0.62			0.74	0.36		0.67	0.05	0.11	0.18
Uniform Delay, d1		36.1	20.8			24.3	7.7		26.8	23.3	23.6	24.0
Progression Factor		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		3.4	0.9			5.4	0.1		5.9	0.0	0.1	0.2
Delay (s)		39.5	21.7			29.6	7.8		32.8	23.3	23.7	24.2
Level of Service		D	C			C	A		C	C	C	C
Approach Delay (s)			21.9				15.0			28.2		
Approach LOS			C				B			C		

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	73.7	Sum of lost time (s)	13.6
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	46	8
Future Volume (vph)	46	8
Ideal Flow (vphpl)	1900	1900
Lane Width	11	11
Total Lost time (s)	4.6	
Lane Util. Factor	1.00	
Frpb, ped/bikes	1.00	
Flpb, ped/bikes	1.00	
Frt	0.98	
Flt Protected	1.00	
Satd. Flow (prot)	1794	
Flt Permitted	1.00	
Satd. Flow (perm)	1794	
Peak-hour factor, PHF	0.93	0.93
Adj. Flow (vph)	49	9
RTOR Reduction (vph)	6	0
Lane Group Flow (vph)	52	0
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases		
Permitted Phases	8	
Actuated Green, G (s)	15.4	
Effective Green, g (s)	15.4	
Actuated g/C Ratio	0.21	
Clearance Time (s)	4.6	
Vehicle Extension (s)	2.5	
Lane Grp Cap (vph)	374	
v/s Ratio Prot		
v/s Ratio Perm	0.03	
v/c Ratio	0.14	
Uniform Delay, d1	23.7	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	23.9	
Level of Service	C	
Approach Delay (s)	24.0	
Approach LOS	C	

Intersection Summary

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	6	1084	11	4	11	550	20	4	0	7	24	0	11
Future Vol, veh/h	6	1084	11	4	11	550	20	4	0	7	24	0	11
Conflicting Peds, #/hr	0	0	3	0	2	0	3	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	70	-	-	-	-	-	-	-	20
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	1	0	0	0	3	0	0	0	0	4	0	0
Mvmt Flow	6	1141	12	4	12	579	21	4	0	7	25	0	12

Major/Minor	Major1			Major2				Minor1			Minor2		
Conflicting Flow All	603	0	0	1153	1156	0	0	1485	1797	580	1208	1793	304
Stage 1	-	-	-	-	-	-	-	1162	1162	-	625	625	-
Stage 2	-	-	-	-	-	-	-	323	635	-	583	1168	-
Critical Hdwy	4.14	-	-	6.4	4.1	-	-	7.5	6.5	6.9	7.58	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.5	5.5	-	6.58	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.5	5.5	-	6.58	5.5	-
Follow-up Hdwy	2.22	-	-	2.5	2.2	-	-	3.5	4	3.3	3.54	4	3.3
Pot Cap-1 Maneuver	971	-	-	269	612	-	-	88	81	463	137	82	698
Stage 1	-	-	-	-	-	-	-	211	272	-	434	480	-
Stage 2	-	-	-	-	-	-	-	669	476	-	460	270	-
Platoon blocked, %		-	-			-	-						
Mov Cap-1 Maneuver	969	-	-	453	453	-	-	84	77	462	130	78	696
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	84	77	-	130	78	-
Stage 1	-	-	-	-	-	-	-	209	270	-	430	462	-
Stage 2	-	-	-	-	-	-	-	634	458	-	450	268	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	27	30.2
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	175	969	-	-	453	-	-	130	696
HCM Lane V/C Ratio	0.066	0.007	-	-	0.035	-	-	0.194	0.017
HCM Control Delay (s)	27	8.7	-	-	13.2	-	-	39.3	10.3
HCM Lane LOS	D	A	-	-	B	-	-	E	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.7	0.1

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	5	999	192	5	197	379	27	269	51	335	23
Future Volume (vph)	3	5	999	192	5	197	379	27	269	51	335	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	12	12	12	11	11	11	11
Total Lost time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Lane Util. Factor		1.00	0.95			1.00	0.95		1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	0.98	1.00
Flpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Frt		1.00	0.98			1.00	0.99		1.00	1.00	0.85	1.00
Flt Protected		0.95	1.00			0.95	1.00		0.95	1.00	1.00	0.95
Satd. Flow (prot)		1745	3262			1754	3433		1709	1837	1507	1743
Flt Permitted		0.95	1.00			0.95	1.00		0.73	1.00	1.00	0.72
Satd. Flow (perm)		1745	3262			1754	3433		1304	1837	1507	1317
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	4	6	1175	226	6	232	446	32	316	60	394	27
RTOR Reduction (vph)	0	0	14	0	0	0	4	0	0	0	268	0
Lane Group Flow (vph)	0	10	1387	0	0	238	474	0	316	60	126	27
Confl. Peds. (#/hr)				2		2		1	1		3	1
Heavy Vehicles (%)	0%	0%	4%	5%	0%	3%	4%	3%	2%	0%	2%	0%
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	custom
Protected Phases	5	5	2		1	1	6					
Permitted Phases									4	4	4	8
Actuated Green, G (s)		1.2	45.4			17.3	61.5		25.5	25.5	25.5	25.5
Effective Green, g (s)		1.2	45.4			17.3	61.5		25.5	25.5	25.5	25.5
Actuated g/C Ratio		0.01	0.45			0.17	0.60		0.25	0.25	0.25	0.25
Clearance Time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Vehicle Extension (s)		2.0	2.5			2.0	2.5		2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		20	1454			298	2073		326	460	377	329
v/s Ratio Prot		0.01	c0.43			c0.14	0.14					
v/s Ratio Perm									c0.24	0.03	0.08	0.02
v/c Ratio		0.50	0.95			0.80	0.23		0.97	0.13	0.34	0.08
Uniform Delay, d1		50.0	27.2			40.6	9.3		37.8	29.6	31.2	29.2
Progression Factor		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		7.0	14.1			13.0	0.0		41.1	0.1	0.4	0.1
Delay (s)		57.0	41.3			53.6	9.3		78.8	29.7	31.6	29.3
Level of Service		E	D			D	A		E	C	C	C
Approach Delay (s)			41.4				24.0			50.8		
Approach LOS			D				C			D		

Intersection Summary			
HCM 2000 Control Delay	39.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	101.8	Sum of lost time (s)	13.6
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	36	6
Future Volume (vph)	36	6
Ideal Flow (vphpl)	1900	1900
Lane Width	11	11
Total Lost time (s)	4.6	
Lane Util. Factor	1.00	
Frpb, ped/bikes	1.00	
Flpb, ped/bikes	1.00	
Frt	0.98	
Flt Protected	1.00	
Satd. Flow (prot)	1797	
Flt Permitted	1.00	
Satd. Flow (perm)	1797	
Peak-hour factor, PHF	0.85	0.85
Adj. Flow (vph)	42	7
RTOR Reduction (vph)	5	0
Lane Group Flow (vph)	44	0
Confl. Peds. (#/hr)		
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases		
Permitted Phases	8	
Actuated Green, G (s)	25.5	
Effective Green, g (s)	25.5	
Actuated g/C Ratio	0.25	
Clearance Time (s)	4.6	
Vehicle Extension (s)	2.5	
Lane Grp Cap (vph)	450	
v/s Ratio Prot		
v/s Ratio Perm	0.02	
v/c Ratio	0.10	
Uniform Delay, d1	29.3	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	29.4	
Level of Service	C	
Approach Delay (s)	29.3	
Approach LOS	C	

Intersection Summary

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	36	593	10	1	4	768	93	4	0	13	16	0	7
Future Vol, veh/h	36	593	10	1	4	768	93	4	0	13	16	0	7
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	70	-	-	-	-	-	-	-	20
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	4	2	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	37	611	10	1	4	792	96	4	0	13	16	0	7

Major/Minor	Major1			Major2				Minor1			Minor2		
Conflicting Flow All	889	0	0	622	621	0	0	1097	1589	311	1231	1546	446
Stage 1	-	-	-	-	-	-	-	690	690	-	851	851	-
Stage 2	-	-	-	-	-	-	-	407	899	-	380	695	-
Critical Hdwy	4.1	-	-	6.4	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.5	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	771	-	-	587	969	-	-	170	109	691	136	116	565
Stage 1	-	-	-	-	-	-	-	406	449	-	325	379	-
Stage 2	-	-	-	-	-	-	-	597	360	-	619	447	-
Platoon blocked, %		-	-			-	-						
Mov Cap-1 Maneuver	770	-	-	853	853	-	-	161	103	691	128	110	564
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	161	103	-	128	110	-
Stage 1	-	-	-	-	-	-	-	387	427	-	309	376	-
Stage 2	-	-	-	-	-	-	-	585	357	-	578	426	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	14.7	29.4
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	389	770	-	-	853	-	-	128	564
HCM Lane V/C Ratio	0.045	0.048	-	-	0.006	-	-	0.129	0.013
HCM Control Delay (s)	14.7	9.9	-	-	9.2	-	-	37.2	11.5
HCM Lane LOS	B	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.4	0

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	2	5	437	240	1	336	675	32	219	17	155	48
Future Volume (vph)	2	5	437	240	1	336	675	32	219	17	155	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	12	12	12	11	11	11	11
Total Lost time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Lane Util. Factor		1.00	0.95			1.00	0.95		1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	0.99			1.00	1.00		1.00	1.00	0.99	1.00
Flpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Frt		1.00	0.95			1.00	0.99		1.00	1.00	0.85	1.00
Flt Protected		0.95	1.00			0.95	1.00		0.95	1.00	1.00	0.95
Satd. Flow (prot)		1745	3143			1753	3449		1711	1837	1509	1742
Flt Permitted		0.95	1.00			0.95	1.00		0.72	1.00	1.00	0.75
Satd. Flow (perm)		1745	3143			1753	3449		1295	1837	1509	1367
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	2	5	470	258	1	361	726	34	235	18	167	52
RTOR Reduction (vph)	0	0	80	0	0	0	3	0	0	0	127	0
Lane Group Flow (vph)	0	7	648	0	0	362	757	0	235	18	40	52
Confl. Peds. (#/hr)				7		1					2	2
Confl. Bikes (#/hr)				3								
Heavy Vehicles (%)	0%	0%	4%	5%	0%	3%	4%	3%	2%	0%	2%	0%
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	custom
Protected Phases	5	5	2		1	1	6					
Permitted Phases									4	4	4	8
Actuated Green, G (s)		1.0	25.4			21.1	45.5		18.9	18.9	18.9	18.9
Effective Green, g (s)		1.0	25.4			21.1	45.5		18.9	18.9	18.9	18.9
Actuated g/C Ratio		0.01	0.32			0.27	0.58		0.24	0.24	0.24	0.24
Clearance Time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Vehicle Extension (s)		2.0	2.5			2.0	2.5		2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		22	1010			468	1986		309	439	361	327
v/s Ratio Prot		0.00	c0.21			c0.21	0.22					
v/s Ratio Perm									c0.18	0.01	0.03	0.04
v/c Ratio		0.32	0.64			0.77	0.38		0.76	0.04	0.11	0.16
Uniform Delay, d1		38.7	22.9			26.7	9.1		27.9	23.1	23.5	23.8
Progression Factor		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		3.0	1.2			7.1	0.1		10.1	0.0	0.1	0.2
Delay (s)		41.7	24.1			33.9	9.2		38.0	23.1	23.6	23.9
Level of Service		D	C			C	A		D	C	C	C
Approach Delay (s)			24.3				17.2			31.6		
Approach LOS			C				B			C		

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	79.0	Sum of lost time (s)	13.6
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	46	8
Future Volume (vph)	46	8
Ideal Flow (vphpl)	1900	1900
Lane Width	11	11
Total Lost time (s)	4.6	
Lane Util. Factor	1.00	
Frpb, ped/bikes	1.00	
Flpb, ped/bikes	1.00	
Frt	0.98	
Flt Protected	1.00	
Satd. Flow (prot)	1794	
Flt Permitted	1.00	
Satd. Flow (perm)	1794	
Peak-hour factor, PHF	0.93	0.93
Adj. Flow (vph)	49	9
RTOR Reduction (vph)	6	0
Lane Group Flow (vph)	52	0
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases		
Permitted Phases	8	
Actuated Green, G (s)	18.9	
Effective Green, g (s)	18.9	
Actuated g/C Ratio	0.24	
Clearance Time (s)	4.6	
Vehicle Extension (s)	2.5	
Lane Grp Cap (vph)	429	
v/s Ratio Prot		
v/s Ratio Perm	0.03	
v/c Ratio	0.12	
Uniform Delay, d1	23.5	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	23.6	
Level of Service	C	
Approach Delay (s)	23.8	
Approach LOS	C	

Intersection Summary

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	12	1084	11	4	11	550	33	4	0	7	93	0	40
Future Vol, veh/h	12	1084	11	4	11	550	33	4	0	7	93	0	40
Conflicting Peds, #/hr	0	0	3	0	2	0	3	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	70	-	-	-	-	-	-	-	20
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	1	0	0	0	3	0	0	0	0	4	0	0
Mvmt Flow	13	1141	12	4	12	579	35	4	0	7	98	0	42

Major/Minor	Major1			Major2				Minor1			Minor2		
Conflicting Flow All	617	0	0	1153	1156	0	0	1499	1825	580	1229	1814	311
Stage 1	-	-	-	-	-	-	-	1176	1176	-	632	632	-
Stage 2	-	-	-	-	-	-	-	323	649	-	597	1182	-
Critical Hdwy	4.14	-	-	6.4	4.1	-	-	7.5	6.5	6.9	7.58	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.5	5.5	-	6.58	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.5	5.5	-	6.58	5.5	-
Follow-up Hdwy	2.22	-	-	2.5	2.2	-	-	3.5	4	3.3	3.54	4	3.3
Pot Cap-1 Maneuver	959	-	-	269	612	-	-	86	78	463	132	79	691
Stage 1	-	-	-	-	-	-	-	207	267	-	430	477	-
Stage 2	-	-	-	-	-	-	-	669	469	-	452	266	-
Platoon blocked, %		-	-			-	-						
Mov Cap-1 Maneuver	957	-	-	453	453	-	-	78	74	462	125	75	689
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	78	74	-	125	75	-
Stage 1	-	-	-	-	-	-	-	204	263	-	423	459	-
Stage 2	-	-	-	-	-	-	-	605	452	-	439	262	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	28.3	70.9
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	166	957	-	-	453	-	-	125	689
HCM Lane V/C Ratio	0.07	0.013	-	-	0.035	-	-	0.783	0.061
HCM Control Delay (s)	28.3	8.8	-	-	13.2	-	-	96.9	10.6
HCM Lane LOS	D	A	-	-	B	-	-	F	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	4.6	0.2

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	5	1019	241	5	197	383	27	278	51	335	23
Future Volume (vph)	3	5	1019	241	5	197	383	27	278	51	335	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	12	12	12	11	11	11	11
Total Lost time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Lane Util. Factor		1.00	0.95			1.00	0.95		1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	0.98	1.00
Flpb, ped/bikes		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Frt		1.00	0.97			1.00	0.99		1.00	1.00	0.85	1.00
Flt Protected		0.95	1.00			0.95	1.00		0.95	1.00	1.00	0.95
Satd. Flow (prot)		1745	3243			1754	3434		1709	1837	1507	1743
Flt Permitted		0.95	1.00			0.95	1.00		0.73	1.00	1.00	0.72
Satd. Flow (perm)		1745	3243			1754	3434		1304	1837	1507	1317
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	4	6	1199	284	6	232	451	32	327	60	394	27
RTOR Reduction (vph)	0	0	18	0	0	0	4	0	0	0	267	0
Lane Group Flow (vph)	0	10	1465	0	0	238	479	0	327	60	127	27
Confl. Peds. (#/hr)				2		2		1	1		3	1
Confl. Bikes (#/hr)				2								
Heavy Vehicles (%)	0%	0%	4%	5%	0%	3%	4%	3%	2%	0%	2%	0%
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	custom
Protected Phases	5	5	2		1	1	6					
Permitted Phases									4	4	4	8
Actuated Green, G (s)		1.2	45.4			17.3	61.5		25.5	25.5	25.5	25.5
Effective Green, g (s)		1.2	45.4			17.3	61.5		25.5	25.5	25.5	25.5
Actuated g/C Ratio		0.01	0.45			0.17	0.60		0.25	0.25	0.25	0.25
Clearance Time (s)		4.0	5.0			4.0	5.0		4.6	4.6	4.6	4.6
Vehicle Extension (s)		2.0	2.5			2.0	2.5		2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		20	1446			298	2074		326	460	377	329
v/s Ratio Prot		0.01	c0.45			c0.14	0.14					
v/s Ratio Perm									c0.25	0.03	0.08	0.02
v/c Ratio		0.50	1.01			0.80	0.23		1.00	0.13	0.34	0.08
Uniform Delay, d1		50.0	28.2			40.6	9.3		38.1	29.6	31.2	29.2
Progression Factor		1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		7.0	26.9			13.0	0.0		50.6	0.1	0.4	0.1
Delay (s)		57.0	55.1			53.6	9.3		88.8	29.7	31.6	29.3
Level of Service		E	E			D	A		F	C	C	C
Approach Delay (s)			55.1				23.9			55.4		
Approach LOS			E				C			E		

Intersection Summary			
HCM 2000 Control Delay	47.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	101.8	Sum of lost time (s)	13.6
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	36	6
Future Volume (vph)	36	6
Ideal Flow (vphpl)	1900	1900
Lane Width	11	11
Total Lost time (s)	4.6	
Lane Util. Factor	1.00	
Frpb, ped/bikes	1.00	
Flpb, ped/bikes	1.00	
Frt	0.98	
Flt Protected	1.00	
Satd. Flow (prot)	1797	
Flt Permitted	1.00	
Satd. Flow (perm)	1797	
Peak-hour factor, PHF	0.85	0.85
Adj. Flow (vph)	42	7
RTOR Reduction (vph)	5	0
Lane Group Flow (vph)	44	0
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases		
Permitted Phases	8	
Actuated Green, G (s)	25.5	
Effective Green, g (s)	25.5	
Actuated g/C Ratio	0.25	
Clearance Time (s)	4.6	
Vehicle Extension (s)	2.5	
Lane Grp Cap (vph)	450	
v/s Ratio Prot		
v/s Ratio Perm	0.02	
v/c Ratio	0.10	
Uniform Delay, d1	29.3	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	29.4	
Level of Service	C	
Approach Delay (s)	29.3	
Approach LOS	C	

Intersection Summary

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	36	593	10	1	4	768	93	4	0	13	16	0
Future Volume (vph)	36	593	10	1	4	768	93	4	0	13	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	11	12	8	12	12	10
Total Lost time (s)	4.5	4.5			4.5	4.5			4.5			4.5
Lane Util. Factor	1.00	0.95			1.00	0.95			1.00			1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.98			0.90			1.00
Flt Protected	0.95	1.00			0.95	1.00			0.99			0.95
Satd. Flow (prot)	1745	3348			1745	3336			1460			1685
Flt Permitted	0.95	1.00			0.95	1.00			0.95			0.75
Satd. Flow (perm)	1745	3348			1745	3336			1398			1324
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	37	611	10	1	4	792	96	4	0	13	16	0
RTOR Reduction (vph)	0	2	0	0	0	12	0	0	13	0	0	0
Lane Group Flow (vph)	37	619	0	0	5	876	0	0	4	0	0	16
Confl. Peds. (#/hr)	1						1					
Heavy Vehicles (%)	0%	4%	2%	0%	0%	3%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	Prot	NA		Perm	NA		Perm	NA
Protected Phases	7	4		3	3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)	1.6	18.8			0.6	17.8			8.9			8.9
Effective Green, g (s)	1.6	18.8			0.6	17.8			8.9			8.9
Actuated g/C Ratio	0.04	0.45			0.01	0.43			0.21			0.21
Clearance Time (s)	4.5	4.5			4.5	4.5			4.5			4.5
Vehicle Extension (s)	3.0	3.0			3.0	3.0			3.0			3.0
Lane Grp Cap (vph)	66	1505			25	1420			297			281
v/s Ratio Prot	c0.02	0.18			0.00	c0.26						
v/s Ratio Perm									0.00			c0.01
v/c Ratio	0.56	0.41			0.20	0.62			0.01			0.06
Uniform Delay, d1	19.8	7.8			20.4	9.3			13.0			13.1
Progression Factor	1.00	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	10.4	0.2			3.9	0.8			0.0			0.1
Delay (s)	30.2	7.9			24.3	10.1			13.0			13.2
Level of Service	C	A			C	B			B			B
Approach Delay (s)		9.2				10.2			13.0			13.1
Approach LOS		A				B			B			B

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	7
Future Volume (vph)	7
Ideal Flow (vphpl)	1900
Lane Width	10
Total Lost time (s)	4.5
Lane Util. Factor	1.00
Frpb, ped/bikes	0.99
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1489
Flt Permitted	1.00
Satd. Flow (perm)	1489
Peak-hour factor, PHF	0.97
Adj. Flow (vph)	7
RTOR Reduction (vph)	6
Lane Group Flow (vph)	1
Confl. Peds. (#/hr)	1
Heavy Vehicles (%)	0%
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	8.9
Effective Green, g (s)	8.9
Actuated g/C Ratio	0.21
Clearance Time (s)	4.5
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	317
v/s Ratio Prot	
v/s Ratio Perm	0.00
v/c Ratio	0.00
Uniform Delay, d1	13.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	13.0
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	12	1084	11	4	11	550	33	4	0	7	93	0
Future Volume (vph)	12	1084	11	4	11	550	33	4	0	7	93	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	11	12	8	12	12	10
Total Lost time (s)	4.5	4.5			4.5	4.5			4.5			4.5
Lane Util. Factor	1.00	0.95			1.00	0.95			1.00			1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.99			0.91			1.00
Flt Protected	0.95	1.00			0.95	1.00			0.98			0.95
Satd. Flow (prot)	1711	3449			1744	3360			1478			1620
Flt Permitted	0.95	1.00			0.95	1.00			0.91			0.75
Satd. Flow (perm)	1711	3449			1744	3360			1370			1280
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1141	12	4	12	579	35	4	0	7	98	0
RTOR Reduction (vph)	0	1	0	0	0	5	0	0	9	0	0	0
Lane Group Flow (vph)	13	1152	0	0	16	609	0	0	2	0	0	98
Confl. Peds. (#/hr)			3		2		3					
Confl. Bikes (#/hr)							1					
Heavy Vehicles (%)	2%	1%	0%	0%	0%	3%	0%	0%	0%	0%	4%	0%
Turn Type	Prot	NA		Prot	Prot	NA		Perm	NA		Perm	NA
Protected Phases	7	4		3	3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)	0.7	22.7			0.7	22.7			10.4			10.4
Effective Green, g (s)	0.7	22.7			0.7	22.7			10.4			10.4
Actuated g/C Ratio	0.01	0.48			0.01	0.48			0.22			0.22
Clearance Time (s)	4.5	4.5			4.5	4.5			4.5			4.5
Vehicle Extension (s)	3.0	3.0			3.0	3.0			3.0			3.0
Lane Grp Cap (vph)	25	1655			25	1612			301			281
v/s Ratio Prot	0.01	c0.33			c0.01	0.18						
v/s Ratio Perm									0.00			c0.08
v/c Ratio	0.52	0.70			0.64	0.38			0.01			0.35
Uniform Delay, d1	23.1	9.6			23.2	7.8			14.4			15.6
Progression Factor	1.00	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	18.1	1.3			44.6	0.1			0.0			0.8
Delay (s)	41.3	10.9			67.7	8.0			14.4			16.3
Level of Service	D	B			E	A			B			B
Approach Delay (s)		11.2				9.5			14.4			15.8
Approach LOS		B				A			B			B

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	47.3	Sum of lost time (s)	13.5
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	40
Future Volume (vph)	40
Ideal Flow (vphpl)	1900
Lane Width	10
Total Lost time (s)	4.5
Lane Util. Factor	1.00
Frpb, ped/bikes	0.99
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1488
Flt Permitted	1.00
Satd. Flow (perm)	1488
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	42
RTOR Reduction (vph)	33
Lane Group Flow (vph)	9
Confl. Peds. (#/hr)	1
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	0%
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	10.4
Effective Green, g (s)	10.4
Actuated g/C Ratio	0.22
Clearance Time (s)	4.5
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	327
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.03
Uniform Delay, d1	14.5
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	14.5
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Appendix E: Signal Warrant Worksheets

FEHR PEERS

Major Street	San Pablo Avenue
Minor Street	Meadow Avenue/Project Driveway

Project	Pinole Shores
Scenario	Existing Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	4	24	6	15
Through	0	0	1,084	550
Right	7	11	11	20
Total	11	35	1,101	585

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	30.2
Approach with Worst Case Delay	SB
Total Vehicles on Approach	35

Warrant 3A, Peak Hour

	Peak Hour Delay on Minor Approach (vehicle-hours)	Peak Hour Volume on Minor Approach (vph)	Peak Hour Entering Volume Serviced (vph)
Existing Conditions	**0.3**	**35**	**1,732**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Met**
Warrant Met	**NO**		

FEHR PEERS

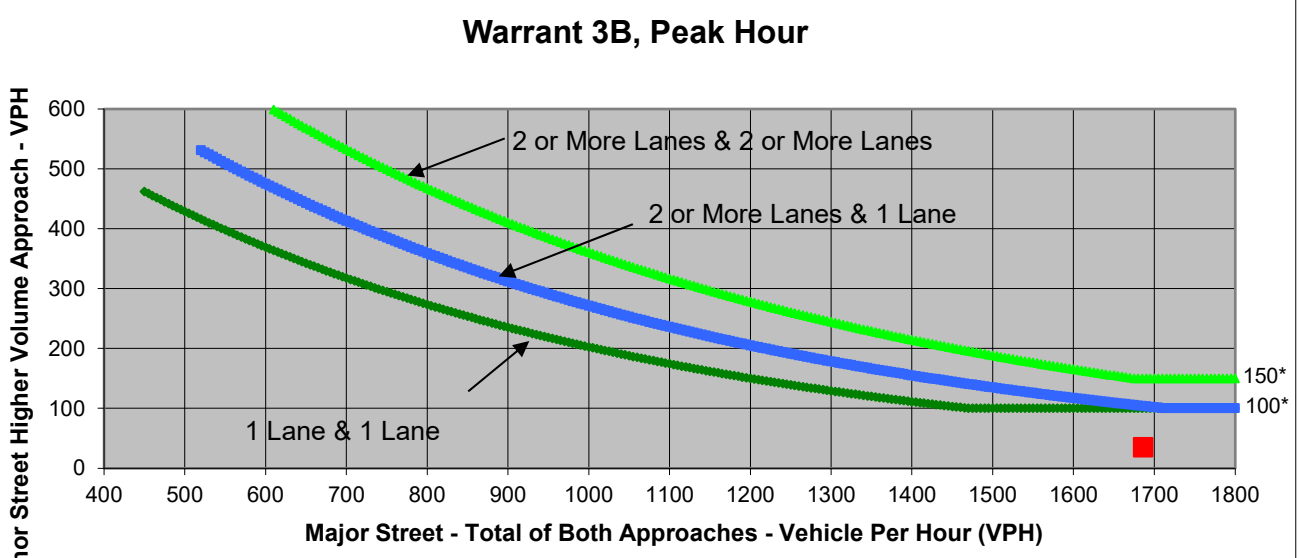
Major Street	San Pablo Avenue	Project	Pinole Shores
Minor Street	Meadow Avenue/Project Driveway	Scenario	Existing Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	4	24	6	15
Through	0	0	1,084	550
Right	7	11	11	20
Total	11	35	1,101	585

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	San Pablo Avenue	Meadow Avenue/Project Driveway	
Number of Approach Lanes	**2**	**1**	**NO**
Traffic Volume (VPH) *	**1,686**	**35**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	San Pablo Avenue
Minor Street	Meadow Avenue/Project Driveway

Project	Pinole Shores
Scenario	Existing Plus Project Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	4	93	11	15
Through	0	0	1,104	550
Right	7	40	60	33
Total	11	133	1,175	598

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	70.9
Approach with Worst Case Delay	SB
Total Vehicles on Approach	133

Warrant 3A, Peak Hour

	Peak Hour Delay on Minor Approach (vehicle-hours)	Peak Hour Volume on Minor Approach (vph)	Peak Hour Entering Volume Serviced (vph)
Existing Plus Project Conditions	**2.6**	**133**	**1,917**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Met**	**Met**
Warrant Met	**NO**		

FEHR PEERS

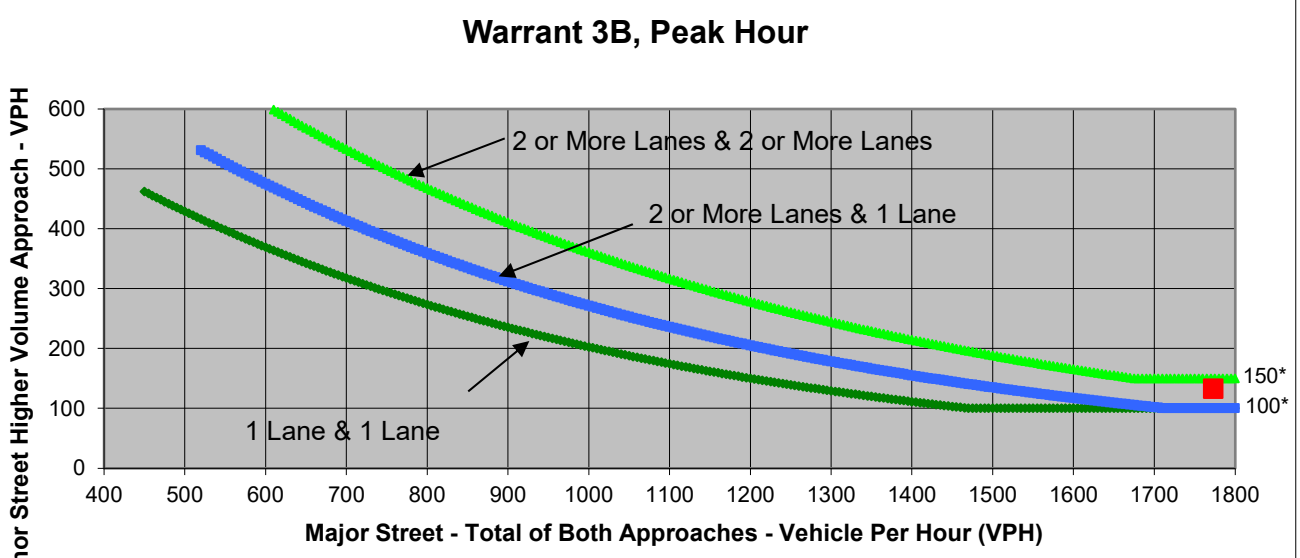
Major Street	San Pablo Avenue	Project	Pinole Shores
Minor Street	Meadow Avenue/Project Driveway	Scenario	Existing Plus Project Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	4	93	11	15
Through	0	0	1,104	550
Right	7	40	60	33
Total	11	133	1,175	598

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	San Pablo Avenue	Meadow Avenue/Project Driveway	
Number of Approach Lanes	**2**	**1**	**YES**
Traffic Volume (VPH) *	**1,773**	**133**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.