Volume 2 - Appendices

EAST BAY MUNICIPAL UTILITY DISTRICT
WEST OF HILLS NORTHERN PIPELINES PROJECT

Draft Environmental Impact Report

Prepared for
East Bay Municipal Utility District

May 2013

ESA

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WEST OF HILLS NORTHERN PIPELINES PROJECT

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ESA

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TABLE OF CONTENTS
West of Hills Northern Pipelines Project EIR

APPENDIX A
Public Involvement

Public Review under CEQA

Public involvement is an essential feature of the California Environmental Quality Act (CEQA) process. The CEQA environmental review process has greatly expanded the opportunities for interested citizens to participate in project planning and government decision-making. CEQA encourages public involvement as early as possible in the project planning phase. The Environmental Impact Report (EIR) is a well-established tool to evaluate and define a broad variety of projects, including the proposed West of Hills Northern Pipelines Project. EBMUD's outreach efforts for the Project, described below, exceed CEQA requirements.

Public Involvement for the Project

EBMUD has provided and will continue to provide opportunities for the public to participate in the CEQA process through meetings, public notices on and public review of the Draft EIR, an additional public meeting, and preparation of the Final EIR. A summary of the public involvement process to date is provided below.

EBMUD held a total of three community meetings in the cities of Berkeley, El Cerrito and San Pablo to involve the public in the West of Hills Northern Pipelines Project, prior to initiating preparation of the EIR. Community meeting dates and locations were:

November 9, 2011	Willard Middle School, 2425 Stuart Street, Berkeley, CA.
November 16, 2011	El Cerrito High School, 540 Ashbury Avenue, El Cerrito, CA.
November 30, 2011	Maple Hall, 1 Alvarado Square, San Pablo, CA.

At the meeting in the City of Berkeley, the project team presented an overview of the project background, objectives, pipeline alignment and construction process. Members of the community had questions regarding the pipeline alignment and construction schedule. They also expressed concerns regarding pipeline leakage, impacts to home access and traffic control during construction. EBMUD took note of the concerns for consideration in the EIR.

At the meeting in the City of El Cerrito, the project team again presented an overview of the project background, objectives, pipeline alignment and construction process. Members of the community had questions regarding the pipeline alignment, safety issues, construction schedule and street paving. One resident expressed particular concern regarding the traffic impacts resulting from construction activities along Richmond Street. EBMUD took note of the concerns for consideration in the EIR.

No members of the public attended the meeting in the City of San Pablo.

EIR Process

Once the Draft EIR is completed, and in conjunction with circulating the Notice of Availability and Draft EIR to agencies, community residents and interested parties, the Draft EIR will be posted on EBMUD's website, to provide opportunities for public review.

EBMUD has attempted in good faith to involve the public in reviewing and commenting on the proposed Project. At each stage of the environmental review process, EBMUD has invited (and continues to invite) the public to provide input. EBMUD welcomes and encourages comments concerning the Project and respects the input that members of the community have to offer.

APPENDIX B
Notice of Preparation

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Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # 2012022068

Project Title: West of Hills Northern Pipelines Project

Lead Agency: East Bay Municipal Utility District
Contact Person: Timothy McGowan
Mailing Address: 375 Eleventh Street, MS 701
Phone: (510) 287-1981
City: Oakland
Zip: 94607
County: Alameda

Project Location: County: Alameda and Contra Costa
City/Nearest Community: Berkeley, ElCerrito, Richmond, San Pablo
Cross Streets:
Zip Code:
Longitude/Latitude (degrees, minutes and seconds): ___° ___′ ___″ N / ___° ___′ ___″ W Total Acres:
Assessor's Parcel No.:
Section: Twp.: Range: Base:
Within 2 Miles: State Hwy #: 123
Waterways: San Francisco Bay
Airports: No
Railways: BART, SP
Schools: Yes

Document Type:

CEQA: ☒ NOP ☐ Early Cons ☐ Neg Dec ☐ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.) ___ Other: ___

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other: ___

Local Action Type:

☐ General Plan Update
☐ General Plan Amendment
☐ General Plan Element
☐ Community Plan
☐ Specific Plan
☐ Master Plan
☐ Planned Unit Development
☐ Site Plan
☐ Rezone
☐ Prezone
☐ Use Permit
☐ Land Division (Subdivision, etc.)
☐ Annexation
☐ Redevelopment
☐ Coastal Permit
☐ Other: ___

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FEB 27 2012
STATE CLEARING HOUSE

Development Type:

☐ Residential: Units ___ Acres ___
☐ Office: Sq.ft. ___ Acres ___ Employees ___
☐ Commercial: Sq.ft. ___ Acres ___ Employees ___
☐ Industrial: Sq.ft. ___ Acres ___ Employees ___
☐ Educational: ___
☐ Recreational: ___
☒ Water Facilities: Type Pipelines MGD n/a
☐ Transportation: Type ___
☐ Mining: Mineral ___
☐ Power: Type ___ MW ___
☐ Waste Treatment: Type ___ MGD ___
☐ Hazardous Waste: Type ___
☐ Other: ___

Project Issues Discussed in Document:

☒ Aesthetic/Visual
☐ Agricultural Land
☒ Air Quality
☒ Archeological/Historical
☒ Biological Resources
☐ Coastal Zone
☒ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☐ Forest Land/Fire Hazard
☒ Geologic/Seismic
☒ Minerals
☒ Noise
☒ Population/Housing Balance
☒ Public Services/Facilities
☒ Recreation/Parks
☐ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☒ Soil Erosion/Compaction/Grading
☒ Solid Waste
☒ Toxic/Hazardous
☒ Traffic/Circulation
☒ Vegetation
☒ Water Quality
☒ Water Supply/Groundwater
☒ Wetland/Riparian
☒ Growth Inducement
☒ Land Use
☒ Cumulative Effects
☐ Other: ___

Present Land Use/Zoning/General Plan Designation:

Primarily developed within existing streets; also Open Space/Parks/Recreation, and Multi-Family Res/Med. Density Residential.

Project Description: *(please use a separate page if necessary)*

The project involves the construction and operation of four transmission pipeline segments in western Alameda and Contra Costa Counties - a proposed 1.5 mile long, 48-inch diameter pipeline in the City of Berkeley; a proposed 36-inch diameter, 2.5 mile long pipeline in the City of El Cerrito; a proposed 36-inch diameter, 2.5 mile long pipeline in the Cities of El Cerrito and Richmond; and a proposed 36-diameter, 1.9 mile long pipeline in the Cities of Richmond and San Pablo. The proposed pipeline routes are located within existing city streets and on non-street properties owned by EBMUD and City of San Pablo.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "S".

S	Air Resources Board	S	Office of Historic Preservation
	Boating & Waterways, Department of		Office of Public School Construction
	California Emergency Management Agency		Parks & Recreation, Department of
	California Highway Patrol		Pesticide Regulation, Department of
S	Caltrans District # 4	X	Public Utilities Commission
	Caltrans Division of Aeronautics	S	Regional WQCB # 2
	Caltrans Planning		Resources Agency
	Central Valley Flood Protection Board		Resources Recycling and Recovery, Department of
	Coachella Valley Mtns. Conservancy		S.F. Bay Conservation & Development Comm.
	Coastal Commission		San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
	Colorado River Board		San Joaquin River Conservancy
	Conservation, Department of		Santa Monica Mtns. Conservancy
	Corrections, Department of		State Lands Commission
	Delta Protection Commission		SWRCB: Clean Water Grants
	Education, Department of		SWRCB: Water Quality
	Energy Commission		SWRCB: Water Rights
S	Fish & Game Region # 3		Tahoe Regional Planning Agency
	Food & Agriculture, Department of		Toxic Substances Control, Department of
	Forestry and Fire Protection, Department of		Water Resources, Department of
	General Services, Department of		
	Health Services, Department of		Other:
	Housing & Community Development		Other:
S	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date February 27, 2012 Ending Date March 29, 2012

Lead Agency (Complete if applicable):

Consulting Firm: ESA
Address: 350 Frank H. Ogawa Plaza
City/State/Zip: Oakland, CA 94612
Contact: Josh Ferris
Phone: (510) 366-9019

Applicant: East Bay Municipal Utility District
Address: 375 Eleventh Street, MS 701
City/State/Zip: Oakland, CA 94607
Phone: (510) 287-1981

Signature of Lead Agency Representative: [signature] **Date:** 02/24/2012

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

NOTICE OF PREPARATION
ENVIRONMENTAL IMPACT REPORT
WEST OF HILLS NORTHERN PIPELINES PROJECT
EAST BAY MUNICIPAL UTILITY DISTRICT
February 27, 2012

To Responsible Agencies and Interested Parties:

The East Bay Municipal Utility District (EBMUD), acting as lead agency under the California Environmental Quality Act (CEQA), is preparing a project-level environmental impact report (EIR) for the West of Hills Northern Pipelines Project. This Notice of Preparation (NOP) EBMUD requests your input regarding the scope and content of the environmental information that should be considered or included in the EIR and that is germane to your agency's statutory responsibilities in connection with the project. CEQA requires that your response be submitted to EBMUD at the earliest possible date, but not later than March 29, 2012. Responses to or questions regarding this NOP should be directed to:

Timothy McGowan, Associate Civil Engineer, Project Manager
East Bay Municipal Utility District
375 Eleventh Street, MS 701
Oakland, CA 94607
(510) 287-1981, tmcgowan@ebmud.com

Project Purpose: The West of Hills Northern Pipelines Project is needed to ensure continued reliable water service to customers located west of the Oakland-Berkeley Hills and north of the Claremont Tunnel terminus in Berkeley. The customers served include parts of north Oakland, Berkeley, Albany, El Cerrito, Richmond, San Pablo, Pinole, Hercules and the unincorporated communities of West Contra Costa including Crockett. The purpose of the West of Hills Northern Pipelines Project is to correct existing deficiencies in water transmission and storage operations, meet future water demands, improve system reliability and water quality challenges, and facilitate repair and replacement of aging infrastructure.

Project Location and Description: The project involves the construction and operation of four transmission pipeline segments in Alameda and Contra Costa Counties (see **Figure 1**). The proposed pipeline routes are located within existing city streets and on non-street properties owned by EBMUD and the City of San Pablo. The exact placement of the pipelines within selected roadways is not presently known for all segments.

- ***Wildcat Pipeline (Berkeley)***. This proposed pipeline, 48 inches in diameter and approximately 1.5 miles long, would be located in the City of Berkeley, Alameda County (see **Figure 2**). An alternative alignment for a segment of this pipeline, located in Benvenue Avenue, is under consideration and will be evaluated in the EIR.

- ***Wildcat Pipeline (El Cerrito).*** This proposed pipeline, 36 inches in diameter and approximately 2.5 miles long, would be located in the City of El Cerrito, Contra Costa County (see **Figure 3**).

- ***Central Pressure Zone Pipeline (El Cerrito/Richmond)***. This proposed pipeline, 36 inches in diameter and approximately 2.5 miles long, would be located in San Pablo Avenue in the Cities of El Cerrito and Richmond, Contra Costa County (see **Figure 3**).

- ***Central Pressure Zone Pipeline (Richmond/San Pablo)***. This proposed pipeline, 36 inches in diameter and approximately 1.9 miles long, would be located primarily in 23rd Street in the Cities of Richmond and San Pablo, Contra Costa County (see **Figure 4**). At San Pablo Creek, the pipeline would be constructed within an existing EBMUD utility corridor consisting of two EBMUD-owned properties (assessor parcels 411-282-002 and 412-300-001, totaling 0.28 acres) located between Brookside Drive and Road 20 in San Pablo. An alternative alignment at San Pablo Creek (near San Pablo Avenue) is under consideration and will be evaluated in the EIR. This alternative alignment would be developed partly within a parcel owned by the City of San Pablo (assessor parcel 411-282-001).

For the most part, construction of the pipelines would be by conventional open trench construction methods. Where the Central Pressure Zone Pipeline (Richmond/San Pablo) crosses San Pablo Creek, EBMUD proposes to construct a pipe bridge and trenchless ("bore and jack") construction is proposed where the Central Pressure Zone Pipeline (Richmond/San Pablo) crosses Wildcat Creek. At Wildcat Creek, a vacant parcel (assessor parcel 411-281-015) owned by the City of San Pablo and intended for park development may be used to locate the entry pit for the bore and jack crossing of the Creek.

Construction would typically occur between 8 a.m. and 7 p.m. Longer construction hours (up to 24 hours per day) may be required where the proposed pipelines connect with existing pipelines to minimize customer water service disruption. Lane and roadway closures would be required during construction hours, with access restored during non-working hours. Construction of both Wildcat Pipeline segments would occur first and over a 9 to 14 month period from approximately January 2015 to June 2016. Construction of both Central Pressure Zone Pipeline segments would occur over a 10 to 16 month beginning in 2021.

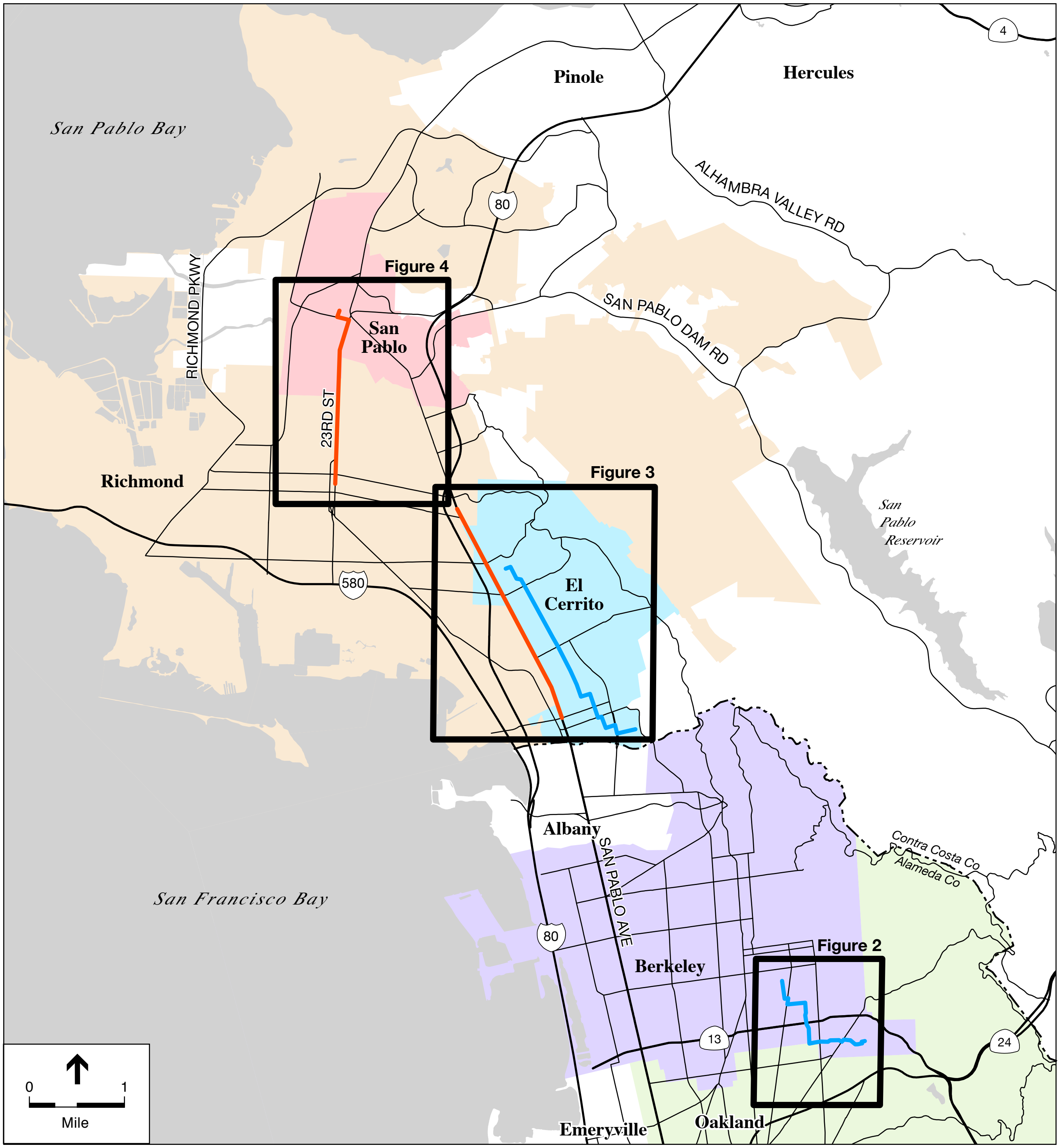
Probable Environmental Effects. Based on an Initial Study completed for the project, the environmental factors that could potentially be affected by this project (i.e. involving at least one impact that is a "Potentially Significant Impact") include aesthetics, air quality, biological resources, cultural resources, geology/soils, greenhouse gas emissions, hazards/hazardous materials, hydrology/water quality, noise, recreation, transportation/traffic, and utilities/service systems. To review the Initial Study prepared for the project, please go to EBMUD's project website at: http://www.ebmud.com/about-ebmud/news/project-updates/west-hills-northern-pipelines-project.

CEQA Process. The Draft EIR is targeted for circulation in late 2012, with action by EBMUD's Board of Directors anticipated in the Spring of 2013. Notice will be given of public meetings. At the end of the review and comment process, EBMUD's Board of Directors will determine whether to certify the EIR and approve the West of Hills Northern Pipelines Project. Additional information about the West of Hills Northern Pipelines Project can be obtained from the EBMUD website

Xavier J. Irias
Director, Engineering and Construction
East Bay Municipal Utility District

Feb 27, 2012
Date

Figures/Maps:



SOURCE: ESA

EBMUD West of Hills Northern Pipelines . 211488

Figure 1
Project Location

Wildcat Pipeline (Berkeley)

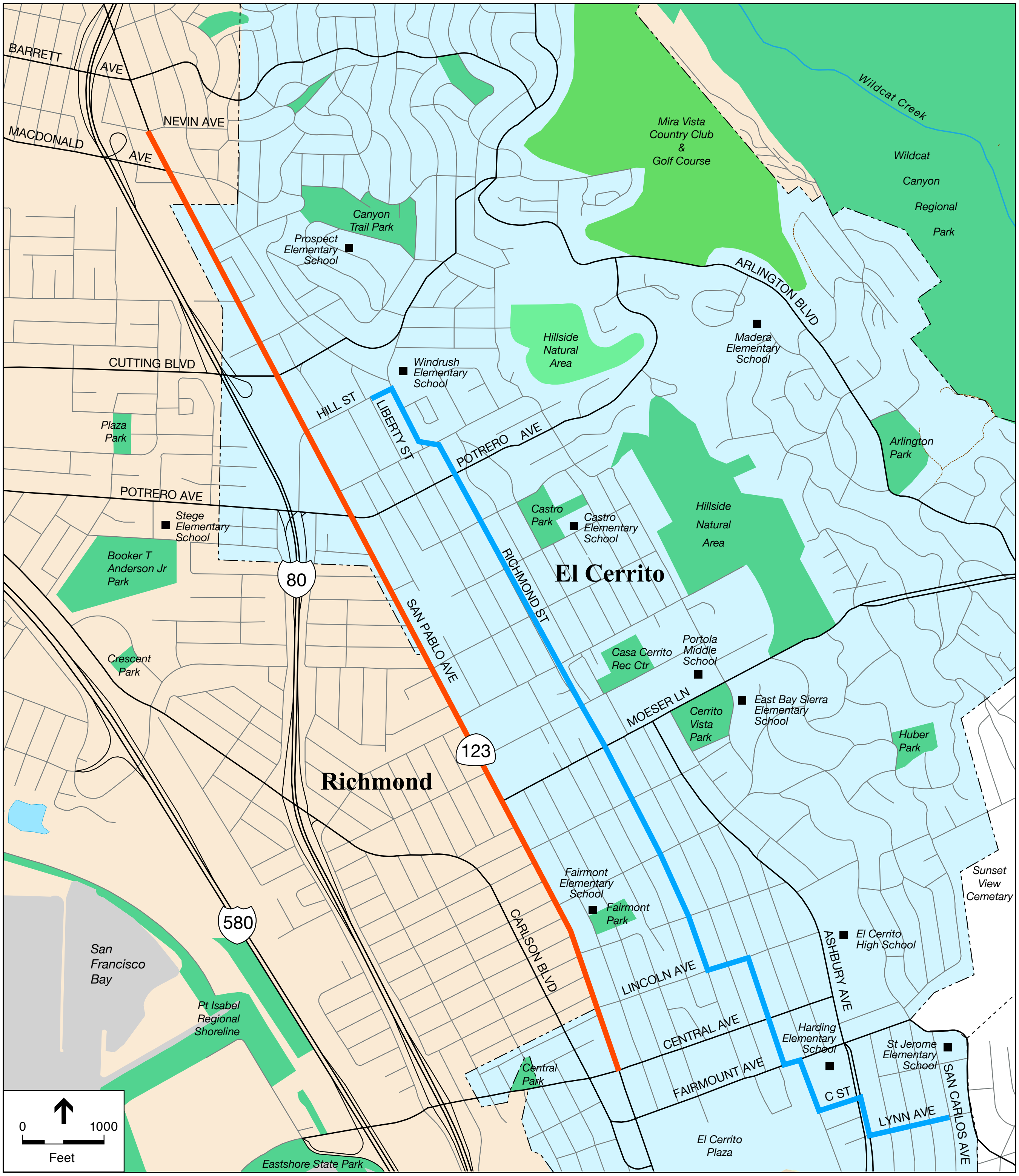
Alternative Alignment (Benvenue Ave)

SOURCE: ESA

EBMUD West of Hills Northern Pipelines . 211488

Figure 2

Wildcat Pipeline (Berkeley)



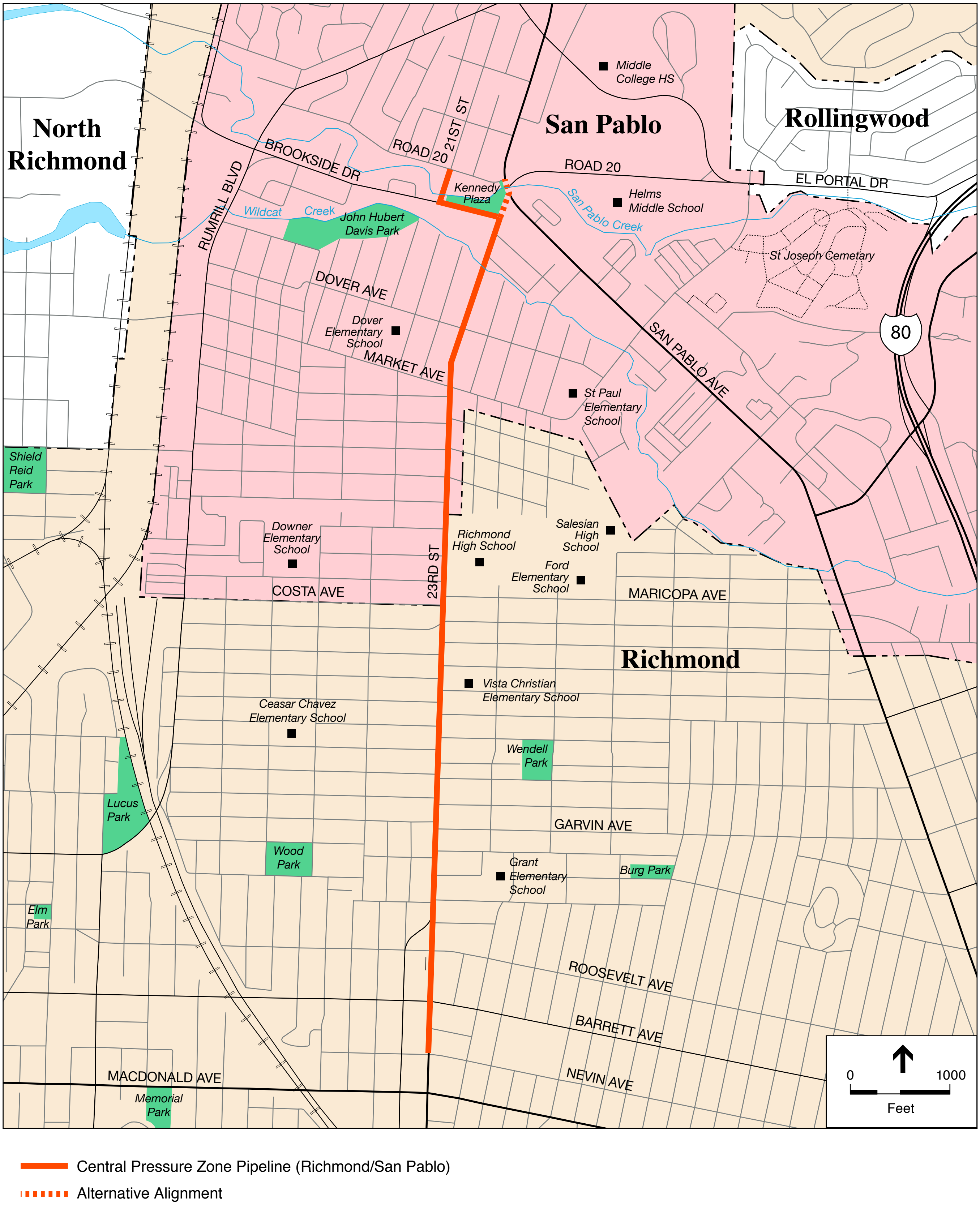
Wildcat Pipeline (El Cerrito)

Central Pressure Zone Pipeline (El Cerrito/Richmond)

SOURCE: ESA

EBMUD West of Hills Northern Pipelines . 211488

Figure 3
Wildcat Pipeline (El Cerrito) and
Central Pressure Zone Pipeline (El Cerrito/Richmond)



SOURCE: ESA

EBMUD West of Hills Northern Pipelines . 211488

Figure 4
Central Pressure Zone Pipeline (Richmond/San Pablo)

APPENDIX C
Construction Details

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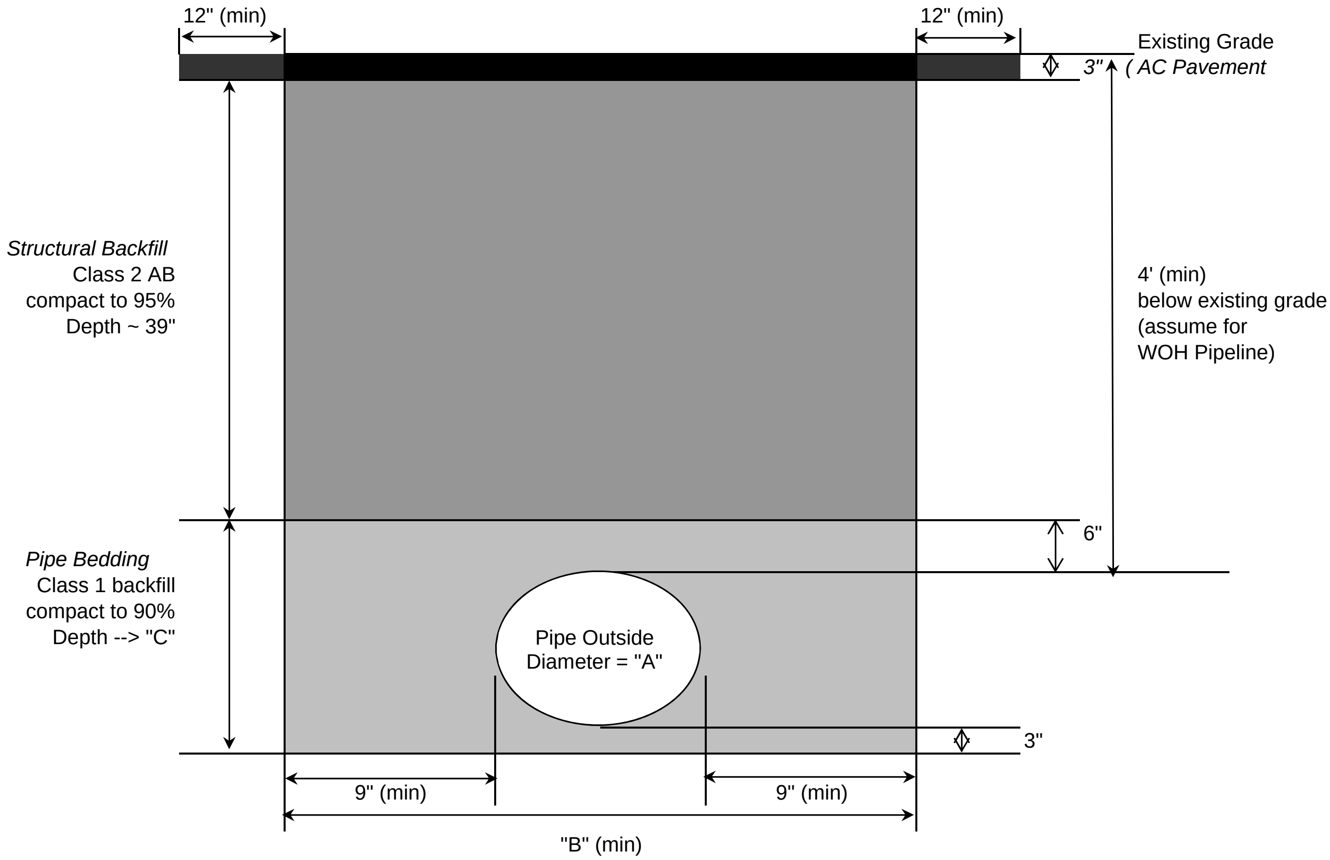
Typical Trench Section: **NTS**

References: 1) EBMUD Std Dwg 1992-A, & 2) Utility Trench Master Permit Conditions - Exhibit A



Pipe ID	A inch	B inch	C inch	Trench Width ft - inch	Trench Depth ft - inch	Spoils CY	Backfill CY/LF
36-inch	38	56	47	4' 8"	7' 5"	1.3	1
48-inch	50	68	59	5' 8"	8' 5"	1.8	1.3

A = pipeline outside diameter

B = trench width (minimum)

C = trench bedding depth

Paving Requirement:

Per discussion with EBMUD Paving Crew foreman, AC paving thickness is 6" (Typ)

Pipe ID	AC Thickness (typ), inch	Width	Volume, ft3/LF	Volume, CY/LF	Remarks
36-inch	6	56	3.3	0.12	Volume is for 6" thick AC
48-inch	6	68	3.8	0.14	Volume is for 6" thick AC
36-inch	12	56	6.7	0.25	Volume is for 1' thick AC (e.g. along San Pablo Ave, per Caltrans trench details provided to City of Richmond Sewer Replacement Project

Pipeline	City	***Contractor's Work Force***								***Other Work Force***				
Pipeline	City	Foreman	Workers [1]	HEO [2]	Truck Driver	Flaggers [3]	Crane Operators	Crew subtotal	Super-intendent	EBMUD's Inspector	City's Inspector	Caltrans' Inspector	Visitor	***Total***
Open-Cut Trenching Method														
Wildcat Pipeline (El Cerrito)	El Cerrito	2	9	4	2	4	na	21	1	1	1	0	1	***25***
Wildcat Pipeline (Berkeley)	Berkeley	2	9	4	2	7	na	24	1	1	1	0	1	***28***
Central PZ Pipeline (El Cerrito / Richmond)	El Cerrito/Richmond	2	9	4	2	2	na	19	1	1	1	1	1	***24***
Central PZ Pipeline (Richmond / San Pablo)	Richmond / San Pablo	2	9	4	3	2	na	20	1	1	1	0	1	***24***
Flushing, Pressure Testing, Chlorination		2	6	1	0	0		9	1	1	1		1	***13***
Hot Tap Connection		2	4	1	0	2		9	1	1	1		1	***13***
Paving (per EBMUD Paving Section Foreman)		1	3	1	2	2		9	1	1	1		1	***13***
Jack & Bore Method														
J&B - Pits Excavation / Backfill		1	2	1	0	2	na	6	1	1			1	***9***
J&B - Casing Installation		1	3	1	0	2	1	8	1	1			1	***11***
J&B - Pipeline Installation		2	6	1	0	2	1	12	1	1			1	***15***
Pipe Bridge Method														
Clear and Grubbing		1	2	2	0	0	0	5	1	1			1	***8***
Pipe Bridge Abutment 3' W x 4' D x 10'L each; 6" above grade		1	2	1	0	0	0	4	1	1			1	***7***
Pipe Bridge Erection		1	3	0	0	2	2	8	1	1			1	***11***
Install Pipeline on Pipe Bridge		1	2	0	0	0	2	5	1	1	1		1	***9***

[1] Include plumbers and welder for pipeline installation, for paving include rakers.

[2] HEO = Heavy Equipment Operator

[3] Traffic control / director detour. Number of flaggers required is site specific.

Work force estimate for open-cut pipeline installation per discussion with TRM (based on his experience on construction projects)
Work force estimate for paving per discussion with EBMUD Paving Section Foreman

Wildcat Pipeline (Berkeley) - Preferred Alignment (Alternative 4)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis.

Reach	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** - Parkside / Nogales to Uplands / Claremont Ave via Parkside Dr & the Uplands.	1,240	48	*80*	3.1	13	3	28	88	4 28	Trucks Vehicles
2	***Phase 2*** - Uplands / Claremont to Hillegass Ave/Woolsey St via Claremont Ave, & Woolsey St.	2,100	48	*80*	5.3	13	3	28	88	4 28	Trucks Vehicles
3	***Phase 3*** - Hillegass/Woolsey to Hillegass Ave/Russell St via Hillegass Ave.	1,700	48	*80*	4.3	13	3	28	88	4 28	Trucks Vehicles
4	***Phase 4*** - Hillegass/Russell to Hillegass Ave/Stuart Ave via Hillegass Ave.	640	48	*80*	1.6	13	3	28	88	4 28	Trucks Vehicles
5	***Phase 5*** - Hillegass/Stuart Ave to Parker St / Dana St via Stuart St, Telegraph Ave, Ward St,	2,550	48	*80*	6.4	13	3	28	88	4 28	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	13	32	1 13	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 8 - Paving	8,230	na	700	2.4	11	0	13	48	3 13	Trucks Vehicles
	Total	8,230	LF of pipe		32	weeks					
	Total Excavated Material	14,814	CY					**MAXIMUM TRIPS =**	**88**	**4** **28**	**Trucks** **Vehicles**

<u>Assumptions</u>:

- *Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).*
- *Construction staging area and two-day material storage to occur along the alignment.*
- *Construction Method for the new 48-inch Wildcat Pipeline (Berkeley) is Open-Cut Trenching.*
- *Excavated spoil will be hauled off site and trench will be backfilled with imported fills.*
- *Trench for 48-inch (ID) pipe is typically 5 feet 8 inches wide and 8 feet 5 inches deep (see Figure A).*
- *Each lineal foot of pipe trench will generate 1.8 cubic yard (CY) of excavated spoil and require 1.3 CY of imported bedding material / aggregate base.*
- *New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.*
- *Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & seven flaggers.*
- *Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.*

<u>Notes:</u>

1. *Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 48-inch transmission pipeline per workday in paved areas.*
   One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. *Duration does not include down-time, mobilization, demobilization nor reflect total duration.*
3. *Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck*
4. *Material truck trips per day include deliveries of pipeline (1), appurtenance (1), and equipment (1), which is 3 material trucks per day*
5. *Worker vehicle trips for pipeline installation consist of crew (24), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average).*
   Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. *Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.*
7. *Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.*
   Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Wildcat Pipeline (Berkeley) - Preferred Alignment (Benvenue Avenue Option)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis.

Segment	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** - Parkside / Nogales to Uplands / Claremont Ave via Parkside Dr & the Uplands.	1,240	48	*80*	3.1	13	3	28	88	4 28	Trucks Vehicles
2A	***Phase 2*** - Uplands / Claremont to Benvenue Ave / Woolsey St via Claremont Ave, & Woolsey St.	1,800	48	*80*	4.5	13	3	28	88	4 28	Trucks Vehicles
3A	***Phase 3*** - Benvenue / Woolsey to Benvenue Ave / Russell St via Benvenue Ave.	1,690	48	*80*	4.2	13	3	28	88	4 28	Trucks Vehicles
4A	***Phase 4*** - Benvenue / Russell to Hillegass Ave/Stuart Ave via Benvenue Ave & Stuart St.	920	48	*80*	2.3	13	3	28	88	4 28	Trucks Vehicles
5	***Phase 5*** - Hillegass/Stuart Ave to Parker St / Dana St via Stuart St, Telegraph Ave, Ward St,	2,550	48	*80*	6.4	13	3	28	88	4 28	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	13	32	1 13	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 7 - Paving	8,200	na	700	2.3	11	0	13	48	3 13	Trucks Vehicles
	Total	8,200	LF of pipe		32	weeks					
	Total Excavated Material	14,760	CY					MAXIMUM TRIPS =	**88**	**4** **28**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).

- Construction staging area and two-day material storage to occur along the alignment.

- Construction Method for the new 48-inch Wildcat Pipeline (Berkeley) is Open-Cut Trenching.

- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.

-Trench for 48-inch (ID) pipe is typically 5 feet 8 inches wide and 8 feet 5 inches deep (see Figure A).

-Each lineal foot of pipe trench will generate 1.8 cubic yard (CY) of excavated spoil and require 1.3 CY of imported bedding material / aggregate base.

-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.

- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & seven flaggers.

- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 48-inch transmission pipeline per workday in paved areas. One paving crew could typically pave 700 LF of trench with 6" AC paving per day.

2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.

3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck

4. Material truck trips per day include deliveries of pipeline (1), appurtenance (1), and equipment (1), which is 3 material trucks per day

5. Worker vehicle trips for pipeline installation consist of crew (24), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average). Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).

6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.

7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period. Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Wildcat Pipeline (Berkeley) - Preferred Alignment (Alternative 4)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis.

Reach	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** - Parkside / Nogales to Uplands / Claremont Ave via Parkside Dr & the Uplands.	1,240	48	*200*	1.2	31	5	28	128	9 28	Trucks Vehicles
2	***Phase 2*** - Uplands / Claremont to Hillegass Ave/Woolsey St via Claremont Ave, & Woolsey St.	2,100	48	*200*	2.1	31	5	28	128	9 28	Trucks Vehicles
3	***Phase 3*** - Hillegass/Woolsey to Hillegass Ave/Russell St via Hillegass Ave.	1,700	48	*200*	1.7	31	5	28	128	9 28	Trucks Vehicles
4	***Phase 4*** - Hillegass/Russell to Hillegass Ave/Stuart Ave via Hillegass Ave.	640	48	*200*	0.6	31	5	28	128	9 28	Trucks Vehicles
5	***Phase 5*** - Hillegass/Stuart Ave to Parker St / Dana St via Stuart St, Telegraph Ave, Ward St,	2,550	48	*200*	2.6	31	5	28	128	9 28	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	13	32	1 13	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 6 - Paving	8,230	na	700	2.4	11	0	13	48	3 13	Trucks Vehicles
	Total	8,230	LF of pipe		20	weeks					
	Total Excavated Material	14,814	CY					**MAXIMUM TRIPS =**	**128**	**9** **28**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 48-inch Wildcat Pipeline (Berkeley) is Open-Cut Trenching.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 48-inch (ID) pipe is typically 5 feet 8 inches wide and 8 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.8 cubic yard (CY) of excavated spoil and require 1.3 CY of imported bedding material / aggregate base.
-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & seven flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 48-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer
9 CY - concrete truck
4. Material truck trips per day include deliveries of pipeline (3), appurtenance (1), and equipment (1), which is 5 material trucks per day
5. Worker vehicle trips for pipeline installation consist of crew (24), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Wildcat Pipeline (Berkeley) - Preferred Alignment (Benvenue Avenue Option)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis.

Segment	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration[2] (weeks)	Haul Trucks[3] (per day)	Materials Trucks[4] (per day)	Worker Vehicles[5] (per day)	Daily One-Way Trips[6]	Max Hourly One-Way Trips[7]	
1	***Phase 1*** - Parkside / Nogales to Uplands / Claremont Ave via Parkside Dr & the Uplands.	1,240	48	*200*	1.2	31	5	28	128	9 28	Trucks Vehicles
2A	***Phase 2*** - Uplands / Claremont to Benvenue Ave / Woolsey St via Claremont Ave, & Woolsey St.	1,800	48	*200*	1.8	31	5	28	128	9 28	Trucks Vehicles
3A	***Phase 3*** - Benvenue / Woolsey to Benvenue Ave / Russell St via Benvenue Ave.	1,690	48	*200*	1.7	31	5	28	128	9 28	Trucks Vehicles
4A	***Phase 4*** - Benvenue / Russell to Hillegass Ave/Stuart Ave via Benvenue Ave & Stuart St.	920	48	*200*	0.9	31	5	28	128	9 28	Trucks Vehicles
5	***Phase 5*** - Hillegass/Stuart Ave to Parker St / Dana St via Stuart St, Telegraph Ave, Ward St,	2,550	48	*200*	2.6	31	5	28	128	9 28	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	13	32	1 13	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 6 - Paving	8,200	na	700	2.3	11	0	13	48	3 13	Trucks Vehicles
	Total	8,200	LF of pipe		20	weeks					
	Total Excavated Material	14,760	CY					**MAXIMUM TRIPS =**	**128**	**9** **28**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).

- Construction staging area and two-day material storage to occur along the alignment.

- Construction Method for the new 48-inch Wildcat Pipeline (Berkeley) is Open-Cut Trenching.

- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.

-Trench for 48-inch (ID) pipe is typically 5 feet 8 inches wide and 8 feet 5 inches deep (see Figure A).

-Each lineal foot of pipe trench will generate 1.8 cubic yard (CY) of excavated spoil and require 1.3 CY of imported bedding material / aggregate base.

-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.

- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & seven flaggers.

- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

*1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 48-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.*

2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.

3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck

4. Material truck trips per day include deliveries of pipeline (3), appurtenance (1), and equipment (1), which is 5 material trucks per day

*5. Worker vehicle trips for pipeline installation consist of crew (24), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).*

6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.

*7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.*

Wildcat Pipeline (El Cerrito) - Preferred Alignment (Alternative 1)

Estimated Vehicle / Truck Trips that project-related activies would generate during construction phase, on both a daily and peak hourly basis.

Reach	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** - Lynn Avenue / San Carlos Avenue to Richmond Street / Lincoln Avenue via Lynn Avenue, Ashbury Avenue, C Street, Behrens Street, Fairmount Avenue, Norvell Street, & Lincoln Avenue.	4,830	36	*80*	12.1	10	3	25	76	3 25	Trucks Vehicles
2	***Phase 2*** - Richmond St / Lincoln Ave to Richmond Street / Schmidt Ln via Richmond Street.	4,220	36	*80*	10.6	10	3	25	76	3 25	Trucks Vehicles
3	***Phase 3*** - Richmond St / Schmidt Ln to Hill St / Liberty St via Richmond St, Elm St, & Hill St.	4,500	36	*80*	11.3	10	3	25	76	3 25	Trucks Vehicles
	Phase 4 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	28	62	1 28	Trucks Vehicles
	Phase 5 - Two Hot Tap Connections	0	na	na	5.0	1	3	24	56	1 24	Trucks Vehicles
	Phase 7 -Paving	13,550	na	700	3.9	10	0	12	44	3 12	Trucks Vehicles
	Total	13,550	LF of pipe		47	weeks					
	Total Excavated Material	17,615	CY					**MAXIMUM TRIPS =**	**76**	**3** **25**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).

- Construction staging area and two-day material storage to occur along the alignment.

- Construction Method for the new 36-inch Wildcat Pipeline (El Cerrito) is Open-Cut Trenching.

- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.

-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).

-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.

-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.

- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & four flaggers.

- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.

2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.

3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer
9 CY - concrete truck

4. Material truck trips per day include deliveries of pipeline (1), appurtenance (1), and equipment (1), which is 3 material trucks per day

5. Worker vehicle trips for pipeline installation consist of crew (21), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).

6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.

7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Wildcat Pipeline (El Cerrito) - Preferred Alignment (Alternative 1)
Estimated Vehicle / Truck Trips that project-related activies would generate during construction phase, on both a daily and peak hourly basis.

Reach	Construction Phase	Pipe length (LF)	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** - Lynn Avenue / San Carlos Avenue to Richmond Street / Lincoln Avenue via Lynn Avenue, Ashbury Avenue, C Street, Behrens Street, Fairmount Avenue, Norvell Street, & Lincoln Avenue.	4,830	36	*200*	4.8	23	4	25	104	7 25	Trucks Vehicles
2	***Phase 2*** - Richmond St / Lincoln Ave to Richmond Street / Schmidt Ln via Richmond Street.	4,220	36	*200*	4.2	23	4	25	104	7 25	Trucks Vehicles
3	***Phase 3*** - Richmond St / Schmidt Ln to Hill St / Liberty St via Richmond St, Elm St, & Hill St.	4,500	36	*200*	4.5	23	4	25	104	7 25	Trucks Vehicles
	Phase 4 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	28	62	1 28	Trucks Vehicles
	Phase 5 - Two Hot Tap Connections	0	na	na	5.0	1	3	24	56	1 24	Trucks Vehicles
	Phase 7 -Paving	13,550	na	700	3.9	10	0	13	46	3 13	Trucks Vehicles
	Total	13,550	LF of pipe		27	weeks					
	Total Excavated Material	17,615	CY					**MAXIMUM TRIPS =**	**104**	**7 25**	**Trucks Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 36-inch Wildcat Pipeline (El Cerrito) is Open-Cut Trenching.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.
-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & four flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY -end dump trailer
9 CY - concrete truck
4. Material truck trips per day include deliveries of pipeline (2), appurtenance (1), and equipment (1), which is 4 material trucks per day
5. Worker vehicle trips for pipeline installation consist of crew (21), contractor's superintendent (1), District's inspector (1), City's inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Central Pressure Zone Pipeline (El Cerrito / Richmond) - Preferred Alignment (Alternative 1)
Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis.

Reach	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** -San Pablo Ave / Central Ave to San Pablo Ave / Schmidt Ln via San Pablo Ave.	4,970	36	*80*	12.4	10	3	24	74	3 24	Trucks Vehicles
2	***Phase 2*** - San Pablo Ave / Schmidt Ln to San Pablo Ave / Potrero Ave via San Pablo Ave.	2,620	36	*80*	6.6	10	3	24	74	3 24	Trucks Vehicles
3	***Phase 3*** - San Pablo Ave / Potrero Ave to San Pablo Ave / Hill Street via San Pablo Ave.	1,200	36	*80*	3.0	10	3	24	74	3 24	Trucks Vehicles
4	***Phase 4*** - San Pablo Ave / Hill St to San Pablo Ave / Nevin Ave via San Pablo Ave.	4,130	36	*80*	10.3	10	3	24	74	3 24	Trucks Vehicles
	Phase 5 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	13	32	1 13	Trucks Vehicles
	Phase 6 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 7 - Paving	12,920	na	350	7.4	10	0	13	46	3 13	Trucks Vehicles
	Total	12,920	LF of pipe		49	weeks					
	Total Excavated Material	16,796	CY					**MAXIMUM TRIPS =**	**74**	**3** **24**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 36-inch Central PZ Pipeline (El Cerrito / Richmond) is Open-Cut Trenching.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.
-New pavement with 12 inches (existing AC along San Pablo Ave is 10 to 14" thick) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 350 LF of trench with 12" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck
4. Material truck trips per day include deliveries of pipeline (1), appurtenance (1), and equipment (1), which is 3 material trucks per day
5. Worker vehicle trips for pipeline installation consist of crew (19), contractor's superintendent (1), District's inspector (1), City's inspector (1), Caltrans' inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Central Pressure Zone Pipeline (El Cerrito / Richmond) - Preferred Alignment (Alternative 1)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis

Reach	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1	***Phase 1*** -San Pablo Ave / Central Ave to San Pablo Ave / Schmidt Ln via San Pablo Ave.	4,970	36	*200*	5.0	23	4	24	102	7 24	Trucks Vehicles
2	***Phase 2*** - San Pablo Ave / Schmidt Ln to San Pablo Ave / Potrero Ave via San Pablo Ave.	2,620	36	*200*	2.6	23	4	24	102	7 24	Trucks Vehicles
3	***Phase 3*** - San Pablo Ave / Potrero Ave to San Pablo Ave / Hill Street via San Pablo Ave.	1,200	36	*200*	1.2	23	4	24	102	7 24	Trucks Vehicles
4	***Phase 4*** - San Pablo Ave / Hill St to San Pablo Ave / Nevin Ave via San Pablo Ave.	4,130	36	*200*	4.1	23	4	24	102	7 24	Trucks Vehicles
	Phase 5 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	24	54	1 24	Trucks Vehicles
	Phase 6 - Two Hot Tap Connections	0	na	na	5.0	1	3	13	34	1 13	Trucks Vehicles
	Phase 7 - Paving	12,920	na	350	7.4	10	0	12	44	3 12	Trucks Vehicles
	Total (include intertie)	12,920	LF of pipe		30	weeks					
	Total Excavated Material	16,796	CY					**MAXIMUM TRIPS =**	**102**	**7** **24**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 36-inch Central PZ Pipeline (El Cerrito / Richmond) is Open-Cut Trenching.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.
-New pavement with 12 inches (existing AC along San Pablo Ave is 10 to 14" thick) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, & two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 350 LF of trench with 12" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration.
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer
9 CY - concrete truck
4. Material truck trips per day include deliveries of pipeline (2), appurtenance (1), and equipment (1), which is 4 material trucks per day
5. Worker vehicle trips for pipeline installation consist of crew (19), contractor's superintendent (1), District's inspector (1), City's inspector (1), Caltrans' inspector (1), and visitors (1 on average).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

Central Pressure Zone Pipeline (Richmond_San Pablo) - Preferred Alignment (Alternative 4)
Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis

Reach	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration[2] (weeks)	Haul Trucks[3] (per day)	Materials Trucks[4] (per day)	Worker Vehicles[5] (per day)	Daily One-Way Trips[6]	Max Hourly One-Way Trips[7]	
1 & 2	***Phase 1*** - 23rd St / Nevin Ave to 23rd St / Brookside Dr via 23rd Street.	8,910	36	*80*	22.3	10	3	24	74	3 24	Trucks Vehicles
3 & 4	***Phase 2*** - 23rd St / Brookside Dr to RW X574/Brookside.	670	36	*80*	1.7	10	3	24	74	3 24	Trucks Vehicles
3 & 4	***Phase 3*** - RW X574/Brookside to RW X574/Road 20.	305	48	*80*	0.8	13	3	24	80	4 24	Trucks Vehicles
Part of 2	***Phase 4*** - Wildcat Creek Crossing by Jack & Bore Method[8]										
	Pits Excavation[9]	na	na	na	2	2	1	9	24	1 9	Trucks Vehicles
	Casing Installation	170	48	10	3.4	1	1	11	26	1 11	Trucks Vehicles
	Pipeline Installation	170	36	50	0.7	0	1	15	32	0.3 15	Trucks Vehicles
	Pits Backfill[9]	na	na	na	4	1	1	9	22	1 9	Trucks Vehicles
Part of 3	***Phase 5*** - San Pablo Creek Crossing by Pipe Bridge Method										
	Clear and Grubbing	na	na	na	1	10	0	8	36	3 8	Trucks Vehicles
	Abutment construction	na	na	na	2	2	1	7	20	1 7	Trucks Vehicles
	Bridge delivery / erection	na	na	na	2 days	0	2	11	26	1 11	Trucks Vehicles
	Pipeline Installation	95	48	50	2 days	0	2	9	22	1 9	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	0	6	1 0	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	7	22	1 7	Trucks Vehicles
	Phase 8 - Paving	9,580	na	700	2.7	10	0	13	46	3 13	Trucks Vehicles
	Total	9,845	LF of pipe		51	weeks					
	Total Excavated Material	12,948	CY					**MAXIMUM TRIPS =**	**80**	**3** **24**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 36-inch Central PZ Pipeline (Richmond / San Pablo) is Open-Cut Trenching, except at Wildcat Creek & San Pablo Creek crossing.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.
-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, and two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer
9 CY - concrete truck
4. Material truck trips for open-cut trench pipeline installation include deliveries of pipeline (1), appurtenance (1), and equipment (1) 3 material truck per day
5. Worker vehicle trips for pipeline installation consist of crew (20), contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitors (1 on avg).
Worker vehicle trips for pits excavation & backfill consist of crew (6) , contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitor (1).
Worker vehicle trips for pipe bridge abutments construction consist of crew (4) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for pipe bridge erection consist of crew (8) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for installation pipe to pipe bridge consist of crew (5) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.
8. Jack and bore method production rates based on Hesperian Boulevard Pipeline Relocation Project (Spec 2020).
9. Insertion pit approximately 36 ft long by 13 ft wide by 19 ft deep and receiving pit approximately 13 ft long by 9 ft wide by 16 feet deep.
Wildcat Creek is ~ 8 ft deep per 2' contours. Receiving pit depth is 8 ft below creek bottom, slope of pipeline between jacking pit and receiving pit is 2% up.

Central Pressure Zone Pipeline (Richmond_San Pablo) - Preferred Alignment (San Pablo Avenue Option)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis

Segment	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration[2] (weeks)	Haul Trucks[3] (per day)	Materials Trucks[4] (per day)	Worker Vehicles[5] (per day)	Daily One-Way Trips[6]	Max Hourly One-Way Trips[7]	
1 & 2	***Phase 1*** - 23rd St / Nevin Ave to 23rd St / Brookside Dr via 23rd Street.	8,910	36	*80*	22.3	10	3	24	74	3 24	Trucks Vehicles
3 & 4	***Phase 2A*** - 23rd St / Brookside Dr to Road 20 via 23rd St, San Pablo Avenue, as well as parcels 411-282-001 & 412-300-010 owned by City of San Pablo.	475	36	*80*	1.2	10	3	24	74	3 24	Trucks Vehicles
Part of 2	***Phase 4*** - Wildcat Creek Crossing by Jack & Bore Method[8]										
	Pits Excavation[9]	na	na	na	2	2	1	9	24	1 9	Trucks Vehicles
	Casing Installation	170	48	10	3.4	1	1	11	26	1 11	Trucks Vehicles
	Pipeline Installation	170	36	50	0.7	0	1	15	32	0.3 15	Trucks Vehicles
	Pits Backfill[9]	na	na	na	4	1	1	9	22	1 9	Trucks Vehicles
Part of 3	***Phase 5*** - San Pablo Creek Crossing by Pipe Bridge Method (San Pablo Avenue										
	Clear and Grubbing	na	na	na	1	10	0	8	36	3 8	Trucks Vehicles
	Abutment construction	na	na	na	2	2	1	7	20	1 7	Trucks Vehicles
	Bridge delivery / erection	na	na	na	2 days	0	2	11	26	1 11	Trucks Vehicles
	Pipeline Installation	100	36	50	2 days	0	2	9	22	1 9	Trucks Vehicles
	Phase 5 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	11	28	1 11	Trucks Vehicles
	Phase 6 - Two Hot Tap Connections	0	na	na	5.0	1	3	9	26	1 9	Trucks Vehicles
	Phase 7 - Paving	9,385	na	700	2.7	10	0	13	46	3 13	Trucks Vehicles
	Total	9,655	LF of pipe		50	weeks					
	Total Excavated Material	12,694	CY					**MAXIMUM TRIPS =**	**74**	**3** **24**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).
- Construction staging area and two-day material storage to occur along the alignment.
- Construction Method for the new 36-inch Central PZ Pipeline (Richmond / San Pablo) is Open-Cut Trenching, except at Wildcat Creek & San Pablo Creek crossings.
- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.
-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).
-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.
-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.
- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.
- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, and two flaggers.

Notes:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. Duration does not include down-time, mobilization, demobilization nor reflect total duration
3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck
4. Material truck trips for open-cut trench pipeline installation include deliveries of pipeline (1), appurtenance (1), and equipment (1. 3 material truck per day
5. Worker vehicle trips for pipeline installation consist of crew (20), contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitors (1 on avg).
Worker vehicle trips for pits excavation & backfill consist of crew (6) , contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitor (1).
Worker vehicle trips for pipe bridge abutments construction consist of crew (4) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
Worker vehicle trips for pipe bridge erection consist of crew (8) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
Worker vehicle trips for installation pipe to pipe bridge consist of crew (5) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.
7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.
8. Jack and bore method production rates based on Hesperian Boulevard Pipeline Relocation Project (Spec 2020).
9. Insertion pit approximately 36 ft long by 13 ft wide by 19 ft deep and receiving pit approximately 13 ft long by 9 ft wide by 16 feet deep.
Wildcat Creek is ~ 8 ft deep per 2' contours. Receiving pit depth is 8 ft below creek bottom, slope of pipeline between jacking pit and receiving pit is 2% up.

Central Pressure Zone Pipeline (Richmond_San Pablo) - Preferred Alignment (Alternative 4)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis

Reach	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration [2] (weeks)	Haul Trucks [3] (per day)	Materials Trucks [4] (per day)	Worker Vehicles [5] (per day)	Daily One-Way Trips [6]	Max Hourly One-Way Trips [7]	
1 & 2	***Phase 1*** - 23rd St / Nevin Ave to 23rd St / Brookside Dr via 23rd Street.	8,910	36	*200*	8.9	23	4	24	102	7 24	Trucks Vehicles
3 & 4	***Phase 2*** - 23rd St / Brookside Dr to RW X574/Brookside.	670	36	*200*	0.7	23	4	24	102	7 24	Trucks Vehicles
3 & 4	***Phase 3*** - RW X574/Brookside to RW X574/Road 20.	305	48	*200*	0.3	31	4	24	118	9 24	Trucks Vehicles
Part of 2	***Phase 4*** - Wildcat Creek Crossing by Jack & Bore Method [8]										
	Pits Excavation [9]	na	na	na	2	2	1	9	24	1 9	Trucks Vehicles
	Casing Installation	170	48	10	3.4	1	1	11	26	1 11	Trucks Vehicles
	Pipeline Installation	170	36	50	0.7	0	1	15	32	0 15	Trucks Vehicles
	Pits Backfill [9]	na	na	na	4	1	1	9	22	1 9	Trucks Vehicles
Part of 3	***Phase 5*** - San Pablo Creek Crossing by Pipe Bridge Method										
	Clear and Grubbing	na	na	na	1	10	0	8	36	3 8	Trucks Vehicles
	Abutment construction	na	na	na	2	2	1	7	20	1 7	Trucks Vehicles
	Bridge delivery / erection	na	na	na	2 days	0	2	11	26	1 11	Trucks Vehicles
	Pipeline Installation	95	48	50	2 days	0	2	9	22	1 9	Trucks Vehicles
	Phase 6 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	0	6	1 0	Trucks Vehicles
	Phase 7 - Two Hot Tap Connections	0	na	na	5.0	1	3	7	22	1 7	Trucks Vehicles
	Phase 8 - Paving	9,580	na	700	2.7	10	0	13	46	3 13	Trucks Vehicles
	Total	9,845	LF of pipe		36	weeks					
	Total Excavated Material	12,948	CY					**MAXIMUM TRIPS =**	**118**	**7** **24**	**Trucks** **Vehicles**

Assumptions:

- Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).

- Construction staging area and two-day material storage to occur along the alignment.

- Construction Method for the new 36-inch Central PZ Pipeline (Richmond / San Pablo) is Open-Cut Trenching, except at Wildcat Creek & San Pablo Creek crossings.

- Excavated spoil will be hauled off site and trench will be backfilled with imported fills.

-Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).

-Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.

-New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.

- Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.

- Paving crew consists of one foreman,one HEO, two truck driver, two rakers, and two flaggers.

Note:

1. Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.
One paving crew could typically pave 700 LF of trench with 6" AC paving per day.

2. Duration does not include down-time, mobilization, demobilization nor reflect total duration

3. Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity: 20 CY - end dump trailer; 9 CY - concrete truck

4. Material truck trips for open-cut trench pipeline installation include deliveries of pipeline (2), appurtenance (1), and equipment (1) . 4 material truck per day

5. Worker vehicle trips for pipeline installation consist of crew (20), contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitors (1 on avg).
Worker vehicle trips for pits excavation & backfill consist of crew (6) , contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitor (1).
Worker vehicle trips for pipe bridge abutments construction consist of crew (4) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for pipe bridge erection consist of crew (8) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for installation pipe to pipe bridge consist of crew (5) , contractor's superintendent (1), District's inspector (1), & City's inspector (1)
Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).

6. Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.

7. Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.
Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.

8. Jack and bore method production rates based on Hesperian Boulevard Pipeline Relocation Project (Spec 2020).

9. Insertion pit approximately 36 ft long by 13 ft wide by 19 ft deep and receiving pit approximately 13 ft long by 9 ft wide by 16 feet deep.
Wildcat Creek is ~ 8 ft deep per 2' contours. Receiving pit depth is 8 ft below creek bottom, slope of pipeline between jacking pit and receiving pit is 2% up.

Central Pressure Zone Pipeline (Richmond_San Pablo) - Preferred Alignment (San Pablo Avenue Option)

Estimated Vehicle / Truck Trips that project-related activies would generate during each construction phase, on both a daily and peak hourly basis

Segment	Construction Phase	Pipe length	Pipe ID (inch)	Production Rate[1] (LF/day)	Duration[2] (weeks)	Haul Trucks[3] (per day)	Materials Trucks[4] (per day)	Worker Vehicles[5] (per day)	Daily One-Way Trips[6]	Max Hourly One-Way Trips[7]	
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3 & 4	***Phase 2A*** - 23rd St / Brookside Dr to Road 20 via 23rd St, San Pablo Avenue, as well as parcels 411-282-001 & 412-300-010 owned by	475	36	*200*	0.5	23	4	24	102	7 24	Trucks Vehicles
Part of 2	***Phase 4*** - Wildcat Creek Crossing by Jack & Bore Method[8]										
	Pits Excavation[9]	na	na	na	2	2	1	9	24	1 9	Trucks Vehicles
	Casing Installation	170	48	10	3.4	1	1	11	26	1 11	Trucks Vehicles
	Pipeline Installation	170	36	50	0.7	0	1	15	32	0 15	Trucks Vehicles
	Pits Backfill[9]	na	na	na	4	1	1	9	22	1 9	Trucks Vehicles
Part of 3	***Phase 5*** - San Pablo Creek Crossing by Pipe Bridge Method (San Pablo Avenue										
	Clear and Grubbing	na	na	na	1	10	0	8	36	3 8	Trucks Vehicles
	Abutment construction	na	na	na	2	2	1	7	20	1 7	Trucks Vehicles
	Bridge delivery / erection	na	na	na	2 days	0	2	11	26	1 11	Trucks Vehicles
	Pipeline Installation	100	36	50	2 days	0	2	9	22	1 9	Trucks Vehicles
	Phase 5 - Flushing, Pressure Testing, Chlorination	0	na	na	4.0	0	3	11	28	1 11	Trucks Vehicles
	Phase 6 - Two Hot Tap Connections	0	na	na	5.0	1	3	9	26	1 9	Trucks Vehicles
	Phase 7 - Paving	9,385	na	700	2.7	10	0	13	46	3 13	Trucks Vehicles
	Total	9,655	LF of pipe		36	weeks					
	Total Excavated Material	12,694	CY				**MAXIMUM TRIPS =**		**102**	**7** **24**	**Trucks** **Vehicles**

Assumptions:

- *Work schedule: 8-hour workday, typical construction hours M -F between 7:00 am to 7:00 pm (per ESP 494 - Mitigation Guidelines for Major Capital Projects).*
- *Construction staging area and two-day material storage to occur along the alignment.*
- *Construction Method for the new 36-inch Central PZ Pipeline (Richmond / San Pablo) is Open-Cut Trenching, except at Wildcat Creek & San Pablo Creek crossings.*
- *Excavated spoil will be hauled off site and trench will be backfilled with imported fills.*
- *Trench for 36-inch (ID) pipe is typically 4 feet 8 inches wide and 7 feet 5 inches deep (see Figure A).*
- *Each lineal foot of pipe trench will generate 1.3 cubic yard (CY) of excavated spoil and require 1 CY of imported bedding material / aggregate base.*
- *New pavement with 6 inches (typical) asphalt concrete (AC), pavement width is 2 feet plus pipe trench width.*
- *Contractor's construction crew consists of two foreman, nine laborers (include plumbers & welder), four heavy equipment operator (HEO), two truck driver, & two flaggers.*
- *Paving crew consists of one foreman,one HEO, two truck driver, two rakers, and two flaggers.*

Note:

1. *Contractor could typically install 80 to 200 lineal feet (LF), 100 LF on average, of 36-inch transmission pipeline per workday in paved areas.*
   One paving crew could typically pave 700 LF of trench with 6" AC paving per day.
2. *Duration does not include down-time, mobilization, demobilization nor reflect total duration*
3. *Haul truck trips include spoil disposal, as well as trench backfill materials and pavement deliveries. Capacity:* *20 CY - end dump trailer*; *9 CY - concrete truck*
4. *Material truck trips for open-cut trench pipeline installation include deliveries of pipeline (2), appurtenance (1), and equipment (1).* *4 material truck per day*
5. *Worker vehicle trips for pipeline installation consist of crew (20), contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitors (1 on avg).*
   Worker vehicle trips for pits excavation & backfill consist of crew (6) , contractor's superintendent (1), District's inspector (1), City's inspector (1), & visitor (1).
   Worker vehicle trips for pipe bridge abutments construction consist of crew (4) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
   Worker vehicle trips for pipe bridge erection consist of crew (8) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
   Worker vehicle trips for installation pipe to pipe bridge consist of crew (5) , contractor's superintendent (1), District's inspector (1), & City's inspector (1).
   Worker vehicle trips for paving consist of crew (9), contractor's superintendent (1), District's inspector (1), City's inspector (1).
6. *Account for haul trucks, material trucks and worker vehicles going to and leaving the project site on a daily basis.*
7. *Max hourly one-way trucks is estimated by averaging the number of trucks to the job site on a daily basis over an 8-hour period.*
   Max hourly one-way vehicles is estiamted by assuming all workers arriving and leaving the job site in an one-hour period.
8. *Jack and bore method production rates based on Hesperian Boulevard Pipeline Relocation Project (Spec 2020).*
9. *Insertion pit approximately 36 ft long by 13 ft wide by 19 ft deep and receiving pit approximately 13 ft long by 9 ft wide by 16 feet deep.*
   Wildcat Creek is ~ 8 ft deep per 2' contours. Receiving pit depth is 8 ft below creek bottom, slope of pipeline between jacking pit and receiving pit is 2% up.

APPENDIX D

Traffic Control Scheme Figures

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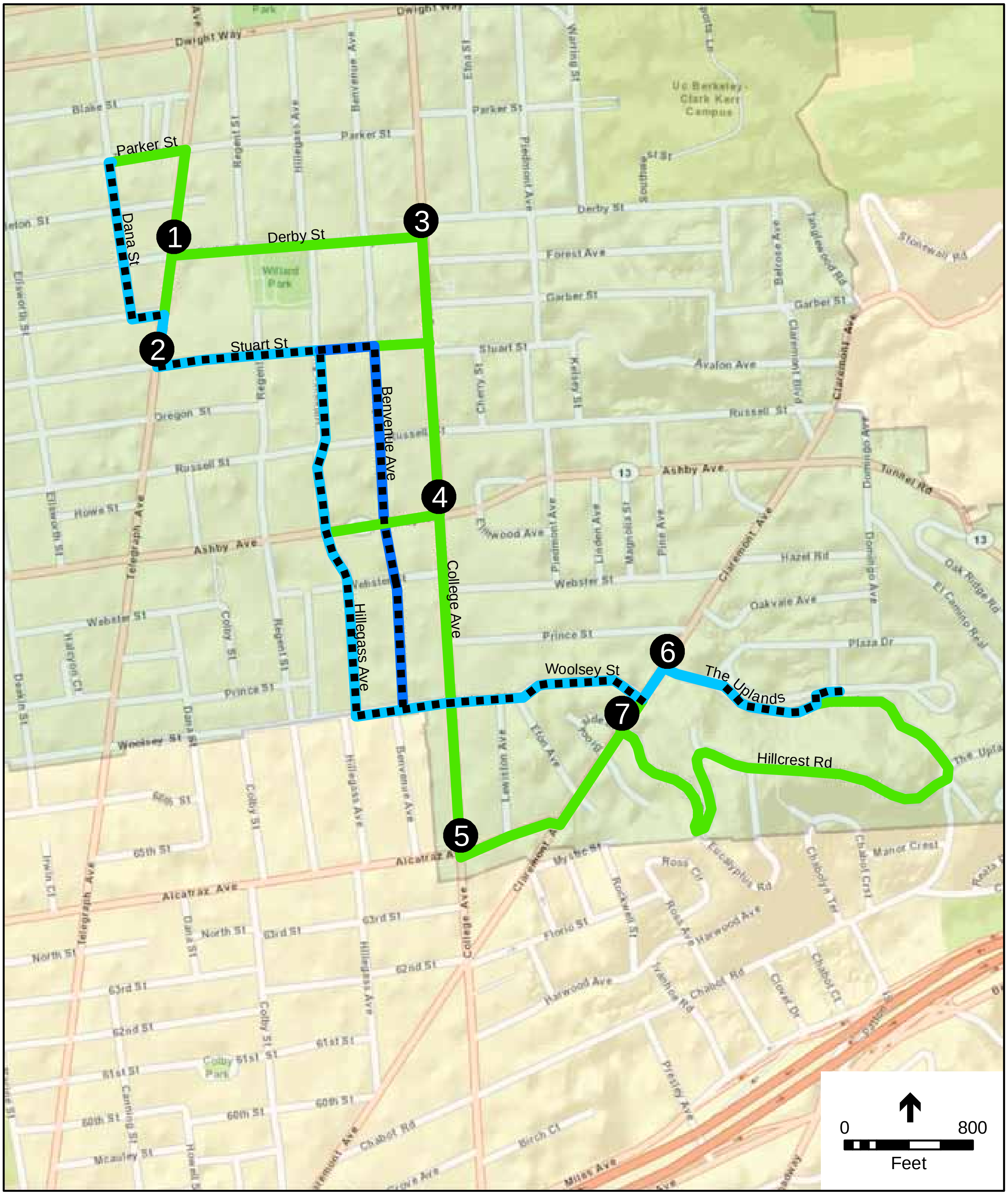

Proposed Road Closures

Wildcat Pipeline (Berkeley)

Alternative Alignment (Benvenue Ave)

Detour Routes

2 Study Intersections

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Figure TC-1

Proposed Detour Routes

Wildcat Pipeline (Berkeley)

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LEGEND:

- TRAFFIC CONE OR DELINEATOR
- TEMPORARY SIGN (SPACED AT 125')
- DIRECTION OF TRAVEL
- CONSTRUCTION WORK AREA
- FLASHING ARROW SIGN (FAS)
- FAS SUPPORT OR TRAILER

Figure TC-2
Traffic Control Plan - Telegraph Ave.
Wildcat Pipeline (Berkeley)

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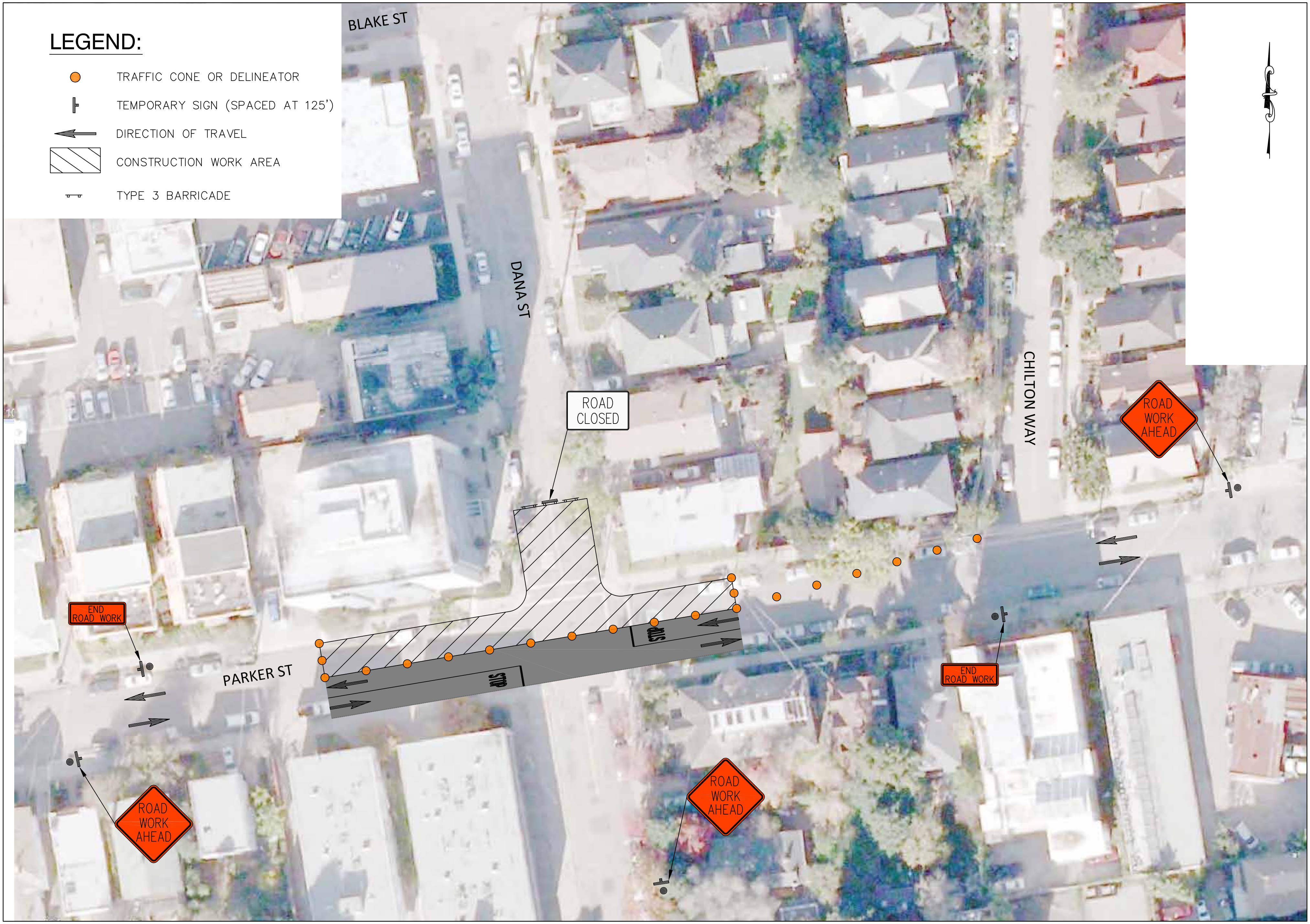

Figure TC-3
Traffic Control Plan - Parker St./Dana St. Tie-in
Wildcat Pipeline (Berkeley)

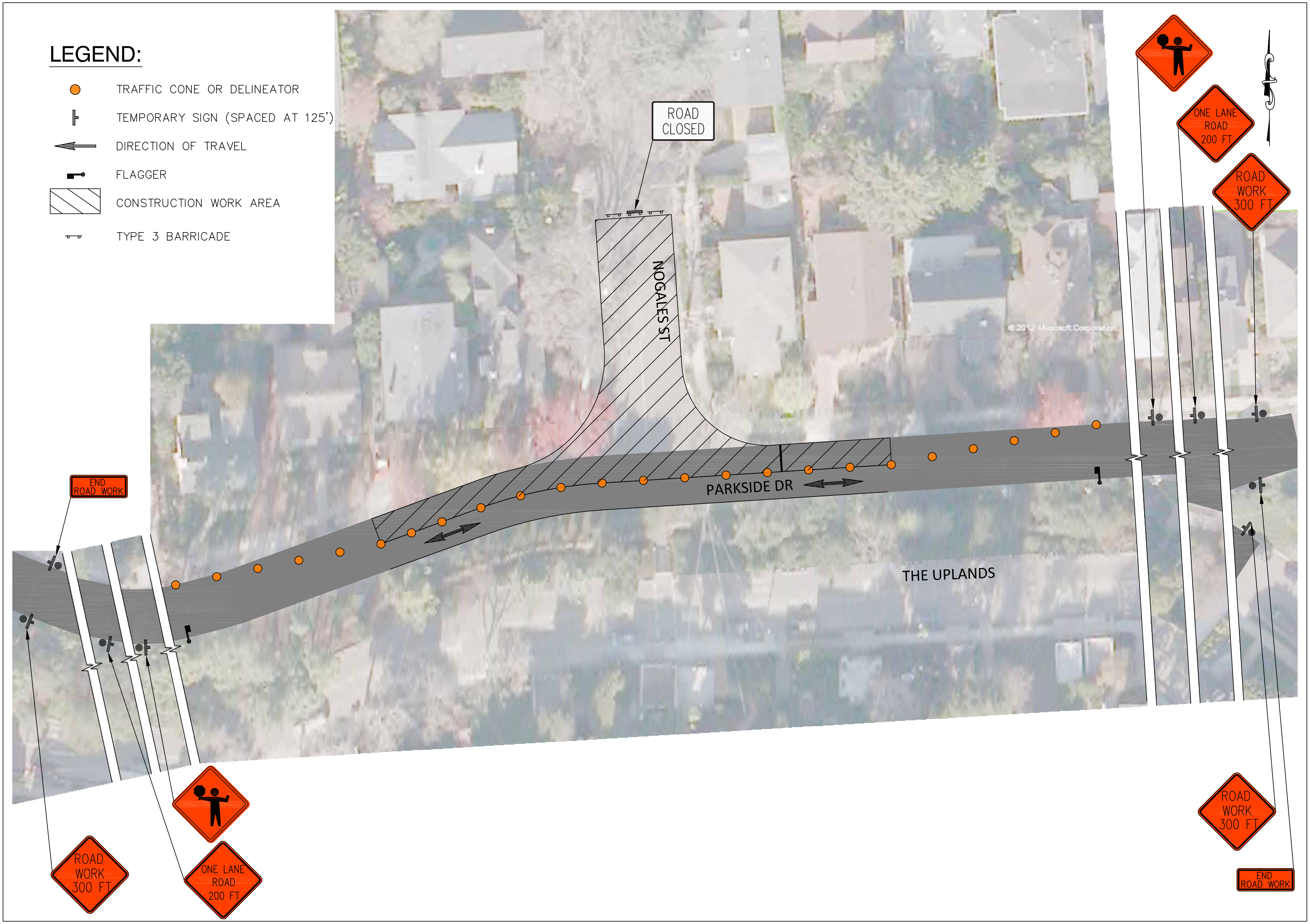

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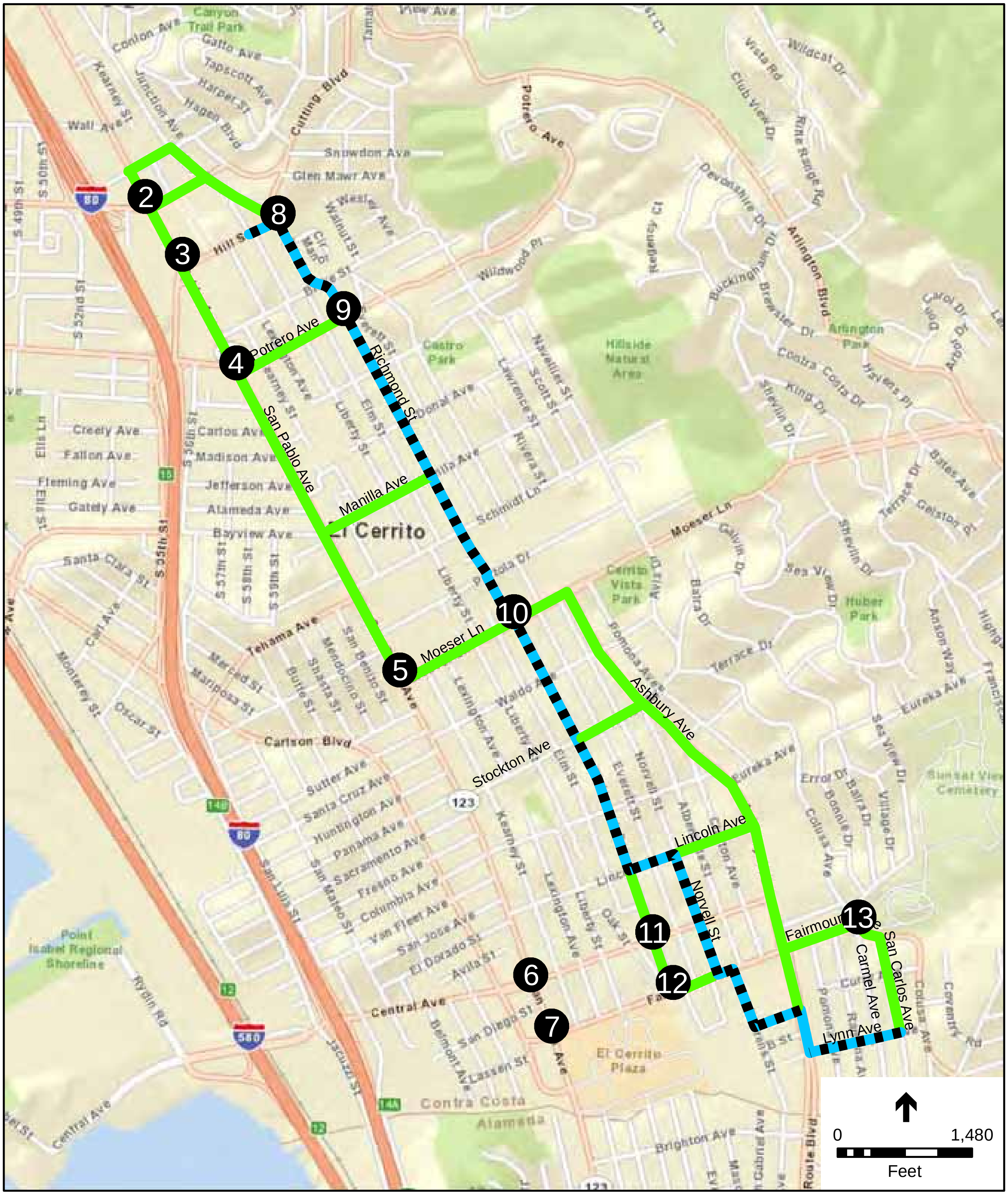
Figure TC-4
Traffic Control Plan - Parkside Dr./Nogales St. Tie-in
Wildcat Pipeline (Berkeley)



Proposed Road Closures
Wildcat Pipeline (El Cerrito)
Detour Routes
2 Study Intersections

EBMUD West of Hills Northern Piplines . 211488

Figure TC-5
Proposed Detour Routes
Wildcat Pipeline (El Cerrito)

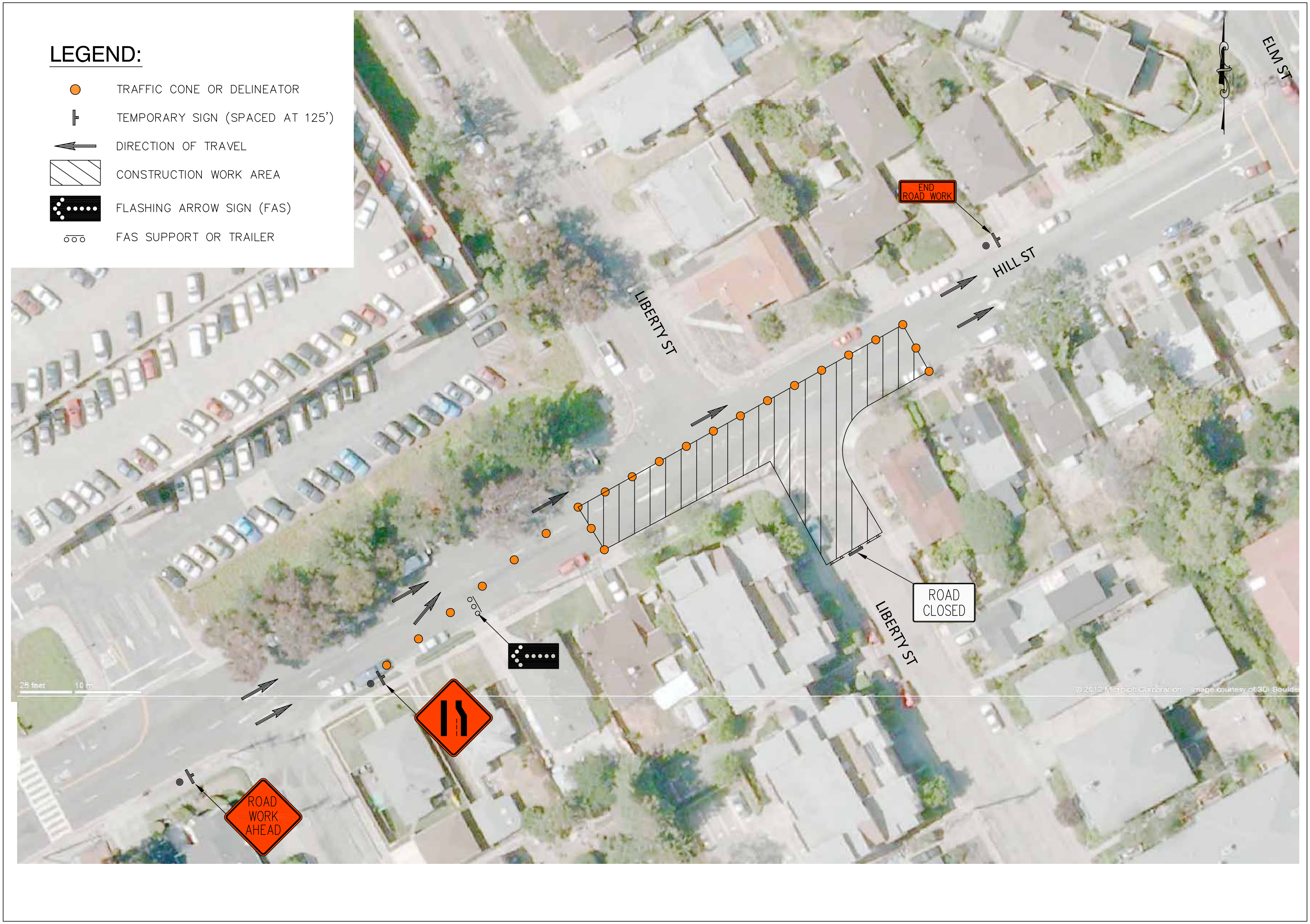


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Figure TC-6

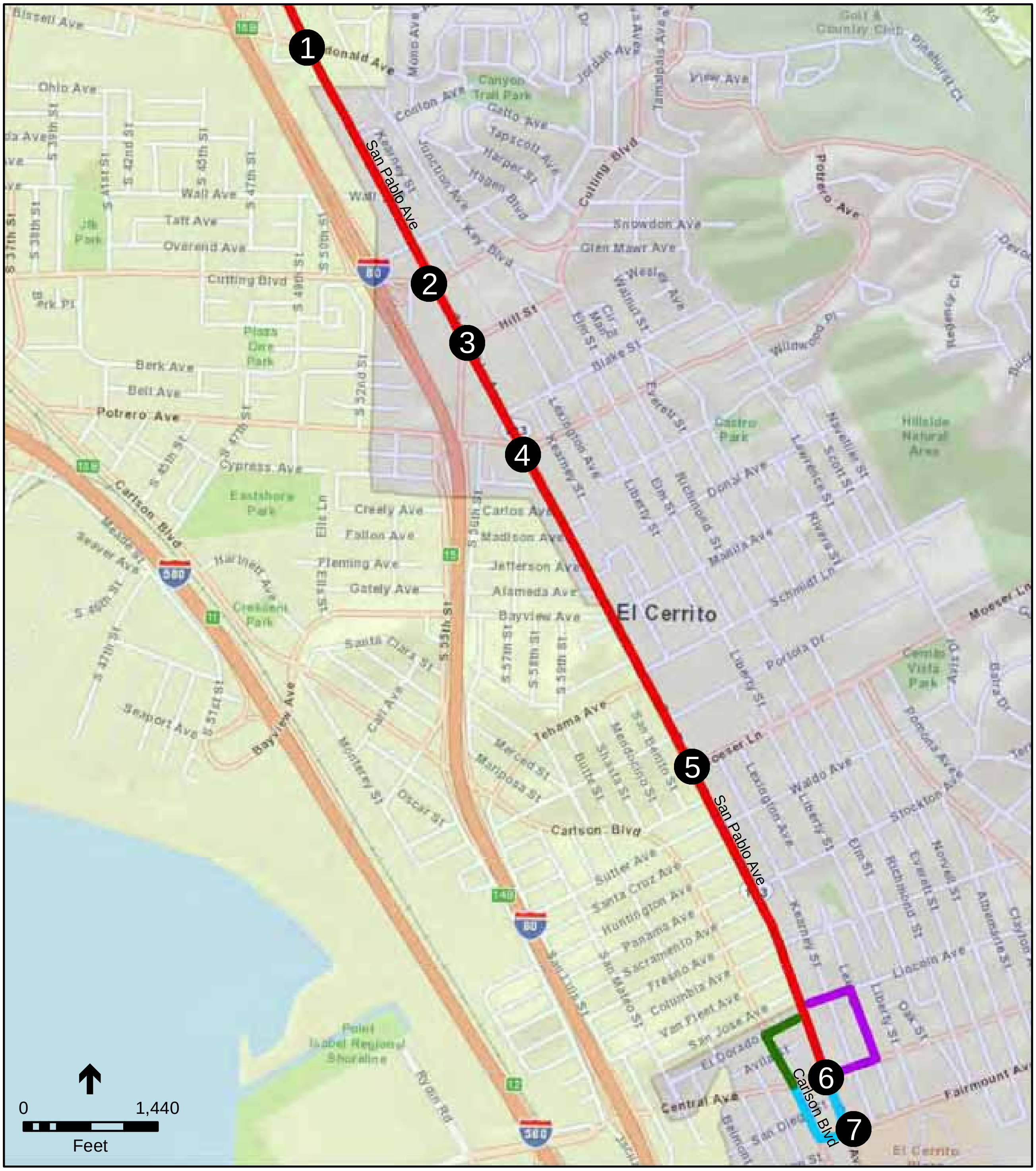
Traffic Control Plan - Hill St./Liberty St. Tie-in
Wildcat Pipeline (El Cerrito)

EBMUD West of Hills Northern Pipelines . 211488

Figure TC-7

Traffic Control Plan - Lynn Ave./San Carlos Ave. Tie-in

Wildcat Pipeline (El Cerrito)



Central Pressure Zone Pipeline (El Cerrito/Richmond)

Detour Route for WB Central Avenue Through Traffic

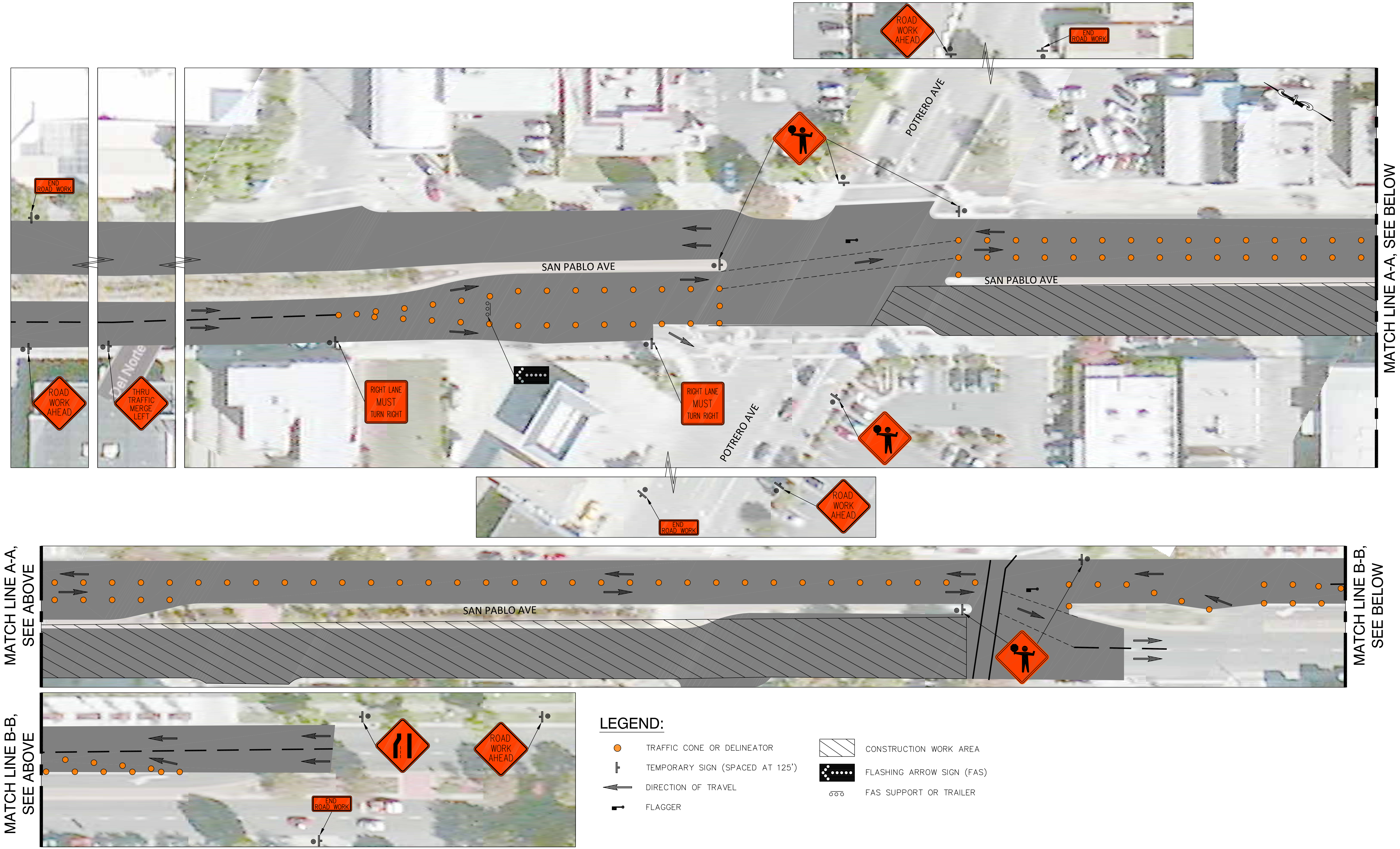
Detour Route for EB LT Central Avenue Traffic

Detour Route for EB Central Avenue Buses and Trucks

2 Study Intersections

EBMUD West of Hills Northern Piplines . 211488

Figure TC-8
Proposed Detour Routes
Central Pressure Zone Pipeline (El Cerrito/Richmond)



EBMUD West of Hills Northern Pipelines . 211488

Figure TC-9

Traffic Control Plan - San Pablo Ave. Segment Detail

Central Pressure Zone Pipeline (El Cerrito/Richmond)

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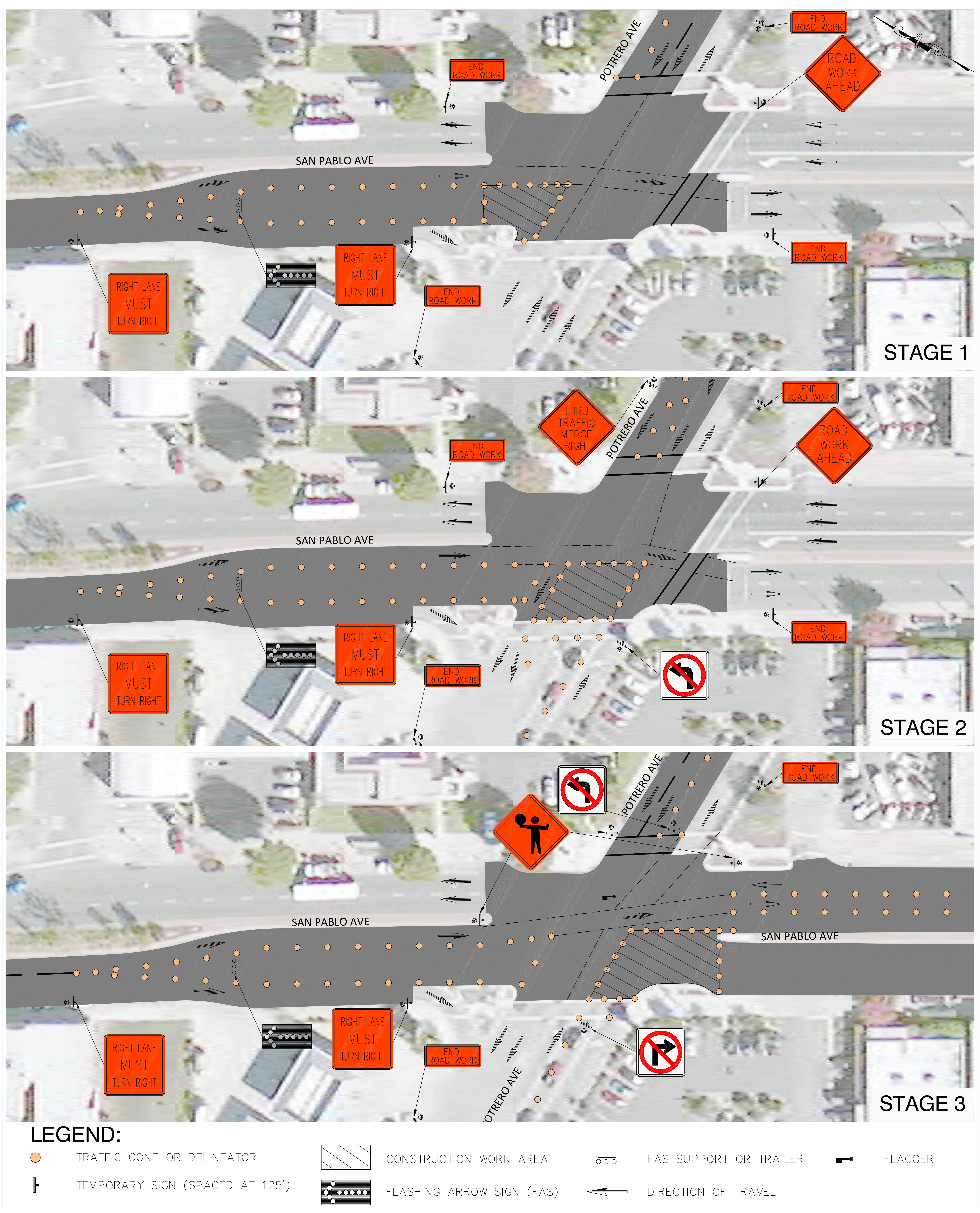


EBMUD West of Hills Northern Pipelines . 211488

Figure TC-10

Traffic Control Plan - San Pablo Ave. Intersection Detail
Central Pressure Zone Pipeline (El Cerrito/Richmond)

Figure TC-11

Traffic Control Plan - San Pablo Ave./Nevin Ave. Tie-in

Central Pressure Zone Pipeline (El Cerrito/Richmond)

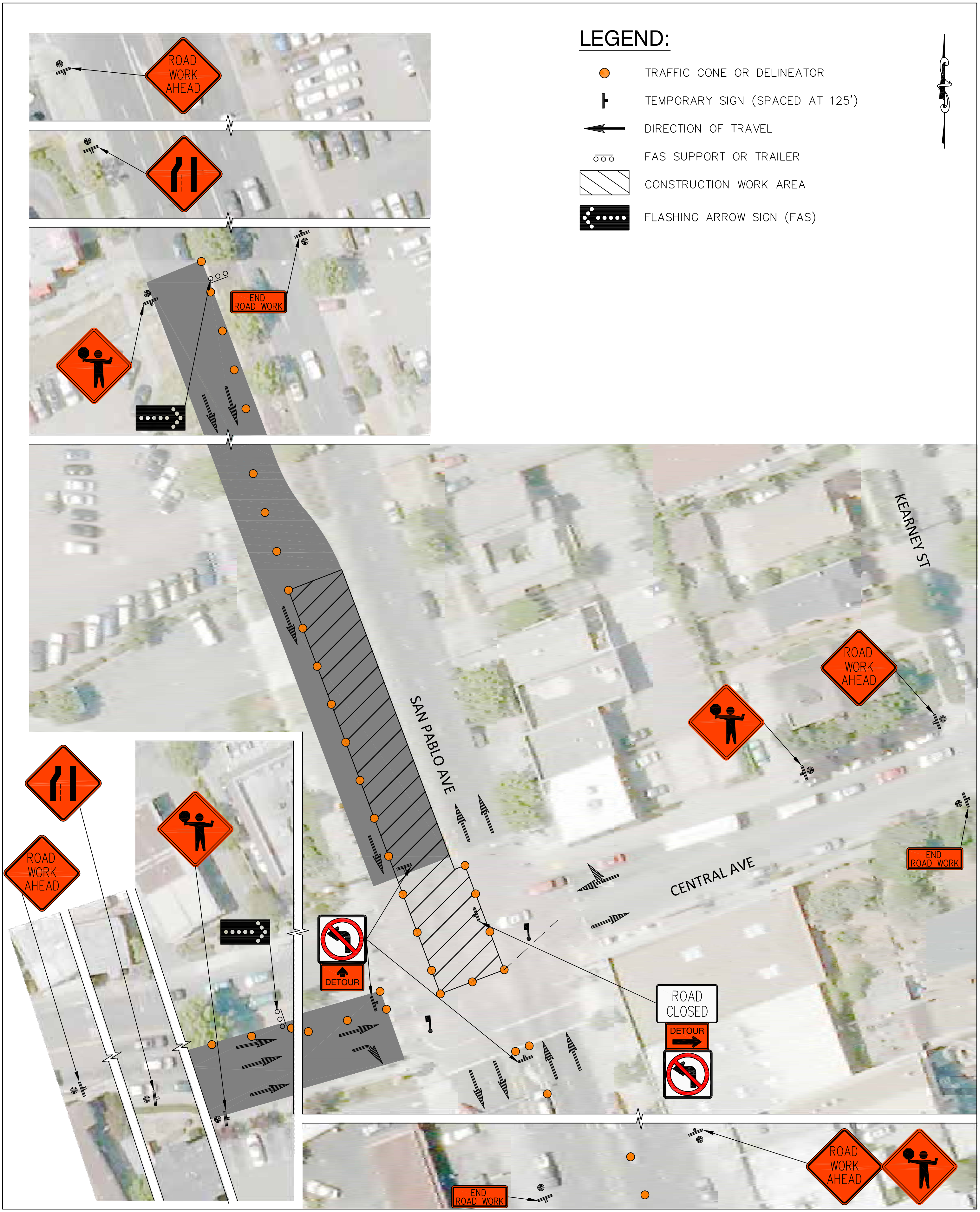
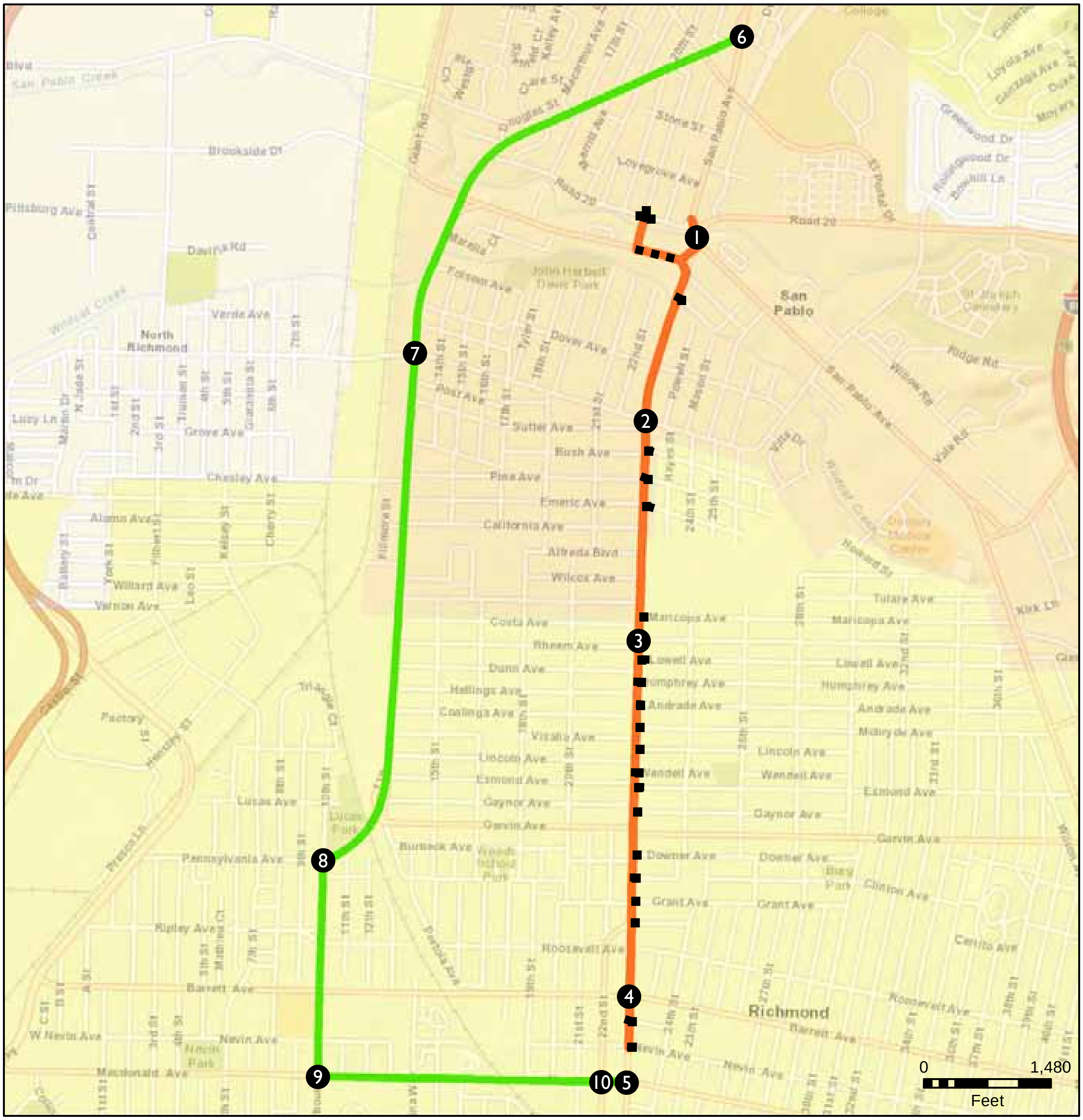


Figure TC-12
Traffic Control Plan - San Pablo Ave./Central Ave. Tie-in
Central Pressure Zone Pipeline (El Cerrito/Richmond)



❷ Study Intersections

■ Proposed Road Closure

Central PZ Pipeline (Richmond/San Pablo) Location

Detour Route

N

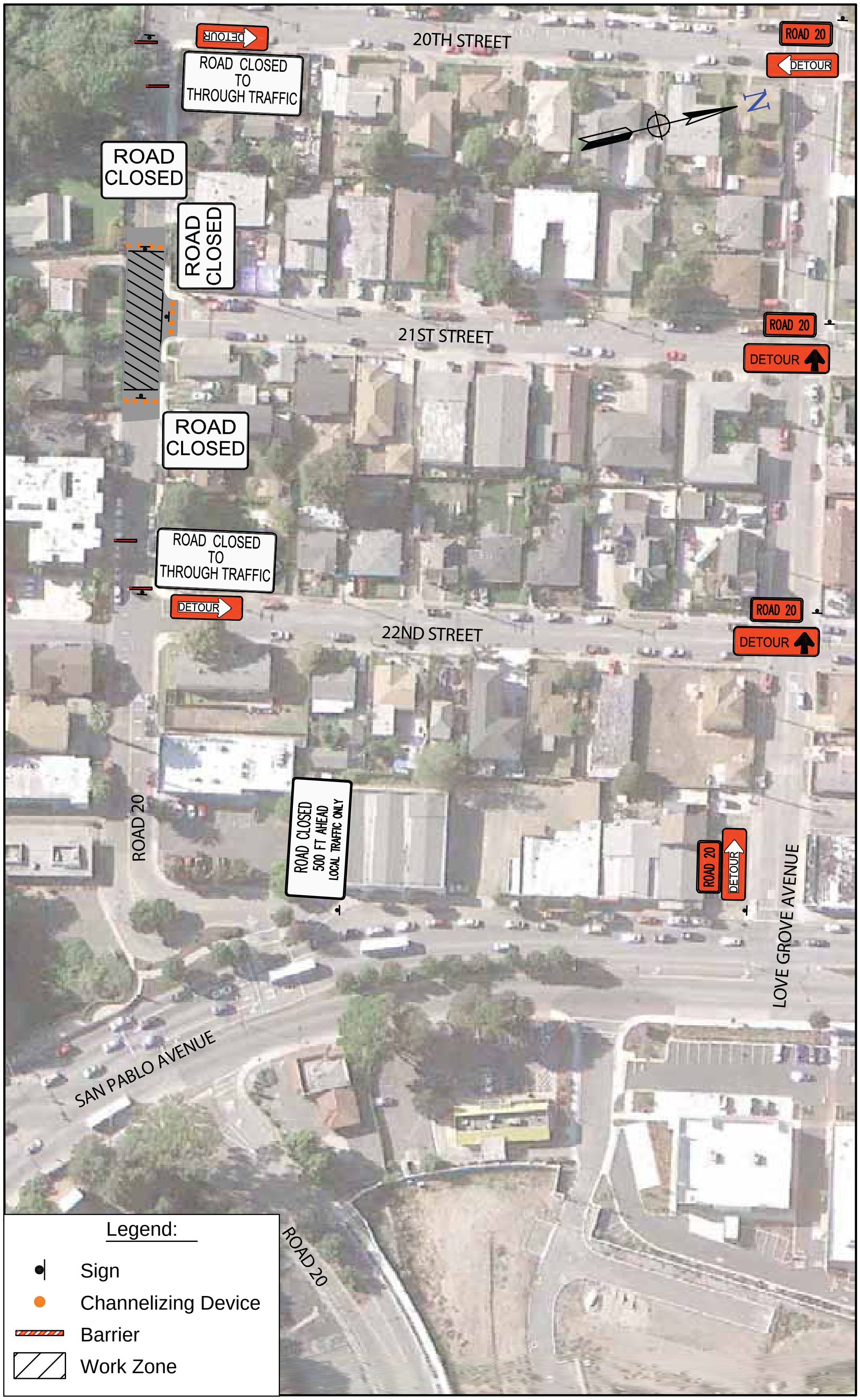
SOURCE: W-Trans, ESRI

EBMUD West of Hills Northern Pipelines . 211488

Figure TC-13

Proposed Detour Routes

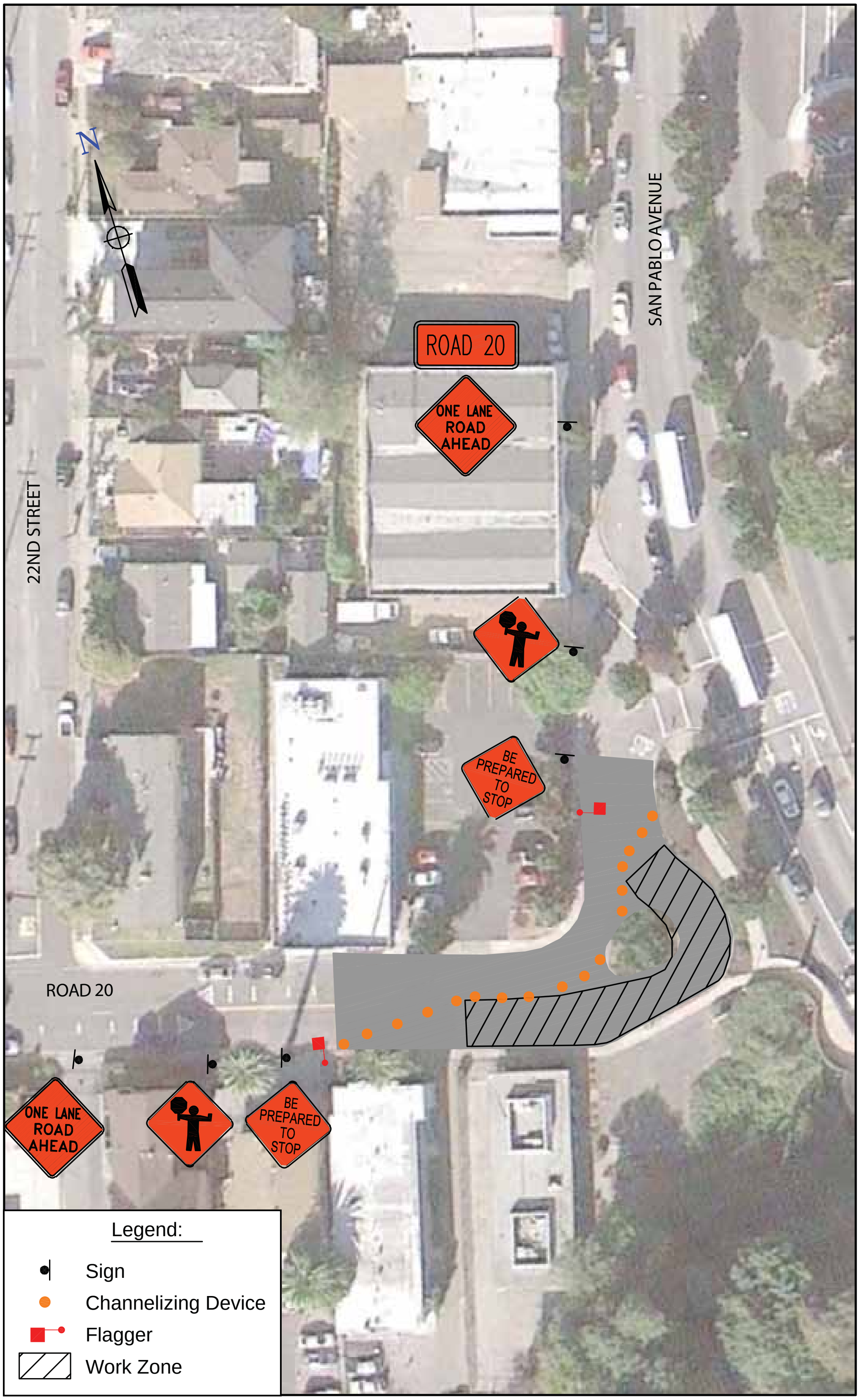
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

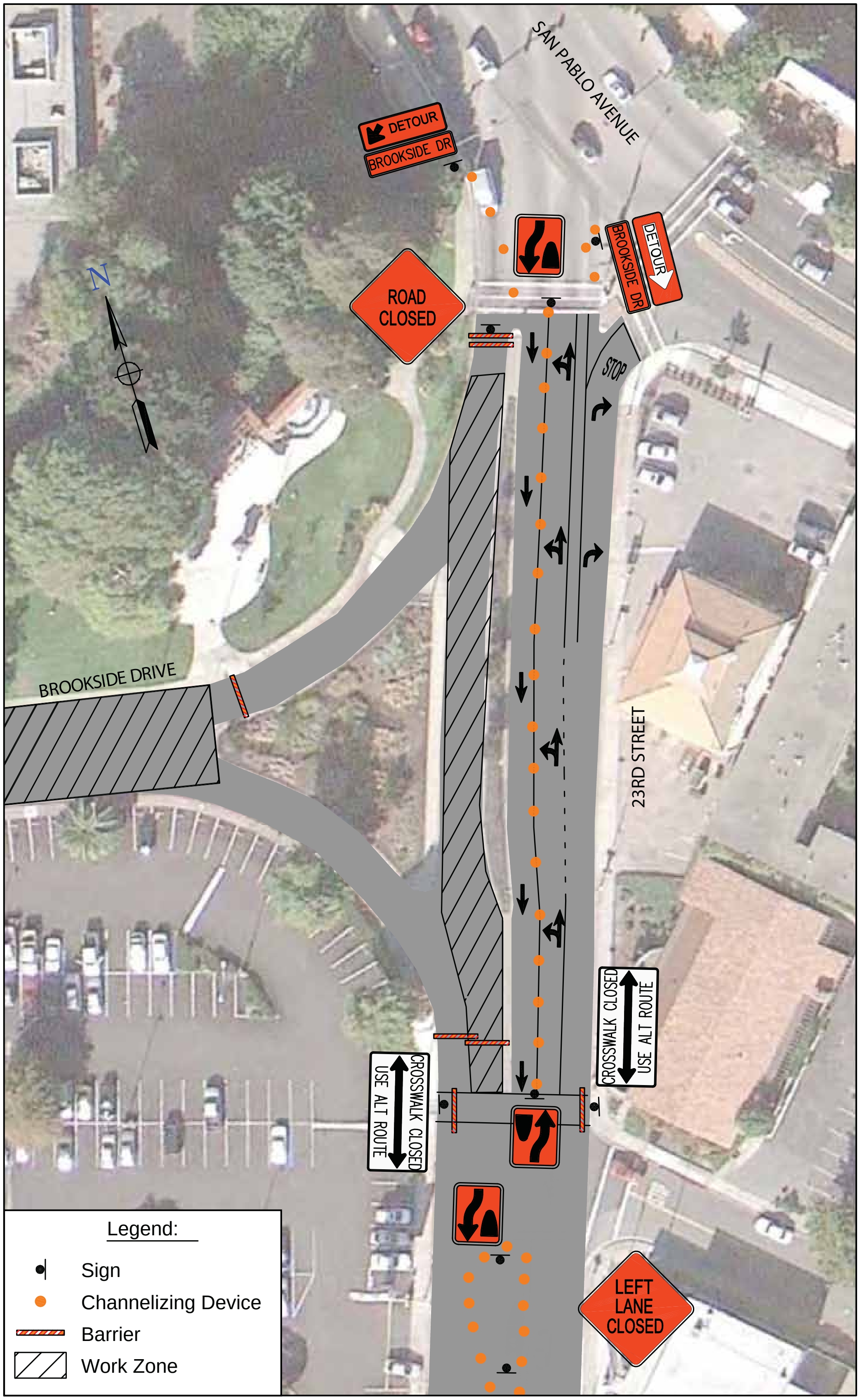
Figure TC-14
Traffic Control Plan – Road 20/21st St. Tie-in
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

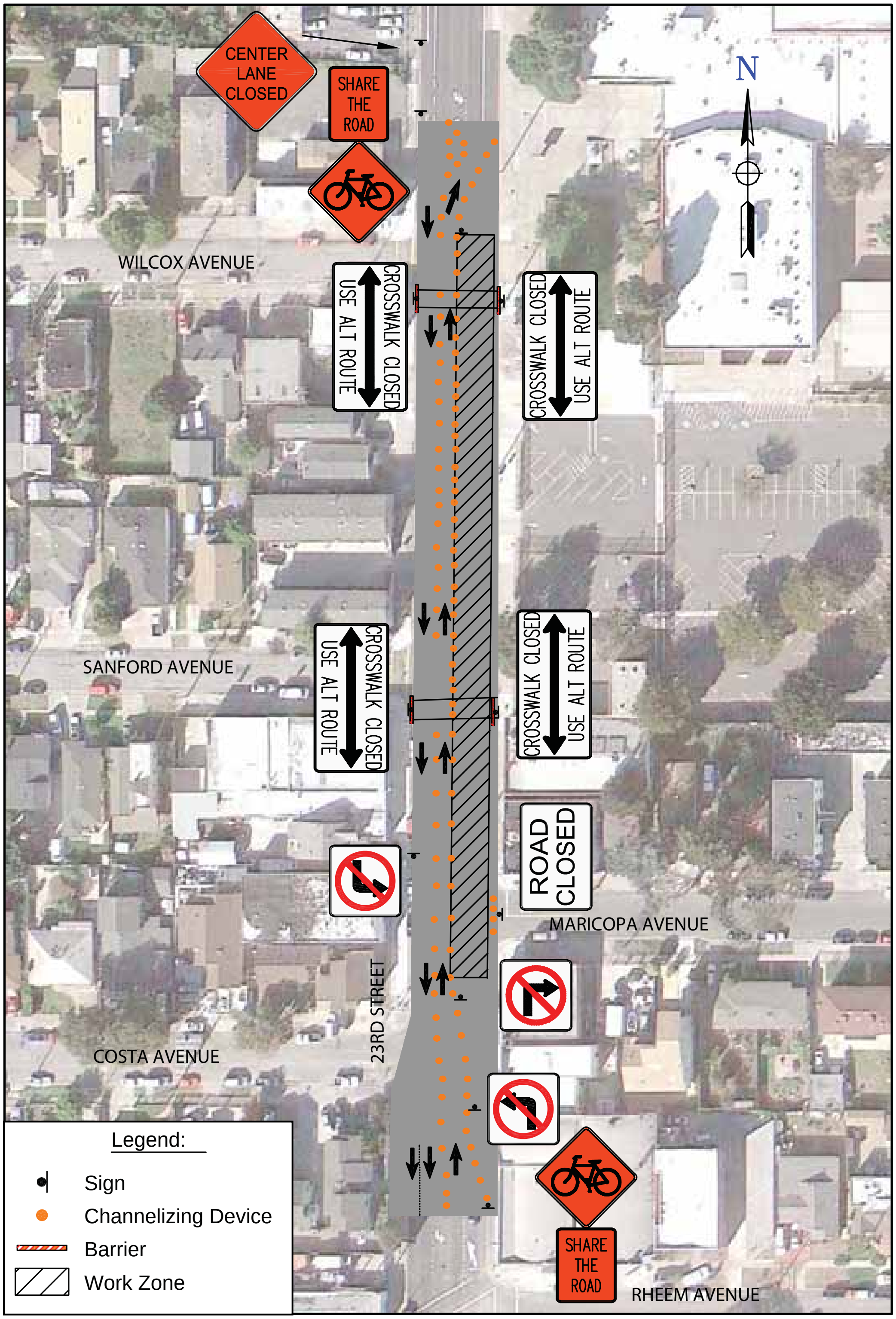
Figure TC-15
Traffic Control Plan – Alternative Road 20 Tie-in
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

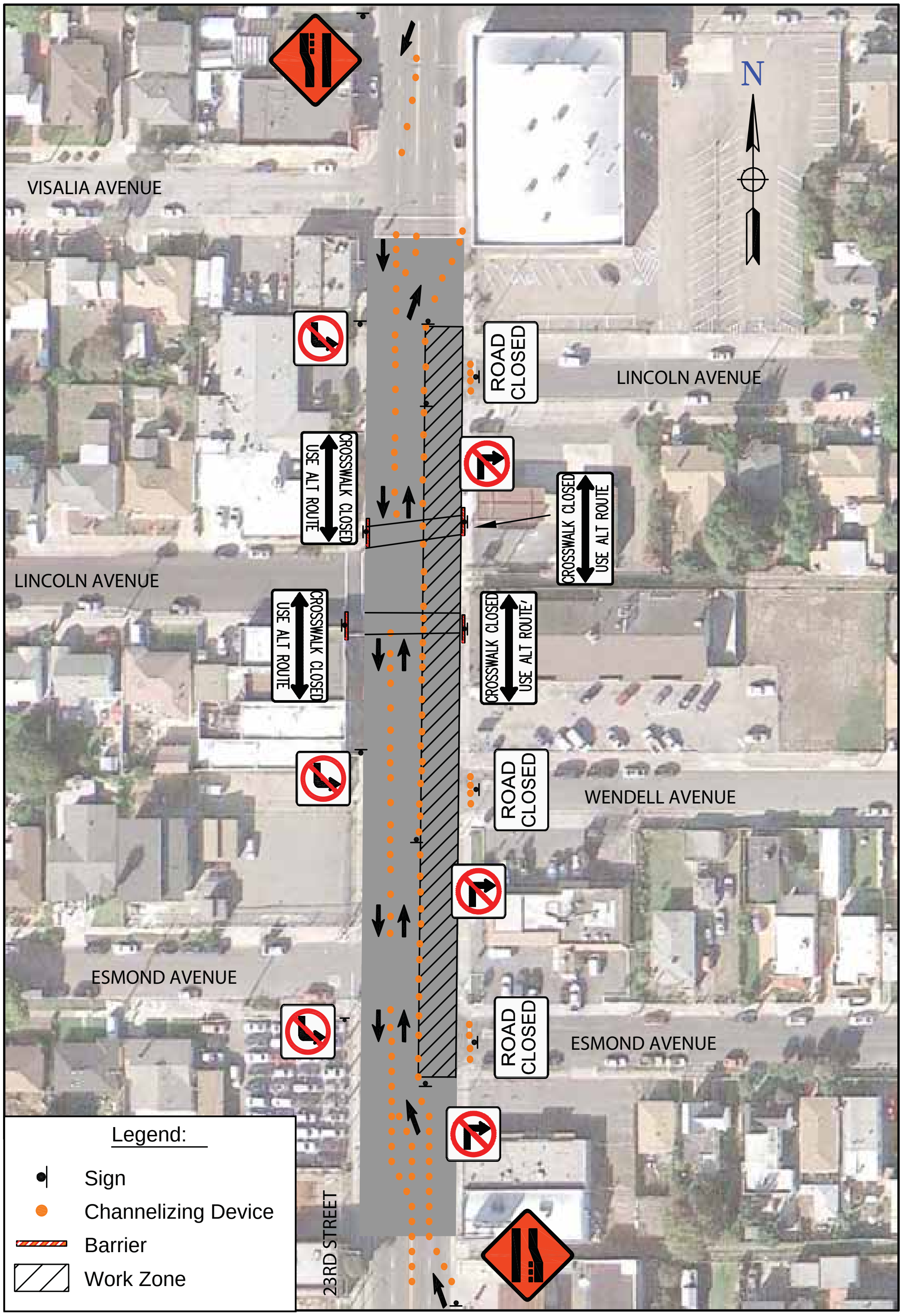
Figure TC-16
Traffic Control Plan – 23rd St. at Brookside Dr. Detail
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

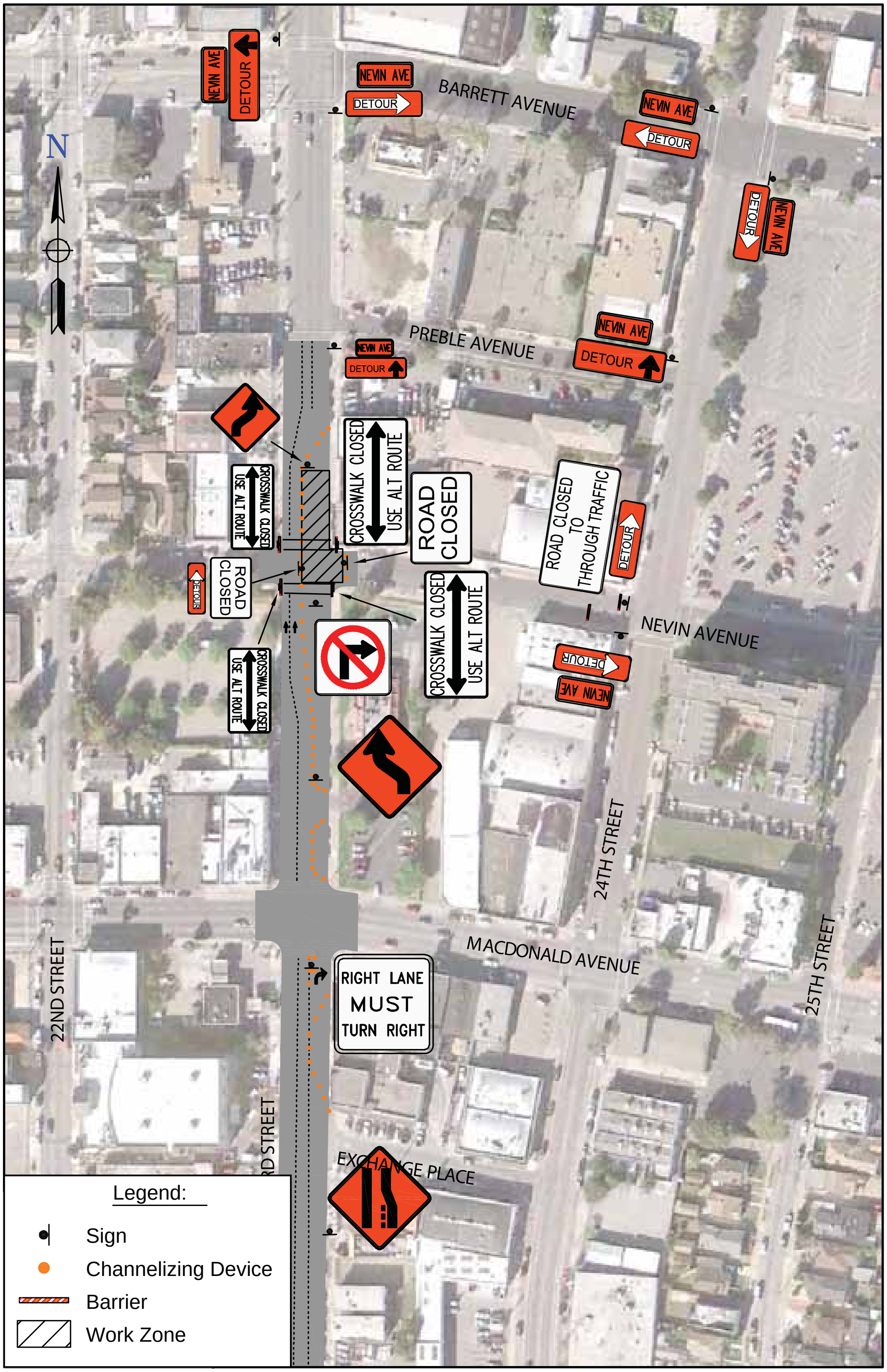
Figure TC-17
Traffic Control Plan – 23rd St 3-Lane Section Detail
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

Figure TC-18
Traffic Control Plan – 23rd St 3-Lane Section Detail
Central Pressure Zone Pipeline (Richmond/San Pablo)



SOURCE: W-Trans

EBMUD West of Hills Northern Pipelines . 211488

Figure TC-19

Traffic Control Plan – 23rd St./Nevin Ave. Tie-in

Central Pressure Zone Pipeline (Richmond/San Pablo)

APPENDIX E

California Manual on Uniform Traffic Control Typical Applications

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CHAPTER 6H. TYPICAL APPLICATIONS

Section 6H.01 Typical Applications

Support:

01 Chapter 6G contains discussions of typical TTC activities. This Chapter presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures. For convenience in using the typical application diagrams, Tables 6C-1 and 6C-4 are reproduced in this Chapter as Tables 6H-3 and 6H-4, respectively.

02 Procedures for establishing TTC zones vary with such conditions as road configuration, location of the work, work activity, duration of work, road user volumes, road vehicle mix (buses, trucks, cars, motorcycles, and bicycles), and road user speeds.

03 In general, the procedures illustrated represent minimum solutions for the situations depicted. Except for the notes (which are clearly classified using headings as being Standard, Guidance, Option, or Support), the information presented in the typical applications can generally be regarded as Guidance.

Option:

04 Other devices may be added to supplement the devices and device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

Support:

05 Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6H-3 is used for the determination of sign spacing and other dimensions for various area and roadway types.

06 Table 6H-1 is an index of the 46 typical applications. Typical applications are shown on the right-hand page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6H-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6H-3. The formulas for determining taper lengths are provided in Table 6H-4.

07 Most of the typical applications show TTC devices for only one direction.

Guidance:

08 *The spacing of channelizing devices should not exceed the maximum distances shown in Table 6F-101(CA).*

Table 6H-1. Index to Typical Applications

Typical Application Description	Typical Application Number
Work Outside of the Shoulder (see Section 6G.06)	
Work Beyond the Shoulder	TA-1
Blasting Zone	TA-2
Work on the Shoulder (see Sections 6G.07 and 6G.08)	
Work on the Shoulders	TA-3
Short Duration or Mobile Operation on a Shoulder	TA-4
Shoulder Closure on a Freeway	TA-5
Shoulder Work with Minor Encroachment	TA-6
Work Within the Traveled Way of a Two-Lane Highway (see Section 6G.10)	
Road Closed with a Diversion	TA-7
Roads Closed with an Off-Site Detour	TA-8
Overlapping Routes with a Detour	TA-9
Lane Closure on a Two-Lane Road Using Flaggers	TA-10
Lane Closure on a Two-Lane Road with Low Traffic Volumes	TA-11
Lane Closure on a Two-Lane Road Using Traffic Control Signals	TA-12
Temporary Road Closure	TA-13
Haul Road Crossing	TA-14
Work in the Center of a Road with Low Traffic Volumes	TA-15
Surveying Along the Center Line of a Road with Low Traffic Volumes	TA-16
Mobile Operations on a Two-Lane Road	TA-17
Work Within the Traveled Way of an Urban Street (see Section 6G.11)	
Lane Closure on a Minor Street	TA-18
Detour for One Travel Direction	TA-19
Detour for a Closed Street	TA-20
Work Within the Traveled Way at an Intersection and on Sidewalks (see Section 6G.13)	
Lane Closure on the Near Side of an Intersection	TA-21
Right-Hand Lane Closure on the Far Side of an Intersection	TA-22
Left-Hand Lane Closure on the Far Side of an Intersection	TA-23
Half Road Closure on the Far Side of an Intersection	TA-24
Multiple Lane Closures at an Intersection	TA-25
Closure in the Center of an Intersection	TA-26
Closure at the Side of an Intersection	TA-27
Sidewalk Detour or Diversion	TA-28
Crosswalk Closures and Pedestrian Detours	TA-29
Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway (see Section 6G.12)	
Interior Lane Closure on a Multi-Lane Street	TA-30
Lane Closure on a Street with Uneven Directional Volumes	TA-31
Half Road Closure on a Multi-Lane, High-Speed Highway	TA-32
Stationary Lane Closure on a Divided Highway	TA-33
Lane Closure with a Temporary Traffic Barrier	TA-34
Mobile Operation on a Multi-Lane Road	TA-35
Work Within the Traveled Way of a Freeway or Expressway (see Section 6G.14)	
Lane Shift on a Freeway	TA-36
Double Lane Closure on a Freeway	TA-37
Interior Lane Closure on a Freeway	TA-38
Median Crossover on a Freeway	TA-39
Median Crossover for an Entrance Ramp	TA-40
Median Crossover for an Exit Ramp	TA-41
Work in the Vicinity of an Exit Ramp	TA-42
Partial Exit Ramp Closure	TA-43
Work in the Vicinity of an Entrance Ramp	TA-44
Temporary Reversible Lane Using Movable Barriers	TA-45
Work in the Vicinity of a Grade Crossing (see Section 6G.18)	
Work in the Vicinity of a Grade Crossing	TA-46

Table 6H-1(CA). Index to Typical Applications

Typical Application Description	Typical Application Number
Work affecting Pedestrian and Bicycle Facilities (see Section 6G.05)	
Shoulder Closure on Urban (Low Speed) Locations to Accommodate Bicyclists	TA-101(CA)
Lane Closure on Freeway, Expressway, Rural and Urban (High Speed) Locations to Accommodate Bicyclists	TA-102(CA)
Detour for Bike Lane on Roads with Closure of One Travel Direction	TA-103(CA)
Right Lane and Bike Lane Closure on Far Side of Intersection	TA-104(CA)
Work Within the Traveled Way of a Two-Lane Highway (see Section 6G.10)	
Lane Shift on Road with Low Traffic Volumes	TA-105(CA)

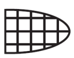
Table 6H-2. Meaning of Symbols on Typical Application Diagrams


Arrow board


Arrow board support or trailer (shown facing down)


Changeable message sign or support trailer


Channelizing device


Crash cushion


Direction of temporary traffic detour


Direction of traffic

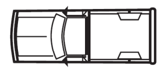

Flagger


High-level warning device (Flag tree)


Longitudinal channelizing device


Luminaire


Pavement markings that should be removed for a long-term project

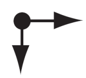

Shadow vehicle

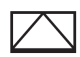

Sign (shown facing left)


Surveyor

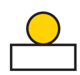

Temporary barrier

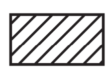

Temporary barrier with warning light


Traffic or pedestrian signal


Truck-mounted attenuator


Type 3 barricade


Warning light


Work space

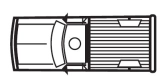

Work vehicle

Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)* - 25 mph or less	100 feet	100 feet	100 feet
Urban (low speed)* - more than 25 mph to 40 mph	250 feet	250 feet	250 feet
Urban (high speed)* - more than 40 mph	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* ~~Speed category to be determined by highway agency.~~

** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

Table 6H-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

Table 6H-4(CA). Taper Length Criteria for Temporary Traffic Control Zones (for 12 feet Offset Width)

Speed* S (mph)	Minimum Taper Length** for Width of Offset 12 feet (W)			
	Merging L (feet)	Shifting L/2 (feet)	Shoulder L/3 (feet)	Down Stream (feet)***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50

* - Posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph.

** - For other offsets use the following merging taper length formula for L:
For speeds of 40 mph or less, $L=WS^2/60$
For speeds of 45 mph or more, $L=WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

*** - Maximum downstream taper length is 100 feet. See Section 6C.08.

Notes for Figure 6H-8—Typical Application 8
Road Closure with an Off-Site Detour

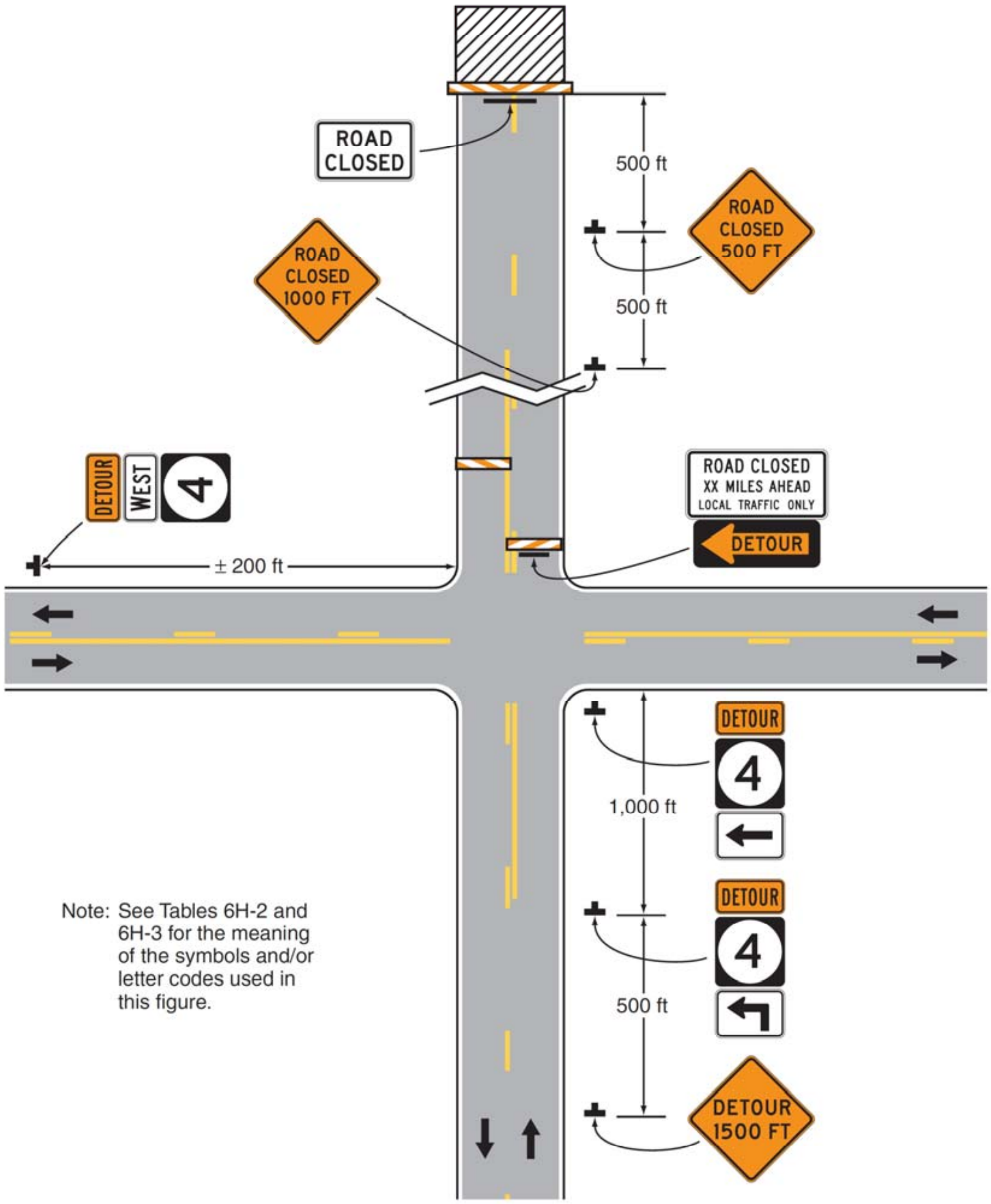
Guidance:

1. Regulatory traffic control devices should be modified as needed for the duration of the detour.

Option:

2. If the road is opened for some distance beyond the intersection and/or there are significant origin/ destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type 3 Barricades may be located at the edge of the traveled way.
3. A Route Sign Directional assembly may be placed on the far left corner of the intersection to augment or replace the one shown on the near right corner.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Cardinal direction plaques may be used with route signs.

Figure 6H-8. Road Closure with an Off-Site Detour (TA-8)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 8

Notes for Figure 6H-18—Typical Application 18
Lane Closure on a Minor Street

Standard:

1. This TTC shall be used only for low-speed facilities having low traffic volumes.

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

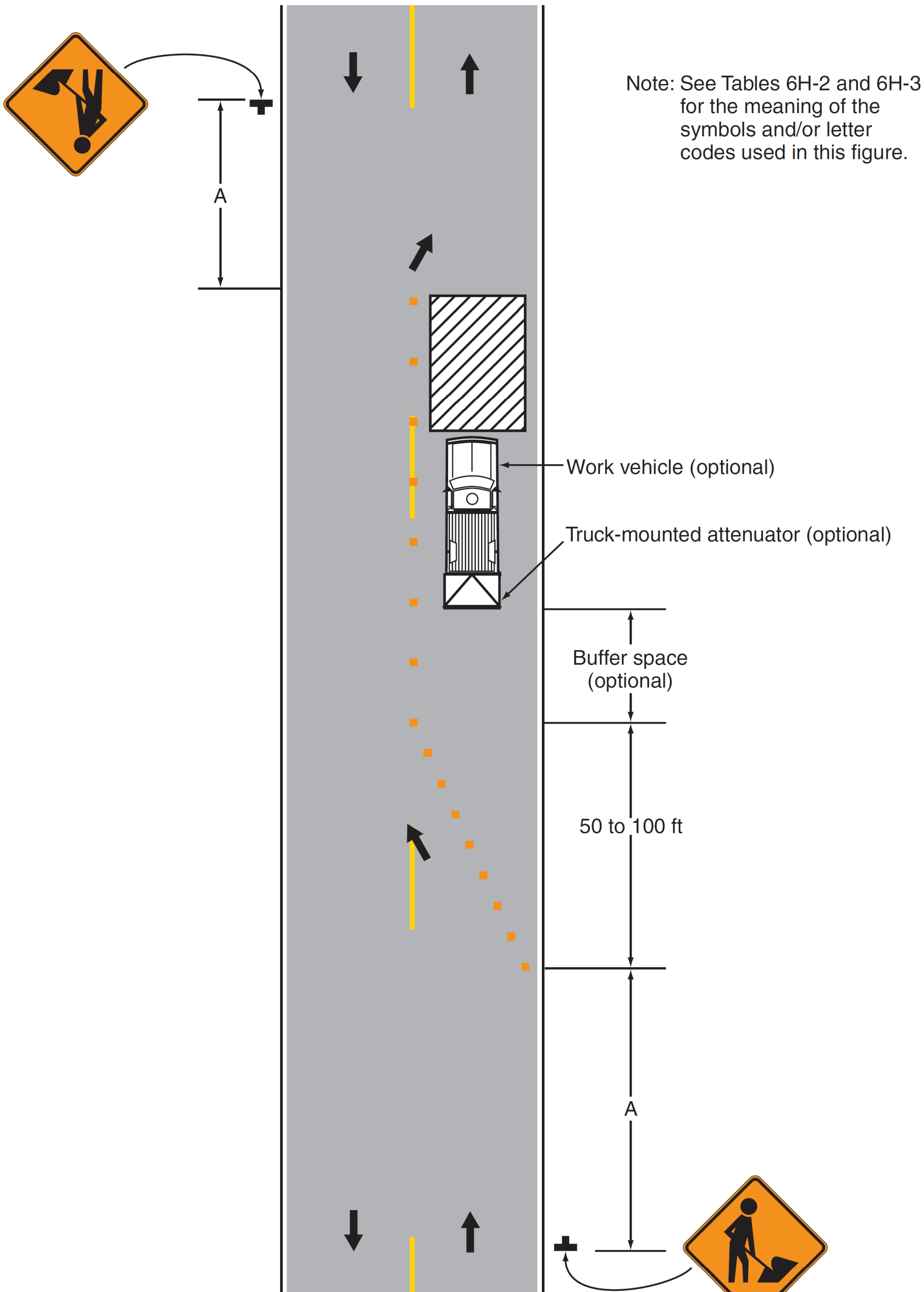
Standard:

3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure ~~6H-10~~ 6H-10(CA).

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.

Figure 6H-18. Lane Closure on a Minor Street (TA-18)



Typical Application 18

Notes for Figure 6H-20—Typical Application 20
Detour for a Closed Street

Guidance:

1. This plan should be used for streets without posted route numbers.

2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type 3 Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

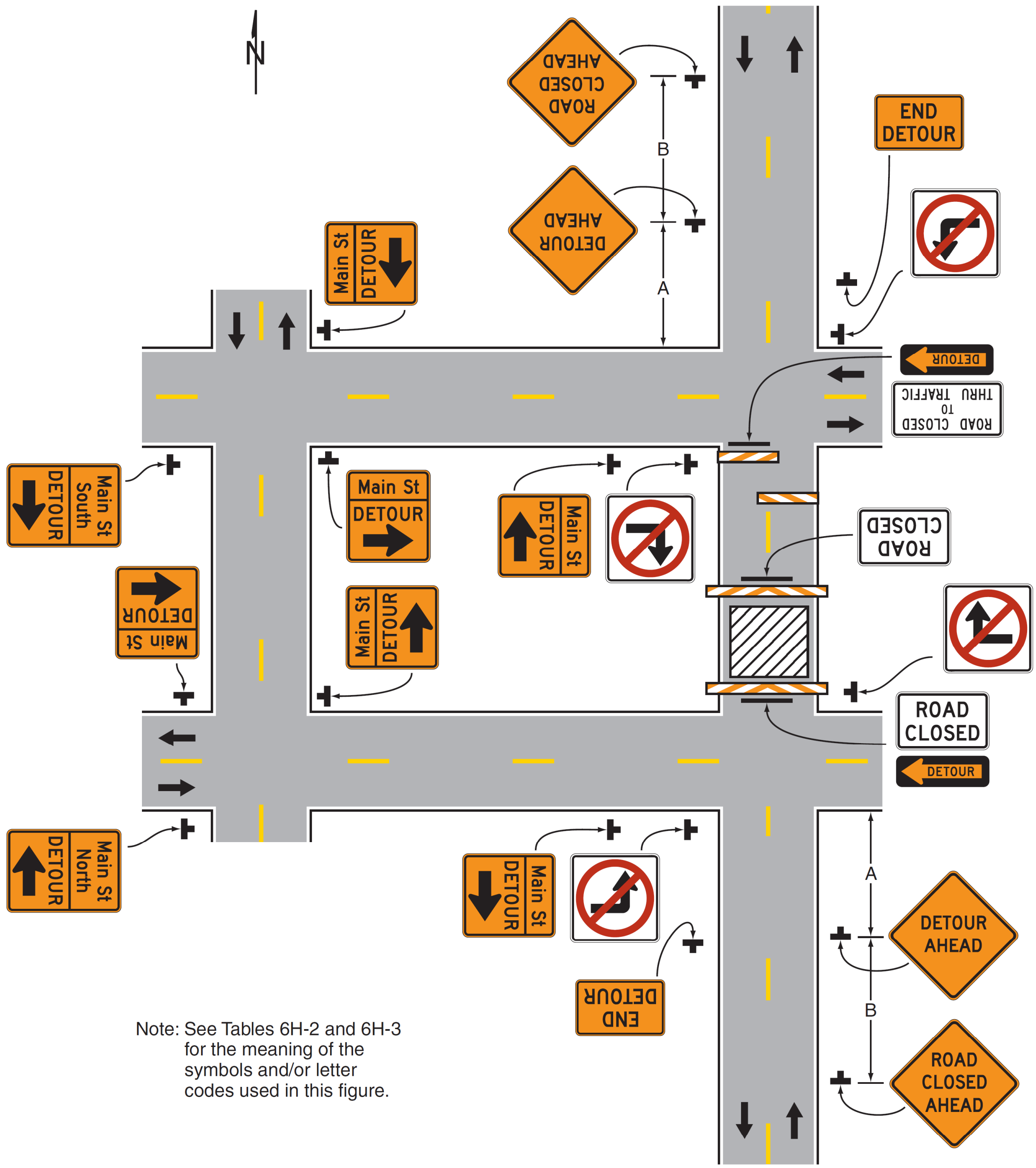
Standard:

7. When used, the Street Name sign shall be placed above the Detour sign.

Support:

8. See Figure 6H-9 for the information for detouring a numbered highway.

Figure 6H-20. Detour for a Closed Street (TA-20)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 20

Notes for Figure 6H-23—Typical Application 23
Left-Hand Lane Closure on the Far Side of an Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

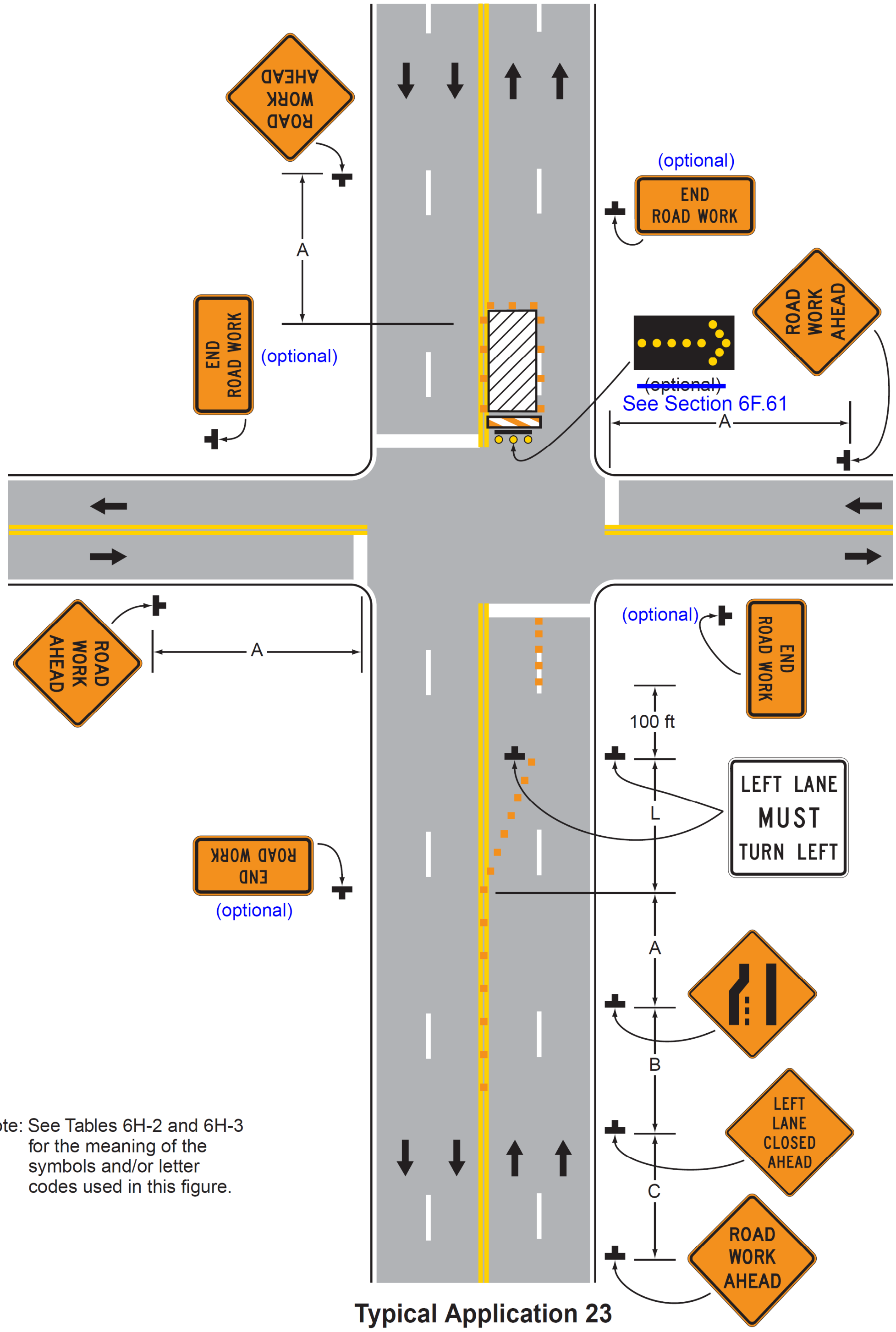
Option:

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

Support:

4. By first closing off the left lane and then reopening it as a turn bay, the left-turn bay allows storage of turning vehicles so that the movement of through traffic is not impeded. A left-turn bay that is long enough to accommodate all turning vehicles during a traffic signal cycle will provide the maximum benefit for through traffic. Also, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.

Figure 6H-23. Left-Hand Lane Closure on the Far Side of an Intersection (TA-23)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 23

Notes for Figure 6H-24 and 6H-24A(CA) —Typical Application 24 Half Road Closure on the Far Side of an Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on the far side of the intersection.

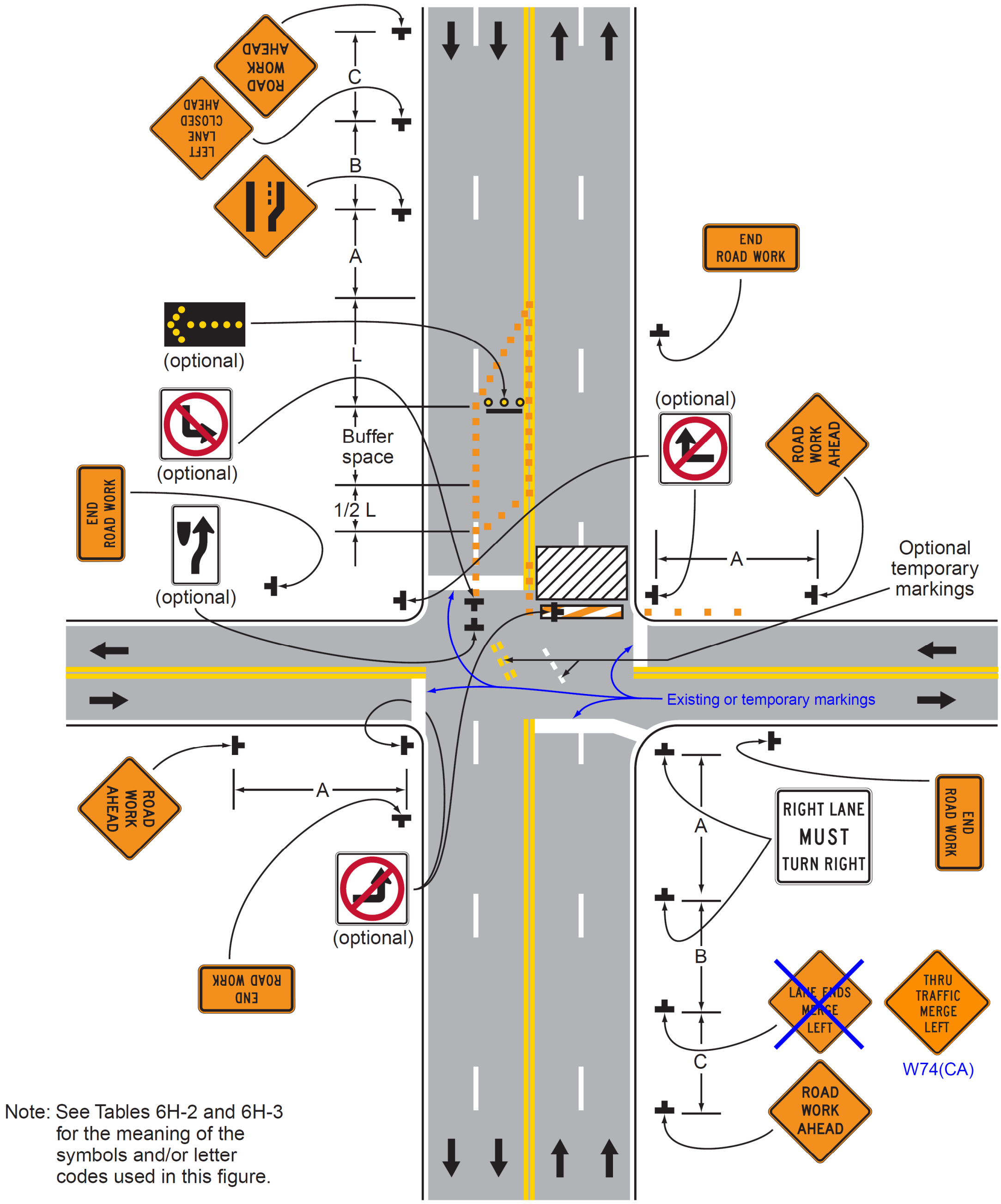
Option:

3. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
4. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, if there is a significant right-turning movement, then the right-hand lane may be restricted to right turns only, as shown.
5. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.
6. There may be insufficient space to place the back-to-back Keep Right sign and No Left Turn symbol signs at the end of the row of channelizing devices separating opposing vehicular traffic flows. In this situation, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.
7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
8. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
9. Temporary pavement markings may be used to delineate the travel path through the intersection.

Support:

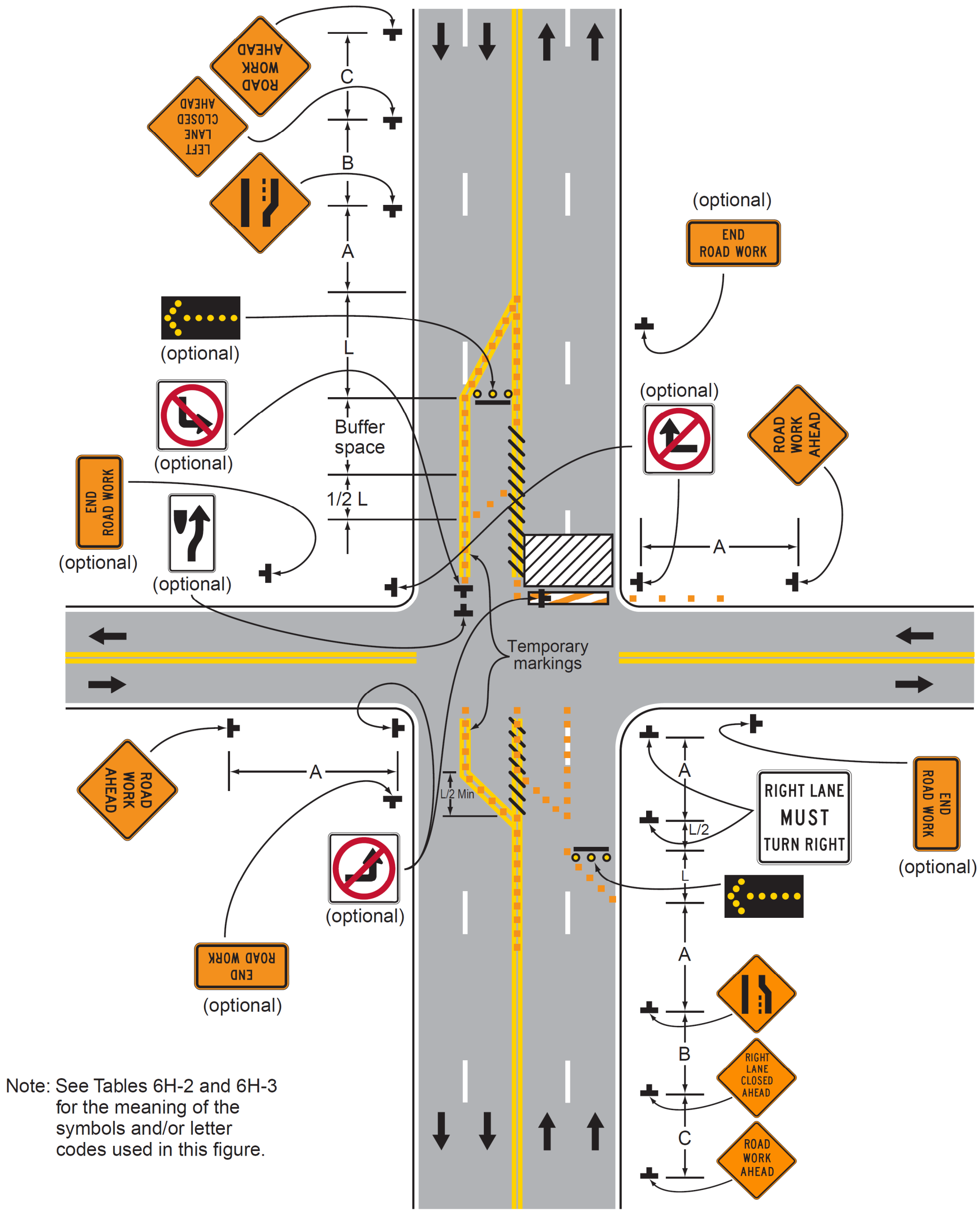
10. Keeping the right-hand lane open increases the through capacity by eliminating right turns from the open through lane.
11. A temporary turn island reinforces the nature of the temporary exclusive right-turn lane and enables a second RIGHT LANE MUST TURN RIGHT sign to be placed in the island.
12. Figure 6H-24 is appropriate for situations where the approach is stop-controlled (Stop sign and/or red flashing beacons) due to the abrupt transition through the intersection.
13. Figure 6H-24A(CA) is appropriate for situations where the approach is uncontrolled or controlled by traffic signals.

Figure 6H-24. Half Road Closure on the Far Side of an Intersection (TA-24)



Typical Application 24

Figure 6H-24A (CA). Half Road Closure on the Far Side of an Intersection (TA-24A(CA))



Typical Application 24A (CA)

Notes for Figure 6H-26—Typical Application 26
Closure in the Center of an Intersection

Guidance:

1. All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.

Option:

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.

Standard:

Note #3 is not applicable for State highways. Note #1 shall be used instead for State highways.

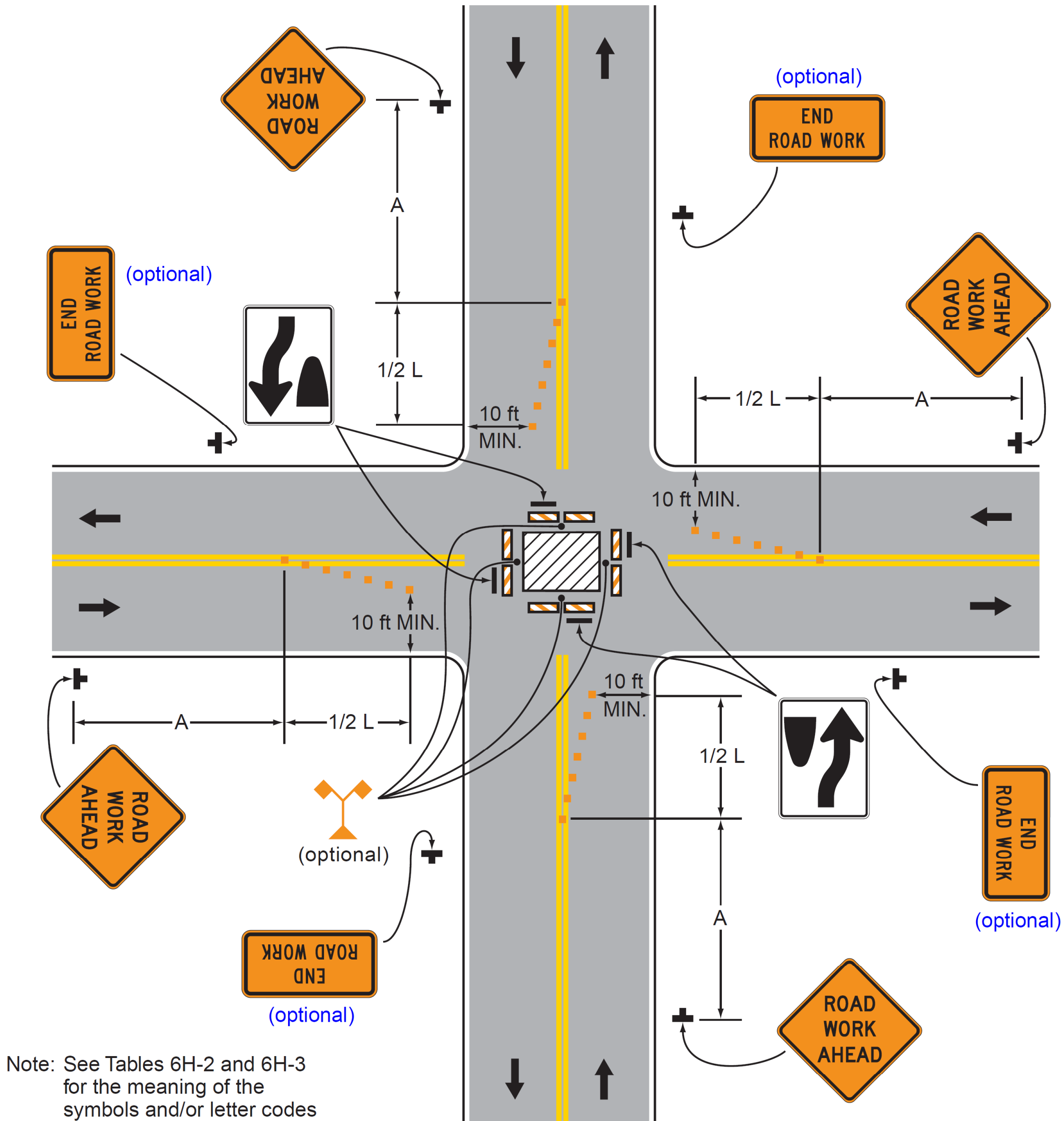
Option:

4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Figure 6H-26. Closure in the Center of an Intersection (TA-26)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 26

Notes for Figure 6H-27—Typical Application 27
Closure at the Side of an Intersection

Guidance:

1. The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.

2. Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.

Standard:

3. At night, flagger stations shall be illuminated, except in emergencies.

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

5. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.

6. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

7. When used, the BE PREPARED TO STOP sign should be located ~~before~~ after the Flagger symbol sign.

8. ONE LANE ROAD AHEAD signs should also be used to provide adequate advance warning.

Support:

9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

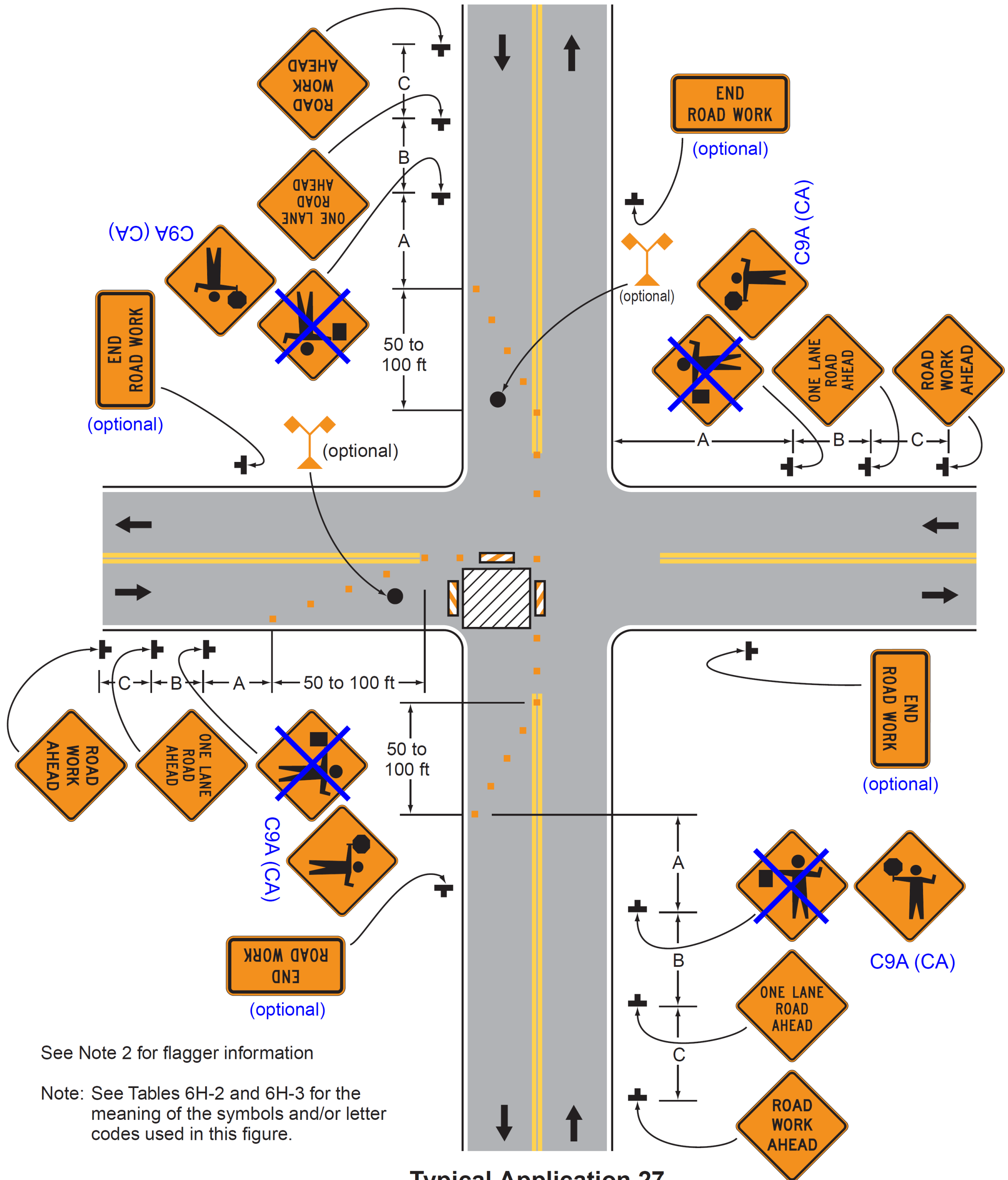
Option:

10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Figure 6H-27. Closure at the Side of an Intersection (TA-27)



Typical Application 27

APPENDIX F
Air Quality Modeling Files

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APPENDIX C
Emissions Calculations

EMFAC2011 Emissions Factors Applied to On-Road Truck Miles
Roadmod Data for Off-Road Equipment

Wildcat Berkeley 200 ft/day Total Emissions

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	5.5	16.5	34.4	11.0	3.0
Excavation	5.9	19.0	35.5	11.4	3.3
Pipeline Install	5.2	14.9	29.0	10.9	2.9
Paving	5.6	17.6	33.9	1.4	1.2

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.6	15.0	13.9	10.8	2.8
Excavation	2.9	17.5	15.0	11.2	3.1
Pipeline Install	2.2	13.4	8.5	10.7	2.6
Paving	2.6	16.1	13.4	1.2	1.0

EMFAC 2011	lbs/day				
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1960 miles/day	2.98	1.52	20.51	0.22	0.20

GHG	Annual CO2	tons/year	tons/year
	Roadmod	EMFAC	Total
	59.8	89.2	149.00

Wildcat Berkeley Total Emissions W Haul Truck Mitigation (Ave Year 2010)

Roadmod for Construction Equipment and EMFAC for Truck Haul

	lbs/day				
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.9	16.8	19.2	11.0	3.0
Excavation	3.2	19.2	20.3	11.4	3.3
Pipeline Install	2.6	15.2	13.8	10.9	2.8
Paving	2.9	17.8	18.7	1.4	1.2

Subtotals

ROADMOD	lbs/day				
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.6	15.0	13.9	10.8	2.8
Excavation	2.9	17.5	15.0	11.2	3.1
Pipeline Install	2.2	13.4	8.5	10.7	2.6
Paving	2.6	16.1	13.4	1.2	1.0

EMFAC	lbs/day				
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1960 miles/day	0.32	1.77	5.30	0.21	0.20

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	59.8	87.9	147.70

Wildcat El Cerrito 200 ft/day Total Emissions

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	5.0	15.6	30.5	11.0	2.9
Exavation	5.4	18.7	32.2	11.4	3.3
Pipeline Install	4.6	14.0	25.2	10.9	2.8
Paving	5.2	17.3	30.7	1.4	1.2

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.5	14.3	13.8	10.8	2.8
Excavation	3.0	17.5	15.5	11.2	3.1
Pipeline Install	2.2	12.8	8.5	10.7	2.6
Paving	2.8	16.1	14.0	1.2	1.1

EMFAC	Truck miles			lbs/day		
OnRoad Haul		**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1598 miles/day		2.43	1.24	16.72	0.18	0.16

GHG	Annual CO2	ton/year	
	Roadmod	EMFAC	Total
	115.0	120.6	235.60

Wildcat El Cerrito 200 ft/day Total Emissions W Haul Truck Mitigation (Ave Year 2010)

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.8	15.8	18.1	11.0	2.9
Excavation	3.3	18.9	19.9	11.4	3.3
Pipeline Install	2.5	14.2	12.8	10.8	2.8
Paving	3.0	17.5	18.3	1.4	1.2

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	2.5	14.3	13.8	10.8	2.8
Excavation	3.0	17.5	15.5	11.2	3.1
Pipeline Install	2.2	12.8	8.5	10.7	2.6
Paving	2.8	16.1	14.0	1.2	1.1

EMFAC			lbs/day		
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1598 miles/day	0.26	1.44	4.32	0.17	0.16

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	115.0	120.6	235.60

CPZ El Cerrito to Richmond 200 ft/day

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	1.8	11.6	14.8	10.6	2.6
Excavation	2.0	15.7	15.4	10.8	2.9
Pipeline Install	1.6	11.7	12.1	10.6	2.6
Paving	1.9	14.4	15.0	0.8	0.7

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	1.6	10.3	9.4	10.5	2.5
Excavation	1.8	14.4	10.0	10.7	2.7
Pipeline Install	1.3	10.4	6.7	10.4	2.4
Paving	1.6	13.2	9.6	0.7	0.5

EMFAC			lbs/day		
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1552 miles/day	0.23	1.27	5.42	0.15	0.14

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	122.0	99.8	221.80

CPZ Richmond to San Pablo 200 ft/day

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	1.8	11.8	16.2	10.7	2.6
Excavation	2.1	15.9	16.8	10.9	2.8
Pipeline Install	1.4	11.0	12.8	10.6	2.5
Paving	1.9	14.6	16.4	0.9	0.8

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pavement Removal	1.5	10.1	9.2	10.5	2.5
Excavation	1.8	14.2	9.8	10.7	2.6
Pipeline Install	1.1	9.4	5.8	10.4	2.4
Paving	1.6	13.0	9.5	0.7	0.6

EMFAC 2011			lbs/day		
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
1960 miles/day	0.30	1.63	6.98	0.19	0.18

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	123.0	100	223.00

CPZ Bridge

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Clear/Grub	1.0	5.6	8.0	1.3	0.5
Abutment	1.1	7.2	8.8	1.4	0.5
Bridge Erection	0.9	7.1	7.6	2.4	0.7
Pipeline Install	0.9	5.5	6.5	0.3	0.3

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Clear/Grub	0.9	5.1	5.7	1.3	0.4
Abutment	1.0	6.7	6.5	1.3	0.5
Bridge Erection	0.8	6.5	5.4	2.3	0.7
Pipeline Install	0.8	5.0	4.2	0.3	0.2

EMFAC			lbs/day			
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**	**CO2**
640 miles/day	0.10	0.53	2.28	0.06	0.06	1299.907

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	16.1	22.3	38.40

CPZ Jack and Bore

Roadmod for Construction Equipment and EMFAC for Truck Haul

			lbs/day		
Combined Total	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pit Excavation	1.2	8.9	7.8	1.4	0.5
Casing Install	0.8	4.5	4.2	1.2	0.4
Pipe Install	1.0	6.3	4.6	2.2	0.6
Backfill	0.6	6.0	3.7	0.2	0.2

Subtotals

ROADMOD			lbs/day		
OffRoad Equipment	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
Pit Excavation	1.2	8.9	7.5	1.4	0.5
Casing Install	0.7	4.5	3.9	1.2	0.4
Pipe Install	1.0	6.2	4.3	2.2	0.6
Backfill	0.6	6.0	3.4	0.2	0.2

EMFAC 2011			lbs/day		
OnRoad Haul	**ROG**	**CO**	**NOx**	**PM-10**	**PM-2.5**
84 miles/day	0.01	0.07	0.30	0.01	0.01

GHG	Annual CO2	tons/year	
	Roadmod	EMFAC	Total
	74.6	4.3	78.90

EMFAC2011 Data

Large Diesel Truck Emissions for Calendar Year 2016 Aggregate Years Fleet 50 MPH

EMFAC2011 Emission Rates
Region Type: Air District
Region: Bay Area AQMD
Calendar Year: 2016
Season: Annual
Vehicle Classification: EMFAC2011 Categories

Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed (miles/hr)	ROG_RUNEX (gms/mile)	TOG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)
Bay Area A	2016	Annual	T6 instate l	DSL	Aggregated	50	0.06921856	0.078800066	0.3531394	4.7554939	1036.63742

Large Diesel Truck Emissions for Year 2016 Fleet: 2010 or Newer, 50 MPH

EMFAC2011 Emission Rates
Region Type: Air District
Region: Bay Area AQMD
Calendar Year: 2016
Season: Annual
Vehicle Classification: EMFAC2011 Categories

Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed (miles/hr)	ROG_RUNEX (gms/mile)	TOG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)
Bay Area A	2016	Annual	T6 instate l	DSL	2010	50	0.07525322	0.085670068	0.4103726	1.22983894	1021.69718

Large Diesel Truck Emissions for Calendar Year 2021Aggregate Years Fleet 50 MPH

Calendar Year: 2021
Season: Annual
Vehicle Classification: EMFAC2011 Categories

Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed (miles/hr)	ROG_RUNEX (gms/mile)	TOG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)
Bay Area A	2021	Annual	T6 instate l	DSL	Aggregated	50	0.06951099	0.079132967	0.3790589	1.61182013	1025.81052

EMFAC2011 Emissions Factors Used to Calculate On-Road Truck Miles

CalYr	MdlYr	CO2_RUNEX(Pavley I+LCFS) (gms/mile)	PM10_RUNEX (gms/mile)	PM2_5_RUNEX (gms/mile)
2016	Aggregated	1000.355106	0.050839557	0.046772393

CalYr	MdlYr	CO2_RUNEX(Pavley I+LCFS) (gms/mile)	PM10_RUNEX (gms/mile)	PM2_5_RUNEX (gms/mile)
2016	2010	985.9377757	0.049360409	0.045411577

		CO2_RUNEX(Pavley I+LCFS) (gms/mile)	PM10_RUNEX (gms/mile)	PM2_5_RUNEX (gms/mile)
2021	Aggregated	923.2294683	0.044637782	0.04106676

Wildcat	200 ft/day	2016 Aggregate Years		EMFAC2011 On-Road Haul Calculations			
			Daily Off Road Truck Emissions				(from Appendix B)
		ROG	CO	NOx	PM10	PM2.5	CO2
EMFAC2011	grams/mile	0.69219	0.35	4.76	0.05	0.05	1000.36
	lbs/mile	0.001522818	0.00	0.01	0.00	0.00	2.20
Wildcat El Cerrito	miles day	1598					
Wildcat El Cerrito	lbs day	2.43	1.24	16.72	0.18	0.16	3516.85
Wildcat Berkeley	miles day	1960					
Wildcat Berkeley	lbs day	2.98	1.52	20.51	0.22	0.20	4313.53

Mileage Per Day Calculations

Wildcat El Cerrito	El Cerrito	23	Haul trips	66	miles rt
		4	Material trips	20	miles rt
	Total Daily	**1598**	miles		
Wildcat Berkeley	Berkeley	31	Haul trips	60	milesrt
		5	Material trips	20	milesrt
	Total Daily	**1960**	miles		

GHG

		Annual tons/year	
	# haul days	tons CO2	tons CO2e
Wildcat El Cerrito	68	119.6	120.6
Wildcat Berkeley	41	88.4	89.2

EMFAC2011 On-Road Haul Calculations

Wildcat	200 ft/day	**2016 2010 and Newer**					
			Daily Off Road Truck Emissions			**(from Appendix B)**	
		ROG	CO	NOx	PM10	PM2.5	CO2
EMFAC2011	grams/mile	0.075	0.41	1.23	0.05	0.05	985.94
	lbs/mile	0.000165	0.00	0.00	0.00	0.00	2.17
WC El Cerrito	miles day	1598					
WC El Cerrito	lbs day	0.26	1.44	4.32	0.17	0.16	3466.16
WC Berkeley	miles day	1960					
WC Berkeley	lbs day	0.32	1.77	5.30	0.21	0.20	4251.36

Mileage Per Day Calculations

WC El Cerrito	El Cerrito	23	Haul trips	66	miles rt
		4	Material trips	20	miles rt
	Total Daily	**1598**	miles		
WC Berkeley	Berkeley	31	Haul trips	60	milesrt
		5	Material trips	20	milesrt
	Total Daily	**1960**	miles		

GHG

		Annual Tons/year	
	# haul days	tons CO2	tons CO2e
WC El Cerrito	68	117.85	118.91
WC Berkeley	41	87.15	87.94

EMFAC2011 On-Road Haul Calculations

Central Pressure Zone 200 ft day **2021 Aggregate Years**

				EMFAC 2011 **Daily Off Road Truck Emissions**			**(from Appendix B)**
		ROG	CO	NOx	PM10	PM2.5	CO2
EMFAC2011	grams/mile	0.07	0.38	1.62	0.04	0.04	923.23
	lbs/mile	0.00	0.00	0.00	0.00	0.00	2.03
CPZ El Cerrito	miles day	1522					
CPZ El Cerrito	lbs day	0.23	1.27	5.42	0.15	0.14	3091.34
CPZ Richmond	miles day	1960					
CPZ Richmond	lbs day	0.30	1.63	6.98	0.19	0.18	3980.97

Mileage Per Day Calculations

CPZ El Cerrito	El Cerrito	23	Haul trips	64	miles rt
		4	Material trips	20	miles rt
	Total Daily	**1552**	miles		
CPZ Richmond	Richmond-San Pal	31	Haul trips	60	milesrt
		5	Material trips	20	milesrt
	Total Daily	**1960**	miles		

GHG

		Annual Tons/year	
	# haul days	tons CO2	tons CO2e
CPZ El Cerrito	64.00	98.92	99.81
CPZ Richmond	50.00	99.52	100.42

EMFAC2011 On-Road Haul Calculations

Bridge and Jack/Bore **2021 AggregateYears**

EMFAC2011

Daily Off Road Truck Emissions

		ROG	CO	NOx	PM10	PM2.5	CO2
EMFAC2011	**grams/mile**	0.07	0.38	1.62	0.04	0.04	923.23
	lbs/mile	0.00	0.00	0.00	0.00	0.00	2.03
Bridge	**miles day**	640					
Bridge	**lbs day**	0.10	0.53	2.28	0.06	0.06	1299.91
Jack and Bore	**miles day**	84					
Jack and Bore	**lbs day**	0.01	0.07	0.30	0.01	0.01	170.61

Mileage Per Day Calculations

Bridge		10	Haul trips	64	miles rt
		0	Material trips	20	miles rt
	Total Daily	**640**	miles		
Jack and Bore		1	Haul trips	64	miles rt
		1	Material trips	20	miles rt
	Total Daily	**84**	miles		

GHG

		Annual Tons/year	
	# haul days	tons CO2	tons CO2e
Bridge	34	22.10	22.30
Jack and Bore	50	4.27	4.30

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> Project Phases (English Units)	Wildcat Berkeley Pref Alt 4 200 LF Day ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Pavement Removal	2.6	15.0	13.9	10.8	0.8	10.0	2.8	0.7	2.1	2,727.9
Grading/Excavation	2.9	17.5	15.0	11.2	1.2	10.0	3.1	1.0	2.1	2,883.1
Pipe Installation	2.2	13.4	8.5	10.7	0.7	10.0	2.6	0.6	2.1	2,165.0
Paving	2.6	16.1	13.4	1.2	1.2	-	1.0	1.0	-	1,939.2
Maximum (pounds/day)	2.9	17.5	15.0	11.2	1.2	10.0	3.1	1.0	2.1	2,883.1
Total (tons/construction project)	0.1	0.4	0.3	0.3	0.0	0.2	0.1	0.0	0.0	59.8

Notes: Project Start Year ->	2015
Project Length (months) ->	3
Total Project Area (acres) ->	4
Maximum Area Disturbed/Day (acres) ->	1
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Project Phases (Metric Units)	Wildcat Berkeley Pref Alt 4 200 LF Day ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Pavement Removal	1.2	6.8	6.3	4.9	0.4	4.5	1.3	0.3	0.9	1,240.0
Grading/Excavation	1.3	7.9	6.8	5.1	0.5	4.5	1.4	0.5	0.9	1,310.5
Pipe Installation	1.0	6.1	3.9	4.9	0.3	4.5	1.2	0.3	0.9	984.1
Paving	1.2	7.3	6.1	0.5	0.5	-	0.5	0.5	-	881.5
Maximum (kilograms/day)	1.3	7.9	6.8	5.1	0.5	4.5	1.4	0.5	0.9	1,310.5
Total (megagrams/construction project)	0.1	0.3	0.3	0.2	0.0	0.2	0.1	0.0	0.0	54.2

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> Wildcat El Cerrito Pref Alt 1 200 LF Day Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Pavement Removal	2.5	14.3	13.8	10.8	0.8	10.0	2.8	0.7	2.1	2,610.1
Grading/Excavation	3.0	17.5	15.5	11.2	1.2	10.0	3.1	1.1	2.1	2,837.4
Pipe Installation	2.2	12.8	8.5	10.7	0.7	10.0	2.6	0.6	2.1	2,047.2
Paving	2.8	16.1	14.0	1.2	1.2	-	1.1	1.1	-	1,968.6
Maximum (pounds/day)	3.0	17.5	15.5	11.2	1.2	10.0	3.1	1.1	2.1	2,837.4
Total (tons/construction project)	0.1	0.7	0.6	0.5	0.0	0.4	0.1	0.0	0.1	115.0

Notes: Project Start Year ->	2015
Project Length (months) ->	4
Total Project Area (acres) ->	3
Maximum Area Disturbed/Day (acres) ->	1
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

F-19

Emission Estimates for -> Wildcat El Cerrito Pref Alt 1 200 LF Day Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Pavement Removal	1.1	6.5	6.3	4.9	0.4	4.5	1.3	0.3	0.9	1,186.4
Grading/Excavation	1.4	7.9	7.1	5.1	0.5	4.5	1.4	0.5	0.9	1,289.7
Pipe Installation	1.0	5.8	3.8	4.9	0.3	4.5	1.2	0.3	0.9	930.5
Paving	1.3	7.3	6.4	0.5	0.5	-	0.5	0.5	-	894.8
Maximum (kilograms/day)	1.4	7.9	7.1	5.1	0.5	4.5	1.4	0.5	0.9	1,289.7
Total (megagrams/construction project)	0.1	0.7	0.6	0.4	0.0	0.4	0.1	0.0	0.1	104.3

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> Project Phases (English Units)	Central Pressure Richmond-San Pablo Pref Alt 4 200 LF Day ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Pavement Removal	1.5	10.1	9.2	10.5	0.5	10.0	2.5	0.4	2.1	2,546.4
Grading/Excavation	1.8	14.2	9.8	10.7	0.7	10.0	2.6	0.6	2.1	2,773.7
Pipe Installation	1.1	9.4	5.8	10.4	0.4	10.0	2.4	0.3	2.1	1,978.7
Paving	1.6	13.0	9.5	0.7	0.7	-	0.6	0.6	-	1,980.1
Maximum (pounds/day)	1.8	14.2	9.8	10.7	0.7	10.0	2.6	0.6	2.1	2,773.7
Total (tons/construction project)	0.1	0.6	0.4	0.3	0.0	0.3	0.1	0.0	0.1	122.9

Notes: Project Start Year ->	2021
Project Length (months) ->	3
Total Project Area (acres) ->	2
Maximum Area Disturbed/Day (acres) ->	1
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Project Phases (Metric Units)	Central Pressure Richmond-San Pablo Pref Alt 4 200 LF Day ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Pavement Removal	0.7	4.6	4.2	4.8	0.2	4.5	1.1	0.2	0.9	1,157.4
Grading/Excavation	0.8	6.5	4.5	4.8	0.3	4.5	1.2	0.3	0.9	1,260.8
Pipe Installation	0.5	4.3	2.7	4.7	0.2	4.5	1.1	0.1	0.9	899.4
Paving	0.7	5.9	4.3	0.3	0.3	-	0.3	0.3	-	900.0
Maximum (kilograms/day)	0.8	6.5	4.5	4.8	0.3	4.5	1.2	0.3	0.9	1,260.8
Total (megagrams/construction project)	0.1	0.6	0.4	0.3	0.0	0.3	0.1	0.0	0.1	111.4

Emission Estimates for -> Project Phases (English Units)	Central Pressure El Cerrito-Richmond Pref Alt 1 200 LF Day ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Pavement Removal	1.6	10.3	9.4	10.5	0.5	10.0	2.5	0.4	2.1	2,569.3
Grading/Excavation	1.8	14.4	10.0	10.7	0.7	10.0	2.6	0.6	2.1	2,796.6
Pipe Installation	1.3	10.4	6.7	10.4	0.4	10.0	2.4	0.3	2.1	2,098.7
Paving	1.6	13.2	9.6	0.7	0.7	-	0.6	0.6	-	1,965.6
Maximum (pounds/day)	1.8	14.4	10.0	10.7	0.7	10.0	2.6	0.6	2.1	2,796.6
Total (tons/construction project)	0.1	0.7	0.5	0.5	0.0	0.5	0.1	0.0	0.1	122.0
Notes: Project Start Year ->	2021									
Project Length (months) ->	5									
Total Project Area (acres) ->	3									
Maximum Area Disturbed/Day (acres) ->	1									
Total Soil Imported/Exported (yd^3/day)->	0									

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Project Phases (Metric Units)	Central Pressure El Cerrito-Richmond Pref Alt 1 200 LF Day ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Pavement Removal	0.7	4.7	4.3	4.8	0.2	4.5	1.1	0.2	0.9	1,167.9
Grading/Excavation	0.8	6.6	4.5	4.9	0.3	4.5	1.2	0.3	0.9	1,271.2
Pipe Installation	0.6	4.7	3.1	4.7	0.2	4.5	1.1	0.2	0.9	953.9
Paving	0.7	6.0	4.4	0.3	0.3	-	0.3	0.3	-	893.4
Maximum (kilograms/day)	0.8	6.6	4.5	4.9	0.3	4.5	1.2	0.3	0.9	1,271.2
Total (megagrams/construction project)	0.1	0.6	0.4	0.4	0.0	0.4	0.1	0.0	0.1	110.6

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> CPZ Richmond to San Pablo Bridge Crossing Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	0.9	5.1	5.7	1.3	0.3	1.0	0.4	0.2	0.2	1,407.3
Abutment Construction	1.0	6.7	6.5	1.3	0.3	1.0	0.5	0.3	0.2	1,660.5
Bridge Erection	0.8	6.5	5.4	2.3	0.3	2.0	0.7	0.3	0.4	1,317.0
Install Pipeline	0.8	5.0	4.2	0.3	0.3	-	0.2	0.2	-	1,083.6
Maximum (pounds/day)	1.0	6.7	6.5	2.3	0.3	2.0	0.7	0.3	0.4	1,660.5
Total (tons/construction project)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	16.1

Notes: Project Start Year ->	2021
Project Length (months) ->	2
Total Project Area (acres) ->	0
Maximum Area Disturbed/Day (acres) ->	0
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> CPZ Richmond to San Pablo Bridge Crossing Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	0.4	2.3	2.6	0.6	0.1	0.5	0.2	0.1	0.1	639.7
Abutment Construction	0.5	3.0	3.0	0.6	0.1	0.5	0.2	0.1	0.1	754.8
Bridge Erection	0.4	3.0	2.4	1.0	0.1	0.9	0.3	0.1	0.2	598.6
Install Pipeline	0.4	2.3	1.9	0.1	0.1	-	0.1	0.1	-	492.5
Maximum (kilograms/day)	0.5	3.0	3.0	1.0	0.1	0.9	0.3	0.1	0.2	754.8
Total (megagrams/construction project)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	14.6

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> Project Phases (English Units)	CPZ Richmond to San Pablo Jack and Bore ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Pit Excavation	1.2	8.9	7.5	1.4	0.4	1.0	0.5	0.3	0.2	2,049.4
Casing Installation	0.7	4.5	3.9	1.2	0.2	1.0	0.4	0.2	0.2	1,297.1
Pipeline Installation	1.0	6.2	4.3	2.2	0.2	2.0	0.6	0.2	0.4	2,222.0
Backfill	0.6	6.0	3.4	0.2	0.2	-	0.2	0.2	-	1,118.5
Maximum (pounds/day)	1.2	8.9	7.5	2.2	0.4	2.0	0.6	0.3	0.4	2,222.0
Total (tons/construction project)	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	74.6

Notes: Project Start Year ->	2021
Project Length (months) ->	2
Total Project Area (acres) ->	0
Maximum Area Disturbed/Day (acres) ->	0
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Project Phases (Metric Units)	CPZ Richmond to San Pablo Jack and Bore ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Pit Excavation	0.5	4.0	3.4	0.6	0.2	0.5	0.2	0.1	0.1	931.6
Casing Installation	0.3	2.0	1.8	0.5	0.1	0.5	0.2	0.1	0.1	589.6
Pipeline Installation	0.4	2.8	2.0	1.0	0.1	0.9	0.3	0.1	0.2	1,010.0
Backfill	0.3	2.7	1.5	0.1	0.1	-	0.1	0.1	-	508.4
Maximum (kilograms/day)	0.5	4.0	3.4	1.0	0.2	0.9	0.3	0.1	0.2	1,010.0
Total (megagrams/construction project)	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	67.7

Pipeline Installation

Pavement Removal	1 Concrete Saw
	1 Dozer
	4 Signal Boards
	1 Water Truck
	1 Tractor/Loader/Backhoe
Excavation	1 Excavator
	1 Forklift
	1 Water Truck
	1 Tractor/Loader/Backhoe
	2 Trenchers
	1 Pump
	4 Signal Boards
Pipe Installation	2 Forklifts
	1 Compactor
	3 Welders
	1 Water Truck
	1 Pump
	4 Signal Boards
Pave	1 Paver
	1 Paving equipment
	1 Roller
	4 Signal Boards
	1 Pump
	1 Sweeper/Scrubber

Jack and Bore

Pit Excavation	1 Excavator
	1 Dozer
	1 Loader
	1 Tractor/Loader/Backhoe
	1 Water Truck
Casing Installation	1 Crane
	1 Forklift
	1 Tractor/Loader/Backhoe
	3 Welders
	1 Water Truck
Pipe Installation	1 Drill Rig
	1 Crane
	3 Welders
	1 Forklift
	1 Water Truck
Backfill	2 Backhoes
	1 Loader
	1 Compactor
	1 Water Truck

Bridge Crossing

Clear Grub	1 Concrete Saw
	1 Dozer
	1 Water Truck
	1 Tractor/Loader/Backhoe
Abutment Construction	1 Loader
	1 Dozer
	1 Tractor/Loader/Backhoe
	1 Water Truck
	1 Compactor
Bridge Erection	1 Generator Set
	1 Crane
	3 Welders
	1 Forklift
	1 Air Compressor
	1 Water Truck
Pipeline Install	3 Welders
	1 Forklift
	1 Crane

APPENDIX G

Plant Species Observed

TABLE G-1
PLANT SPECIES OBSERVED ON WEST OF HILLS PIPELINE SEGMENTS

Family	*Scientific Name*	Common Name	Wildcat Pipeline (Berkeley)	Wildcat Pipeline (El Cerrito)	Central Pressure Zone Pipeline (El Cerrito)	Central Pressure Zone (Richmond/ San Pablo)
Adoxaceae	*Sambucus nigra* ssp. *caerulea (=S. mexicana)*	Blue elderberry				x
Altingiaceae	*Liquidambar* sp.	Sweetgum (ornamental)	x		x	
Amaryllidaceae	*Agapanthus* sp.	Lily of the Nile	x		x	x
Amaryllidaceae	*Narcissus* sp.	Narcissus (ornamental)		x		
Apiaceae	*Foeniculum vulgare*	Fennel			x	x
Araliaceae	*Hedera canariensis*	Canary ivy			x	x
Arecaceae	*Phoenix canariensis*	Canary island date palm	x			x
Asteraceae	*Artemisia californica*	Coastal sage brush				x
Asteraceae	*Baccharis pilularis* ssp. *consanguinea*	Coyote brush				x
Asteraceae	*Bellis perennis*	English lawn daisy				x
Asteraceae	*Delairea odorata (=Senecio mikanioides)*	Cape ivy				x
Asteraceae	*Erigeron canadensis (=Conyza c.)*	Horseweed			x	x
Asteraceae	*Helminthotheca echioides (=Picris e.)*	Bristly ox-tongue		x	x	x
Asteraceae	*Pseudognaphalium* sp.	Cudweed			x	
Asteraceae	*Sonchus asper* ssp. *asper*	Sow thistle	x			
Asteraceae	*Taraxacum officinale*	Red seeded dandelion			x	x
Berberidaceae	*Nandina domestica*	Heavenly bamboo	x		x	
Betulaceae	*Alnus rhombifolia*	White alder				x
Betulaceae	*Betula* sp.	Birch (ornamental)		x		
Brassicaceae	*Brassica oleracea*	Broccoli				x
Cactaceae	*Opuntia* sp.	Beavertail, tuna (ornamental)				x
Celastraaceae	*Maytenus boaria*	Mayten tree	x			
Crassulaceae	*Crassula ovata*	Jade plant (ornamental)	x	x		
Cupressaceae	*Juniperus* sp.	Juniper (ornamental)		x		x
Cupressaceae	*Sequoia sempervirens*	Coast redwood	x			
Cyperaceae	*Carex* sp.	Sedge				x
Cyperaceae	*Cyperus eragrostis*	Tall cyperus				x
Equisetaceae	*Equisetum hyemale* ssp. *affine*	Giant scouring rush				x
Ericaceae	*Arbutus unedo*	Strawberry tree				x
Ericaceae	*Rhododendron* sp.	Azalea (ornamental)		x		
Fabaceae	*Medicago polymorpha*	California burclover				x
Fagaceae	*Quercus agrifolia* var. *agrifolia*	Coast live oak				x
Geraniaceae	*Geranium dissectum*	Wild geranium				x
Geraniaceae	*Pelargonium* sp.	Geranium (ornamental)				x
Iridaceae	*Iris* sp.	Horticultural iris	x			
Juglandaceae	*Juglans regia*	English walnut				x
Juncaceae	*Juncus* sp.	Rush				x
Lauraceae	*Umbellularia californica*	California laurel				x
Magnoliaceae	*Magnolia* sp.	Magnolia (ornamental)	x		x	
Malvaceae	*Malva parviflora*	Cheeseweed			x	x
Myrtaceae	*Eucalyptus globulus*	Blue gum		x		x
Oleaceae	*Ligustrum* sp.	Privet (ornamental)	x			x
Oxalidaceae	*Oxalis pes-caprae*	Bermuda buttercup	x	x	x	x
Papaveraceae	*Eschscholzia californica*	California poppy		x		
Pinaceae	*Pinus radiata*	Monterey pine				x
Pinaceae	*Pinus* sp.	Pine (ornamental)	x		x	
Pittosporaceae	*Pittosporum* sp.	Pittosporum (ornamental)				x
Plantaginaceae	*Plantago lanceolata*	Ribwort				x
Plantaginaceae	*Plantago major*	Common plantain				x
Platanaceae	*Platanus x acerifolia*	London plane tree			x	
Poaceae	*Abrostis* sp.	Bentgrass			x	
Poaceae	*Avena barbata*	Slim oat		x	x	x
Poaceae	*Bromus diandrus*	Ripgut brome		x		
Poaceae	*Festuca* sp.	Fescue (lawn)				x

TABLE G-1
PLANT SPECIES OBSERVED ON WEST OF HILLS PIPELINE SEGMENTS

Family	*Scientific Name*	Common Name	Wildcat Pipeline (Berkeley)	Wildcat Pipeline (El Cerrito)	Central Pressure Zone Pipeline (El Cerrito)	Central Pressure Zone (Richmond/ San Pablo)
Poaceae	*Festuca microstachys (=Vulpia m.)*	Few-flowered fescue			x	
Poaceae	*Hordeum murinum* ssp. *leporinum*	Farmer's foxtail				x
Poaceae	*Pennisetum clandestinum*	Kikuyu grass				x
Polygonaceae	*Muehlenbeckia complexa*	Mattress vine				x
Polygonaceae	*Rumex crispus*	Rhubarb				x
Primulaceae	*Primula* sp.	Primrose (ornamental)	x			
Rhamnaceae	*Ceanothus* sp.	Ceanothus	x			
Rosaceae	*Cotoneaster* sp.	Cotoneaster				x
Rosaceae	*Photinia* sp.	Photinia (ornamental)		x		x
Rosaceae	*Prunus cerasifera*	Cherry plum	x			x
Rosaceae	*Pyracantha angustifolia*	Firethorn	x			
Rosaceae	*Pyrus* sp.	Flowering pear			x	x
Rosaceae	*Rosa* sp.	Rose (ornamental)		x		
Rosaceae	*Rubus armeniacus (=Rubus discolor)*	Himalayan blackberry			x	x
Salicaceae	*Salix lasiolepis*	Arroyo willow				x
Sapindaceae	*Acer negundo* var. *californicum*	California box elder				x
Sapindaceae	*Acer palmatum*	Japanese maple	x			
Sapindaceae	*Aesculus californica*	Buckeye				x
Solanaceae	*Solanum* sp.	Potato vine (ornamental)				x
Theaceae	*Camellia* sp.	Camellia (ornamental)		x		
Tropaeolaceae	*Tropaeolum majus*	Garden nasturtium				x
Ulmaceae	*Ulmus* sp.	Elm (ornamental)		x		
Urticaceae	*Urtica dioica* ssp. *holosericea*	Stinging nettle				x
Valerianaceae	*Centranthus ruber*	Jupiter's beard			x	x
Verbenaceae	*Verbena* sp.	Verbena (ornamental)				x

APPENDIX H
List of Special Status Species

TABLE H-1
SPECIAL-STATUS PLANTS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/ CDFG/CNPS**[1]	**General Habitat**	**Potential to Occur**
Species Listed or Proposed for Listing			
Pallid manzanita *Arctostaphylos pallida*	FT/CE/1B.1	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub; on siliceous shale, sandy or gravelly substrates; 600-1600 ft.	**Not present.** Natural habitat suitable for this species is lacking in project area and species was not observed. Nearest population is on Sobrante Ridge.
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE/--/1B.1	Openings in cismontane woodland, coastal dunes, coastal scrub; sandy terraces or bluffs in loose sand; 10-1000 ft.	**Not present.** Loose sandy substrate not present in project area. Only one historic record in general vicinity; presumed extirpated from the East Bay.
Presidio clarkia *Clarkia franciscana*	FE/CE/1B.1	Coastal scrub, valley and foothill grassland; serpentine outcrops in grassland or scrub; 80-1000 ft.	**Not present.** Natural serpentine habitat is lacking in project area. Nearest known locality is along Skyline Boulevard in Oakland.
Santa Cruz tarplant *Holocarpha macradenia*	FT/CE/1B.1	Grassland, coastal prairie; often with non-natives in light sandy or sandy clay soil; 30 to 850 ft.	**Low.** Natural coastal prairie and grassland habitat lacking in project area. All naturally occurring San Francisco Bay area populations presumed extirpated.
Beach layia *Layia carnosa*	FE/CE/1B.1	Coastal dunes, coastal scrub; on semi-stabilized dunes, usually behind foredunes; 0-200 ft.	**Not present.** Coastal dune and scrub habitat lacking in project area. Nearest known occurrence is an extirpated site in former sand dunes in San Francisco.
San Francisco popcorn-flower *Plagiobothrys diffusus*	--/CE/1B.1	Coastal prairie, valley and foothill grassland; historically on grasslands with marine influence; 200-1200 ft.	**Low.** Natural grasslands not present within project area. Nearest known occurrence is on Skyline Boulevard in Oakland.
Adobe sanicle *Sanicula maritima*	--/CR/1B.1	Chaparral, coastal prairie, meadows, seeps, valley and foothill grassland; moist serpentinite clay soil; 100-800 ft.	**Not present.** Moist clay serpentinite substrate not present in project area. Nearest known occurrence is an apparently extirpated site in the vicinity of Alameda.
California sea-blite *Suaeda californica*	FE/--/1B.1	Coastal salt marshes and swamps, coastal dunes; 0-20 ft.	**Not present.** No suitable habitat within project area. All naturally occurring San Francisco Bay area populations thought to have been extirpated. Reintroduced on San Francisco Peninsula.
Other Special-Status Species			
Plants			
Bent-flowered fiddleneck *Amsinckia lunaris*	--/--/1B.2	Coastal bluff scrub, valley and foothill grassland; 10-1700 ft.	**Low.** All upland habitat in project area has been disturbed; no suitable habitat remains for this species. Nearest known localities are on San Pablo and Sobrante ridges.

[1] Key to listing status codes can be found at the end of Table 1.

TABLE H-1 (Continued)
SPECIAL-STATUS PLANTS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/ CDFG/CNPS**[2]	**General Habitat**	**Potential to Occur**
Other Special-Status Species (cont.)			
Alkalil milk vetch *Astragalus tener* var. *tener*	--/--/1B.2	Adobe clay soils in valley and foothill grassland; 3-300 ft.	**Low.** Adobe clay soils not present on project site. All upland habitat in survey area has been disturbed in the past. Nearest historic records are flats near bay in present-day Emeryville, Oakland, Richmond.
San Joaquin spearscale *Atriplex joaquiniana*	--/--/1B.2	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland; seasonal wetlands in alkaline soils; 0-825 ft.	**Not present.** Suitable habitat not present survey area. Nearest locality is Oakland marshes but population is possibly extirpated; last seen in 1929.
Big-scale balsamroot *Balsamorhiza macrolepis* var. *macrolepis*	--/--/1B.2	Chaparral, cismontane woodland, valley and foothill grassland; sometimes on serpentinite; 300-4620 ft.	**Low.** Suitable habitat not observed in survey area. Nearest record is Anthony Chabot Regional Park; all other nearby records are farther to south and east.
Round-leaved filaree *California macrophylla*	--/--/1B.1	Cismontane woodland, valley and foothill grassland; clay substrate, in low, somewhat moist sites; 50-4000 ft.	**Low.** Natural habitat for this species has probably been eliminated from nearly all of the Bay Area. Four localities are known from the three-quad study area; all are possibly extirpated.
Pacific false bindweed *Calystegia purpurata* ssp. *saxicola*	--/--/1B.2	Coastal dunes, coastal scrub, coniferous forest; 50-350 ft.	**Low.** All upland habitat in survey area has been disturbed in the past, no suitable habitat remains. Nearest records are from Richmond and Red Rock Island.
Bristly sedge *Carex comosa*	--/--/2.1	Coastal prairie, marshes and swamps, valley and foothill grassland; 0-1400 ft.	**Low.** Suitable habitat not observed in survey area. Nearest locality is in San Francisco, presumed extirpated.
Point Reyes bird's-beak *Chloropyron maritimum* ssp. *palustre*	--/--/1B.2	Coastal salt marshes and swamps; 0-35 ft.	**Not present.** Salt marsh habitat is not present in survey area. Presumed extirpated from Alameda County. Nearest occurrences are Shell Mound, Bay Farm Island.
San Francisco spineflower *Chorizanthe cuspidata* var. *cuspidata*	--/--/1B.2	Coastal scrub, coastal dunes, coastal prairie, coastal bluff scrub; 10-710 ft.	**Not present.** Suitable coastal habitat not present in survey area. Only known locality from a non-specific locality in Oakland, west of Lake Merritt, which is presumed extirpated.
Western leatherwood *Dirca occidentalis*	--/--/1B.2	Mesic situations in many habitats, including riparian woodland and forest, chaparral, broadleafed upland forest, and cismontane woodland; 100-1800 ft.	**Low.** Many nearby records, including Wildcat Regional Park. Riparian woodland understory in the survey area was highly disturbed and dominated by non-native species.

[2] Key to listing status codes can be found at the end of Table 1.

TABLE H-1 (Continued)
SPECIAL-STATUS PLANTS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/ CDFG/CNPS**[2]	**General Habitat**	**Potential to Occur**
Other Special-Status Species (cont.)			
Tiburon buckwheat *Eriogonum luteolum* var. *caninum*	--/--/1B.2	Chaparral, coastal prairie, valley and foothill grassland; sandy to gravelly sites, usually on serpentinite; 0-2300 ft.	**Not present.** Serpentinite substrate not present in survey area. Nearest records are from Skyline Drive in Oakland.
Fragrant fritillary *Fritillaria liliacea*	FSC/--/ 1B.2	Coastal prairie and scrub, grasslands, often on serpentine soils; 10-1350 ft.	**Not present.** Serpentine soils not present. Nearest recorded observation is historical and from Point Richmond.
Blue coast gilia *Gilia capitata* ssp. *chamissonis*	--/--/1B.1	Coastal dunes and scrub, sandy soils; 10-700 ft.	**Not present.** Suitable sandy substrate not present in survey area. Nearest records are from San Francisco sandy habitats.
Diablo helianthella *Helianthella castanea*	--/--/List 1B.2	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; 200-4000 ft.	**Low.** Only marginally suitable habitat, dominated by non-native species is available within the survey area. Nearest record is San Pablo Ridge.
White seaside tarplant *Hemizonia congesta* ssp. *congesta*	--/--/1B.2	Grassy sites, marshy edges; less than 330 ft.	**Low.** Native grasslands and marshes are no longer present in survey area. According to CCH (2012), nearest known populations are in Marin County, while CalFlora (2012) reports some occurrences in West Oakland.
Loma Prieta hoita *Hoita strobilina*	--/--/1B.2	Mesic areas, usually on serpentinite, riparian or cismontane woodland, chaparral; 100-2000 ft.	**Low.** No serpentine soils present. Only marginally suitable habitat, dominated by non-native species is available in survey area. Nearest records are in the Oakland Hills.
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	--/--/1B.1	Closed-cone coniferous forest, chaparral (maritime), coastal scrub; sandy or gravelly openings; 30-650 ft.	**Low.** Suitable habitat not observed in survey area. Alameda County records are very old and CNPS considers the species extirpated from the county.
Rose leptosiphon *Leptosiphon rosaceus*	--/--/1B.1	Coastal bluff scrub, 0-350 ft.	**Not present.** Suitable coastal bluff scrub habitat not present in survey area. Nearest, and possibly only known, locality is near Pacifica.
Oregon meconella *Meconella oregana*	FSC/--/1B.1	Coastal scrub and prairie; typically on north-facing, rocky slopes; 800-1600 ft.	**Low.** Only marginally suitable habitat, dominated by non-native species is available within in survey area. Known only from five occurrences, including Oakland East, Richmond, and Briones Valley quads.
Woodland woollythreads *Monolopia gracilens*	--/--/1B.2	Serpentine grassland, open chaparral, oak woodland; 350-3800 ft.	**Low.** No suitable natural habitat was observed in survey area; nearest known localities are in Oakland Hills and foothills of Mount Diablo.
Choris' popcorn-flower *Plagiobothrys chorisianus*	--/--/1B.2	Chaparral, coastal prairie, coastal scrub; mesic habitats; 50-350 ft.	**Low**. No suitable natural habitat was observed in survey area; nearest known localities are San Francisco and San Mateo counties; presumed extirpated from Alameda County.

TABLE H-1 (Continued)
SPECIAL-STATUS PLANTS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/ CDFG/CNPS**[2]	**General Habitat**	**Potential to Occur**
Other Special-Status Species (cont.)			
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus (=S. glandulosus* ssp. *glandulosus)*	FSC/--/1B.2	Ridges and slopes; chaparral, valley and foothill grassland, and woodland; on serpentine outcrops; 360-3300 ft.	**Not present.** No serpentine soils or outcrops within the survey area. Nearest known localities are Richmond and the Berkeley Hills.
Slender-leaved pondweed *Stuckenia filiformis*	--/--/2.2	Marshes and swamps (assorted shallow freshwater); 990-7000 ft.	**Not present**. Suitable marsh and ponded freshwater habitats not present within survey area; nearest known record is from Sibley Regional Park.
Suisun marsh aster *Symphyotrichum lentum (=Aster lentus)*	--/--/1B.2	Marshes and swamps (brackish and freshwater); 0-10 ft.	**Low**. Suitable habitat nearby, but not observed within survey area. Nearest recorded location is at Point Molate.
Saline clover *Trifolium hydrophilum*	--/--/1B.2	Marshes and swamps, valley and foothill grassland, vernal pools; mesic, alkaline sites; 0-1000 ft	**Low.** Mesic, alkaline natural habitats not observed in survey area; nearest known localities are from Richmond, the Berkeley shoreline, and West Oakland, but many sites are old records and may be extirpated.

STATUS CODES:

FEDERAL: (U.S. Fish and Wildlife Service)
FE = Listed as Endangered (in danger of extinction) by the Federal Government.
FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the Federal Government.
FP = Proposed for Listing as Endangered or Threatened.
FC = Candidate to become a *proposed* species.
FSC = Former FWS Species of Concern. The USFWS no longer lists Species of Concern but recommends that species considered to be at potential risk by a number of organizations and agencies be addressed during project environmental review.

STATE: (California Department of Fish and Game)
CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California (plants only)
CSC = California Species of Special Concern

California Native Plant Society
List 1A=Plants presumed extinct in California
List 1B=Plants rare, Threatened, or Endangered in California and elsewhere
List 2= Plants rare, Threatened, or Endangered in California but more common elsewhere
List 3= Plants about which more information is needed
List 4= Plants of limited distribution

An extension reflecting the level of threat to each species is appended to each rarity category as follows:
.1 – Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

SOURCE: CDFG, 2012a; CNPS, 2012; USFWS, 2012; Consortium of California Herbaria, 2012; CalFlora, 2012

TABLE H-2
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[3]	**General Habitat**	**Potential to Occur**
Species Listed or Proposed for Listing			
Animals			
Invertebrates			
Vernal pool fairy shrimp *Branchinecta lynchi*	FT/	Small, clear-water sandstone depression pools and grassy swales.	**Not present.** No suitable habitat present. No CNDDB records from 3-quad study area.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/	Serpentine bunchgrass and valley needlegrass grassland. Larval food plants are *Plantago erecta*, *Castilleja densiflora* and *C. exserta.* Adult food plants are *Lomatium* spp., *Lasthenia californica* and *Layia platyglossa.*	**Not present.** No suitable habitat present. No CNDDB records from 3-quad study area.
Callippe silverspot butterfly *Speyeria callippe callippe*	FE/	Grasslands with larval food plant *Viola pedunculata* and nearby adult nectar sources.	**Not present.** No native grassland habitat present. No CNDDB records from 3-quad study area.
Fish			
Southern DPS green sturgeon *Acipenser medirostris*	FT/CSC	Inhabit near-shore marine waters from Mexico to the Bering Sea. Utilize the waters of the Delta for juvenile rearing, adult holding, and migratory movements to and from Upper Sacramento River spawning grounds.	**Not Present.** May migrate through bay waters downstream of project area and juveniles may be present in bay year-round. Not known from San Pablo or Wildcat Creek watersheds (Leidy, 2007)
Tidewater goby *Eucyclogobius newberryi*	FE/CSC	Shallow waters of bays and estuaries, in lower stream reaches, in coastal stream lagoons	**Not present.** Estuary and lagoon habitat not present in project area.
Delta smelt *Hypomesus transpacificus* Critical Habitat designated	FT/CT	Shallow, open waters of the estuary where salinities are 2-7 ppt. Spawn and rear in sloughs and edge waters shallow of channels in upper Delta and Sacramento River, Suisun Marsh and Bay.	**Not present.** Estuary and lagoon habitat not present in project area.
Coho salmon – Central California coast ESU *Oncorhynchus kisutch* Critical Habitat designated	FE/CE	Accessible Bay Area and coastal rivers and streams with cover, cool water and sufficient dissolved oxygen. Require beds of loose, silt-free gravel for spawning.	**Low.** San Francisco Bay/Sacramento – San Joaquin River system is within the historical range of the species, but coho salmon are currently considered extirpated in project area.
Central California coast steelhead *Oncorhynchus mykiss* Critical Habitat designated	FT/CSC	Spawns and rears in coastal streams between the Russian River and Aptos Creek, as well as drainages of the San Francisco and San Pablo bays. Requires gravelly substrate and shaded riparian habitat.	**Moderate.** May occasionally stray into Wildcat and San Pablo creeks, but flow, temperature, fine sediments, water quality, and barriers to passage are limiting for spawning and rearing. Resident rainbow trout populations occur in Wildcat Creek and have occurred in San Pablo Creek. Historical steelhead run in San Pablo Creek thought to be extirpated or nearly so (Moyle, 2007).

[3] Key to listing status codes can be found at the end of Table 1.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[4]	**General Habitat**	**Potential to Occur**
Species Listed or Proposed for Listing (cont.)			
Animals (cont.)			
Fish (cont.)			
California Central Valley steelhead *Oncorhynchus mykiss* Critical Habitat designated	FT/CSC	Spawns and rears in the Sacramento/San Joaquin River systems and tributaries where gravelly substrate and shaded riparian habitat occurs.	**Low to moderate.** Migrates through bay waters downstream of project area. Could occasionally stray into San Pablo or Wildcat creeks but suitable spawning habitat very limited.
Sacramento winter-run Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat designated	FE/CE	Spawns and rears in Sacramento River and tributaries where gravelly substrate and shaded riparian habitat occurs.	**Low.** Migrates through bay waters downstream of project area. Not known to occur in either the San Pablo or Wildcat Creek. Populations are at all time low numbers, highly unlikely to occur in project area creeks.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat designated	FT/CT	Spawns and rears in Sacramento River and tributaries where gravelly substrate and shaded riparian habitat occurs.	**Low.** Migrates through bay waters downstream of project area. Not known to occur in either the San Pablo or Wildcat Creek. Populations are at all-time low numbers, highly unlikely to occur in project area creeks.
Amphibians			
California tiger salamander *Ambystoma californiense*	FT/CT	Natural pools and artificial ponds (usually ephemeral) for breeding and upland mammal burrows in annual grassland for adult cover and foraging.	**Not present.** Pools and ponds not present in survey area; upland habitat and burrows very limited and fragmented; CNDDB considers extirpated from three-quad study area.
California red-legged frog *Rana draytonii*	FT/CSC	Breed in stock ponds, pools, and slow-moving streams	**Low to Moderate.** Potentially suitable aquatic habitat present in San Pablo and Wildcat creeks. Nearest documented location is just below San Pablo Reservoir 5 miles distant. Potential for movement downstream into project area.
Reptiles			
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT	Most often in coastal scrub and chaparral; also can be present in grassland, woodland, and forest natural communities. Rock outcrops important in foraging for lizards.	**Low.** No natural coastal scrub or grassland habitat present in survey area, and ruderal habitat highly fragmented.
Birds			
Western snowy plover *Charadrius alexandrinus nivosus*	FT/	Forage for small invertebrates on dry or wet beach sand; breeds from southern Washington to Baja California on open sandy beaches, sand spits, dunes, and salt pans.	**Not present**. Suitable sandy habitat not present in survey area. No CNDDB records from vicinity of project area.

4 Key to listing status codes can be found at the end of Table 1.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[4]	**General Habitat**	**Potential to Occur**
Species Listed or Proposed for Listing (cont.)			
Animals (cont.)			
Birds (cont.)			
California black rail *Laterallus jamaicensis coturniculus*	--/CT	Salt marshes along large bays, also freshwater marshes	**Not present.** Documented in both San Pablo and Wildcat marshes downstream, but no suitable habitat present in project area.
California brown pelican *Pelecanus occidentalis californicus*	FT/	Forages for fish in open coastal waters; colonial nester on rocky sites.	**Not present.** Suitable habitat not present in survey area.
California clapper rail *Rallus longirostrus obsoletus*	FE/CE	Salt-water and brackish marshes with tidal sloughs.	**Not present.** Documented in Giant, San Pablo and Wildcat marshes downstream, but no suitable habitat within the project area.
California least tern *Sternula antillarum browni*	FE/	Breeds in colonies on open sand, tidal flats, sparsely vegetated beaches. Feed on small fish and crustaceans.	**Not present.** No suitable habitat present in project area. Known from San Pablo Bay National Wildlife Refuge.
Mammals			
Salt marsh harvest mouse *Reithrodontomys raviventris*	FE/CE	Saline emergent wetlands of San Francisco Bay and tributaries.	**Not present.** No suitable habitat within project area. Documented in San Pablo, Wildcat, Giant, and Breuner marshes downstream.
Other Special Status Species			
Animals			
Invertebrates			
Sandy beach tiger beetle *Cicindela hirticollis gravida*	--/SA	Found in moist sand near the ocean, for example in swales behind dunes or upper beaches beyond normal high tides.	**Not present.** Sandy beach and dune habitats not present in survey area. Nearest CNDDB is an extirpated site in San Francisco.
Monarch butterfly *Danaus plexippus*	--/* Wintering sites only	Winter roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress) with nectar and water sources nearby.	**Low.** Potential winter roosting habitat very limited in vicinity of San Pablo Creek. Nearest documented wintering roost is at Point Pinole.
Bridges' coast range shoulderband snail *Helminthoglypta nickliniana bridgesii*	--/SA	Found in hillside habitats of Alameda and Contra Costa counties; colonizes under tall grass and weeds.	**Low.** Hillside habitats with natural vegetation not found in survey area. Nearest CNDDB record is from San Pablo Creek, about 1 mile east of project area.
Lee's microblind harvestman *Microcina leei*	--/SA	Xeric (dry) habitats in the San Francisco Bay region; beneath sandstone rocks in open oak grassland.	**Low.** Sandstone rock and oak-grassland habitats not found in survey area.
A leaf-cutter bee *Trachusa gummifera*	--/SA	May inhabit brushy hillsides or slopes with tall grasses.	**Low.** All known records are from San Francisco.
Mimic tryonia *Tryonia imitator*	--/SA	Permanently submerged areas in coastal lagoons, salt marshes, and estuaries; tolerates a wide range of salinities.	**Not present.** Brackish water habitats not present in survey area. Nearest CNDDB record is from Lake Merritt.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[4]	**General Habitat**	**Potential to Occur**
Other Special Status Species (cont.)			
Animals (cont.)			
Fish			
Sacramento perch *Archoplites interruptus*	--/CSC	Tidal waters, freshwater lower-elevation pools in slow moving streams, and floodplain lakes, often with emergent vegetation.	Low. Species was introduced to and documented from Jewel Lake and Lake Anza (manmade lakes on upper Wildcat Creek) in Tilden Regional Park from the 1980's. Since thought to be extirpated from Lake Anza and to persist in small numbers in Jewel Lake. Species is thought to be extinct throughout most of its native range.
Central Valley fall/late fall-run Chinook salmon *Oncorhynchus tshawytscha*	FSC/CSC	Spawns and rears in Sacramento River and tributaries where gravelly substrate and shaded riparian habitat occurs.	**Low.** Migrates through waters of San Pablo Bay to spawning grounds. May occasionally stray into San Pablo and Wildcat creeks within the project area.
Longfin smelt *Spirinchus thaleichthys*	--/CSC	Occur in the middle or bottom of water column in salt or brackish water. Concentrated in Suisun Bay, Montezuma Slough, and the lower reaches of the Sacramento and San Joaquin Rivers, but may be found throughout San Francisco Bay.	**Not present.** Migrates through waters of San Pablo Bay to spawning grounds. Not expected to occur in San Pablo and Wildcat creeks.
Reptiles			
Western pond turtle *Emys marmorata*	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs.	**Moderate.** Aquatic habitat available in San Pablo Creek within the project area. Known from San Pablo Reservoir, about 5 miles upstream.
Foothill yellow-legged frog *Rana boylii*	--/CSC	Partly shaded, shallow streams and riffles with rocky substrate on permanent streams.	**Low.** Historically known from San Pablo Creek in Orinda, but no recent CNDDB records from this or Wildcat Creek watersheds.
Birds			
Cooper's hawk Accipiter cooperii	--/* 3503.5	Nests in conifers or deciduous stands near riparian areas	**Moderate.** Suitable nesting habitat present in larger trees along the San Pablo and Wildcat Creek riparian corridors.
Sharp-shinned hawk *Accipiter striatus*	--/CSC 3503.5	Nests in mountainous woodlands and forests in either coniferous or deciduous trees	**Low.** Do not generally breed in the region. May winter in the project area.
Golden eagle *Aquila chrysaetos*	--/* 3503.5	Nests in large trees, snags, and cliffs, winters on lakes and reservoirs.	**Not present.** Suitable nesting and foraging habitat absent.
Great egret *Ardea alba*	--/* Rookeries only	Nest colonially in groves of trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Low.** May forage along San Pablo and Wildcat creeks. Unlikely to nest in immediate vicinity of project area because of high ambient levels of activity and disturbance. No rookeries are recorded in the immediate vicinity of the project area.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG[4]**	**General Habitat**	**Potential to Occur**
	Other Special Status Species (cont.)		
Animals (cont.)			
Birds (cont.)			
Great blue heron *Ardea herodias*	--/* Rookeries only	Nest colonially in groves of trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Low.** May forage along San Pablo and Wildcat creeks, but suitable nesting habitat is not available in project area and no rookeries are recorded in the immediate vicinity.
Burrowing owl Athene cunicularia	--/CSC	Nests and forages in low-growing grasslands that support burrowing mammals.	**Low.** Only marginally suitable grassland habitat present. Not documented from the immediate area.
Great horned owl *Bubo virginianus*	--/3503.5	Often uses abandoned nests of corvids or squirrels; nests in large oaks, conifers, eucalyptus.	**High.** Suitable nesting habitat present in larger trees along the San Pablo and Wildcat Creek riparian corridors.
Red-tailed hawk Buteo jamaicensis	--/3503.5	Usually nests in large trees, often in woodland or riparian deciduous habitats	**High.** Suitable nesting habitat present in larger trees along the San Pablo and Wildcat Creek riparian corridors.
Red-shouldered hawk Buteo lineatus	--/3503.5	Usually nests in large trees, often in woodland or riparian deciduous habitats. Forages over open grasslands and woodlands	**High.** Suitable nesting habitat present in larger trees along the San Pablo and Wildcat Creek riparian corridors.
Northern harrier *Circus cyaneus*	--/CSC	Mostly nests in emergent vegetation, wet meadows or near rivers and lakes, but may nest in grasslands away from water.	**Not present.** Suitable nesting and foraging habitat not present in project area. Recorded as occurring in Wildcat Marsh.
Snowy egret *Egretta thula*	--/* Rookeries only	Nest colonially in groves of trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Low.** Likely to forage along San Pablo and Wildcat creeks, but suitable nesting habitat is limited and no rookeries are recorded in the immediate vicinity.
White-tailed kite Elanus leucurus	FSC/Fully Protected	Nests in trees adjacent to grasslands, forages over grasslands and agricultural lands	**Low.** Very limited foraging and nesting habitat in project area. Documented nearby as occurring in Wildcat Marsh.
American kestrel *Falco sparverius*	--/3503.5	Nests in cavities in large trees near open areas.	**Moderate**. May nest in cavities of mature riparian corridor trees along San Pablo and Wildcat creeks. Limiting foraging habitat in project area.
Salt-marsh common yellowthroat Geothlypis trichas sinuosa	FSC/CSC	Emergent wetlands	**Not present.** Associated with salt and fresh water marshes, habitats not present in project area.
Caspian tern *Hydroprogne caspia*	--/SA	Nests on sandy or gravelly beaches and shell banks in small colonies inland and along the coast.	**Not present.** Sandy or gravelly beach habitat is not present in survey area. Nearest recorded locality is on Brooks Island.
Alameda song sparrow *Melospiza melodia pusillula*	--/CSC	Endemic to central San Francisco Bay. Found in pickleweed marshes, nests in low shrubs and pickleweed above high tide levels	**Not present.** Suitable marsh habitat not present in project area. Nearby Wildcat Marsh contains potential habitat.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG[4]**	**General Habitat**	**Potential to Occur**
	Other Special Status Species (cont.)		
Animals (cont.)			
Birds (cont.)			
San Pablo song sparrow *Melospiza melodia samuelis*	--/CSC	Salt marshes along northern S.F. and San Pablo Bays.	**Not present.** Salt marsh habitat not present within project area Recorded nearby from Wildcat Marsh.
Black-crowned night heron *Nycticorax nycticorax*	--/* Rookeries only	Various wetland habitats, including salt, brackish, and freshwater marshes, swamps, streams, lakes, and agricultural fields. Nest in large trees, often with other herons or egrets.	**Low.** May forage along San Pablo and Wildcat Creeks, but relatively high levels of disturbance likely preclude nesting. No rookeries documented nearby.
Allen's hummingbird *Selasphorus sasin*	FSC/* (AWLY)	Inhabits coastal scrub and a variety of woodlands and riparian habitat, as well as gardens in the urban-wildland interface.	**Moderate to High.** Suitable nesting and foraging habitat is present in landscaped areas and riparian woodlands. Known records are from Pt. Pinole Regional Park and Miller/Knox Regional Shoreline.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	--/CSC	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds.	**Not present.** Suitable freshwater emergent wetlands not present in survey area. Nearest known CNDDB record is Pinole.
Mammals			
Pallid bat *Antrozous pallidus*	FSC/CSC	Various habitats including grasslands, scrubs, woodlands, and mixed conifer forests, but is most common in open, dry habitats with rocky areas for roosting. Day roosts include hollow trees, buildings, caves, crevices, and mines.	**Low.** Potential roosting habitat may be available in trees on or within the vicinity of the project area. However there is a general lack of foraging habitat in the vicinity. Most CNDDB records from vicinity of project are old.
Berkeley kangaroo rat *Dipodomys heermannii berkeleyensis*	--/SA	Open grassy hilltops and open spaces in chaparral and blue oak-gray pine woodlands; requires fine, deep, well-drained soil for burrowing.	**Low.** Natural vegetation such as grassy hilltops, open spaces and oak-pine woodland are not present in survey area.
Silver-haired bat *Lasionycteris noctivagans*	--/*	Commonly associated with old growth forests. Maternity colonies found in tree cavities or small hollows. Hibernation roosts include small tree hollows, beneath exfoliating bark, in wood piles, cliff faces, and cave entrances. Feed predominantly in disturbed areas, often in small clearings and along roadways or water courses.	**Low.** May occur on a transient basis within the project area during spring and fall migration.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[4]	**General Habitat**	**Potential to Occur**
Other Special Status Species (cont.)			
Animals (cont.)			
Mammals (cont.)			
Hoary bat *Lasiurus cinereus*	--/*	A relatively common, solitary species that occurs throughout California, wintering along the coast and in southern California, and breeds in areas inland and north of the winter range. Prefers open habitats or habitat mosaics, with trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees.	**Low.** Potential roosting habitat is available in large riparian trees in the project area. Not expected to breed in the area but may migrate through and may potentially winter there as well.
San Pablo vole *Microtus californicus sanpabloensis*	--/CSC	Salt marshes and adjacent riparian habitat of San Pablo Creek, San Pablo Bay.	**Low.** Recorded in 1986 from riparian corridors of both San Pablo and Wildcat Creeks west of project area.
Long-eared myotis *Myotis evotis*	FSC/--	Inhabits woodlands and forests up to approximately 8,200 feet in elevation; roosts in crevices and snags.	**Moderate.** Suitable foraging habitat is limited in the project area. Roosting habitat available in riparian woodlands along San Pablo and Wildcat creeks.
Fringed myotis *Myotis thysanodes*	FSC/--	Inhabits a variety of woodland habitats, roosts in crevices or caves, and forages over water and open habitats.	**Moderate.** Suitable foraging habitat is limited in the project area. Roosting habitat available in riparian woodlands along San Pablo and Wildcat creeks.
Yuma myotis *Myotis yumanensis*	FSC/CSC	Open forests and woodlands below 8,000 feet in close association with water bodies	**Moderate.** Vacant or underutilized structures may provide roosting habitat. Suitable foraging habitat is limited and is mainly along San Pablo and Wildcat creeks.
Big free-tailed bat *Nyctinomops macrotis*	--/CSC	Known from isolated populations throughout southwestern U.S., into Mexico. Lives in rocky areas of desert scrub or coniferous forests. Roosts by day in crevices on cliff faces. Feeds on insects. Forms colonies and bear one young each year, in the early summer.	**Low.** Rare and not known to breed in California. One known record (a suspected vagrant) documented locally (from Alameda County. May migrate through area and be present occasionally on a transient basis.
Alameda Island vole *Scapanus latimanus parvus*	--/CSC	Moist, friable but not flooded soils in a variety of habitats, mostly annual and perennial grasslands.	**Not present.** All known CNDDB records are from Alameda Island.
Salt marsh wandering shrew *Sorex vagrans halicoetes*	FSC/CSC	Salt marsh habitat 6-8 feet above sea level, with abundant pickleweed and driftwood.	**Not present.** Suitable salt marsh habitat not present in project area. Recorded from San Pablo Creek Marsh and Giant Marsh.

TABLE H-2 (Continued)
SPECIAL STATUS ANIMALS CONSIDERED IN THE EVALUATION OF THE PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFG**[4]	**General Habitat**	**Potential to Occur**
Other Special Status Species (cont.)			
Animals (cont.)			
Mammals (cont.)			
American badger *Taxidea taxus*	--/CSC	Known from many shrub, forest and herbaceous habitats, usually in drier, more open examples; requires friable soils for digging; preferred prey is rodents	**Low.** This species requires fairly large home ranges and a reliable prey base and therefore is unlikely to be found in project area. Nearest CNDDB records are Orinda and Mills College.

STATUS CODES:

FEDERAL: (U.S. Fish and Wildlife Service)
FE = Listed as Endangered (in danger of extinction) by the Federal Government.
FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the Federal Government.
FP = Proposed for Listing as Endangered or Threatened.
FC = Candidate to become a *proposed* species.
FSC = Former FWS Species of Concern. The USFWS no longer lists Species of Concern but recommends that species considered to be at potential risk by a number of organizations and agencies be addressed during project environmental review. Also may be NMFS Species of Concern, which are still listed.
MMPA = Marine Mammal Protection Act

STATE: (California Department of Fish and Game)
CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California (plants only)
CSC = California Species of Special Concern
3503.5=Protection for nesting species of Falconiformes (hawks) and Strigiformes (owls)
*Special animal—listed on CDFG's Special Animals List

SOURCE: CDFG, 2012a; USFWS, 2012

APPENDIX I
Supplemental Noise Information

Noise Descriptors

Sound is a phenomenon that occurs in a medium (such as air or water), and the manner in which sound travels through this medium is influenced by the physical properties of the medium (such as temperature, density, and humidity). The amount of energy in the sound is proportional to the pressure it generates in the medium. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (**dB**) scale is used to quantify sound intensity. Sound can vary in intensity by more than 1 million times within the range of human hearing; therefore, a logarithmic scale is used to keep sound pressure measurements within a convenient and manageable range. Because the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” which is expressed as “**dBA**.” The A-weighted decibel, dBA, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented in this report are expressed in terms of dBA unless otherwise indicated. **Table I-1** shows some representative noise sources and their corresponding noise levels in dBA.

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land-use type. Some general guidelines are as follows: noise levels above 35 dBA can disturb sleep; noise levels of 60 dBA begin to interfere with human speech; prolonged exposure to noise levels greater than 85 dBA can damage hearing (USEPA, 1974).

Variations in noise exposure over time are typically expressed in terms of a steady-state energy level (called **Leq**) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to “quiet time” noise levels to form a 24-hour noise descriptor called the community noise equivalent level (**CNEL**). CNEL adds a 5-dBA “penalty” during the evening hours (7 p.m. to 10 p.m.) and a 10-dBA penalty during nighttime hours (10 p.m. to 7 a.m.). Another 24-hour noise descriptor, called the day-night noise level (**Ldn**), is similar to CNEL. Both CNEL and Ldn add a 10-dBA penalty to all nighttime noise events between 10 p.m. and 7 a.m., but Ldn does not add the 5-dBA evening penalty. In

TABLE I-1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Examples of Common, Easily Recognized Sounds	A-Weighted Decibels (dBA)	Subjective Evaluations
Near Jet Engine	140	Deafening
Threshold of Pain	130	
Threshold of Feeling – Hard Rock Band	120	
Accelerating Motorcycle (at a few feet away)	110	
Loud Horn (at 10 feet away)	100	Very Loud
Noisy Urban Street	90	
Noisy Factory	85[a]	
School Cafeteria with Untreated Surfaces	80	Loud
Lawnmower	70[b]	
Near Freeway Auto Traffic	60[b]	Moderate
Average Office	50[b]	
Soft Radio Music in Apartment	40	Faint
Average Residence without Stereo Playing	30	
Average Whisper	20	Very Faint
Rustle of Leaves in Wind	10	
Human Breathing	5	
Threshold of Audibility	0	

[a] Continuous exposure above 85 dBA is likely to degrade the hearing of most people.
[b] The range of speech is 50 to 70 dBA.

SOURCE: U.S. Department of Housing and Urban Development, 1985.

practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources. **Lmax** is the maximum, instantaneous noise level registered during a measurement period.

Vibration Descriptors

Vibrations caused by construction activities can be interpreted as energy transmitted in waves through the ground. These energy waves generally dissipate with distance from the vibration source (e.g., pile driving or sheet pile driving). Energy is lost during the transfer of energy from one particle to another, and vibration becomes less perceptible as distance from the source increases. Vibration attenuates as a function of the distance between the source and receptor. Vibration emanating from a single location (a “point source”) attenuates at a rate of approximately 50 percent for each doubling of distance from the source (termed the “inverse square law”). This calculation tends to underestimate attenuation, and thus provides a worst-case estimate of vibration at the receptor.

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is used to assess the potential for damage to buildings and structures and is expressed in inches per second (in/sec).

The responses of human receptors and structures to vibration are influenced by a combination of factors, including soil/rock type, distance from the source, duration, and the number of perceived vibration events. Energy transmitted through the ground as vibration can reach levels that cause structural damage; however, humans are very sensitive to vibration, and the vibration amplitudes that can be perceived by humans are well below the levels that cause architectural or structural damage.

Some reference values for vibration are as follows: (1) a freight train passing at a distance of 100 feet can result in vibrations of 0.1 in/sec PPV, and (2) a strong earthquake can produce vibrations in the range of 10 in/sec PPV.

Regulatory Setting

Federal and State Regulations

No federal or state standards related to noise are applicable to the proposed project. The Federal Noise Control Act of 1972 divides powers between federal, state, and local governments, in which the primary federal responsibility is for noise source emission control. State and local governments are responsible for controlling the use of noise sources and determining the levels of noise to be permitted in their environment (USEPA, 1974).

Local Regulations and Policies

At the local level, noise is addressed through the implementation of general plan policies, including noise and land use compatibility guidelines, and through enforcement of noise ordinances. General plan policies provide guidelines for determining whether a noise environment is appropriate for a proposed or planned land use. Local noise ordinances regulate such sources as mechanical equipment and amplified sounds, as well as prescribe hours of heavy equipment operation. Pursuant to California Government Code Section 53091, the East Bay Municipal Utility District (EBMUD)—as a local agency and utility district serving a broad regional area—is not subject to building and land use zoning ordinances (such as noise ordinances) for projects involving facilities that would produce, generate, store, or transmit water. However, it is the practice of EBMUD to work with local jurisdictions and neighboring communities during project planning, and to conform to local environmental protection policies to the extent feasible.

City of Berkeley

The Berkeley Noise Ordinance (Chapter 13.40, Section 13.40.070[B][7], Construction/ Demolition) specifies construction and demolition noise limits for various land uses and types of construction activities. **Table I-2** lists the noise limits for residential uses.

TABLE I-2
CITY OF BERKELEY CONSTRUCTION NOISE LIMITS

Equipment Type	Zone	Time Period	Allowable Exterior Noise Level (dBA)
Mobile (non-scheduled, intermittent, operating <10 days)	R-1, R-2 Residential	Daily, 7:00 a.m. to 7:00 p.m. Weekends, 9:00 a.m. to 8:00 p.m. and Legal Holidays	75 60
Stationary (repetitively scheduled, long-term, operating >10 days)	R-1, R-2 Residential	Daily, 7:00 a.m. to 7:00 p.m. Weekends, 9:00 a.m. to 8:00 p.m. and Legal Holidays	60 50

SOURCE: Berkeley Municipal Code (Chapter 13.40, Community Noise, Section 13.40.070[B][7], Construction/ Demolition).

Exterior noise limits for the R-1 and R-2 residential zones specified in Section 13.40.050 convert to the Leq and CNEL noise limits listed in **Table I-3**.

TABLE I-3
CITY OF BERKELEY EXTERIOR NOISE STANDARDS AND CONVERTED Leq AND CNEL EQUIVALENTS

Ordinance Noise Limits			
Maximum Time (minutes/hour)	**Model Duration (minutes/hour)**	**Daytime (7 a.m. to 7 p.m.)**	**Nighttime (10 p.m. to 7 a.m.)**
30	30	55	45
5	25	65	55
1	4	70	60
0	1	75	65
Converted Leq and CNEL Noise Limit Equivalents[a]			
Leq	60 minutes	64.3	54.3

[a] Since construction noise levels vary with location and use of equipment during any given modeling period, construction noise levels are not comparable to these simpler ordinance noise energy calculations. Therefore, the above-listed noise limits for each modeled daytime and nighttime hour and their specified durations were converted to Leq levels assuming that the maximum permitted noise levels occur during the modeled hour (WIA, 2000).

SOURCE: Berkeley Municipal Code (Chapter 13.40.050, Exterior Noise Standards).

City of El Cerrito

The El Cerrito Municipal Code does not specifically address construction time or noise limits. However, the Municipal Code does include outdoor noise standards for residential development, which are listed in **Table I-4**. The Municipal Code states:

TABLE I-4
CITY OF EL CERRITO OUTDOOR NOISE LIMITS

Land Use Type	Exterior Noise Exposure (Ldn or CNEL)		
	Normally Acceptable	Conditionally Acceptable	Unacceptable
Residential, Hotel and Motels, Schools, Libraries, Hospitals	60	75	>75
Office Buildings, Business, Commercial and Professional	60	80	>80

SOURCE: El Cerrito Municipal Code (Title 19, Zoning, Chapter 19.21, General Site Standards, Section 19.21.050[B][2], Performance Standards).

The goal for maximum outdoor noise levels in residential areas is an Ldn of 60 dB. This level is a requirement to guide the design and location of future development and is a goal for the reduction of noise in existing development. This goal will be applied where outdoor use is a major consideration (e.g., backyards in single-family housing developments and open space areas in multi-family housing projects). The outdoor standard will not normally be applied to the small decks associated with apartments and condominiums but these will be evaluated on a case-by-case basis. Where the Zoning Administrator determines that providing an Ldn of 60 dB or lower outdoors is not feasible, the outdoor goal may be increased to an Ldn of 65 dB at the discretion of the Planning Commission. (Section 19.21.050.B.2.a, Outdoor Noise Levels for Residential Areas)

The noise environment in existing residential areas shall be protected. The City of El Cerrito shall require the evaluation of mitigation measures for projects under the following circumstances:

a. The project would cause the Ldn to increase 3 dBA or more.

b. Any increase would result in an Ldn greater than 60 dBA.

c. The Ldn already exceeds 60 dBA.

d. The project has the potential to generate significant adverse community response.

(Section 19.21.050.B.4, Evaluation of Noise Impacts in Existing Residential Areas)

Municipal Code Section 19.21.050.E (Performance Standards, Vibration) states that no use, activity, or process will produce vibrations that are perceptible without instruments by a reasonable person at or beyond the property line of the site on which they are situated.

Municipal Code Section 10.30.010 prohibits any person from making any unnecessary noises or sounds that are physically annoying to persons of ordinary sensitiveness, or so harsh or so prolonged or unnatural or unusual in their use, time, or place as to cause physical discomfort to the inhabitants of the neighborhood.

For construction work within the public right-of-way, the City of El Cerrito requires an encroachment permit. The City's standard encroachment permit conditions indicate that time limits within the public right-of-way shall be 8:00 to 5:00 p.m., Monday – Friday (excluding holidays) or as directed by the City Engineer (City of El Cerrito, 2009).

City of Richmond

The City of Richmond Municipal Code contains two chapters governing noise: Chapter 9.52, Community Noise Ordinance, and Chapter 15.04, Zoning. The City of Richmond Community Noise Ordinance (No. 43-95 or Chapter 9.52 of the Richmond Municipal Code) includes provisions to limit noise impacts generated by construction activity in residential areas. The Noise Ordinance limits the hours that construction activities can occur to 7:00 a.m. to 7:00 p.m. on weekdays and 9:00 a.m. to 8:00 p.m. on weekends and legal holidays. For short-term (temporary), non-scheduled, intermittent operation of mobile construction equipment, the Noise Ordinance limits maximum noise levels to 75 dBA on weekdays (7:00 a.m. to 7:00 p.m.) and 60 dBA on weekends and legal holidays (9:00 a.m. to 8:00 p.m.). For scheduled, long-term operation of stationary equipment (15 days or more), the Noise Ordinance limits maximum noise levels to 60 dBA on weekdays (7:00 a.m. to 7:00 p.m.) and 55 dBA on weekends and legal holidays (9:00 a.m. to 8:00 p.m.). These limits apply to construction activities, wherever technically and economically feasible. This ordinance also specifies exterior noise limits of 60 dBA (a level not to be exceeded more than 30 minutes in any hour) in single-family residential zoning districts (measured at the property boundary).

Section 15.04.840.020, Noise Standards, of Chapter 15.04, Zoning, stipulates that the noise level between 10 p.m. and 7:00 a.m. at the property line of a single-family residence must not exceed 50 dBA for more than 30 minutes in any hour. During those nighttime hours, the standards permit a noise level (at the property line of a single-family residence) of 55 dBA for no more than a cumulative period of 5 minutes in any hour, and 60 dBA for no more than a cumulative period of 1 minute in any hour. The standards result in a converted Leq noise limit equivalent of 54 dBA for nighttime construction activities, as indicated in **Table I-5**.

TABLE I-5

CITY OF RICHMOND NIGHTTIME EXTERIOR NOISE STANDARDS FOR SINGLE-FAMILY RESIDENTIAL ZONING DISTRICT AND CONVERTED Leq EQUIVALENT

Ordinance Noise Limits		
Maximum Time (minutes/hour)	**Model Duration**	**Nighttime (10 p.m. to 7 a.m.)**
30	30 minutes at 49.9 dBA	50 dBA
5	25 minutes at 54.9 dBA	55 dBA
1	5 minutes at 59.9 dBA	60 dBA
	Converted Leq[a]	
Leq	60 minutes	54 dBA

[a] Since construction noise levels vary with location and use of equipment during any given modeling period, construction noise levels are not comparable to these simpler ordinance noise energy calculations. Therefore, the above-listed noise limits were converted to Leq levels assuming that the maximum permitted noise levels occur during the modeled hour (WIA, 2000).

SOURCE: Richmond Municipal Code (Section 15.04.840.020, Noise Standards).

City of San Pablo

Section 9.12.010 of the San Pablo Municipal Code prohibits the operation of the following equipment between the hours of 10:00 p.m. and 7:00 a.m.: pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, power-driven saw, or any other tool or apparatus the use of which is attended by loud or unusual noise, except by written permission of the building inspector, and then only in case of emergency. In addition, the San Pablo General Plan Noise Element, Action PS 4.G prohibits construction hours near sensitive land uses between 9:00 p.m and 7:00 a.m. on weekdays and 5:00 p.m. to 9:00 a.m. on weekends and holidays.

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TABLE I-6

ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Sources	Reference Noise Level, Lmax in dBA at 50 feet[a]	Minimum Distance Between Project and Closest Sensitive Receptor[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	Leq Noise Level Adjusted for Distance and Usage	Impact 3.11-1: Leq Exceeds 75-dBA Ordinance Daytime Noise Limit?	Impact 3.11-1: Impact 3.11-1 Significance Determination	Impact 3.11-2: Leq Exceeds 70-dBA Speech Interference Threshold?	Impact 3.11-2: Duration of Construction[d] (Workdays)	Impact 3.11-2: Impact 3.11-2 Significance Determination	Noise Reduction From Mitigation Measure NOI-1 and NOI-2b[e]	Mitigated L_{eq} With Mitigation Measure NOI-1 and NOI-2b[e]
Open Trench Pipeline Construction															
Wildcat Pipeline (Berkeley)								*Berkeley Ordinance Noise Limit for Short-term Construction Activities:*	*75 dBA*						
Closest residential	Pavement Cutting	Pavement Saw	90	30	4	10%	-10	84	Yes	**SU**	Yes	1 Day	LS	0	**84**
receptors on: Parkside,		Jackhammer	89	30	4	10%	-10	83	Yes	**SU**	Yes	1 Day	LS	-5	**78**
The Uplands, Hillegass	Excavation and	Excavator	81	30	4	40%	-4	81	Yes	**SU**	Yes	3 Days	LS	0	**81**
or Benvenue,	Pipe Installation	Various Trucks (dump, flatbed, water)	76	30	4	40%	-4	76	Yes	**SU**	Yes	3 Days	LS	0	**76**
Stuart, Telegraph,		Backhoe, Loader, Forklift	79	30	4	40%	-4	79	Yes	**SU**	Yes	3 Days	LS	0	**79**
Ward, Dana		Mobile Batch Plant[f]	76	30	4	15%	-8	72	No	LS	Yes	2 Days	LS	0	72
	Repaving	Paving Equipment (roller)	80	30	4	10%	-10	74	No	LS	Yes	2 Days	LS	0	74
		Compactor	83	30	4	10%	-10	77	Yes	**SU**	Yes	2 Days	LS	0	**77**
							Highest Combined Leq at Closest Receptor:	89	Total Construction Days at One Receptor:			6 Days			
Wildcat Pipeline (El Cerrito)								*El Cerrito Ordinance Noise Limit for Short-term Construction Activities:*	*None*						
Closest residential	Pavement Cutting	Pavement Saw	90	25	6	10%	-10	86	-	-	Yes	1 Day	LS	0	86
receptors on: Lynn,		Jackhammer	89	25	6	10%	-10	85	-	-	Yes	1 Day	LS	-5	80
C Street, Behrens,	Excavation and	Excavator	81	25	6	40%	-4	83	-	-	Yes	3 Days	LS	0	83
Fairmount, Norvell	Pipe Installation	Various Trucks (dump, flatbed, water)	76	25	6	40%	-4	78	-	-	Yes	3 Days	LS	0	78
Lincoln, Richmond,		Backhoe, Loader, Forklift	79	25	6	40%	-4	81	-	-	Yes	3 Days	LS	0	81
Hill		Mobile Batch Plant[f]	76	25	6	15%	-8	74	-	-	Yes	2 Days	LS	0	74
	Repaving	Paving Equipment (roller)	80	25	6	10%	-10	76	-	-	Yes	2 Days	LS	0	76
		Compactor	83	25	6	10%	-10	79	-	-	Yes	2 Days	LS	0	79
							Highest Combined Leq at Closest Receptor:	91	Total Construction Days at One Receptor:			6 Days			
Central Pressure Zone Pipeline (El Cerrito/Richmond)								*El Cerrito Ordinance Noise Limit for Short-term Construction Activities:*	*None*						
Closest residential	Pavement Cutting	Pavement Saw	90	30	4	10%	-10	84	-	-	Yes	1 Day	LS	0	84
receptors on San		Jackhammer	89	30	4	10%	-10	83	-	-	Yes	1 Day	LS	-5	78
Pablo Avenue	Excavation and	Excavator	81	30	4	40%	-4	81	-	-	Yes	3 Days	LS	0	81
(Highway 123)	Pipe Installation	Various Trucks (dump, flatbed, water)	76	30	4	40%	-4	76	-	-	Yes	3 Days	LS	0	76
		Backhoe, Loader, Forklift	79	30	4	40%	-4	79	-	-	Yes	3 Days	LS	0	79
		Mobile Batch Plant[f]	76	30	4	15%	-8	72	-	-	Yes	2 Days	LS	0	72
	Repaving	Paving Equipment (roller)	80	30	4	10%	-10	74	-	-	Yes	2 Days	LS	0	74
		Compactor	83	30	4	10%	-10	77	-	-	Yes	2 Days	LS	0	77
							Highest Combined Leq at Closest Receptor:	89	Total Construction Days at One Receptor:			6 Days			
Central Pressure Zone Pipeline (Richmond/San Pablo)								*Richmond Ordinance Noise Limit for Short-term Construction Activities:*	*75 dBA*						
Closest school	Pavement Cutting	Pavement Saw	90	55	-1	10%	-10	79	Yes	**SU**	Yes	1 Day	LS	0	**79**
receptor (Richmond		Jackhammer	89	55	-1	10%	-10	78	Yes	**SM**	Yes	1 Day	LS	-5	73
High School)	Excavation and	Excavator	81	55	-1	40%	-4	76	Yes	**SU**	Yes	3 Days	LS	0	**76**
on 23rd Street	Pipe Installation	Various Trucks (dump, flatbed, water)	76	55	-1	40%	-4	71	No	LS	Yes	3 Days	LS	0	71
		Backhoe, Loader, Forklift	79	55	-1	40%	-4	74	No	LS	Yes	3 Days	LS	0	74
		Mobile Batch Plant[f]	76	55	-1	15%	-8	67	No	LS	Yes	2 Days	LS	0	67
	Repaving	Paving Equipment (roller)	80	55	-1	10%	-10	69	No	LS	Yes	2 Days	LS	0	69
		Compactor	83	55	-1	10%	-10	72	No	LS	Yes	2 Days	LS	0	72
							Highest Combined Leq at Closest Receptor:	84	Total Construction Days at One Receptor:			6 Days			

TABLE I-6 (Continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Sources	Reference Noise Level, Lmax in dBA at 50 feet[a]	Minimum Distance Between Project and Closest Sensitive Receptor[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	Leq Noise Level Adjusted for Distance and Usage	Impact 1: Leq Exceeds 75-dBA Ordinance Daytime Noise Limit?	Impact 1: Impact 1 Significance Determination	Impact 2: Leq Exceeds 70-dBA Speech Interference Threshold?	Impact 2: Duration of Construction[d] (Workdays)	Impact 2: Impact 2 Significance Determination	Noise Reduction From Mitigation Measure NOI-1[e]	Mitigated L_{eq} With Controls
Open Trench Pipeline Construction															
Central Pressure Zone Pipeline (Richmond/San Pablo)				*Richmond Ordinance Noise Limit for Short-term Construction Activities:*					*75 dBA*						
Closest residential	Pavement Cutting	Pavement Saw	90	20	8	10%	-10	88	Yes	**SU**	Yes	1 Day	LS	0	**88**
receptor at 404		Jackhammer	89	20	8	10%	-10	87	Yes	**SU**	Yes	1 Day	LS	-5	**82**
23rd Street	Excavation and	Excavator	81	20	8	40%	-4	85	Yes	**SU**	Yes	3 Days	LS	0	**85**
	Pipe Installation	Various Trucks (dump, flatbed, water)	76	20	8	40%	-4	80	Yes	**SU**	Yes	3 Days	LS	0	**80**
		Backhoe, Loader, Forklift	79	20	8	40%	-4	83	Yes	**SU**	Yes	3 Days	LS	0	**83**
		Mobile Batch Plant[f]	76	20	8	15%	-8	76	Yes	**SU**	Yes	2 Days	LS	0	**76**
	Repaving	Paving Equipment (roller)	80	20	8	10%	-10	78	Yes	**SU**	Yes	2 Days	LS	0	**78**
		Compactor	83	20	8	10%	-10	81	Yes	**SU**	Yes	2 Days	LS	0	**81**
				Highest Combined Leq at Closest Receptor:				93	Total Construction Days at One Receptor:			6 Days			
Central Pressure Zone Pipeline (Richmond/San Pablo)				*San Pablo Ordinance Noise Limit for Short-term Construction Activities:*					*None*						
Closest residential	Pavement Cutting	Pavement Saw	90	10	14	10%	-10	94	-	-	Yes	1 Day	LS	0	94
receptors on: 23rd		Jackhammer	89	10	14	10%	-10	93	-	-	Yes	1 Day	LS	-5	88
Street, Brookside,	Excavation and	Excavator	81	10	14	40%	-4	91	-	-	Yes	3 Days	LS	0	91
EBMUD ROW	Pipe Installation	Various Trucks (dump, flatbed, water)	76	10	14	40%	-4	86	-	-	Yes	3 Days	LS	0	86
across San Pablo		Backhoe, Loader, Forklift	79	10	14	40%	-4	89	-	-	Yes	3 Days	LS	0	89
Creek to Road 20		Mobile Batch Plant[f]	76	10	14	15%	-8	82	-	-	Yes	2 Days	LS	0	82
	Repaving	Paving Equipment (roller)	80	10	14	10%	-10	84	-	-	Yes	2 Days	LS	0	84
		Compactor	83	10	14	10%	-10	87	-	-	Yes	2 Days	LS	0	87
				Highest Combined Leq at Closest Receptor:				99	Total Construction Days at One Receptor:			6 Days			
Jack-and-Bore Construction															
Wildcat Creek Crossing (San Pablo)				*San Pablo Ordinance Noise Limit for Short-term Construction Activities:*					*None*						
Closest residential	Pit Excavation	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	70	-3	20%	-7	91	-	-	Yes	10 Days	**SM**	0	91
receptor to receiving		Impact/Vibratory Sheetpile Driver – Lower Range	75	70	-3	20%	-7	65	-	-	No	10 Days	LS	0	65
pit across the street		Excavator	81	70	-3	40%	-4	74	-	-	Yes	10 Days	**SM**	0	74
(2006 23rd Street)		Various Trucks (dump, flatbed, water)	76	70	-3	40%	-4	69	-	-	Yes	10 Days	LS	0	69
		Backhoe, Loader, Forklift	79	70	-3	40%	-4	72	-	-	Yes	10 Days	**SM**	0	72
	Pipe Installation	Boring Machine or Auger[h]	84	70	-3	40%	-4	77	-	-	Yes	20 Days	**SM**	-5	72
		Boring Jack Power Unit[h]	83	70	-3	40%	-4	76	-	-	Yes	20 Days	**SM**	-3	73
	Repaving	Paving Equipment (roller)	80	70	-3	10%	-10	67	-	-	Yes	20 Days	LS	0	67
		Compactor	83	70	-3	10%	-10	70	-	-	Yes	20 Days	LS	0	70
				Highest Combined Leq at Closest Receptor:				92	Total Construction Days at One Receptor:			50 Days			
Pipe Bridge Construction															
San Pablo Creek Crossing (San Pablo)				*San Pablo Ordinance Noise Limit for Short-term Construction Activities:*					*None*						
Closest residential	Excavation and	Excavator	81	70	-3	40%	-4	74	-	-	Yes	5 Days	LS	0	74
receptors at 2215	Bridge Construction	Various Trucks (dump, flatbed, water)	76	70	-3	40%	-4	69	-	-	No	5 Days	LS	0	69
Road 20 to the west		Drill Rig	84	70	-3	20%	-7	74	-	-	Yes	5 Days	LS	0	74
and 41 Campo Verde		Crane	81	70	-3	20%	-7	71	-	-	Yes	5 Days	LS	0	71
Circle to the east		Backhoe, Loader, Forklift	79	70	-3	40%	-4	72	-	-	Yes	5 Days	LS	0	72
	Repaving	Paving Equipment (roller)	80	70	-3	10%	-10	67	-	-	No	5 Days	LS	0	67
		Compactor	83	70	-3	10%	-10	70	-	-	Yes	5 Days	LS	0	70
				Highest Combined Leq at Closest Receptor:				80	Total Construction Days at One Receptor:			20 Days			

TABLE I-6 (Continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Sources	Reference Noise Level, Lmax in dBA at 50 feet[a]	Minimum Distance Between Project and Closest Sensitive Receptor[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	Leq Noise Level Adjusted for Distance and Usage	Impact 3.11-1: Leq Exceeds 75-dBA Ordinance Daytime Noise Limit?	Impact 3.11-1: Impact 3.11-1 Significance Determination	Impact 3.11-2: Leq Exceeds 70-dBA Speech Interference Threshold?	Impact 3.11-2: Duration of Construction[d] (Workdays)	Impact 3.11-2: Impact 3.11-2 Significance Determination	Noise Reduction From Mitigation Measure NOI-1 and NOI-2b[e]	Mitigated L_{eq} With Mitigation Measure NOI-1 and NOI-2b[e]
Tie-in Construction															
Wildcat Pipeline (Berkeley) Tie-ins		*Berkeley Ordinance Noise Limit for Short-term Construction Activities:*							*75 dBA*						
Closest residential receptors on: Dana/ Parker (north tie-in) and Parker/Nogales (south tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	30	4	20%	-7	98	Yes	**SM**	Yes	<10 Days	LS	0	98
		Impact/Vibratory Sheetpile Driver – Lower Range	75	30	4	20%	-7	72	No	LS	No	<10 Days	LS	0	72
		Excavator	81	30	4	40%	-4	81	Yes	LS	Yes	<10 Days	LS	0	81
		Various Trucks (dump, flatbed, water)	76	30	4	40%	-4	76	Yes	LS	No	<10 Days	LS	0	76
		Backhoe, Loader, Forklift	79	30	4	40%	-4	79	Yes	LS	Yes	<10 Days	LS	0	79
	Pipe Connection	Hydraulic Compressor	80	20	8	100%	0	88	Yes	**SU**	Yes	1 Day	LS	-5	83
		Hot Tapping Machine	78	20	8	100%	0	86	Yes	**SU**	Yes	1 Day	LS	-5	81
		Hot Tapping Machine Motor/Generator	81	20	8	100%	0	89	Yes	**SU**	Yes	1 Day	LS	-5	84
		Various Trucks (dump, flatbed, water)	76	5	20	40%	-4	92	Yes	**SU**	Yes	1 Day	LS	-5	87
		Backhoe, Loader, Forklift	79	5	20	40%	-4	95	Yes	**SU**	Yes	1 Day	LS	-5	90
	Testing	Dewatering Pump	45	20	8	100%	0	53	No	LS	No	25 Days	LS	-5	48
							Highest Combined Leq at One Receptor:	98	Total Construction Days at One Receptor:			25 Days			
Wildcat Pipeline (El Cerrito) Tie-ins		*El Cerrito Ordinance Noise Limit for Short-term Construction Activities:*							*None*						
Closest residential receptors at Liberty/Hill (north tie-in) and Lynn/San Carlos (south tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	30	4	20%	-7	98	-	-	Yes	<10 Days	LS	0	98
		Impact/Vibratory Sheetpile Driver – Lower Range	75	30	4	20%	-7	72	-	-	No	<10 Days	LS	0	72
		Excavator	81	30	4	40%	-4	81	-	-	Yes	<10 Days	LS	0	81
		Various Trucks (dump, flatbed, water)	76	30	4	40%	-4	76	-	-	Yes	<10 Days	LS	0	76
		Backhoe, Loader, Forklift	79	30	4	40%	-4	79	-	-	Yes	<10 Days	LS	0	79
	Pipe Connection	Hydraulic Compressor	80	30	4	100%	0	84	-	-	Yes	1 Day	LS	-5	79
		Hot Tapping Machine	78	30	4	100%	0	82	-	-	Yes	1 Day	LS	-5	77
		Hot Tapping Machine Motor/Generator	81	30	4	100%	0	85	-	-	Yes	1 Day	LS	-5	80
		Various Trucks (dump, flatbed, water)	76	25	6	40%	-4	78	-	-	Yes	1 Day	LS	-5	73
		Backhoe, Loader, Forklift	79	25	6	40%	-4	81	-	-	Yes	1 Day	LS	-5	76
	Testing	Dewatering Pump	45	30	4	100%	0	49	-	-	No	25 Days	LS	-5	44
							Highest Combined Leq at One Receptor:	90	Total Construction Days at One Receptor:			25 Days			
Central Pressure Zone Pipeline (El Cerrito/Richmond) Tie-in		*Richmond Ordinance Noise Limit for Short-term Construction Activities:*							*75 dBA*						
Closest residential receptors at San Pablo/ Nevin (north tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	130	-8	20%	-7	86	Yes	**SM**	Yes	<10 Days	LS	0	86
		Impact/Vibratory Sheetpile Driver – Lower Range	75	130	-8	20%	-7	60	No	LS	No	<10 Days	LS	0	60
		Excavator	81	130	-8	40%	-4	69	No	LS	Yes	<10 Days	LS	0	69
		Various Trucks (dump, flatbed, water)	76	130	-8	40%	-4	64	No	LS	Yes	<10 Days	LS	0	64
		Backhoe, Loader, Forklift	79	130	-8	40%	-4	67	No	LS	Yes	<10 Days	LS	0	67
	Pipe Connection	Hydraulic Compressor	80	130	-8	100%	0	72	Yes	**SU**	Yes	1 Day	LS	-5	67
		Hot Tapping Machine	78	130	-8	100%	0	70	Yes	**SU**	Yes	1 Day	LS	-5	65
		Hot Tapping Machine Motor/Generator	81	130	-8	100%	0	73	Yes	**SU**	Yes	1 Day	LS	-5	68
		Various Trucks (dump, flatbed, water)	76	130	-8	40%	-4	64	Yes	**SU**	Yes	1 Day	LS	-5	59
		Backhoe, Loader, Forklift	79	130	-8	40%	-4	67	Yes	**SU**	Yes	1 Day	LS	-5	62
	Testing	Dewatering Pump	45	30	4	100%	0	49	No	LS	No	25 Days	LS	-5	44
							Highest Combined Leq at One Receptor:	77	Total Construction Days at One Receptor:			25 Days			

TABLE I-6 (Continued)

ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Sources	Reference Noise Level, Lmax in dBA at 50 feet[a]	Minimum Distance Between Project and Closest Sensitive Receptor[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	Leq Noise Level Adjusted for Distance and Usage	Impact 3.11-1: Leq Exceeds 75-dBA Ordinance Daytime Noise Limit?	Impact 3.11-1: Impact 3.11-1 Significance Determination	Impact 3.11-2: Leq Exceeds 70-dBA Speech Interference Threshold?	Impact 3.11-2: Duration of Construction[d] (Workdays)	Impact 3.11-2: Impact 3.11-2 Significance Determination	Noise Reduction From Mitigation Measure NOI-1 and NOI-2b[e]	Mitigated L_{eq} With Mitigation Measure NOI-1 and NOI-2b[e]
Tie-in Construction															
Central Pressure Zone Pipeline (El Cerrito/Richmond) Tie-in								*El Cerrito Ordinance Noise Limit for Short-term Construction Activities:*	*None*						
Closest residential receptors at San Pablo/ Central (south tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	70	-3	20%	-7	91	-	-	Yes	<10 Days	LS	0	91
		Impact/Vibratory Sheetpile Driver – Lower Range	75	70	-3	20%	-7	65	-	-	No	<10 Days	LS	0	65
		Excavator	81	70	-3	40%	-4	74	-	-	Yes	<10 Days	LS	0	74
		Various Trucks (dump, flatbed, water)	76	70	-3	40%	-4	69	-	-	Yes	<10 Days	LS	0	69
		Backhoe, Loader, Forklift	79	70	-3	40%	-4	72	-	-	Yes	<10 Days	LS	0	72
	Pipe Connection	Hydraulic Compressor	80	30	4	100%	0	84	-	-	Yes	1 Day	LS	-5	79
		Hot Tapping Machine	78	30	4	100%	0	82	-	-	Yes	1 Day	LS	-5	77
		Hot Tapping Machine Motor/Generator	81	30	4	100%	0	85	-	-	Yes	1 Day	LS	-5	80
		Various Trucks (dump, flatbed, water)	76	10	14	40%	-4	86	-	-	Yes	1 Day	LS	-5	81
		Backhoe, Loader, Forklift	79	10	14	40%	-4	89	-	-	Yes	1 Day	LS	-5	84
	Testing	Dewatering Pump	45	30	4	100%	0	49	-	-	No	25 Days	LS	-5	44
							Highest Combined Leq at One Receptor:	93	Total Construction Days at One Receptor:			25 Days			
Central Pressure Zone Pipeline (Richmond/San Pablo) Tie-in								*San Pablo Ordinance Noise Limit for Short-term Construction Activities:*	*None*						
Closest residential receptor at Road 20th/21st (north tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	70	-3	20%	-7	91	-	-	Yes	<10 Days	LS	0	91
		Impact/Vibratory Sheetpile Driver – Lower Range	75	70	-3	20%	-7	65	-	-	No	<10 Days	LS	0	65
		Excavator	81	70	-3	40%	-4	74	-	-	Yes	<10 Days	LS	0	74
		Various Trucks (dump, flatbed, water)	76	70	-3	40%	-4	69	-	-	No	<10 Days	LS	0	69
		Backhoe, Loader, Forklift	79	70	-3	40%	-4	72	-	-	Yes	<10 Days	LS	0	72
	Pipe Connection	Hydraulic Compressor	80	20	8	100%	0	88	-	-	Yes	1 Day	LS	-5	83
		Hot Tapping Machine	78	20	8	100%	0	86	-	-	Yes	1 Day	LS	-5	81
		Hot Tapping Machine Motor/Generator	81	20	8	100%	0	89	-	-	Yes	1 Day	LS	-5	84
		Various Trucks (dump, flatbed, water)	76	12	12	40%	-4	84	-	-	Yes	1 Day	LS	-5	79
		Backhoe, Loader, Forklift	79	12	12	40%	-4	87	-	-	Yes	1 Day	LS	-5	82
	Testing	Dewatering Pump	45	20	8	100%	0	53	-	-	No	25 Days	LS	-5	48
							Highest Combined Leq at One Receptor:	94	Total Construction Days at One Receptor:			25 Days			
Central Pressure Zone Pipeline (Richmond/San Pablo) Tie-in								*Richmond Ordinance Noise Limit for Short-term Construction Activities:*	*75 dBA*						
Closest residential receptors at 23rd/Nevin (south tie-in)	Pit Excavation and Backfill	Impact/Vibratory Sheetpile Driver[g] – Upper Range	101	70	-3	20%	-7	91	Yes	**SM**	Yes	<10 Days	LS	0	91
		Impact/Vibratory Sheetpile Driver – Lower Range	75	70	-3	20%	-7	65	No	LS	No	<10 Days	LS	0	65
		Excavator	81	70	-3	40%	-4	74	No	LS	Yes	<10 Days	LS	0	74
		Various Trucks (dump, flatbed, water)	76	70	-3	40%	-4	69	No	LS	Yes	<10 Days	LS	0	69
		Backhoe, Loader, Forklift	79	70	-3	40%	-4	72	No	LS	Yes	<10 Days	LS	0	72
	Pipe Connection	Hydraulic Compressor	80	40	2	100%	0	82	Yes	**SU**	Yes	1 Day	LS	-5	77
		Hot Tapping Machine	78	40	2	100%	0	80	Yes	**SM**	Yes	1 Day	LS	-5	75
		Hot Tapping Machine Motor/Generator	81	40	2	100%	0	83	Yes	**SU**	Yes	1 Day	LS	-5	78
		Various Trucks (dump, flatbed, water)	76	20	8	40%	-4	80	Yes	**SM**	Yes	1 Day	LS	-5	75
		Backhoe, Loader, Forklift	79	20	8	40%	-4	83	Yes	**SU**	Yes	1 Day	LS	-5	78
	Testing	Dewatering Pump	45	40	2	100%	0	47	No	LS	No	25 Days	LS	-5	42
							Highest Combined Leq at One Receptor:	89	Total Construction Days at One Receptor:			25 Days			

TABLE I-6 (Continued)

ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS

NOTES: Noise Levels in **BOLD** indicate a significant impact because they exceed the ordinance noise limit and/or exceed the 70-dBA speech interference threshold for longer than two weeks (10 weekdays). "SU" indicates the impact would be significant and could not be reduced to a less-than-significant level with specified mitigation measures.

[a] Reference noise levels are based on noise measurements collected during construction of the Central Artery/Tunnel Project (completed in 2007) and these measurements also serve as default values in the FHWA Roadway Construction Noise Model. Available online at: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

[b] These distances represent the predominant setback distance from the closest receptors to the curb, which is the closest possible location where construction equipment could operate. For San Pablo Avenue, there are scattered residential uses along the alignment with setback distances ranging between 15 and 45 feet, and this distance represents the average setback distance. For the combined noise level, the minimum distance between source and receptor would vary because of the narrow work area. Also, as construction progresses approximately 200 feet along the pipeline alignment each day, the equipment operations is also conservatively estimated to move at least 100 feet along the alignment.

[c] Equipment usage factors are estimated by the Federal Highway Administration based on a roadway tunnel project (FHWA, 2006), but adjusted based on noise monitoring experience of Wilson Ihrig Associates (WIA) on similar construction projects.

[d] For daytime noise, significance is determined based on whether both the speech interference threshold and two-week construction duration threshold is exceeded at a given receptor.

[e] Mitigation Measure NOI-1 includes EBMUD Best Practices mitigation measures to reduce noise levels using noise standards of the local jurisdictions and measures to reduce noise levels for activities that may generate noise levels greater than 90 dBA (if applicable).

[f] A mobile batch plant is assumed to include a colloidal mixer, agitator, and hydraulic double-acting pump and operate without an enclosure (WIA, 2001).

[g] Reference hourly noise level of 101 dBA (Lmax) applied, but assumes maximum noise levels would occur 20% of every one-hour time period (12 minutes). Noise levels generated by a sheetpile driver can vary substantially if a vibratory impact pile driver can be used instead of an impact pile driver and if no substantial subsurface obstructions are encountered. The low to high range captures the potential variation in noise levels due to these factors (i.e. impact vs. vibratory and subsurface obstructions vs. no obstructions).

[h] Since the boring machine only operates in the insertion pit, this is the distance to the closest residential receptor at the insertion pit. the Since the boring machine/auger would be located at the bottom of the insertion pit, an 5 dBA reduction is applied to account for noise attenuation benefits by pit walls (see Noise Reduction from Mitigation column). Since the boring jack power unit would be located at ground surface (above the pit), no additional attenuation benefit from the pit walls is applied. However, implementation of Mitigation Measure NOI-1b is conservatively estimated provide a minimum 3-dB noise reduction during operation of the boring jack power unit.

Source: Orion Environmental Associates.

TABLE I-7

ESTIMATED NIGHTTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Source	Reference Noise Level, L_{max} in dBA at 50 feet[a]	Distance Between Project and Closest Residential Receptors[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	L_{eq} Noise Level Adjusted for Distance and Usage	Impact 3.11-1: Exceeds 54-dBA Ordinance Nighttime Noise Limit?	Impact 3.11-1: Impact 3.11-1 Significance Determination	3.11-2: Exceeds 60-dBA Sleep Disturbance Threshold?	3.11-2: Duration of Construction[d] (Workdays)	3.11-2: Impact 3.11-2 Significance Determination
Tie-in Construction													
Wildcat Pipeline Tie-ins (Berkeley)				*Berkeley Ordinance Noise Limit for Nighttime Construction Activities:*					*54*				
Closest residential receptors on: Parkside and Dana	Pipe Connection	Hydraulic Compressor	80	20	8	100%	0	88	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping Machine	78	20	8	100%	0	86	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping & Lighting Generators	84	20	8	100%	0	92	Yes	**SU**	Yes	1 Day	**SU**
		Various Trucks (dump, flatbed, water)	76	5	20	40%	-4	92	Yes	**SU**	Yes	1 Day	**SU**
		Backhoe, Loader, Forklift	79	5	20	40%	-4	95	Yes	**SU**	Yes	1 Day	**SU**
	Testing	Dewatering Pump	45	20	8	100%	0	53	No	LS	No	20 Days	LS
					Highest Combined Leq at One Receptor:			99	Total Construction Days at One Receptor:			1 Day	
Wildcat Pipeline Tie-ins (El Cerrito)				*El Cerrito Ordinance Noise Limit for Nighttime Construction Activities:*					*None*				
Closest residential receptors at Liberty/Hill (north tie-in) and Lynn/San Carlos (south tie-in)	Pipe Connection	Hydraulic Compressor	80	30	4	100%	0	84	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping Machine	78	30	4	100%	0	82	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping & Lighting Generators	84	30	4	100%	0	88	Yes	**SU**	Yes	1 Day	**SU**
		Various Trucks (dump, flatbed, water)	76	25	6	40%	-4	78	Yes	**SU**	Yes	1 Day	**SU**
		Backhoe, Loader, Forklift	79	25	6	40%	-4	81	Yes	**SU**	Yes	1 Day	**SU**
	Testing	Dewatering Pump	45	30	4	100%	0	49	No	LS	No	20 Days	LS
					Highest Combined Leq at One Receptor:			91	Total Construction Days at One Receptor:			1 Day	
Central Pressure Zone Pipeline Tie-ins (El Cerrito)				*El Cerrito Ordinance Noise Limit for Nighttime Construction Activities:*					*None*				
Closest residential receptors at San Pablo/ Nevin (north tie-in) and San Pablo/Central (south tie-in)	Pipe Connection	Hydraulic Compressor	80	30	4	100%	0	84	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping Machine	78	30	4	100%	0	82	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping & Lighting Generators	84	30	4	100%	0	88	Yes	**SU**	Yes	1 Day	**SU**
		Various Trucks (dump, flatbed, water)	76	10	14	40%	-4	86	Yes	**SU**	Yes	1 Day	**SM**
		Backhoe, Loader, Forklift	79	10	14	40%	-4	89	Yes	**SU**	Yes	1 Day	**SU**
	Testing	Dewatering Pump	45	30	4	100%	0	49	No	LS	No	20 Days	LS
					Highest Combined Leq at One Receptor:			94	Total Construction Days at One Receptor:			1 Day	
Central Pressure Zone Pipeline Tie-in (Richmond)				*Richmond Ordinance Noise Limit for Nighttime Construction Activities:*					*54*				
Closest residential receptor at Road 20th/21st (north tie-in)	Pipe Connection	Hydraulic Compressor	80	20	8	100%	0	88	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping Machine	78	20	8	100%	0	86	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping & Lighting Generators	84	20	8	100%	0	92	Yes	**SU**	Yes	1 Day	**SU**
		Various Trucks (dump, flatbed, water)	76	12	12	40%	-4	84	Yes	**SU**	Yes	1 Day	**SU**
		Backhoe, Loader, Forklift	79	12	12	40%	-4	87	Yes	**SU**	Yes	1 Day	**SU**
	Testing	Dewatering Pump	45	20	8	100%	0	53	No	LS	No	20 Days	LS
					Highest Combined Leq at One Receptor:			95	Total Construction Days at One Receptor:			1 Day	
Central Pressure Zone Pipeline Tie-in (San Pablo)				*San Pablo Ordinance Noise Limit for Nighttime Construction Activities:*					*None*				
Closest residential receptors at 23rd/Nevin (south tie-in)	Pipe Connection	Hydraulic Compressor	80	40	2	100%	0	82	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping Machine	78	40	2	100%	0	80	Yes	**SU**	Yes	1 Day	**SU**
		Hot Tapping & Lighting Generators	84	40	2	100%	0	86	Yes	**SU**	Yes	1 Day	**SU**
		Various Trucks (dump, flatbed, water)	76	20	8	40%	-4	80	Yes	**SU**	Yes	1 Day	**SU**
		Backhoe, Loader, Forklift	79	20	8	40%	-4	83	Yes	**SU**	Yes	1 Day	**SU**
	Testing	Dewatering Pump	45	40	2	100%	0	47	No	LS	No	20 Days	LS
					Highest Combined Leq at One Receptor:			90	Total Construction Days at One Receptor:			1 Day	

TABLE I-7 (Continued)
ESTIMATED NIGHTTIME CONSTRUCTION NOISE LEVELS

Pipeline and Closest Noise-Sensitive Receptor Location	Construction Activity	Principal Noise Source	Reference Noise Level, L_{max} in dBA at 50 feet[a]	Distance Between Project and Closest Residential Receptors[b]	Noise Level Adjustment Factor for Distance	Assumed Usage Factor[c]	Noise Level Adjustment Factor for Usage	L_{eq} Noise Level Adjusted for Distance and Usage	Impact 3.11-1: Exceeds 54-dBA Ordinance Nighttime Noise Limit?	Impact 3.11-1: Impact 3.11-1 Significance Determination	3.11-2: Exceeds 60-dBA Sleep Disturbance Threshold?	3.11-2: Duration of Construction[d] (Workdays)	3.11-2: Impact 3.11-2 Significance Determination
Open Trench Pipeline Construction at Some Major Intersections													
Intersections (All Locations)			*Berkeley and Richmond Ordinance Noise Limit for Nighttime Construction Activities:*						*54*				
Minimum Distance from Residential Receptors	Pavement Cutting	Pavement Saw	90	20	8	10%	-10	88	Yes	**SU**	Yes	1 Day	**SU**
		Jackhammer	89	20	8	10%	-10	87	Yes	**SU**	Yes	1 Day	**SU**
	Excavation and Pipe Installation	Excavator	81	20	8	40%	-4	85	Yes	**SU**	Yes	3 Days	**SU**
		Various Trucks (dump, flatbed, water)	76	20	8	40%	-4	80	Yes	**SU**	Yes	3 Days	**SU**
		Backhoe, Loader, Forklift	79	20	8	40%	-4	83	Yes	**SU**	Yes	3 Days	**SU**
		Mobile Batch Plant	76	20	8	15%	-8	76	Yes	**SU**	Yes	2 Days	**SU**
	Repaving	Paving Equipment (roller)	80	20	8	10%	-10	78	Yes	**SU**	Yes	2 Days	**SU**
		Compactor	83	20	8	10%	-10	81	Yes	**SU**	Yes	2 Days	**SU**
					Highest Combined Leq at One Receptor:			93	Total Construction Days at One Receptor:			6 Days	

NOTES: Noise Levels in **BOLD** indicate a significant impact because they exceed the ordinance noise limit and/or exceed the 60-dBA sleep interference threshold. "SU" indicates the impact would be significant and could not be reduced to a less-than-significant level with specified mitigation measures.

[a] Reference noise levels are based on noise measurements collected during construction of the Central Artery/Tunnel Project (completed in 2007) and these measurements also serve as default values in the FHWA Roadway Construction Noise Model. Available online at: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

[b] These distances represent the predominant setback distance from the closest sensitive receptors with a direct line-of-sight to the closest possible location where construction equipment could operate. For the combined noise level, the minimum distance between source and receptor would vary because all equipment could not operate at the same minimum distance simultaneously because of the limited work area at tie-ins.

[c] Equipment usage factors are estimated by the Federal Highway Administration based on a roadway tunnel project (FHWA, 2006), but adjusted based on noise monitoring experience of Wilson Ihrig Associates (WIA) on similar construction projects.

[d] For nighttime noise, significance is based solely on whether the estimated noise level exceeds the sleep interference threshold (i.e. construction duration is not a factor) since even one night of sleep disruption is considered significant.

Source: Orion Environmental Associates.

TABLE I-8

ESTIMATED CONSTRUCTION VIBRATION LEVELS

Pipeline and Closest Structure	Construction Activity	Construction Equipment with Potential to Generate Vibration that Could Cause Cosmetic or Structural Damage	Reference Vibration Level, in/sec PPV at 25 feet[a]	Distance Between Project and Closest Structure[b]	Vibration Level Adjusted For Distance	Impact 3.11-3: Exceeds 0.5 in/sec PPV Cosmetic Damage Threshold for Impact Vibration?	Impact 3.11-3: Exceeds 0.4 in/sec PPV Cosmetic Damage Threshold for Continuous Vibration?	Impact 3.11-3 Significance Determination
Open Trench Pipeline Construction								
All Pipelines								
Closest structures	Excavation and	Earthmoving Equipment	0.089	15	0.191	-	Yes	**SM**
to Pipeline	Pipe Installation	Loaded Trucks	0.076	10	0.300	-	No	LS
Alignments	Backfill and Repaving	Vibratory Compactor	0.210	7	1.417	-	Yes	**SM**
Jack-and-Bore and Tie-in Construction								
Wildcat Creek Crossing (San Pablo) and All Pipeline Tie-ins								
Closest structure to	Pit Excavation	Impact Sheetpile Driver-Upper Range OR	1.518	15	3.266	Yes	-	**SM**
Southerly Receiving		Impact Sheetpile Driver-Low Range	0.644	15	1.386	Yes	-	**SM**
Pit (15 feet) and closest		Vibratory Sheetpile Driver-Upper Range OR	0.734	15	1.579	-	Yes	**SM**
structure to Creek		Vibratory Sheetpile Driver-Lower Range	0.170	15	0.366	-	No	LS
Crossing Tie-in Pits		Earthmoving Equipment	0.089	15	0.191	-	No	LS
(18 feet)		Loaded Trucks	0.076	15	0.164	-	No	LS
	Repaving	Vibratory Compactor	0.210	15	0.452	-	Yes	**SM**
		Jumping Jack Vibratory Compactor	0.035	15	0.075	-	No	LS
Pipe Bridge Construction								
San Pablo Creek Crossing (San Pablo)								
Closest structure to either pipe bridge	Excavation	Caisson Drilling	0.089	70	0.019	-	No	LS
Tie-in Construction								
Wildcat Pipeline Tie-ins (Berkeley)								
Closest residential receptors	Pipe Connection	Earthmoving Equipment	0.089	20	0.124	-	No	LS
on: Parkside and Dana		Loaded Trucks	0.076	20	0.106	-	No	LS
Wildcat Pipeline Tie-ins (El Cerrito)								
Closest residential receptors	Pipe Connection	Earthmoving Equipment	0.089	30	0.068	-	No	LS
40 feet from north tie-in		Loaded Trucks	0.076	30	0.058	-	No	LS
and 30 feet from south tie-in								
Tie-in Construction								
Central Pressure Zone Pipeline Tie-ins (El Cerrito)								
Closest residential receptors	Pipe Connection	Earthmoving Equipment	0.089	30	0.068	-	No	LS
with direct line-of-sight located		Loaded Trucks	0.076	30	0.058	-	No	LS
125 feet from north tie-in and								
250 feet from south tie-in								
Central Pressure Zone Pipeline Tie-in (Richmond)								
Closest residential receptor	Pipe Connection	Earthmoving Equipment	0.089	20	0.124	-	No	LS
at 404 23rd Street		Loaded Trucks	0.076	20	0.106	-	No	LS
Central Pressure Zone Pipeline Tie-in (San Pablo)								
Closest residential	Pipe Connection	Earthmoving Equipment	0.089	40	0.044	-	No	LS
receptors at 2028, 2029,		Loaded Trucks	0.076	40	0.038	-	No	LS
2100, and 2101 Road 20								

NOTES: Vibration Levels in **BOLD** indicate a significant impact because they exceed the threshold for either impact or continuous vibration for cosmetic damage. "SM" indicates the impact would be significant but mitigated to a less-than-significant level with specified mitigation measures.

[a] Reference vibration levels are based on vibration data provided by the Federal Transit Administration (FTA, 2006).

[b] These distances represent the predominant minimum setback distance from the closest receptors to the curb, which is the closest possible location where construction equipment could operate.

Source: Orion Environmental Associates.

APPENDIX J

Wildcat Pipeline (Berkeley) Level of Service Calculations

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	30	27	67	34	19	17	641	43	34	454	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00			1.00			0.95	1.00		0.95	1.00
Frt		0.94			0.98			1.00	0.85		1.00	0.85
Flt Protected		0.99			0.97			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1749			1773			3535	1583		3527	1583
Flt Permitted		0.94			0.79			0.94	1.00		0.89	1.00
Satd. Flow (perm)		1649			1437			3322	1583		3149	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	33	29	73	37	21	18	697	47	37	493	3
RTOR Reduction (vph)	0	24	0	0	18	0	0	0	23	0	0	1
Lane Group Flow (vph)	0	46	0	0	113	0	0	715	24	0	530	2
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		4.0			4.0			12.6	12.6		12.6	12.6
Effective Green, g (s)		4.0			4.0			12.6	12.6		12.6	12.6
Actuated g/C Ratio		0.16			0.16			0.51	0.51		0.51	0.51
Clearance Time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		268			234			1702	811		1613	811
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.08			c0.22	0.02		0.17	0.00
v/c Ratio		0.17			0.48			0.42	0.03		0.33	0.00
Uniform Delay, d1		8.9			9.4			3.7	3.0		3.5	2.9
Progression Factor		1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.3			1.6			0.2	0.0		0.1	0.0
Delay (s)		9.2			10.9			3.9	3.0		3.6	2.9
Level of Service		A			B			A	A		A	A
Approach Delay (s)		9.2			10.9			3.8			3.6	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	24.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	70	26	77	68	55	47	681	17	12	531	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			1.00			0.99	
Flt Protected		1.00			0.98			1.00			1.00	
Satd. Flow (prot)		1778			1730			3502			3499	
Flt Permitted		0.98			0.83			0.89			0.94	
Satd. Flow (perm)		1742			1457			3144			3278	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	76	28	84	74	60	51	740	18	13	577	29
RTOR Reduction (vph)	0	21	0	0	37	0	0	4	0	0	8	0
Lane Group Flow (vph)	0	88	0	0	182	0	0	805	0	0	611	0
Confl. Peds. (#/hr)	62		22	22		62	40		94	94		40
Confl. Bikes (#/hr)			8			3			44			5
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		6.9			6.9			13.9			13.9	
Effective Green, g (s)		6.9			6.9			13.9			13.9	
Actuated g/C Ratio		0.24			0.24			0.48			0.48	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		417			349			1517			1582	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.12			c0.26			0.19	
v/c Ratio		0.21			0.52			0.53			0.39	
Uniform Delay, d1		8.8			9.5			5.2			4.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			1.4			0.4			0.2	
Delay (s)		9.0			10.9			5.5			4.9	
Level of Service		A			B			A			A	
Approach Delay (s)		9.0			10.9			5.5			4.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	28.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	21	75	93	359	232	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	82	101	390	252	36

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	104	491	288
Volume Left (vph)	23	101	0
Volume Right (vph)	82	0	36
Hadj (s)	-0.39	0.08	-0.04
Departure Headway (s)	5.3	4.6	4.7
Degree Utilization, x	0.15	0.63	0.38
Capacity (veh/h)	600	767	734
Control Delay (s)	9.2	15.1	10.5
Approach Delay (s)	9.2	15.1	10.5
Approach LOS	A	C	B

Intersection Summary			
Delay	12.9		
HCM Level of Service	B		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	415	70	6	625	156	76	316	22	69	173	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frt		0.98			0.97			0.99			0.97	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1826			3432			1832			1794	
Flt Permitted		0.99			0.95			0.90			0.86	
Satd. Flow (perm)		1803			3264			1656			1555	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	451	76	7	679	170	83	343	24	75	188	62
RTOR Reduction (vph)	0	15	0	0	55	0	0	5	0	0	22	0
Lane Group Flow (vph)	0	519	0	0	801	0	0	445	0	0	303	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.0			14.0			13.5			13.5	
Effective Green, g (s)		14.0			14.0			13.5			13.5	
Actuated g/C Ratio		0.39			0.39			0.38			0.38	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		711			1287			630			591	
v/s Ratio Prot												
v/s Ratio Perm		c0.29			0.25			c0.27			0.20	
v/c Ratio		0.73			0.62			0.71			0.51	
Uniform Delay, d1		9.1			8.6			9.3			8.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.8			0.9			3.6			0.8	
Delay (s)		12.9			9.6			12.9			9.2	
Level of Service		B			A			B			A	
Approach Delay (s)		12.9			9.6			12.9			9.2	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	35.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

2016 Wildcat Pipeline (Berkeley) No Project AM Peak
5: Alcatraz Ave & College Ave

6/7/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	136	140	12	125	10	131	310	18	7	213	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.99			0.99			0.97	
Flt Protected		0.99			1.00			0.99			1.00	
Satd. Flow (prot)		1741			1838			1827			1813	
Flt Permitted		0.94			0.96			0.83			0.99	
Satd. Flow (perm)		1646			1767			1533			1790	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	148	152	13	136	11	142	337	20	8	232	55
RTOR Reduction (vph)	0	67	0	0	6	0	0	3	0	0	19	0
Lane Group Flow (vph)	0	280	0	0	154	0	0	496	0	0	276	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		10.8			10.8			15.7			15.7	
Effective Green, g (s)		10.8			10.8			15.7			15.7	
Actuated g/C Ratio		0.31			0.31			0.46			0.46	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		515			553			698			815	
v/s Ratio Prot												
v/s Ratio Perm		c0.17			0.09			c0.32			0.15	
v/c Ratio		0.54			0.28			0.71			0.34	
Uniform Delay, d1		9.8			8.9			7.6			6.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.3			3.4			0.2	
Delay (s)		11.0			9.2			11.0			6.3	
Level of Service		B			A			B			A	
Approach Delay (s)		11.0			9.2			11.0			6.3	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	34.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	86	77	411	54	31	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.99		1.00			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.94		0.98			1.00
Flt Protected	0.97		1.00			1.00
Satd. Flow (prot)	1676		3463			3524
Flt Permitted	0.97		1.00			0.89
Satd. Flow (perm)	1676		3463			3156
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	84	447	59	34	402
RTOR Reduction (vph)	68	0	26	0	0	0
Lane Group Flow (vph)	109	0	480	0	0	436
Confl. Peds. (#/hr)	52	46		19	19	
Confl. Bikes (#/hr)				5		
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	3.8		7.8			7.8
Effective Green, g (s)	3.8		7.8			7.8
Actuated g/C Ratio	0.19		0.40			0.40
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	325		1378			1256
v/s Ratio Prot	c0.07		c0.14			
v/s Ratio Perm						0.14
v/c Ratio	0.34		0.35			0.35
Uniform Delay, d1	6.8		4.1			4.1
Progression Factor	1.00		1.00			1.00
Incremental Delay, d2	0.6		0.2			0.2
Delay (s)	7.4		4.3			4.3
Level of Service	A		A			A
Approach Delay (s)	7.4		4.3			4.3
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	19.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	0	17	0	15	1	463	10	6	436	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	0	18	0	16	1	503	11	7	474	1
Pedestrians		27			16			2			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		2			1			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											460	
pX, platoon unblocked												
vC, conflicting volume	786	1047	266	779	1042	274	502			530		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	786	1047	266	779	1042	274	502			530		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	98	100			99		
cM capacity (veh/h)	261	217	714	272	219	713	1035			1020		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	1	35	253	262	243	238
Volume Left	1	18	1	0	7	0
Volume Right	0	16	0	11	0	1
cSH	261	384	1035	1700	1020	1700
Volume to Capacity	0.00	0.09	0.00	0.15	0.01	0.14
Queue Length 95th (ft)	0	7	0	0	0	0
Control Delay (s)	18.9	15.3	0.0	0.0	0.3	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	18.9	15.3	0.0		0.1	
Approach LOS	C	C				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	61	29	110	74	20	29	531	62	56	791	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00			1.00			0.95	1.00		0.95	1.00
Frt		0.96			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			0.97			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1780			1789			3530	1583		3528	1583
Flt Permitted		0.93			0.77			0.89	1.00		0.89	1.00
Satd. Flow (perm)		1662			1414			3153	1583		3146	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	66	32	120	80	22	32	577	67	61	860	18
RTOR Reduction (vph)	0	24	0	0	12	0	0	0	34	0	0	9
Lane Group Flow (vph)	0	91	0	0	210	0	0	609	33	0	921	9
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		7.7			7.7			14.8	14.8		14.8	14.8
Effective Green, g (s)		7.7			7.7			14.8	14.8		14.8	14.8
Actuated g/C Ratio		0.25			0.25			0.49	0.49		0.49	0.49
Clearance Time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		420			357			1530	768		1527	768
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.15			0.19	0.02		c0.29	0.01
v/c Ratio		0.22			0.59			0.40	0.04		0.60	0.01
Uniform Delay, d1		9.0			10.0			5.0	4.1		5.7	4.1
Progression Factor		1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.3			2.5			0.2	0.0		0.7	0.0
Delay (s)		9.3			12.5			5.2	4.1		6.4	4.1
Level of Service		A			B			A	A		A	A
Approach Delay (s)		9.3			12.5			5.1			6.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	30.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	57	41	46	45	24	15	664	40	12	863	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.94			0.97			0.99			1.00	
Flt Protected		1.00			0.98			1.00			1.00	
Satd. Flow (prot)		1737			1759			3492			3514	
Flt Permitted		0.99			0.82			0.93			0.94	
Satd. Flow (perm)		1721			1473			3255			3318	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	62	45	50	49	26	16	722	43	13	938	27
RTOR Reduction (vph)	0	25	0	0	22	0	0	8	0	0	4	0
Lane Group Flow (vph)	0	84	0	0	103	0	0	773	0	0	974	0
Confl. Peds. (#/hr)	26		14	14		26	64		48	48		64
Confl. Bikes (#/hr)			6			5			15			5
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		4.0			4.0			14.4			14.4	
Effective Green, g (s)		4.0			4.0			14.4			14.4	
Actuated g/C Ratio		0.15			0.15			0.55			0.55	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		261			223			1775			1810	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.07			0.24			c0.29	
v/c Ratio		0.32			0.46			0.44			0.54	
Uniform Delay, d1		10.0			10.2			3.6			3.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.7			1.5			0.2			0.3	
Delay (s)		10.7			11.7			3.7			4.2	
Level of Service		B			B			A			A	
Approach Delay (s)		10.7			11.7			3.7			4.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	26.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	36	103	86	271	394	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	112	93	295	428	60

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	151	388	488
Volume Left (vph)	39	93	0
Volume Right (vph)	112	0	60
Hadj (s)	-0.36	0.08	-0.04
Departure Headway (s)	5.6	5.0	4.8
Degree Utilization, x	0.24	0.54	0.65
Capacity (veh/h)	570	693	728
Control Delay (s)	10.3	13.9	16.5
Approach Delay (s)	10.3	13.9	16.5
Approach LOS	B	B	C

Intersection Summary			
Delay	14.6		
HCM Level of Service	B		
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	739	81	8	463	105	45	230	44	108	240	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frt		0.99			0.97			0.98			0.98	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1837			3440			1815			1802	
Flt Permitted		0.99			0.94			0.90			0.77	
Satd. Flow (perm)		1817			3249			1642			1402	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	803	88	9	503	114	49	250	48	117	261	65
RTOR Reduction (vph)	0	6	0	0	30	0	0	9	0	0	9	0
Lane Group Flow (vph)	0	900	0	0	596	0	0	338	0	0	434	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		33.2			33.2			21.2			21.2	
Effective Green, g (s)		33.2			33.2			21.2			21.2	
Actuated g/C Ratio		0.53			0.53			0.34			0.34	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		967			1729			558			476	
v/s Ratio Prot												
v/s Ratio Perm		c0.50			0.18			0.21			c0.31	
v/c Ratio		0.93			0.34			0.61			0.91	
Uniform Delay, d1		13.5			8.4			17.1			19.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		15.0			0.1			1.9			21.6	
Delay (s)		28.5			8.5			19.0			41.3	
Level of Service		C			A			B			D	
Approach Delay (s)		28.5			8.5			19.0			41.3	
Approach LOS		C			A			B			D	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	62.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	193	156	18	93	15	128	256	25	14	331	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.95			0.98			0.99			0.98	
Flt Protected		0.99			0.99			0.98			1.00	
Satd. Flow (prot)		1753			1820			1819			1819	
Flt Permitted		0.95			0.93			0.78			0.98	
Satd. Flow (perm)		1680			1699			1441			1788	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	210	170	20	101	16	139	278	27	15	360	73
RTOR Reduction (vph)	0	53	0	0	11	0	0	6	0	0	16	0
Lane Group Flow (vph)	0	376	0	0	126	0	0	438	0	0	432	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.3			12.3			15.5			15.5	
Effective Green, g (s)		12.3			12.3			15.5			15.5	
Actuated g/C Ratio		0.34			0.34			0.43			0.43	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		577			584			624			774	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.07			c0.30			0.24	
v/c Ratio		0.65			0.22			0.70			0.56	
Uniform Delay, d1		9.9			8.3			8.3			7.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			0.2			3.6			0.9	
Delay (s)		12.6			8.5			11.9			8.5	
Level of Service		B			A			B			A	
Approach Delay (s)		12.6			8.5			11.9			8.5	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	35.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	61	69	680	142	36	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.98		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.93		0.97			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1652		3429			3524
Flt Permitted	0.98		1.00			0.86
Satd. Flow (perm)	1652		3429			3047
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	75	739	154	39	408
RTOR Reduction (vph)	64	0	34	0	0	0
Lane Group Flow (vph)	77	0	859	0	0	447
Confl. Peds. (#/hr)	23	64		14		
Confl. Bikes (#/hr)				2		
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	3.6		13.4			13.4
Effective Green, g (s)	3.6		13.4			13.4
Actuated g/C Ratio	0.14		0.54			0.54
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	238		1838			1633
v/s Ratio Prot	c0.05		c0.25			
v/s Ratio Perm						0.15
v/c Ratio	0.32		0.47			0.27
Uniform Delay, d1	9.6		3.6			3.2
Progression Factor	1.00		1.00			1.00
Incremental Delay, d2	0.8		0.2			0.1
Delay (s)	10.4		3.8			3.2
Level of Service	B		A			A
Approach Delay (s)	10.4		3.8			3.2
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	25.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	12	0	8	3	764	21	12	399	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	13	0	9	3	830	23	13	434	1
Pedestrians		54			23			4			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		4			2			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											460	
pX, platoon unblocked												
vC, conflicting volume	946	1397	275	1118	1386	451	489			876		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	946	1397	275	1118	1386	451	489			876		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	91	100	98	100			98		
cM capacity (veh/h)	190	128	687	148	130	545	1022			752		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	22	418	438	230	218
Volume Left	0	13	3	0	13	0
Volume Right	0	9	0	23	0	1
cSH	1700	209	1022	1700	752	1700
Volume to Capacity	0.00	0.10	0.00	0.26	0.02	0.13
Queue Length 95th (ft)	0	9	0	0	1	0
Control Delay (s)	0.0	24.2	0.1	0.0	0.7	0.0
Lane LOS	A	C	A		A	
Approach Delay (s)	0.0	24.2	0.0		0.4	
Approach LOS	A	C				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	30	27	220	34	19	17	641	140	34	454	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00			1.00			0.95	1.00		0.95	1.00
Frt		0.94			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			0.96			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1749			1774			3535	1583		3527	1583
Flt Permitted		0.95			0.72			0.94	1.00		0.89	1.00
Satd. Flow (perm)		1665			1329			3321	1583		3140	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	33	29	239	37	21	18	697	152	37	493	3
RTOR Reduction (vph)	0	20	0	0	8	0	0	0	84	0	0	2
Lane Group Flow (vph)	0	50	0	0	289	0	0	715	68	0	530	1
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		9.2			9.2			13.9	13.9		13.9	13.9
Effective Green, g (s)		9.2			9.2			13.9	13.9		13.9	13.9
Actuated g/C Ratio		0.30			0.30			0.45	0.45		0.45	0.45
Clearance Time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		493			393			1484	708		1403	708
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.22			c0.22	0.04		0.17	0.00
v/c Ratio		0.10			0.74			0.48	0.10		0.38	0.00
Uniform Delay, d1		7.9			9.9			6.1	5.0		5.7	4.8
Progression Factor		1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.1			7.0			0.2	0.1		0.2	0.0
Delay (s)		8.0			16.9			6.3	5.0		5.9	4.8
Level of Service		A			B			A	A		A	A
Approach Delay (s)		8.0			16.9			6.1			5.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	31.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	101	0	0	200	0	728	17	0	543	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.95			0.95			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.86			0.86			1.00			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1524			1528			1851			1846	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1524			1528			1851			1846	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	110	0	0	217	0	791	18	0	590	29
RTOR Reduction (vph)	0	84	0	0	31	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	26	0	0	186	0	0	808	0	0	616	0
Confl. Peds. (#/hr)	62		22	22		62	40		94	94		40
Confl. Bikes (#/hr)			8			3			44			5
Turn Type	Perm			Perm								
Protected Phases		4			8			2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.5			7.5			16.8			16.8	
Effective Green, g (s)		7.5			7.5			16.8			16.8	
Actuated g/C Ratio		0.23			0.23			0.52			0.52	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		354			355			963			960	
v/s Ratio Prot		0.02			c0.12			c0.44			0.33	
v/s Ratio Perm												
v/c Ratio		0.07			0.52			0.84			0.64	
Uniform Delay, d1		9.7			10.8			6.6			5.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.1			1.4			6.5			1.5	
Delay (s)		9.8			12.2			13.1			7.1	
Level of Service		A			B			B			A	
Approach Delay (s)		9.8			12.2			13.1			7.1	
Approach LOS		A			B			B			A	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	32.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	21	172	246	359	232	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	187	267	390	252	36

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	210	658	288
Volume Left (vph)	23	267	0
Volume Right (vph)	187	0	36
Hadj (s)	-0.48	0.12	-0.04
Departure Headway (s)	5.8	5.1	5.4
Degree Utilization, x	0.34	0.93	0.43
Capacity (veh/h)	596	695	646
Control Delay (s)	11.7	41.1	12.5
Approach Delay (s)	11.7	41.1	12.5
Approach LOS	B	E	B

Intersection Summary			
Delay	28.6		
HCM Level of Service	D		
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	415	130	6	625	156	137	316	22	69	173	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frt		0.97			0.97			0.99			0.97	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1802			3432			1825			1794	
Flt Permitted		0.99			0.95			0.82			0.84	
Satd. Flow (perm)		1783			3263			1527			1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	451	141	7	679	170	149	343	24	75	188	62
RTOR Reduction (vph)	0	28	0	0	55	0	0	4	0	0	21	0
Lane Group Flow (vph)	0	571	0	0	801	0	0	512	0	0	304	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.8			14.8			15.0			15.0	
Effective Green, g (s)		14.8			14.8			15.0			15.0	
Actuated g/C Ratio		0.39			0.39			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		698			1278			606			608	
v/s Ratio Prot												
v/s Ratio Perm		c0.32			0.25			c0.34			0.20	
v/c Ratio		0.82			0.63			0.84			0.50	
Uniform Delay, d1		10.3			9.3			10.3			8.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		7.4			1.0			10.4			0.6	
Delay (s)		17.7			10.2			20.8			9.2	
Level of Service		B			B			C			A	
Approach Delay (s)		17.7			10.2			20.8			9.2	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	37.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	136	140	12	125	71	131	310	18	67	213	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.95			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		1741			1772			1827			1806	
Flt Permitted		0.93			0.97			0.83			0.86	
Satd. Flow (perm)		1629			1723			1530			1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	148	152	13	136	77	142	337	20	73	232	55
RTOR Reduction (vph)	0	66	0	0	44	0	0	3	0	0	15	0
Lane Group Flow (vph)	0	281	0	0	182	0	0	496	0	0	345	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.0			11.0			15.9			15.9	
Effective Green, g (s)		11.0			11.0			15.9			15.9	
Actuated g/C Ratio		0.32			0.32			0.46			0.46	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		513			543			697			713	
v/s Ratio Prot												
v/s Ratio Perm		c0.17			0.11			c0.32			0.22	
v/c Ratio		0.55			0.34			0.71			0.48	
Uniform Delay, d1		9.9			9.2			7.7			6.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.4			3.4			0.5	
Delay (s)		11.1			9.5			11.1			7.2	
Level of Service		B			A			B			A	
Approach Delay (s)		11.1			9.5			11.1			7.2	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	34.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	163	411	54	0	401
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		1.00			0.95
Frpb, ped/bikes	0.95		1.00			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.86		0.98			1.00
Flt Protected	1.00		1.00			1.00
Satd. Flow (prot)	1532		1826			3539
Flt Permitted	1.00		1.00			1.00
Satd. Flow (perm)	1532		1826			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	177	447	59	0	436
RTOR Reduction (vph)	151	0	11	0	0	0
Lane Group Flow (vph)	26	0	495	0	0	436
Confl. Peds. (#/hr)	52	46		19	19	
Confl. Bikes (#/hr)				5		
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	3.0		9.8			9.8
Effective Green, g (s)	3.0		9.8			9.8
Actuated g/C Ratio	0.14		0.47			0.47
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	221		860			1667
v/s Ratio Prot	c0.02		c0.27			0.12
v/s Ratio Perm						
v/c Ratio	0.12		0.58			0.26
Uniform Delay, d1	7.7		4.0			3.3
Progression Factor	1.00		1.00			1.00
Incremental Delay, d2	0.2		0.9			0.1
Delay (s)	8.0		4.9			3.4
Level of Service	A		A			A
Approach Delay (s)	8.0		4.9			3.4
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	20.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	0	42	0	40	1	463	77	73	436	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	0	46	0	43	1	503	84	79	474	1
Pedestrians		27			16			2			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		2			1			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											460	
pX, platoon unblocked												
vC, conflicting volume	958	1265	266	961	1224	310	502			603		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	958	1265	266	961	1224	310	502			603		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	100	76	100	94	100			92		
cM capacity (veh/h)	176	148	714	189	157	676	1035			958		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	1	89	253	335	316	238
Volume Left	1	46	1	0	79	0
Volume Right	0	43	0	84	0	1
cSH	176	292	1035	1700	958	1700
Volume to Capacity	0.01	0.31	0.00	0.20	0.08	0.14
Queue Length 95th (ft)	0	31	0	0	7	0
Control Delay (s)	25.6	22.7	0.0	0.0	2.9	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	25.6	22.7	0.0		1.7	
Approach LOS	D	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	0	0	42	0	40	1	463	77	73	436	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			0.93			0.98			1.00	
Flt Protected		0.95			0.97			1.00			0.99	
Satd. Flow (prot)		1768			1679			3444			3509	
Flt Permitted		1.00			1.00			0.95			0.84	
Satd. Flow (perm)		1861			1723			3287			2964	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	0	0	46	0	43	1	503	84	79	474	1
RTOR Reduction (vph)	0	0	0	0	39	0	0	19	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	50	0	0	569	0	0	554	0
Confl. Peds. (#/hr)	1		2	2		1	27		16	16		27
Confl. Bikes (#/hr)									6			14
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		2.8			2.8			21.3			21.3	
Effective Green, g (s)		2.8			2.8			21.3			21.3	
Actuated g/C Ratio		0.09			0.09			0.66			0.66	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		162			150			2181			1967	
v/s Ratio Prot												
v/s Ratio Perm		0.00			c0.03			0.17			c0.19	
v/c Ratio		0.01			0.33			0.26			0.28	
Uniform Delay, d1		13.4			13.8			2.2			2.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.0			1.3			0.1			0.1	
Delay (s)		13.4			15.1			2.3			2.3	
Level of Service		B			B			A			A	
Approach Delay (s)		13.4			15.1			2.3			2.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	32.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	61	29	216	74	20	29	531	169	56	791	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00			1.00			0.95	1.00		0.95	1.00
Frt		0.96			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			0.97			1.00	1.00		1.00	1.00
Satd. Flow (prot)		1780			1784			3530	1583		3528	1583
Flt Permitted		0.93			0.72			0.89	1.00		0.88	1.00
Satd. Flow (perm)		1670			1332			3139	1583		3131	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	66	32	235	80	22	32	577	184	61	860	18
RTOR Reduction (vph)	0	20	0	0	6	0	0	0	108	0	0	10
Lane Group Flow (vph)	0	95	0	0	331	0	0	609	76	0	921	8
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		12.9			12.9			14.7	14.7		14.7	14.7
Effective Green, g (s)		12.9			12.9			14.7	14.7		14.7	14.7
Actuated g/C Ratio		0.36			0.36			0.41	0.41		0.41	0.41
Clearance Time (s)		4.0			4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		605			483			1296	654		1293	654
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.25			0.19	0.05		c0.29	0.01
v/c Ratio		0.16			0.68			0.47	0.12		0.71	0.01
Uniform Delay, d1		7.7			9.6			7.6	6.4		8.7	6.2
Progression Factor		1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.1			4.0			0.3	0.1		1.9	0.0
Delay (s)		7.8			13.6			7.9	6.5		10.6	6.2
Level of Service		A			B			A	A		B	A
Approach Delay (s)		7.8			13.6			7.6			10.5	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	35.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	100	0	0	115	0	679	40	0	875	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.95			0.97			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.86			0.86			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1534			1557			1842			1852	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1534			1557			1842			1852	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	109	0	0	125	0	738	43	0	951	27
RTOR Reduction (vph)	0	24	0	0	57	0	0	4	0	0	2	0
Lane Group Flow (vph)	0	85	0	0	68	0	0	777	0	0	976	0
Confl. Peds. (#/hr)	26		14	14		26	64		48	48		64
Confl. Bikes (#/hr)			6			5			15			5
Turn Type	Perm			Perm								
Protected Phases		4			8			2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		4.2			4.2			16.9			16.9	
Effective Green, g (s)		4.2			4.2			16.9			16.9	
Actuated g/C Ratio		0.14			0.14			0.58			0.58	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		221			225			1070			1076	
v/s Ratio Prot		c0.06			0.04			0.42			c0.53	
v/s Ratio Perm												
v/c Ratio		0.38			0.30			0.73			0.91	
Uniform Delay, d1		11.3			11.1			4.4			5.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.1			0.8			2.5			10.9	
Delay (s)		12.4			11.9			6.9			16.3	
Level of Service		B			B			A			B	
Approach Delay (s)		12.4			11.9			6.9			16.3	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	29.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	36	210	192	271	394	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	228	209	295	428	60

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	267	503	488
Volume Left (vph)	39	209	0
Volume Right (vph)	228	0	60
Hadj (s)	-0.45	0.12	-0.04
Departure Headway (s)	6.0	5.6	5.5
Degree Utilization, x	0.45	0.79	0.75
Capacity (veh/h)	541	624	630
Control Delay (s)	13.7	26.4	23.1
Approach Delay (s)	13.7	26.4	23.1
Approach LOS	B	D	C

Intersection Summary			
Delay	22.4		
HCM Level of Service	C		
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	739	234	8	463	105	125	230	44	108	240	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frt		0.97			0.97			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1802			3440			1807			1802	
Flt Permitted		0.99			0.94			0.68			0.75	
Satd. Flow (perm)		1785			3240			1251			1370	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	803	254	9	503	114	136	250	48	117	261	65
RTOR Reduction (vph)	0	17	0	0	30	0	0	7	0	0	9	0
Lane Group Flow (vph)	0	1055	0	0	596	0	0	427	0	0	434	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		35.0			35.0			22.0			22.0	
Effective Green, g (s)		35.0			35.0			22.0			22.0	
Actuated g/C Ratio		0.54			0.54			0.34			0.34	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		961			1745			423			464	
v/s Ratio Prot												
v/s Ratio Perm		c0.59			0.18			c0.34			0.32	
v/c Ratio		1.10			0.34			1.01			0.93	
Uniform Delay, d1		15.0			8.5			21.5			20.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		59.5			0.1			46.4			26.1	
Delay (s)		74.5			8.6			67.9			46.9	
Level of Service		E			A			E			D	
Approach Delay (s)		74.5			8.6			67.9			46.9	
Approach LOS		E			A			E			D	

Intersection Summary			
HCM Average Control Delay	52.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	193	156	18	93	95	128	256	25	167	331	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.95			0.94			0.99			0.98	
Flt Protected		0.99			1.00			0.98			0.99	
Satd. Flow (prot)		1753			1739			1819			1806	
Flt Permitted		0.94			0.96			0.74			0.78	
Satd. Flow (perm)		1659			1675			1361			1428	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	210	170	20	101	103	139	278	27	182	360	73
RTOR Reduction (vph)	0	55	0	0	70	0	0	5	0	0	10	0
Lane Group Flow (vph)	0	374	0	0	154	0	0	439	0	0	605	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.0			13.0			20.0			20.0	
Effective Green, g (s)		13.0			13.0			20.0			20.0	
Actuated g/C Ratio		0.32			0.32			0.49			0.49	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		526			531			664			697	
v/s Ratio Prot												
v/s Ratio Perm		c0.23			0.09			0.32			c0.42	
v/c Ratio		0.71			0.29			0.66			0.87	
Uniform Delay, d1		12.3			10.5			7.9			9.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.5			0.3			2.5			11.1	
Delay (s)		16.8			10.8			10.4			20.4	
Level of Service		B			B			B			C	
Approach Delay (s)		16.8			10.8			10.4			20.4	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	41.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	130	680	142	0	411
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0
Lane Util. Factor	1.00		1.00			0.95
Frpb, ped/bikes	0.92		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.86		0.98			1.00
Flt Protected	1.00		1.00			1.00
Satd. Flow (prot)	1487		1809			3539
Flt Permitted	1.00		1.00			1.00
Satd. Flow (perm)	1487		1809			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	141	739	154	0	447
RTOR Reduction (vph)	73	0	13	0	0	0
Lane Group Flow (vph)	68	0	880	0	0	447
Confl. Peds. (#/hr)	23	64		14		
Confl. Bikes (#/hr)				2		
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	4.1		16.9			16.9
Effective Green, g (s)	4.1		16.9			16.9
Actuated g/C Ratio	0.14		0.58			0.58
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	210		1054			2062
v/s Ratio Prot	c0.05		c0.49			0.13
v/s Ratio Perm						
v/c Ratio	0.32		0.83			0.22
Uniform Delay, d1	11.2		4.9			2.9
Progression Factor	1.00		1.00			1.00
Incremental Delay, d2	0.9		5.8			0.1
Delay (s)	12.1		10.7			2.9
Level of Service	B		B			A
Approach Delay (s)	12.1		10.7			2.9
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	29.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	83	0	78	3	764	71	62	399	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	90	0	85	3	830	77	67	434	1
Pedestrians		54			23			4			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		4			2			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											460	
pX, platoon unblocked												
vC, conflicting volume	1131	1560	275	1254	1522	478	489			931		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1131	1560	275	1254	1522	478	489			931		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	18	100	84	100			91		
cM capacity (veh/h)	112	94	687	111	99	523	1022			717		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	175	418	492	284	218
Volume Left	0	90	3	0	67	0
Volume Right	0	85	0	77	0	1
cSH	1700	179	1022	1700	717	1700
Volume to Capacity	0.00	0.98	0.00	0.29	0.09	0.13
Queue Length 95th (ft)	0	196	0	0	8	0
Control Delay (s)	0.0	114.3	0.1	0.0	3.4	0.0
Lane LOS	A	F	A		A	
Approach Delay (s)	0.0	114.3	0.0		1.9	
Approach LOS	A	F				

Intersection Summary			
Average Delay	13.2		
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	83	0	78	3	764	71	62	399	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					1.00			0.95			0.95	
Frpb, ped/bikes					0.99			1.00			1.00	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.93			0.99			1.00	
Flt Protected					0.97			1.00			0.99	
Satd. Flow (prot)					1676			3477			3511	
Flt Permitted					0.84			0.95			0.80	
Satd. Flow (perm)					1440			3317			2836	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	90	0	85	3	830	77	67	434	1
RTOR Reduction (vph)	0	0	0	0	47	0	0	12	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	128	0	0	898	0	0	502	0
Confl. Peds. (#/hr)				4		1	54		23	23		54
Confl. Bikes (#/hr)						1			16			16
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)					6.9			20.2			20.2	
Effective Green, g (s)					6.9			20.2			20.2	
Actuated g/C Ratio					0.20			0.58			0.58	
Clearance Time (s)					4.0			4.0			4.0	
Vehicle Extension (s)					3.0			3.0			3.0	
Lane Grp Cap (vph)					283			1909			1632	
v/s Ratio Prot												
v/s Ratio Perm					c0.09			c0.27			0.18	
v/c Ratio					0.45			0.47			0.31	
Uniform Delay, d1					12.4			4.3			3.8	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					1.2			0.2			0.1	
Delay (s)					13.6			4.5			3.9	
Level of Service					B			A			A	
Approach Delay (s)		0.0			13.6			4.5			3.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	35.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX K
Wildcat Pipeline (El Cerrito) Level of Service Calculations

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	548	79	123	294	33	125	43	163	40	69	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3415	1863	1554	1767	1831		1770	3539	1542	1764	4860	
Flt Permitted	0.55	1.00	1.00	0.33	1.00		0.69	1.00	1.00	0.72	1.00	
Satd. Flow (perm)	1971	1863	1554	610	1831		1277	3539	1542	1346	4860	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	596	86	134	320	36	136	47	177	43	75	26
RTOR Reduction (vph)	0	0	48	0	9	0	0	0	130	0	19	0
Lane Group Flow (vph)	21	596	38	134	347	0	136	47	47	43	82	0
Confl. Peds. (#/hr)	10		6	6		10			4	4		
Confl. Bikes (#/hr)			7			2			2			2
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	12.2	12.2	12.2	12.2	12.2		7.4	7.4	7.4	7.4	7.4	
Effective Green, g (s)	12.2	12.2	12.2	12.2	12.2		7.4	7.4	7.4	7.4	7.4	
Actuated g/C Ratio	0.44	0.44	0.44	0.44	0.44		0.27	0.27	0.27	0.27	0.27	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	871	824	687	270	809		342	949	413	361	1303	
v/s Ratio Prot		c0.32			0.19			0.01			0.02	
v/s Ratio Perm	0.01		0.02	0.22			c0.11		0.03	0.03		
v/c Ratio	0.02	0.72	0.06	0.50	0.43		0.40	0.05	0.11	0.12	0.06	
Uniform Delay, d1	4.3	6.3	4.4	5.5	5.3		8.3	7.5	7.6	7.6	7.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	3.2	0.0	1.4	0.4		0.8	0.0	0.1	0.1	0.0	
Delay (s)	4.4	9.5	4.4	6.9	5.7		9.0	7.5	7.8	7.8	7.5	
Level of Service	A	A	A	A	A		A	A	A	A	A	
Approach Delay (s)		8.7			6.0			8.2			7.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	27.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	184	0	750	106	239	48	330	402	0	0	476	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.59		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	1101		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	200	0	815	115	260	52	359	437	0	0	517	175
RTOR Reduction (vph)	0	0	523	0	0	42	0	0	0	0	0	128
Lane Group Flow (vph)	200	0	292	115	260	10	359	437	0	0	517	47
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.2		19.8	10.1	10.1	10.1	4.1	21.9			14.8	14.8
Effective Green, g (s)	12.2		19.8	10.1	10.1	10.1	4.1	21.9			14.8	14.8
Actuated g/C Ratio	0.22		0.36	0.18	0.18	0.18	0.07	0.40			0.27	0.27
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	243		1000	628	648	290	262	2017			949	424
v/s Ratio Prot					c0.07			0.09			c0.15	
v/s Ratio Perm	c0.18		0.10	0.03		0.01	c0.10					0.03
v/c Ratio	0.82		0.29	0.18	0.40	0.03	1.37	0.22			0.54	0.11
Uniform Delay, d1	20.5		12.7	19.1	19.9	18.5	25.6	11.0			17.3	15.2
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	19.7		0.2	0.1	0.4	0.0	189.0	0.1			0.6	0.1
Delay (s)	40.1		12.8	19.2	20.3	18.6	214.6	11.0			18.0	15.4
Level of Service	D		B	B	C	B	F	B			B	B
Approach Delay (s)		18.2			19.8			102.8			17.3	
Approach LOS		B			B			F			B	

Intersection Summary			
HCM Average Control Delay	41.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	15	31	22	2	40	37	4	66	31	7	471	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1833	1583				1778	1583		1770	3539	1583
Flt Permitted		0.24	1.00				0.70	1.00		0.09	1.00	1.00
Satd. Flow (perm)		442	1583				1303	1583		171	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	34	24	2	43	40	4	72	34	8	512	93
RTOR Reduction (vph)	0	0	2	0	0	0	0	66	0	0	0	59
Lane Group Flow (vph)	0	50	24	0	0	0	87	6	0	42	512	34
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		12.3	12.3				10.3	10.3		51.0	43.5	43.5
Effective Green, g (s)		12.3	12.3				10.3	10.3		51.0	43.5	43.5
Actuated g/C Ratio		0.10	0.10				0.09	0.09		0.43	0.37	0.37
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		46	164				113	137		174	1296	580
v/s Ratio Prot										0.02	0.14	
v/s Ratio Perm		c0.11	0.02				c0.07	0.00		0.09		0.02
v/c Ratio		1.09	0.15				0.77	0.05		0.24	0.40	0.06
Uniform Delay, d1		53.2	48.5				53.1	49.7		23.2	27.9	24.4
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		159.3	0.4				26.5	0.1		0.7	0.2	0.0
Delay (s)		212.5	48.9				79.6	49.9		24.0	28.1	24.4
Level of Service		F	D				E	D		C	C	C
Approach Delay (s)		156.6					66.1				27.3	
Approach LOS		F					E				C	

Intersection Summary			
HCM Average Control Delay	36.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	118.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	527	856	351	9	12	156	111	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		1.00
Frt	1.00	0.96				0.94		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3382				3299		1583
Flt Permitted	0.33	1.00				0.97		1.00
Satd. Flow (perm)	1207	3382				3299		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	573	930	382	10	13	170	121	16
RTOR Reduction (vph)	0	1	0	0	0	0	0	14
Lane Group Flow (vph)	573	1321	0	0	0	304	0	2
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	64.0	53.5				16.2		16.2
Effective Green, g (s)	64.0	53.5				16.2		16.2
Actuated g/C Ratio	0.54	0.45				0.14		0.14
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	959	1523				450		216
v/s Ratio Prot	c0.08	c0.39						
v/s Ratio Perm	0.24					0.09		0.00
v/c Ratio	0.60	0.87				0.68		0.01
Uniform Delay, d1	16.3	29.5				48.8		44.4
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	1.0	5.5				4.0		0.0
Delay (s)	17.3	35.0				52.8		44.4
Level of Service	B	C				D		D
Approach Delay (s)		29.6				52.4		
Approach LOS		C				D		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	266	178	100	373	97	122	404	14	107	794	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3430		1770	3522		1770	3539	1583
Flt Permitted	0.36	1.00	1.00	0.42	1.00		0.25	1.00		0.48	1.00	1.00
Satd. Flow (perm)	664	1863	1583	790	3430		461	3522		901	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	289	193	109	405	105	133	439	15	116	863	35
RTOR Reduction (vph)	0	0	138	0	42	0	0	3	0	0	0	20
Lane Group Flow (vph)	51	289	55	109	468	0	133	451	0	116	863	15
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2		25.9	22.1		25.9	22.1	22.1
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2		25.9	22.1		25.9	22.1	22.1
Actuated g/C Ratio	0.28	0.28	0.28	0.28	0.28		0.52	0.44		0.52	0.44	0.44
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	188	528	449	224	972		338	1554		532	1561	698
v/s Ratio Prot		c0.16			0.14		c0.03	0.13		0.02	c0.24	
v/s Ratio Perm	0.08		0.03	0.14			0.17			0.10		0.01
v/c Ratio	0.27	0.55	0.12	0.49	0.48		0.39	0.29		0.22	0.55	0.02
Uniform Delay, d1	13.9	15.2	13.3	14.9	14.9		6.7	9.0		6.3	10.3	7.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	1.2	0.1	1.7	0.4		0.8	0.1		0.2	0.4	0.0
Delay (s)	14.7	16.4	13.4	16.6	15.3		7.5	9.1		6.5	10.8	7.9
Level of Service	B	B	B	B	B		A	A		A	B	A
Approach Delay (s)		15.2			15.5			8.7			10.2	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	311	91	33	456	94	153	785
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.97		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1547	1770	3429		1767	3539
Flt Permitted	0.95	1.00	0.29	1.00		0.36	1.00
Satd. Flow (perm)	1770	1547	535	3429		678	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	338	99	36	496	102	166	853
RTOR Reduction (vph)	0	70	0	24	0	0	0
Lane Group Flow (vph)	338	29	36	574	0	166	853
Confl. Peds. (#/hr)	1	20			10	10	
Confl. Bikes (#/hr)					2		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	14.2	14.2	23.1	21.7		26.3	23.3
Effective Green, g (s)	14.2	14.2	23.1	21.7		26.3	23.3
Actuated g/C Ratio	0.29	0.29	0.47	0.44		0.54	0.48
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	514	449	288	1522		431	1686
v/s Ratio Prot	c0.19		0.00	0.17		c0.02	c0.24
v/s Ratio Perm		0.02	0.06			0.18	
v/c Ratio	0.66	0.06	0.12	0.38		0.39	0.51
Uniform Delay, d1	15.2	12.5	7.0	9.1		5.9	8.8
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.0	0.1	0.2	0.2		0.6	0.2
Delay (s)	18.3	12.6	7.2	9.2		6.5	9.1
Level of Service	B	B	A	A		A	A
Approach Delay (s)	17.0			9.1			8.6
Approach LOS	B			A			A

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	48.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	134	252	94	101	283	35	18	458	69	35	601	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.99		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1765	1583		3453		1770	3470		1770	3415	
Flt Permitted	0.49	0.97	1.00		0.55		0.16	1.00		0.30	1.00	
Satd. Flow (perm)	866	1712	1583		1925		290	3470		553	3415	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	274	102	110	308	38	20	498	75	38	653	199
RTOR Reduction (vph)	0	0	78	0	6	0	0	11	0	0	25	0
Lane Group Flow (vph)	131	289	24	0	450	0	20	562	0	38	827	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	20.5	20.5	20.5		24.3		27.7	25.7		27.9	25.8	
Effective Green, g (s)	20.5	20.5	20.5		24.3		27.7	25.7		27.9	25.8	
Actuated g/C Ratio	0.24	0.24	0.24		0.28		0.32	0.30		0.32	0.30	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	206	408	377		543		128	1036		209	1023	
v/s Ratio Prot							0.00	0.16		c0.00	c0.24	
v/s Ratio Perm	0.15	c0.17	0.02		c0.23		0.05			0.05		
v/c Ratio	0.64	0.71	0.06		1.17dl		0.16	0.54		0.18	0.81	
Uniform Delay, d1	29.4	30.1	25.4		28.9		21.5	25.3		20.5	27.9	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	5.6	0.1		10.0		0.6	0.6		0.4	4.8	
Delay (s)	35.7	35.6	25.5		39.0		22.1	25.9		20.9	32.6	
Level of Service	D	D	C		D		C	C		C	C	
Approach Delay (s)		33.7			39.0			25.7			32.1	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	9.5
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	215	13	87	196	105	22	336	72	99	691	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.99			0.96		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1844			3317		1769	3407		1754	3523	
Flt Permitted	0.45	1.00			0.77		0.36	1.00		0.44	1.00	
Satd. Flow (perm)	831	1844			2571		669	3407		807	3523	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	234	14	95	213	114	24	365	78	108	751	21
RTOR Reduction (vph)	0	4	0	0	63	0	0	24	0	0	2	0
Lane Group Flow (vph)	2	244	0	0	359	0	24	419	0	108	770	0
Confl. Peds. (#/hr)	43		22	22		43	10		37	37		10
Confl. Bikes (#/hr)			2						3			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	12.5	12.5			12.5		23.6	22.9		29.7	26.0	
Effective Green, g (s)	12.5	12.5			12.5		23.6	22.9		29.7	26.0	
Actuated g/C Ratio	0.25	0.25			0.25		0.47	0.46		0.59	0.52	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	459			640		330	1554		549	1825	
v/s Ratio Prot		0.13					0.00	0.12		c0.01	c0.22	
v/s Ratio Perm	0.00				c0.14		0.03			0.10		
v/c Ratio	0.01	0.53			0.56		0.07	0.27		0.20	0.42	
Uniform Delay, d1	14.2	16.3			16.5		7.1	8.5		4.6	7.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.2			1.1		0.1	0.1		0.2	0.2	
Delay (s)	14.2	17.5			17.6		7.2	8.6		4.7	7.6	
Level of Service	B	B			B		A	A		A	A	
Approach Delay (s)		17.5			17.6			8.5			7.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	50.2	Sum of lost time (s)	7.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	NEL	NER
Lane Configurations									
Volume (vph)	2	179	179	48	188	0	4	115	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5			5.5	5.5			5.5	5.5
Lane Util. Factor	1.00			1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Frt	0.87			1.00	1.00			1.00	0.85
Flt Protected	1.00			0.96	1.00			0.95	1.00
Satd. Flow (prot)	1613			1784	1857			1770	1583
Flt Permitted	1.00			0.57	1.00			0.95	1.00
Satd. Flow (perm)	1613			1054	1857			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	195	195	52	204	0	4	125	110
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	96
Lane Group Flow (vph)	197	0	0	247	207	0	0	125	14
Confl. Peds. (#/hr)			3				3		
Confl. Bikes (#/hr)							2		
Turn Type			Perm						Perm
Protected Phases	3			4 2	7 2			8	
Permitted Phases			4 2						8
Actuated Green, G (s)	15.2			30.6	27.0			11.9	11.9
Effective Green, g (s)	15.2			30.6	27.0			11.9	11.9
Actuated g/C Ratio	0.16			0.32	0.28			0.12	0.12
Clearance Time (s)	5.5							5.5	5.5
Vehicle Extension (s)	3.0							3.0	3.0
Lane Grp Cap (vph)	258			339	527			221	198
v/s Ratio Prot	c0.12				c0.11			c0.07	
v/s Ratio Perm				c0.23					0.01
v/c Ratio	0.76			0.73	0.39			0.57	0.07
Uniform Delay, d1	38.3			28.6	27.5			39.2	36.8
Progression Factor	1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	12.6			7.6	0.5			3.3	0.1
Delay (s)	50.9			36.2	28.0			42.5	36.9
Level of Service	D			D	C			D	D
Approach Delay (s)	50.9			36.2	28.0			39.9	
Approach LOS	D			D	C			D	

Intersection Summary			
HCM Average Control Delay	38.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	27.5
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

2016 Wildcat and Central Pressure Zone Pipeline (El Cerrito/Richmond) No Project AM Peak
9: Potrero Ave & Richmond St

6/7/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	107	76	22	145	24	59	254	13	12	335	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.95			0.98			0.99			0.98	
Flt Protected		0.99			0.99			0.99			1.00	
Satd. Flow (prot)		1760			1821			1836			1831	
Flt Permitted		0.91			0.93			0.89			0.98	
Satd. Flow (perm)		1620			1706			1647			1800	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	116	83	24	158	26	64	276	14	13	364	49
RTOR Reduction (vph)	0	59	0	0	15	0	0	4	0	0	12	0
Lane Group Flow (vph)	0	175	0	0	193	0	0	350	0	0	414	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		6.5			6.5			8.7			8.7	
Effective Green, g (s)		6.5			6.5			8.7			8.7	
Actuated g/C Ratio		0.28			0.28			0.37			0.37	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		454			478			618			675	
v/s Ratio Prot												
v/s Ratio Perm		0.11			c0.11			0.21			c0.23	
v/c Ratio		0.39			0.40			0.57			0.61	
Uniform Delay, d1		6.7			6.8			5.8			5.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.6			1.2			1.7	
Delay (s)		7.3			7.3			7.0			7.5	
Level of Service		A			A			A			A	
Approach Delay (s)		7.3			7.3			7.0			7.5	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	23.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	217	15	65	274	76	20	164	11	81	351	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.98			0.99			0.99	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		1842			1783			1836			1818	
Flt Permitted		1.00			0.91			0.93			0.91	
Satd. Flow (perm)		1837			1638			1723			1672	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	236	16	71	298	83	22	178	12	88	382	48
RTOR Reduction (vph)	0	6	0	0	18	0	0	5	0	0	9	0
Lane Group Flow (vph)	0	248	0	0	434	0	0	207	0	0	509	0
Confl. Peds. (#/hr)	28		11	11		28	4		5	5		4
Confl. Bikes (#/hr)			1						1			
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.1			14.1			15.9			15.9	
Effective Green, g (s)		14.1			14.1			15.9			15.9	
Actuated g/C Ratio		0.37			0.37			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		682			608			721			700	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.26			0.12			c0.30	
v/c Ratio		0.36			0.71			0.29			0.73	
Uniform Delay, d1		8.7			10.2			7.3			9.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			4.0			0.2			3.8	
Delay (s)		9.0			14.2			7.5			13.0	
Level of Service		A			B			A			B	
Approach Delay (s)		9.0			14.2			7.5			13.0	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	56	171	32	11	282	77	33	67	4	36	193	124
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	186	35	12	307	84	36	73	4	39	210	135

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	282	402	113	384
Volume Left (vph)	61	12	36	39
Volume Right (vph)	35	84	4	135
Hadj (s)	0.00	-0.08	0.07	-0.16
Departure Headway (s)	6.4	6.1	7.1	6.2
Degree Utilization, x	0.50	0.68	0.22	0.66
Capacity (veh/h)	507	552	408	549
Control Delay (s)	15.7	21.0	12.2	20.2
Approach Delay (s)	15.7	21.0	12.2	20.2
Approach LOS	C	C	B	C

Intersection Summary			
Delay	18.6		
HCM Level of Service	C		
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	27	291	300	77	139	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	316	326	84	151	71

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	346	410	222
Volume Left (vph)	29	0	151
Volume Right (vph)	0	84	71
Hadj (s)	0.05	-0.09	-0.02
Departure Headway (s)	5.2	5.0	5.7
Degree Utilization, x	0.50	0.57	0.35
Capacity (veh/h)	662	697	568
Control Delay (s)	13.3	14.3	11.9
Approach Delay (s)	13.3	14.3	11.9
Approach LOS	B	B	B

Intersection Summary			
Delay	13.4		
HCM Level of Service	B		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	EBR2	WBT	NBL2	NBL	NBR2	SEL	SET	SER	SER2
Lane Configurations												
Volume (vph)	62	8	198	3	2	9	22	1	4	253	29	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5			4.5		4.5
Lane Util. Factor		1.00			1.00		1.00			0.95		0.95
Frt		0.90			1.00		1.00			0.98		0.85
Flt Protected		0.99			1.00		0.95			1.00		1.00
Satd. Flow (prot)		1657			1863		1770			1734		1504
Flt Permitted		0.93			1.00		0.95			1.00		1.00
Satd. Flow (perm)		1560			1863		1770			1730		1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	9	215	3	2	10	24	1	4	275	32	101
RTOR Reduction (vph)	0	1	0	0	0	0	1	0	0	1	0	73
Lane Group Flow (vph)	0	293	0	0	2	0	34	0	0	320	0	18
Turn Type	Perm					Perm			Perm			custom
Protected Phases		6			2		4			8		
Permitted Phases	6					4			8			4
Actuated Green, G (s)		14.9			14.9		5.2			18.6		5.2
Effective Green, g (s)		14.9			14.9		5.2			18.6		5.2
Actuated g/C Ratio		0.29			0.29		0.10			0.36		0.10
Clearance Time (s)		4.5			4.5		4.5			4.5		4.5
Vehicle Extension (s)		3.0			3.0		3.0			3.0		3.0
Lane Grp Cap (vph)		445			532		176			616		150
v/s Ratio Prot					0.00							
v/s Ratio Perm		c0.19					0.02			0.18		0.01
v/c Ratio		0.66			0.00		0.19			0.52		0.12
Uniform Delay, d1		16.4			13.3		21.6			13.3		21.4
Progression Factor		1.00			1.00		1.00			1.00		1.00
Incremental Delay, d2		3.5			0.0		0.5			0.7		0.4
Delay (s)		19.9			13.3		22.1			14.0		21.8
Level of Service		B			B		C			B		C
Approach Delay (s)		19.9			13.3		22.1			15.7		
Approach LOS		B			B		C			B		

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	52.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL2	NWL	NWT
Lane Configurations			
Volume (vph)	1	165	157
Ideal Flow (vphpl)	1900	1900	1900
Total Lost time (s)		4.5	4.5
Lane Util. Factor		1.00	1.00
Frt		1.00	1.00
Flt Protected		0.95	1.00
Satd. Flow (prot)		1770	1863
Flt Permitted		0.46	1.00
Satd. Flow (perm)		856	1863
Peak-hour factor, PHF	0.92	0.92	0.92
Adj. Flow (vph)	1	179	171
RTOR Reduction (vph)	0	0	0
Lane Group Flow (vph)	0	180	171
Turn Type	Perm	Perm	
Protected Phases			8
Permitted Phases	8	8	
Actuated Green, G (s)		18.6	18.6
Effective Green, g (s)		18.6	18.6
Actuated g/C Ratio		0.36	0.36
Clearance Time (s)		4.5	4.5
Vehicle Extension (s)		3.0	3.0
Lane Grp Cap (vph)		305	664
v/s Ratio Prot			0.09
v/s Ratio Perm		c0.21	
v/c Ratio		0.59	0.26
Uniform Delay, d1		13.7	11.9
Progression Factor		1.00	1.00
Incremental Delay, d2		3.0	0.2
Delay (s)		16.7	12.1
Level of Service		B	B
Approach Delay (s)			14.5
Approach LOS			B

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	403	108	212	775	90	297	97	263	28	55	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00		1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00		0.97	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	1863	1520	1747	1828		1713	3539	1521	1743	4764	
Flt Permitted	0.12	1.00	1.00	0.44	1.00		0.70	1.00	1.00	0.69	1.00	
Satd. Flow (perm)	428	1863	1520	805	1828		1253	3539	1521	1259	4764	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	438	117	230	842	98	323	105	286	30	60	27
RTOR Reduction (vph)	0	0	52	0	6	0	0	0	197	0	19	0
Lane Group Flow (vph)	34	438	65	230	934	0	323	105	89	30	68	0
Confl. Peds. (#/hr)	12		24	24		12	19		9	9		19
Confl. Bikes (#/hr)			3			8			2			1
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	33.8	33.8	33.8	33.8	33.8		19.0	19.0	19.0	19.0	19.0	
Effective Green, g (s)	33.8	33.8	33.8	33.8	33.8		19.0	19.0	19.0	19.0	19.0	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56		0.31	0.31	0.31	0.31	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	238	1036	845	448	1016		392	1106	475	393	1489	
v/s Ratio Prot		0.24			c0.51			0.03			0.01	
v/s Ratio Perm	0.08		0.04	0.29			c0.26		0.06	0.02		
v/c Ratio	0.14	0.42	0.08	0.51	0.92		0.82	0.09	0.19	0.08	0.05	
Uniform Delay, d1	6.5	7.8	6.3	8.4	12.3		19.4	14.8	15.3	14.7	14.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3	0.0	1.0	12.8		13.1	0.0	0.2	0.1	0.0	
Delay (s)	6.8	8.1	6.3	9.4	25.0		32.5	14.8	15.5	14.8	14.6	
Level of Service	A	A	A	A	C		C	B	B	B	B	
Approach Delay (s)		7.7			21.9			23.1			14.6	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	60.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	194	0	574	100	504	88	475	880	0	0	578	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.45		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	833		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	211	0	624	109	548	96	516	957	0	0	628	214
RTOR Reduction (vph)	0	0	438	0	0	42	0	0	0	0	0	141
Lane Group Flow (vph)	211	0	186	109	548	54	516	957	0	0	628	73
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.2		19.8	17.7	17.7	17.7	4.1	25.7			18.6	18.6
Effective Green, g (s)	12.2		19.8	17.7	17.7	17.7	4.1	25.7			18.6	18.6
Actuated g/C Ratio	0.18		0.30	0.27	0.27	0.27	0.06	0.39			0.28	0.28
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	153		829	912	941	421	217	1962			988	442
v/s Ratio Prot					c0.15			0.19			c0.18	
v/s Ratio Perm	c0.25		0.07	0.03		0.03	c0.15					0.05
v/c Ratio	1.38		0.22	0.12	0.58	0.13	2.38	0.49			0.64	0.16
Uniform Delay, d1	27.2		17.6	18.5	21.2	18.6	31.2	15.5			21.0	18.1
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	206.0		0.1	0.1	0.9	0.1	634.0	0.2			1.3	0.2
Delay (s)	233.2		17.8	18.6	22.2	18.7	665.3	15.7			22.4	18.3
Level of Service	F		B	B	C	B	F	B			C	B
Approach Delay (s)		72.2			21.2			243.2			21.3	
Approach LOS		E			C			F			C	

Intersection Summary			
HCM Average Control Delay	115.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	46	33	35	2	29	32	15	239	61	24	940	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.97	1.00				0.96	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1810	1583				1790	1583		1770	3539	1583
Flt Permitted		0.16	1.00				0.71	1.00		0.10	1.00	1.00
Satd. Flow (perm)		306	1583				1322	1583		177	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	36	38	2	32	35	16	260	66	26	1022	125
RTOR Reduction (vph)	0	0	1	0	0	0	0	244	0	0	0	87
Lane Group Flow (vph)	0	86	39	0	0	0	83	16	0	92	1022	38
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		41.0	41.0				9.0	9.0		52.0	42.0	42.0
Effective Green, g (s)		41.0	41.0				9.0	9.0		52.0	42.0	42.0
Actuated g/C Ratio		0.28	0.28				0.06	0.06		0.36	0.29	0.29
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		86	446				82	98		173	1021	457
v/s Ratio Prot										0.04	0.29	
v/s Ratio Perm		c0.28	0.02				c0.06	0.01		0.15		0.02
v/c Ratio		1.00	0.09				1.01	0.16		0.53	1.00	0.08
Uniform Delay, d1		52.3	38.5				68.3	64.7		36.9	51.8	37.8
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		97.0	0.1				102.8	0.8		3.1	28.4	0.1
Delay (s)		149.3	38.6				171.1	65.5		40.0	80.2	37.8
Level of Service		F	D				F	E		D	F	D
Approach Delay (s)		114.2					91.1				72.9	
Approach LOS		F					F				E	

Intersection Summary			
HCM Average Control Delay	79.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	145.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	324	677	236	8	14	274	113	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		1.00
Frt	1.00	0.96				0.96		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3398				3341		1583
Flt Permitted	0.09	1.00				0.97		1.00
Satd. Flow (perm)	336	3398				3341		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	352	736	257	9	15	298	123	50
RTOR Reduction (vph)	0	1	0	0	0	0	0	42
Lane Group Flow (vph)	352	1001	0	0	0	436	0	8
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	53.0	43.0				23.6		23.6
Effective Green, g (s)	53.0	43.0				23.6		23.6
Actuated g/C Ratio	0.36	0.30				0.16		0.16
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	335	1004				542		257
v/s Ratio Prot	c0.07	0.29						
v/s Ratio Perm	c0.31					0.13		0.01
v/c Ratio	1.05	1.00				0.80		0.03
Uniform Delay, d1	38.4	51.2				58.8		51.4
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	63.1	27.5				8.5		0.1
Delay (s)	101.5	78.8				67.2		51.4
Level of Service	F	E				E		D
Approach Delay (s)		84.7				65.6		
Approach LOS		F				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	191	155	69	185	62	138	959	26	81	612	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3406		1770	3525		1770	3539	1583
Flt Permitted	0.58	1.00	1.00	0.53	1.00		0.34	1.00		0.20	1.00	1.00
Satd. Flow (perm)	1081	1863	1583	996	3406		626	3525		379	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	208	168	75	201	67	150	1042	28	88	665	103
RTOR Reduction (vph)	0	0	126	0	50	0	0	2	0	0	0	55
Lane Group Flow (vph)	114	208	42	75	218	0	150	1068	0	88	665	48
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	12.2	12.2	12.2	12.2	12.2		28.4	24.6		25.2	23.0	23.0
Effective Green, g (s)	12.2	12.2	12.2	12.2	12.2		28.4	24.6		25.2	23.0	23.0
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25		0.58	0.50		0.51	0.47	0.47
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	269	464	394	248	848		452	1770		257	1661	743
v/s Ratio Prot		c0.11			0.06		c0.03	c0.30		0.02	0.19	
v/s Ratio Perm	0.11		0.03	0.08			0.17			0.16		0.03
v/c Ratio	0.42	0.45	0.11	0.30	0.26		0.33	0.60		0.34	0.40	0.07
Uniform Delay, d1	15.4	15.6	14.2	14.9	14.8		4.9	8.7		6.5	8.5	7.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.1	0.7	0.1	0.7	0.2		0.4	0.6		0.8	0.2	0.0
Delay (s)	16.5	16.2	14.3	15.6	14.9		5.4	9.3		7.3	8.7	7.2
Level of Service	B	B	B	B	B		A	A		A	A	A
Approach Delay (s)		15.6			15.1			8.8			8.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	49.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	210	66	60	1086	136	143	631
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.98		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1520	1770	3459		1769	3539
Flt Permitted	0.95	1.00	0.27	1.00		0.20	1.00
Satd. Flow (perm)	1770	1520	508	3459		372	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	72	65	1180	148	155	686
RTOR Reduction (vph)	0	41	0	16	0	0	0
Lane Group Flow (vph)	228	31	65	1312	0	155	686
Confl. Peds. (#/hr)		41			18	18	
Confl. Bikes (#/hr)					8		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	26.0	26.0	24.0	20.0		24.0	20.0
Effective Green, g (s)	26.0	26.0	24.0	20.0		24.0	20.0
Actuated g/C Ratio	0.43	0.43	0.40	0.33		0.40	0.33
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Grp Cap (vph)	767	659	287	1153		242	1180
v/s Ratio Prot	c0.13		0.02	c0.38		c0.04	0.19
v/s Ratio Perm		0.02	0.08			0.21	
v/c Ratio	0.30	0.05	0.23	1.14		0.64	0.58
Uniform Delay, d1	11.1	9.8	11.5	20.0		14.2	16.5
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	0.1	1.8	73.0		12.3	2.1
Delay (s)	12.0	10.0	13.4	93.0		26.5	18.6
Level of Service	B	A	B	F		C	B
Approach Delay (s)	11.5			89.3			20.1
Approach LOS	B			F			C

Intersection Summary			
HCM Average Control Delay	57.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	382	229	153	52	210	76	159	866	57	44	576	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1741	1583		3393		1770	3506		1770	3397	
Flt Permitted	0.53	0.76	1.00		0.55		0.18	1.00		0.20	1.00	
Satd. Flow (perm)	943	1338	1583		1884		339	3506		373	3397	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	415	249	166	57	228	83	173	941	62	48	626	228
RTOR Reduction (vph)	0	0	115	0	27	0	0	5	0	0	37	0
Lane Group Flow (vph)	295	369	51	0	341	0	173	998	0	48	817	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	31.0	31.0	31.0		30.0		28.0	22.0		24.0	20.0	
Effective Green, g (s)	31.0	31.0	31.0		30.0		28.0	22.0		24.0	20.0	
Actuated g/C Ratio	0.31	0.31	0.31		0.30		0.28	0.22		0.24	0.20	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	291	413	488		562		180	767		145	676	
v/s Ratio Prot							c0.06	c0.28		0.01	0.24	
v/s Ratio Perm	c0.31	0.28	0.03		c0.18		0.21			0.07		
v/c Ratio	1.01	0.89	0.10		0.61		0.96	1.30		0.33	1.21	
Uniform Delay, d1	34.8	33.2	24.8		30.2		34.1	39.2		31.2	40.2	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	56.3	24.3	0.4		4.8		57.6	145.2		6.0	107.4	
Delay (s)	91.1	57.4	25.3		35.0		91.7	184.4		37.3	147.7	
Level of Service	F	E	C		D		F	F		D	F	
Approach Delay (s)		63.0			35.0			170.8			141.8	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM Average Control Delay	120.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.5	Sum of lost time (s)	12.5
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

7: Fairmont Ave & San Pablo Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	170	16	110	171	56	72	1024	121	88	801	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.99			0.98		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1833			3359		1768	3469		1769	3530	
Flt Permitted	0.51	1.00			0.79		0.21	1.00		0.14	1.00	
Satd. Flow (perm)	937	1833			2682		387	3469		266	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	185	17	120	186	61	78	1113	132	96	871	12
RTOR Reduction (vph)	0	5	0	0	25	0	0	14	0	0	1	0
Lane Group Flow (vph)	12	197	0	0	342	0	78	1231	0	96	882	0
Confl. Peds. (#/hr)	21		30	30		21	30		10	10		30
Confl. Bikes (#/hr)			3			2			4			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	25.0	25.0			25.0		32.0	28.0		32.0	28.0	
Effective Green, g (s)	25.0	25.0			25.0		32.0	28.0		32.0	28.0	
Actuated g/C Ratio	0.37	0.37			0.37		0.47	0.41		0.47	0.41	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	344	674			986		263	1428		214	1454	
v/s Ratio Prot		0.11					0.02	c0.36		c0.03	0.25	
v/s Ratio Perm	0.01				c0.13		0.12			0.19		
v/c Ratio	0.03	0.29			0.35		0.30	0.86		0.45	0.61	
Uniform Delay, d1	13.8	15.2			15.6		10.8	18.2		13.1	15.7	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.1			1.0		2.9	7.1		6.7	1.9	
Delay (s)	14.0	16.3			16.6		13.7	25.3		19.7	17.6	
Level of Service	B	B			B		B	C		B	B	
Approach Delay (s)		16.2			16.6			24.6			17.8	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	NEL	NER
Lane Configurations									
Volume (vph)	0	118	291	112	133	0	4	176	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00			1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00			0.99	1.00			1.00	1.00
Frt	0.86			1.00	1.00			1.00	0.85
Flt Protected	1.00			0.97	1.00			0.95	1.00
Satd. Flow (prot)	1611			1783	1856			1770	1583
Flt Permitted	1.00			0.65	1.00			0.95	1.00
Satd. Flow (perm)	1611			1196	1856			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	128	316	122	145	0	4	191	110
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	92
Lane Group Flow (vph)	128	0	0	438	148	0	0	191	18
Confl. Peds. (#/hr)			5					2	
Turn Type			Perm						Perm
Protected Phases	3			4 2	7 2			8	
Permitted Phases			4 2						8
Actuated Green, G (s)	16.0			32.0	32.0			16.0	16.0
Effective Green, g (s)	16.0			32.0	32.0			16.0	16.0
Actuated g/C Ratio	0.16			0.32	0.32			0.16	0.16
Clearance Time (s)	4.0							4.0	4.0
Lane Grp Cap (vph)	258			383	594			283	253
v/s Ratio Prot	c0.08				c0.08			c0.11	
v/s Ratio Perm				c0.37					0.01
v/c Ratio	0.50			1.14	0.25			0.67	0.07
Uniform Delay, d1	38.3			34.0	25.1			39.6	35.7
Progression Factor	1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	6.7			91.2	1.0			12.2	0.5
Delay (s)	45.0			125.2	26.1			51.7	36.2
Level of Service	D			F	C			D	D
Approach Delay (s)	45.0			125.2	26.1			46.1	
Approach LOS	D			F	C			D	

Intersection Summary			
HCM Average Control Delay	77.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	142	60	31	82	18	39	337	23	16	197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.98			0.99			0.98	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1785			1806			1839			1829	
Flt Permitted		0.92			0.90			0.95			0.96	
Satd. Flow (perm)		1664			1640			1759			1769	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	154	65	34	89	20	42	366	25	17	214	29
RTOR Reduction (vph)	0	28	0	0	12	0	0	5	0	0	11	0
Lane Group Flow (vph)	0	246	0	0	131	0	0	428	0	0	249	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		666			656			704			708	
v/s Ratio Prot												
v/s Ratio Perm		c0.15			0.08			c0.24			0.14	
v/c Ratio		0.37			0.20			0.61			0.35	
Uniform Delay, d1		8.4			7.8			9.5			8.4	
Progression Factor		1.00			1.00			1.49			1.00	
Incremental Delay, d2		1.6			0.7			3.3			1.4	
Delay (s)		10.0			8.5			17.5			9.7	
Level of Service		B			A			B			A	
Approach Delay (s)		10.0			8.5			17.5			9.7	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	198	11	26	182	116	26	322	26	79	241	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.95			0.99			0.99	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1836			1741			1836			1814	
Flt Permitted		0.94			0.96			0.96			0.86	
Satd. Flow (perm)		1736			1686			1769			1585	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	215	12	28	198	126	28	350	28	86	262	37
RTOR Reduction (vph)	0	4	0	0	50	0	0	7	0	0	10	0
Lane Group Flow (vph)	0	252	0	0	302	0	0	399	0	0	375	0
Confl. Peds. (#/hr)	15		7	7		15	2		2	2		2
Confl. Bikes (#/hr)												1
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		694			674			708			634	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.18			0.23			c0.24	
v/c Ratio		0.36			0.45			0.56			0.59	
Uniform Delay, d1		8.4			8.8			9.3			9.4	
Progression Factor		1.00			1.00			1.00			0.76	
Incremental Delay, d2		1.5			2.1			3.2			3.9	
Delay (s)		9.9			10.9			12.5			11.1	
Level of Service		A			B			B			B	
Approach Delay (s)		9.9			10.9			12.5			11.1	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	94	191	40	3	95	38	35	206	8	36	172	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	102	208	43	3	103	41	38	224	9	39	187	92

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	353	148	271	318
Volume Left (vph)	102	3	38	39
Volume Right (vph)	43	41	9	92
Hadj (s)	0.02	-0.13	0.04	-0.12
Departure Headway (s)	6.1	6.4	6.2	6.0
Degree Utilization, x	0.60	0.26	0.47	0.53
Capacity (veh/h)	548	473	529	560
Control Delay (s)	17.6	11.7	14.5	15.4
Approach Delay (s)	17.6	11.7	14.5	15.4
Approach LOS	C	B	B	C

Intersection Summary			
Delay	15.4		
HCM Level of Service	C		
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	122	331	283	96	102	96
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	133	360	308	104	111	104

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	492	412	215
Volume Left (vph)	133	0	111
Volume Right (vph)	0	104	104
Hadj (s)	0.09	-0.12	-0.15
Departure Headway (s)	5.3	5.2	6.0
Degree Utilization, x	0.72	0.59	0.36
Capacity (veh/h)	665	672	541
Control Delay (s)	20.6	15.4	12.3
Approach Delay (s)	20.6	15.4	12.3
Approach LOS	C	C	B

Intersection Summary			
Delay	17.1		
HCM Level of Service	C		
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	EBR2	WBT	WBR	NBL2	NBL	SET	SER	SER2	NWL2
Lane Configurations												
Volume (vph)	138	5	176	4	11	1	7	19	117	16	77	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00			1.00	0.95		0.95	
Frt		0.92			0.99			1.00	0.98		0.85	
Flt Protected		0.98			1.00			0.95	1.00		1.00	
Satd. Flow (prot)		1687			1843			1770	1726		1504	
Flt Permitted		0.86			1.00			0.95	1.00		1.00	
Satd. Flow (perm)		1474			1843			1770	1726		1504	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	150	5	191	4	12	1	8	21	127	17	84	1
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	3	0	49	0
Lane Group Flow (vph)	0	349	0	0	12	0	0	29	149	0	27	0
Turn Type	Perm						Perm				custom	Perm
Protected Phases		6!			2!			4	8			
Permitted Phases	6!						4		8		6	8
Actuated Green, G (s)		15.2			15.2			1.1	13.2		15.2	
Effective Green, g (s)		15.2			15.2			1.1	13.2		15.2	
Actuated g/C Ratio		0.35			0.35			0.03	0.31		0.35	
Clearance Time (s)		4.5			4.5			4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		521			651			45	530		532	
v/s Ratio Prot					0.01				0.09			
v/s Ratio Perm		c0.24						0.02			0.02	
v/c Ratio		0.67			0.02			0.64	0.28		0.05	
Uniform Delay, d1		11.8			9.0			20.8	11.3		9.1	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.4			0.0			27.5	0.3		0.0	
Delay (s)		15.2			9.1			48.2	11.6		9.2	
Level of Service		B			A			D	B		A	
Approach Delay (s)		15.2			9.1			48.2	10.8			
Approach LOS		B			A			D	B			

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	43.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	NWL	NWT
Lane Configurations		
Volume (vph)	201	235
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	4.5
Lane Util. Factor	1.00	1.00
Frt	1.00	1.00
Flt Protected	0.95	1.00
Satd. Flow (prot)	1770	1863
Flt Permitted	0.66	1.00
Satd. Flow (perm)	1221	1863
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	218	255
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	219	255
Turn Type	Perm	
Protected Phases		8
Permitted Phases	8	
Actuated Green, G (s)	13.2	13.2
Effective Green, g (s)	13.2	13.2
Actuated g/C Ratio	0.31	0.31
Clearance Time (s)	4.5	4.5
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	375	572
v/s Ratio Prot		0.14
v/s Ratio Perm	c0.18	
v/c Ratio	0.58	0.45
Uniform Delay, d1	12.6	12.0
Progression Factor	1.00	1.00
Incremental Delay, d2	2.3	0.6
Delay (s)	14.9	12.5
Level of Service	B	B
Approach Delay (s)		13.6
Approach LOS		B

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	548	79	123	294	33	125	43	163	40	69	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3415	1863	1554	1767	1831		1770	3539	1542	1764	4860	
Flt Permitted	0.55	1.00	1.00	0.33	1.00		0.69	1.00	1.00	0.72	1.00	
Satd. Flow (perm)	1971	1863	1554	610	1831		1277	3539	1542	1346	4860	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	596	86	134	320	36	136	47	177	43	75	26
RTOR Reduction (vph)	0	0	48	0	9	0	0	0	130	0	19	0
Lane Group Flow (vph)	21	596	38	134	347	0	136	47	47	43	82	0
Confl. Peds. (#/hr)	10		6	6		10			4	4		
Confl. Bikes (#/hr)			7			2			2			2
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	12.2	12.2	12.2	12.2	12.2		7.4	7.4	7.4	7.4	7.4	
Effective Green, g (s)	12.2	12.2	12.2	12.2	12.2		7.4	7.4	7.4	7.4	7.4	
Actuated g/C Ratio	0.44	0.44	0.44	0.44	0.44		0.27	0.27	0.27	0.27	0.27	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	871	824	687	270	809		342	949	413	361	1303	
v/s Ratio Prot		c0.32			0.19			0.01			0.02	
v/s Ratio Perm	0.01		0.02	0.22			c0.11		0.03	0.03		
v/c Ratio	0.02	0.72	0.06	0.50	0.43		0.40	0.05	0.11	0.12	0.06	
Uniform Delay, d1	4.3	6.3	4.4	5.5	5.3		8.3	7.5	7.6	7.6	7.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	3.2	0.0	1.4	0.4		0.8	0.0	0.1	0.1	0.0	
Delay (s)	4.4	9.5	4.4	6.9	5.7		9.0	7.5	7.8	7.8	7.5	
Level of Service	A	A	A	A	A		A	A	A	A	A	
Approach Delay (s)		8.7			6.0			8.2			7.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	27.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	184	0	750	561	239	48	330	645	0	0	476	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.59		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	1101		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	200	0	815	610	260	52	359	701	0	0	517	175
RTOR Reduction (vph)	0	0	154	0	0	36	0	0	0	0	0	132
Lane Group Flow (vph)	200	0	661	610	260	16	359	701	0	0	517	43
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.3		19.9	20.6	20.6	20.6	4.1	23.6			16.5	16.5
Effective Green, g (s)	12.3		19.9	20.6	20.6	20.6	4.1	23.6			16.5	16.5
Actuated g/C Ratio	0.18		0.29	0.31	0.31	0.31	0.06	0.35			0.24	0.24
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	201		822	1048	1080	483	214	1778			865	387
v/s Ratio Prot					0.07			0.14			c0.15	
v/s Ratio Perm	c0.18		0.24	c0.18		0.01	c0.10					0.03
v/c Ratio	1.00		0.80	0.58	0.24	0.03	1.68	0.39			0.60	0.11
Uniform Delay, d1	27.6		22.0	19.8	17.6	16.5	31.7	16.6			22.6	19.8
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	61.7		5.8	0.8	0.1	0.0	324.5	0.1			1.1	0.1
Delay (s)	89.3		27.8	20.6	17.7	16.5	356.2	16.7			23.7	19.9
Level of Service	F		C	C	B	B	F	B			C	B
Approach Delay (s)		39.9			19.6			131.7			22.7	
Approach LOS		D			B			F			C	

Intersection Summary			
HCM Average Control Delay	58.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	15	31	22	2	40	37	4	66	31	7	714	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1833	1583				1778	1583		1770	3539	1583
Flt Permitted		0.24	1.00				0.70	1.00		0.10	1.00	1.00
Satd. Flow (perm)		442	1583				1303	1583		177	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	34	24	2	43	40	4	72	34	8	776	93
RTOR Reduction (vph)	0	0	2	0	0	0	0	66	0	0	0	60
Lane Group Flow (vph)	0	50	24	0	0	0	87	6	0	42	776	33
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		12.3	12.3				10.3	10.3		49.5	42.0	42.0
Effective Green, g (s)		12.3	12.3				10.3	10.3		49.5	42.0	42.0
Actuated g/C Ratio		0.10	0.10				0.09	0.09		0.42	0.35	0.35
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		46	164				113	137		174	1251	560
v/s Ratio Prot										0.02	0.22	
v/s Ratio Perm		c0.11	0.02				c0.07	0.00		0.08		0.02
v/c Ratio		1.09	0.15				0.77	0.05		0.24	0.62	0.06
Uniform Delay, d1		53.2	48.5				53.1	49.7		26.9	31.8	25.4
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		159.3	0.4				26.5	0.1		0.7	1.0	0.0
Delay (s)		212.5	48.9				79.6	49.9		27.6	32.8	25.4
Level of Service		F	D				E	D		C	C	C
Approach Delay (s)		156.6					66.1				31.8	
Approach LOS		F					E				C	

Intersection Summary			
HCM Average Control Delay	77.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	118.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	527	1311	351	9	12	156	111	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		1.00
Frt	1.00	0.97				0.94		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3425				3299		1583
Flt Permitted	0.18	1.00				0.97		1.00
Satd. Flow (perm)	659	3425				3299		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	573	1425	382	10	13	170	121	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	573	1817	0	0	0	304	0	2
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	64.0	53.5				16.2		16.2
Effective Green, g (s)	64.0	53.5				16.2		16.2
Actuated g/C Ratio	0.54	0.45				0.14		0.14
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	775	1542				450		216
v/s Ratio Prot	c0.11	c0.53						
v/s Ratio Perm	0.29					0.09		0.00
v/c Ratio	0.74	1.18				0.68		0.01
Uniform Delay, d1	19.0	32.6				48.8		44.4
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	3.7	87.3				4.0		0.0
Delay (s)	22.7	120.0				52.8		44.4
Level of Service	C	F				D		D
Approach Delay (s)		96.7				52.4		
Approach LOS		F				D		
Intersection Summary								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	266	178	100	373	340	122	404	14	562	794	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3286		1770	3522		1770	3539	1583
Flt Permitted	0.26	1.00	1.00	0.42	1.00		0.26	1.00		0.45	1.00	1.00
Satd. Flow (perm)	481	1863	1583	791	3286		484	3522		841	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	289	193	109	405	370	133	439	15	611	863	35
RTOR Reduction (vph)	0	0	137	0	262	0	0	3	0	0	0	19
Lane Group Flow (vph)	51	289	56	109	513	0	133	451	0	611	863	16
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	15.5	15.5	15.5	15.5	15.5		26.5	22.6		28.9	23.8	23.8
Effective Green, g (s)	15.5	15.5	15.5	15.5	15.5		26.5	22.6		28.9	23.8	23.8
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.50	0.42		0.54	0.45	0.45
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	140	543	461	230	957		335	1496		546	1583	708
v/s Ratio Prot		0.16			c0.16		0.03	0.13		c0.11	0.24	
v/s Ratio Perm	0.11		0.04	0.14			0.17			c0.50		0.01
v/c Ratio	0.36	0.53	0.12	0.47	0.54		0.40	0.30		1.12	0.55	0.02
Uniform Delay, d1	14.9	15.8	13.9	15.5	15.8		7.5	10.1		10.9	10.7	8.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	1.0	0.1	1.5	0.6		0.8	0.1		75.5	0.4	0.0
Delay (s)	16.6	16.8	14.0	17.0	16.4		8.3	10.2		86.4	11.1	8.2
Level of Service	B	B	B	B	B		A	B		F	B	A
Approach Delay (s)		15.8			16.5			9.8			41.5	
Approach LOS		B			B			A			D	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	53.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	311	333	33	456	94	629	785
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.97		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1546	1770	3429		1767	3539
Flt Permitted	0.95	1.00	0.30	1.00		0.35	1.00
Satd. Flow (perm)	1770	1546	556	3429		645	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	338	362	36	496	102	684	853
RTOR Reduction (vph)	0	213	0	24	0	0	0
Lane Group Flow (vph)	338	149	36	574	0	684	853
Confl. Peds. (#/hr)	1	20			10	10	
Confl. Bikes (#/hr)					2		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	14.7	14.7	23.7	22.2		28.7	24.7
Effective Green, g (s)	14.7	14.7	23.7	22.2		28.7	24.7
Actuated g/C Ratio	0.29	0.29	0.47	0.44		0.56	0.49
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	511	446	295	1496		452	1717
v/s Ratio Prot	c0.19		0.00	0.17		c0.12	0.24
v/s Ratio Perm		0.10	0.05			c0.73	
v/c Ratio	0.66	0.33	0.12	0.38		1.51	0.50
Uniform Delay, d1	15.9	14.2	7.5	9.7		10.3	8.9
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.2	0.4	0.2	0.2		242.2	0.2
Delay (s)	19.1	14.7	7.7	9.9		252.5	9.1
Level of Service	B	B	A	A		F	A
Approach Delay (s)	16.8			9.8			117.4
Approach LOS	B			A			F

Intersection Summary			
HCM Average Control Delay	69.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	50.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	134	252	94	101	283	35	18	458	69	35	601	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.99		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1765	1583		3453		1770	3470		1770	3415	
Flt Permitted	0.49	0.97	1.00		0.55		0.16	1.00		0.30	1.00	
Satd. Flow (perm)	866	1712	1583		1925		290	3470		553	3415	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	274	102	110	308	38	20	498	75	38	653	199
RTOR Reduction (vph)	0	0	78	0	6	0	0	11	0	0	25	0
Lane Group Flow (vph)	131	289	24	0	450	0	20	562	0	38	827	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	20.5	20.5	20.5		24.3		27.7	25.7		27.9	25.8	
Effective Green, g (s)	20.5	20.5	20.5		24.3		27.7	25.7		27.9	25.8	
Actuated g/C Ratio	0.24	0.24	0.24		0.28		0.32	0.30		0.32	0.30	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	206	408	377		543		128	1036		209	1023	
v/s Ratio Prot							0.00	0.16		c0.00	c0.24	
v/s Ratio Perm	0.15	c0.17	0.02		c0.23		0.05			0.05		
v/c Ratio	0.64	0.71	0.06		1.17dl		0.16	0.54		0.18	0.81	
Uniform Delay, d1	29.4	30.1	25.4		28.9		21.5	25.3		20.5	27.9	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	5.6	0.1		10.0		0.6	0.6		0.4	4.8	
Delay (s)	35.7	35.6	25.5		39.0		22.1	25.9		20.9	32.6	
Level of Service	D	D	C		D		C	C		C	C	
Approach Delay (s)		33.7			39.0			25.7			32.1	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	9.5
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	215	13	87	196	105	22	336	72	99	691	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.99			0.96		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1844			3317		1769	3407		1754	3523	
Flt Permitted	0.45	1.00			0.77		0.36	1.00		0.44	1.00	
Satd. Flow (perm)	831	1844			2571		669	3407		807	3523	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	234	14	95	213	114	24	365	78	108	751	21
RTOR Reduction (vph)	0	4	0	0	63	0	0	24	0	0	2	0
Lane Group Flow (vph)	2	244	0	0	359	0	24	419	0	108	770	0
Confl. Peds. (#/hr)	43		22	22		43	10		37	37		10
Confl. Bikes (#/hr)			2						3			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	12.5	12.5			12.5		23.6	22.9		29.7	26.0	
Effective Green, g (s)	12.5	12.5			12.5		23.6	22.9		29.7	26.0	
Actuated g/C Ratio	0.25	0.25			0.25		0.47	0.46		0.59	0.52	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	459			640		330	1554		549	1825	
v/s Ratio Prot		0.13					0.00	0.12		c0.01	c0.22	
v/s Ratio Perm	0.00				c0.14		0.03			0.10		
v/c Ratio	0.01	0.53			0.56		0.07	0.27		0.20	0.42	
Uniform Delay, d1	14.2	16.3			16.5		7.1	8.5		4.6	7.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.2			1.1		0.1	0.1		0.2	0.2	
Delay (s)	14.2	17.5			17.6		7.2	8.6		4.7	7.6	
Level of Service	B	B			B		A	A		A	A	
Approach Delay (s)		17.5			17.6			8.5			7.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	50.2	Sum of lost time (s)	7.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	NEL	NER
Lane Configurations									
Volume (vph)	2	179	179	48	188	0	4	115	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5			5.5	5.5			5.5	5.5
Lane Util. Factor	1.00			1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Frt	0.87			1.00	1.00			1.00	0.85
Flt Protected	1.00			0.96	1.00			0.95	1.00
Satd. Flow (prot)	1613			1784	1857			1770	1583
Flt Permitted	1.00			0.57	1.00			0.95	1.00
Satd. Flow (perm)	1613			1054	1857			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	195	195	52	204	0	4	125	110
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	96
Lane Group Flow (vph)	197	0	0	247	207	0	0	125	14
Confl. Peds. (#/hr)			3				3		
Confl. Bikes (#/hr)							2		
Turn Type			Perm						Perm
Protected Phases	3			4 2	7 2			8	
Permitted Phases			4 2						8
Actuated Green, G (s)	15.2			30.6	27.0			11.9	11.9
Effective Green, g (s)	15.2			30.6	27.0			11.9	11.9
Actuated g/C Ratio	0.16			0.32	0.28			0.12	0.12
Clearance Time (s)	5.5							5.5	5.5
Vehicle Extension (s)	3.0							3.0	3.0
Lane Grp Cap (vph)	258			339	527			221	198
v/s Ratio Prot	c0.12				c0.11			c0.07	
v/s Ratio Perm				c0.23					0.01
v/c Ratio	0.76			0.73	0.39			0.57	0.07
Uniform Delay, d1	38.3			28.6	27.5			39.2	36.8
Progression Factor	1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	12.6			7.6	0.5			3.3	0.1
Delay (s)	50.9			36.2	28.0			42.5	36.9
Level of Service	D			D	C			D	D
Approach Delay (s)	50.9			36.2	28.0			39.9	
Approach LOS	D			D	C			D	

Intersection Summary			
HCM Average Control Delay	38.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	27.5
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	107	531	22	145	24	326	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			1.00				
Frt		0.89			0.98			1.00				
Flt Protected		1.00			0.99			0.95				
Satd. Flow (prot)		1659			1821			1770				
Flt Permitted		0.98			0.92			0.76				
Satd. Flow (perm)		1627			1692			1410				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	116	577	24	158	26	354	0	0	0	0	0
RTOR Reduction (vph)	0	337	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	391	0	0	196	0	0	354	0	0	0	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.2			12.2			9.4				
Effective Green, g (s)		12.2			12.2			9.4				
Actuated g/C Ratio		0.41			0.41			0.32				
Clearance Time (s)		4.0			4.0			4.0				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		671			697			448				
v/s Ratio Prot												
v/s Ratio Perm		c0.24			0.12			c0.25				
v/c Ratio		0.58			0.28			0.79				
Uniform Delay, d1		6.7			5.8			9.2				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		1.3			0.2			9.2				
Delay (s)		8.0			6.0			18.4				
Level of Service		A			A			B				
Approach Delay (s)		8.0			6.0			18.4			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	29.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	298	368	65	350	0	184	0	11	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			1.00				
Frpb, ped/bikes		0.98			1.00			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		0.93			1.00			0.99				
Flt Protected		1.00			0.99			0.95				
Satd. Flow (prot)		1693			1847			1755				
Flt Permitted		1.00			0.75			0.74				
Satd. Flow (perm)		1693			1401			1356				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	324	400	71	380	0	200	0	12	0	0	0
RTOR Reduction (vph)	0	76	0	0	0	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	648	0	0	451	0	0	205	0	0	0	0
Confl. Peds. (#/hr)	28		11	11		28	4		5	5		4
Confl. Bikes (#/hr)			1						1			
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.9			17.9			8.5				
Effective Green, g (s)		17.9			17.9			8.5				
Actuated g/C Ratio		0.52			0.52			0.25				
Clearance Time (s)		4.0			4.0			4.0				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		881			729			335				
v/s Ratio Prot		c0.38										
v/s Ratio Perm					0.32			c0.15				
v/c Ratio		0.74			0.62			0.61				
Uniform Delay, d1		6.4			5.8			11.5				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		3.2			1.6			3.3				
Delay (s)		9.6			7.4			14.8				
Level of Service		A			A			B				
Approach Delay (s)		9.6			7.4			14.8			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	171	32	11	282	77	33	453	4	36	587	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.97			1.00			0.98	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1768			1780			1853			1804	
Flt Permitted		0.79			0.99			0.93			0.96	
Satd. Flow (perm)		1411			1760			1726			1742	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	186	35	12	307	84	36	492	4	39	638	135
RTOR Reduction (vph)	0	9	0	0	17	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	273	0	0	386	0	0	532	0	0	799	0
Confl. Peds. (#/hr)	23		86	86		23	27		11	11		27
Confl. Bikes (#/hr)			4			3			2			1
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			31.0			31.0	
Effective Green, g (s)		16.0			16.0			31.0			31.0	
Actuated g/C Ratio		0.29			0.29			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		410			512			973			982	
v/s Ratio Prot												
v/s Ratio Perm		0.19			c0.22			0.31			c0.46	
v/c Ratio		0.67			0.75			0.55			0.81	
Uniform Delay, d1		17.1			17.7			7.6			9.7	
Progression Factor		1.00			1.00			1.56			1.00	
Incremental Delay, d2		8.3			9.9			0.8			7.4	
Delay (s)		25.4			27.6			12.5			17.0	
Level of Service		C			C			B			B	
Approach Delay (s)		25.4			27.6			12.5			17.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	27	291	300	463	533	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	0.91		0.98	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.92		0.99	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		1855	1553		1729	
Flt Permitted		0.67	1.00		0.96	
Satd. Flow (perm)		1251	1553		1729	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	316	326	503	579	71
RTOR Reduction (vph)	0	0	101	0	8	0
Lane Group Flow (vph)	0	345	728	0	642	0
Confl. Peds. (#/hr)	76			76	16	131
Confl. Bikes (#/hr)				5		
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		27.0	27.0		20.0	
Effective Green, g (s)		27.0	27.0		20.0	
Actuated g/C Ratio		0.49	0.49		0.36	
Clearance Time (s)		4.0	4.0		4.0	
Lane Grp Cap (vph)		614	762		629	
v/s Ratio Prot			c0.47		c0.37	
v/s Ratio Perm		0.28				
v/c Ratio		0.56	0.96		1.02	
Uniform Delay, d1		9.8	13.4		17.5	
Progression Factor		1.00	1.00		1.33	
Incremental Delay, d2		3.7	23.4		32.1	
Delay (s)		13.5	36.8		55.3	
Level of Service		B	D		E	
Approach Delay (s)		13.5	36.8		55.3	
Approach LOS		B	D		E	
Intersection Summary						
HCM Average Control Delay			39.0	HCM Level of Service		D
HCM Volume to Capacity ratio			0.98			
Actuated Cycle Length (s)			55.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization			88.2%	ICU Level of Service		E
Analysis Period (min)			15			

c Critical Lane Group

Movement	EBL	EBT	EBR	EBR2	WBT	NBL2	NBL	NBR2	SEL	SET	SER	SER2
Lane Configurations												
Volume (vph)	62	8	198	73	2	62	22	1	4	253	29	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5			4.5		4.5
Lane Util. Factor		1.00			1.00		1.00			0.95		0.95
Frt		0.89			1.00		1.00			0.98		0.85
Flt Protected		0.99			1.00		0.95			1.00		1.00
Satd. Flow (prot)		1648			1863		1772			1734		1504
Flt Permitted		0.95			1.00		0.95			1.00		1.00
Satd. Flow (perm)		1572			1863		1772			1730		1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	9	215	79	2	67	24	1	4	275	32	101
RTOR Reduction (vph)	0	13	0	0	0	0	1	0	0	1	0	71
Lane Group Flow (vph)	0	357	0	0	2	0	91	0	0	320	0	20
Turn Type	Perm					Perm			Perm			custom
Protected Phases		6			2		4			8		
Permitted Phases	6					4			8			4
Actuated Green, G (s)		17.1			17.1		6.6			18.8		6.6
Effective Green, g (s)		17.1			17.1		6.6			18.8		6.6
Actuated g/C Ratio		0.31			0.31		0.12			0.34		0.12
Clearance Time (s)		4.5			4.5		4.5			4.5		4.5
Vehicle Extension (s)		3.0			3.0		3.0			3.0		3.0
Lane Grp Cap (vph)		480			569		209			581		177
v/s Ratio Prot					0.00							
v/s Ratio Perm		c0.23					0.05			0.18		0.01
v/c Ratio		0.74			0.00		0.44			0.55		0.11
Uniform Delay, d1		17.5			13.5		23.0			15.2		22.1
Progression Factor		1.00			1.00		1.00			1.00		1.00
Incremental Delay, d2		6.1			0.0		1.5			1.1		0.3
Delay (s)		23.6			13.5		24.4			16.3		22.4
Level of Service		C			B		C			B		C
Approach Delay (s)		23.6			13.5		24.4			17.6		
Approach LOS		C			B		C			B		

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL2	NWL	NWT
Lane Configurations			
Volume (vph)	1	165	157
Ideal Flow (vphpl)	1900	1900	1900
Total Lost time (s)		4.5	4.5
Lane Util. Factor		1.00	1.00
Frt		1.00	1.00
Flt Protected		0.95	1.00
Satd. Flow (prot)		1770	1863
Flt Permitted		0.44	1.00
Satd. Flow (perm)		812	1863
Peak-hour factor, PHF	0.92	0.92	0.92
Adj. Flow (vph)	1	179	171
RTOR Reduction (vph)	0	0	0
Lane Group Flow (vph)	0	180	171
Turn Type	Perm	Perm	
Protected Phases			8
Permitted Phases	8	8	
Actuated Green, G (s)		18.8	18.8
Effective Green, g (s)		18.8	18.8
Actuated g/C Ratio		0.34	0.34
Clearance Time (s)		4.5	4.5
Vehicle Extension (s)		3.0	3.0
Lane Grp Cap (vph)		273	625
v/s Ratio Prot			0.09
v/s Ratio Perm		c0.22	
v/c Ratio		0.66	0.27
Uniform Delay, d1		15.9	13.6
Progression Factor		1.00	1.00
Incremental Delay, d2		5.7	0.2
Delay (s)		21.5	13.8
Level of Service		C	B
Approach Delay (s)			17.8
Approach LOS			B

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	403	108	212	775	90	297	97	263	28	55	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00		1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00		0.97	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	1863	1520	1747	1828		1713	3539	1521	1743	4764	
Flt Permitted	0.12	1.00	1.00	0.44	1.00		0.70	1.00	1.00	0.69	1.00	
Satd. Flow (perm)	428	1863	1520	805	1828		1253	3539	1521	1259	4764	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	438	117	230	842	98	323	105	286	30	60	27
RTOR Reduction (vph)	0	0	52	0	6	0	0	0	197	0	19	0
Lane Group Flow (vph)	34	438	65	230	934	0	323	105	89	30	68	0
Confl. Peds. (#/hr)	12		24	24		12	19		9	9		19
Confl. Bikes (#/hr)			3			8			2			1
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	33.8	33.8	33.8	33.8	33.8		19.0	19.0	19.0	19.0	19.0	
Effective Green, g (s)	33.8	33.8	33.8	33.8	33.8		19.0	19.0	19.0	19.0	19.0	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56		0.31	0.31	0.31	0.31	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	238	1036	845	448	1016		392	1106	475	393	1489	
v/s Ratio Prot		0.24			c0.51			0.03			0.01	
v/s Ratio Perm	0.08		0.04	0.29			c0.26		0.06	0.02		
v/c Ratio	0.14	0.42	0.08	0.51	0.92		0.82	0.09	0.19	0.08	0.05	
Uniform Delay, d1	6.5	7.8	6.3	8.4	12.3		19.4	14.8	15.3	14.7	14.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3	0.0	1.0	12.8		13.1	0.0	0.2	0.1	0.0	
Delay (s)	6.8	8.1	6.3	9.4	25.0		32.5	14.8	15.5	14.8	14.6	
Level of Service	A	A	A	A	C		C	B	B	B	B	
Approach Delay (s)		7.7			21.9			23.1			14.6	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	60.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	194	0	574	449	504	88	475	1270	0	0	578	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.45		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	833		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	211	0	624	488	548	96	516	1380	0	0	628	214
RTOR Reduction (vph)	0	0	203	0	0	31	0	0	0	0	0	140
Lane Group Flow (vph)	211	0	421	488	548	65	516	1380	0	0	628	74
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.2		19.8	22.1	22.1	22.1	4.1	27.8			20.7	20.7
Effective Green, g (s)	12.2		19.8	22.1	22.1	22.1	4.1	27.8			20.7	20.7
Actuated g/C Ratio	0.17		0.27	0.30	0.30	0.30	0.06	0.38			0.28	0.28
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	139		755	1038	1070	479	198	1934			1002	448
v/s Ratio Prot					c0.15			c0.27			0.18	
v/s Ratio Perm	c0.25		0.15	0.14		0.04	c0.15					0.05
v/c Ratio	1.52		0.56	0.47	0.51	0.14	2.61	0.71			0.63	0.16
Uniform Delay, d1	30.4		22.9	20.7	21.0	18.6	34.5	19.3			22.8	19.7
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	266.3		0.9	0.3	0.4	0.1	737.2	1.3			1.2	0.2
Delay (s)	296.8		23.8	21.1	21.5	18.7	771.7	20.5			24.1	19.9
Level of Service	F		C	C	C	B	F	C			C	B
Approach Delay (s)		92.8			21.1			225.0			23.0	
Approach LOS		F			C			F			C	

Intersection Summary			
HCM Average Control Delay	116.3	HCM Level of Service	F
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	73.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	46	33	35	2	29	32	15	239	61	24	1330	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.97	1.00				0.96	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1810	1583				1790	1583		1770	3539	1583
Flt Permitted		0.16	1.00				0.71	1.00		0.10	1.00	1.00
Satd. Flow (perm)		306	1583				1322	1583		177	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	36	38	2	32	35	16	260	66	26	1446	125
RTOR Reduction (vph)	0	0	1	0	0	0	0	244	0	0	0	61
Lane Group Flow (vph)	0	86	39	0	0	0	83	16	0	92	1446	64
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		41.0	41.0				9.0	9.0		52.0	42.0	42.0
Effective Green, g (s)		41.0	41.0				9.0	9.0		52.0	42.0	42.0
Actuated g/C Ratio		0.28	0.28				0.06	0.06		0.36	0.29	0.29
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		86	446				82	98		173	1021	457
v/s Ratio Prot										0.04	c0.41	
v/s Ratio Perm		c0.28	0.02				c0.06	0.01		0.15		0.04
v/c Ratio		1.00	0.09				1.01	0.16		0.53	1.42	0.14
Uniform Delay, d1		52.3	38.5				68.3	64.7		37.0	51.8	38.4
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		97.0	0.1				102.8	0.8		3.1	193.1	0.1
Delay (s)		149.3	38.6				171.1	65.5		40.1	244.9	38.5
Level of Service		F	D				F	E		D	F	D
Approach Delay (s)		114.2					91.1				218.1	
Approach LOS		F					F				F	

Intersection Summary			
HCM Average Control Delay	177.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	145.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	324	1016	236	8	14	274	113	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		1.00
Frt	1.00	0.97				0.96		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3436				3341		1583
Flt Permitted	0.09	1.00				0.97		1.00
Satd. Flow (perm)	336	3436				3341		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	352	1104	257	9	15	298	123	50
RTOR Reduction (vph)	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	352	1370	0	0	0	436	0	8
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	53.0	43.0				23.6		23.6
Effective Green, g (s)	53.0	43.0				23.6		23.6
Actuated g/C Ratio	0.36	0.30				0.16		0.16
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	335	1015				542		257
v/s Ratio Prot	c0.07	0.40						
v/s Ratio Perm	0.31					0.13		0.01
v/c Ratio	1.05	1.35				0.80		0.03
Uniform Delay, d1	38.4	51.3				58.8		51.4
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	63.1	164.0				8.5		0.1
Delay (s)	101.5	215.3				67.2		51.4
Level of Service	F	F				E		D
Approach Delay (s)		192.0				65.6		
Approach LOS		F				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	191	155	69	185	452	138	959	26	420	612	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3163		1770	3525		1770	3539	1583
Flt Permitted	0.24	1.00	1.00	0.56	1.00		0.35	1.00		0.16	1.00	1.00
Satd. Flow (perm)	446	1863	1583	1035	3163		643	3525		304	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	208	168	75	201	491	150	1042	28	457	665	103
RTOR Reduction (vph)	0	0	115	0	124	0	0	3	0	0	0	58
Lane Group Flow (vph)	114	208	53	75	568	0	150	1067	0	457	665	45
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	17.5	17.5	17.5	17.5	17.5		28.0	24.2		28.6	24.5	24.5
Effective Green, g (s)	17.5	17.5	17.5	17.5	17.5		28.0	24.2		28.6	24.5	24.5
Actuated g/C Ratio	0.31	0.31	0.31	0.31	0.31		0.50	0.43		0.51	0.44	0.44
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	140	584	496	325	992		399	1529		264	1554	695
v/s Ratio Prot		0.11			0.18		0.03	0.30		c0.13	0.19	
v/s Ratio Perm	c0.26		0.03	0.07			0.16			c0.76		0.03
v/c Ratio	0.81	0.36	0.11	0.23	0.57		0.38	0.70		1.73	0.43	0.07
Uniform Delay, d1	17.7	14.8	13.6	14.2	16.0		7.7	12.8		11.3	10.8	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	29.1	0.4	0.1	0.4	0.8		0.6	1.4		344.4	0.2	0.0
Delay (s)	46.8	15.2	13.7	14.5	16.8		8.3	14.2		355.7	11.0	9.1
Level of Service	D	B	B	B	B		A	B		F	B	A
Approach Delay (s)		22.0			16.6			13.5			139.4	
Approach LOS		C			B			B			F	

Intersection Summary			
HCM Average Control Delay	56.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	6.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	210	531	60	1086	136	497	631
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.98		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1520	1770	3459		1769	3539
Flt Permitted	0.95	1.00	0.27	1.00		0.20	1.00
Satd. Flow (perm)	1770	1520	508	3459		372	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	577	65	1180	148	540	686
RTOR Reduction (vph)	0	107	0	16	0	0	0
Lane Group Flow (vph)	228	470	65	1312	0	540	686
Confl. Peds. (#/hr)		41			18	18	
Confl. Bikes (#/hr)					8		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	26.0	26.0	24.0	20.0		24.0	20.0
Effective Green, g (s)	26.0	26.0	24.0	20.0		24.0	20.0
Actuated g/C Ratio	0.43	0.43	0.40	0.33		0.40	0.33
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Grp Cap (vph)	767	659	287	1153		242	1180
v/s Ratio Prot	0.13		0.02	0.38		c0.15	0.19
v/s Ratio Perm		c0.31	0.08			c0.74	
v/c Ratio	0.30	0.71	0.23	1.14		2.23	0.58
Uniform Delay, d1	11.1	13.9	11.5	20.0		18.3	16.5
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	6.5	1.8	73.0		567.3	2.1
Delay (s)	12.0	20.4	13.4	93.0		585.6	18.6
Level of Service	B	C	B	F		F	B
Approach Delay (s)	18.1			89.3			268.3
Approach LOS	B			F			F

Intersection Summary			
HCM Average Control Delay	136.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.41		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	382	229	153	52	210	76	159	866	57	44	576	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1741	1583		3393		1770	3506		1770	3397	
Flt Permitted	0.53	0.76	1.00		0.55		0.18	1.00		0.20	1.00	
Satd. Flow (perm)	943	1338	1583		1884		339	3506		373	3397	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	415	249	166	57	228	83	173	941	62	48	626	228
RTOR Reduction (vph)	0	0	115	0	27	0	0	5	0	0	37	0
Lane Group Flow (vph)	295	369	51	0	341	0	173	998	0	48	817	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	31.0	31.0	31.0		30.0		28.0	22.0		24.0	20.0	
Effective Green, g (s)	31.0	31.0	31.0		30.0		28.0	22.0		24.0	20.0	
Actuated g/C Ratio	0.31	0.31	0.31		0.30		0.28	0.22		0.24	0.20	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	291	413	488		562		180	767		145	676	
v/s Ratio Prot							c0.06	c0.28		0.01	0.24	
v/s Ratio Perm	c0.31	0.28	0.03		c0.18		0.21			0.07		
v/c Ratio	1.01	0.89	0.10		0.61		0.96	1.30		0.33	1.21	
Uniform Delay, d1	34.8	33.2	24.8		30.2		34.1	39.2		31.2	40.2	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	56.3	24.3	0.4		4.8		57.6	145.2		6.0	107.4	
Delay (s)	91.1	57.4	25.3		35.0		91.7	184.4		37.3	147.7	
Level of Service	F	E	C		D		F	F		D	F	
Approach Delay (s)		63.0			35.0			170.8			141.8	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM Average Control Delay	120.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.5	Sum of lost time (s)	12.5
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	170	16	110	171	56	72	1024	121	88	801	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.99			0.98		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1833			3359		1768	3469		1769	3530	
Flt Permitted	0.51	1.00			0.79		0.21	1.00		0.14	1.00	
Satd. Flow (perm)	937	1833			2682		387	3469		266	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	185	17	120	186	61	78	1113	132	96	871	12
RTOR Reduction (vph)	0	5	0	0	25	0	0	14	0	0	1	0
Lane Group Flow (vph)	12	197	0	0	342	0	78	1231	0	96	882	0
Confl. Peds. (#/hr)	21		30	30		21	30		10	10		30
Confl. Bikes (#/hr)			3			2			4			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	25.0	25.0			25.0		32.0	28.0		32.0	28.0	
Effective Green, g (s)	25.0	25.0			25.0		32.0	28.0		32.0	28.0	
Actuated g/C Ratio	0.37	0.37			0.37		0.47	0.41		0.47	0.41	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	344	674			986		263	1428		214	1454	
v/s Ratio Prot		0.11					0.02	c0.36		c0.03	0.25	
v/s Ratio Perm	0.01				c0.13		0.12			0.19		
v/c Ratio	0.03	0.29			0.35		0.30	0.86		0.45	0.61	
Uniform Delay, d1	13.8	15.2			15.6		10.8	18.2		13.1	15.7	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.1			1.0		2.9	7.1		6.7	1.9	
Delay (s)	14.0	16.3			16.6		13.7	25.3		19.7	17.6	
Level of Service	B	B			B		B	C		B	B	
Approach Delay (s)		16.2			16.6			24.6			17.8	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	NEL	NER
Lane Configurations									
Volume (vph)	0	118	291	112	133	0	4	176	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00			1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00			0.99	1.00			1.00	1.00
Frt	0.86			1.00	1.00			1.00	0.85
Flt Protected	1.00			0.97	1.00			0.95	1.00
Satd. Flow (prot)	1611			1783	1856			1770	1583
Flt Permitted	1.00			0.65	1.00			0.95	1.00
Satd. Flow (perm)	1611			1196	1856			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	128	316	122	145	0	4	191	110
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	92
Lane Group Flow (vph)	128	0	0	438	148	0	0	191	18
Confl. Peds. (#/hr)			5					2	
Turn Type			Perm						Perm
Protected Phases	3			4 2	7 2			8	
Permitted Phases			4 2						8
Actuated Green, G (s)	16.0			32.0	32.0			16.0	16.0
Effective Green, g (s)	16.0			32.0	32.0			16.0	16.0
Actuated g/C Ratio	0.16			0.32	0.32			0.16	0.16
Clearance Time (s)	4.0							4.0	4.0
Lane Grp Cap (vph)	258			383	594			283	253
v/s Ratio Prot	c0.08				c0.08			c0.11	
v/s Ratio Perm				c0.37					0.01
v/c Ratio	0.50			1.14	0.25			0.67	0.07
Uniform Delay, d1	38.3			34.0	25.1			39.6	35.7
Progression Factor	1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	6.7			91.2	1.0			12.2	0.5
Delay (s)	45.0			125.2	26.1			51.7	36.2
Level of Service	D			F	C			D	D
Approach Delay (s)	45.0			125.2	26.1			46.1	
Approach LOS	D			F	C			D	

Intersection Summary			
HCM Average Control Delay	77.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	142	399	31	82	18	399	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			1.00				
Frt		0.91			0.98			1.00				
Flt Protected		1.00			0.99			0.95				
Satd. Flow (prot)		1686			1806			1770				
Flt Permitted		0.96			0.86			0.76				
Satd. Flow (perm)		1634			1571			1410				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	154	434	34	89	20	434	0	0	0	0	0
RTOR Reduction (vph)	0	187	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	456	0	0	131	0	0	434	0	0	0	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0				
Effective Green, g (s)		16.0			16.0			16.0				
Actuated g/C Ratio		0.40			0.40			0.40				
Clearance Time (s)		4.0			4.0			4.0				
Lane Grp Cap (vph)		654			628			564				
v/s Ratio Prot												
v/s Ratio Perm		c0.28			0.08			c0.31				
v/c Ratio		0.70			0.21			0.77				
Uniform Delay, d1		10.0			7.9			10.4				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		6.1			0.8			9.7				
Delay (s)		16.1			8.6			20.1				
Level of Service		B			A			C				
Approach Delay (s)		16.1			8.6			20.1			0.0	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	277	279	26	298	0	348	0	26	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			1.00				
Frpb, ped/bikes		0.99			1.00			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		0.93			1.00			0.99				
Flt Protected		1.00			1.00			0.96				
Satd. Flow (prot)		1712			1855			1756				
Flt Permitted		1.00			0.85			0.74				
Satd. Flow (perm)		1712			1584			1361				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	301	303	28	324	0	378	0	28	0	0	0
RTOR Reduction (vph)	0	91	0	0	0	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	513	0	0	352	0	0	399	0	0	0	0
Confl. Peds. (#/hr)	15		7	7		15	2		2	2		2
Confl. Bikes (#/hr)												1
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0				
Effective Green, g (s)		16.0			16.0			16.0				
Actuated g/C Ratio		0.40			0.40			0.40				
Clearance Time (s)		4.0			4.0			4.0				
Lane Grp Cap (vph)		685			634			544				
v/s Ratio Prot		c0.30										
v/s Ratio Perm					0.22			c0.29				
v/c Ratio		0.75			0.56			0.73				
Uniform Delay, d1		10.3			9.3			10.2				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		7.4			3.5			8.5				
Delay (s)		17.7			12.7			18.7				
Level of Service		B			B			B				
Approach Delay (s)		17.7			12.7			18.7			0.0	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	94	191	40	3	95	38	35	612	8	36	560	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			0.98			1.00			1.00	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.98			0.96			1.00			0.98	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1766			1755			1853			1819	
Flt Permitted		0.88			0.99			0.95			0.95	
Satd. Flow (perm)		1580			1744			1757			1729	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	208	43	3	103	41	38	665	9	39	609	92
RTOR Reduction (vph)	0	9	0	0	26	0	0	1	0	0	9	0
Lane Group Flow (vph)	0	344	0	0	121	0	0	711	0	0	731	0
Confl. Peds. (#/hr)	29		44	44		29	17		21	21		17
Confl. Bikes (#/hr)			1						2			1
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			31.0			31.0	
Effective Green, g (s)		16.0			16.0			31.0			31.0	
Actuated g/C Ratio		0.29			0.29			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		460			507			990			975	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.07			0.40			c0.42	
v/c Ratio		0.75			0.24			0.72			0.75	
Uniform Delay, d1		17.7			14.9			8.8			9.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		10.6			1.1			4.5			5.3	
Delay (s)		28.3			16.0			13.3			14.3	
Level of Service		C			B			B			B	
Approach Delay (s)		28.3			16.0			13.3			14.3	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	122	331	283	502	490	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	0.91		0.97	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.91		0.98	
Flt Protected		0.99	1.00		0.96	
Satd. Flow (prot)		1838	1546		1699	
Flt Permitted		0.36	1.00		0.96	
Satd. Flow (perm)		679	1546		1699	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	360	308	546	533	104
RTOR Reduction (vph)	0	0	85	0	10	0
Lane Group Flow (vph)	0	493	769	0	627	0
Confl. Peds. (#/hr)	53			53	26	98
Confl. Bikes (#/hr)				3		49
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		43.0	43.0		24.0	
Effective Green, g (s)		43.0	43.0		24.0	
Actuated g/C Ratio		0.57	0.57		0.32	
Clearance Time (s)		4.0	4.0		4.0	
Lane Grp Cap (vph)		389	886		544	
v/s Ratio Prot			0.50		c0.37	
v/s Ratio Perm		c0.73				
v/c Ratio		1.27	0.87		1.15	
Uniform Delay, d1		16.0	13.6		25.5	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		139.3	11.2		88.5	
Delay (s)		155.3	24.8		114.0	
Level of Service		F	C		F	
Approach Delay (s)		155.3	24.8		114.0	
Approach LOS		F	C		F	

Intersection Summary			
HCM Average Control Delay	85.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	116.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	EBR2	WBT	WBR	NBL2	NBL	SET	SER	SER2	NWL2
Lane Configurations												
Volume (vph)	138	5	176	84	11	1	71	19	117	16	77	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00			1.00	0.95		0.95	
Frt		0.91			0.99			1.00	0.98		0.85	
Flt Protected		0.98			1.00			0.95	1.00		1.00	
Satd. Flow (prot)		1672			1843			1770	1726		1504	
Flt Permitted		0.88			1.00			0.95	1.00		1.00	
Satd. Flow (perm)		1499			1843			1770	1726		1504	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	150	5	191	91	12	1	77	21	127	17	84	1
RTOR Reduction (vph)	0	14	0	0	1	0	0	0	3	0	49	0
Lane Group Flow (vph)	0	423	0	0	12	0	0	98	149	0	27	0
Turn Type	Perm						Perm				custom	Perm
Protected Phases		6!			2!			4	8			
Permitted Phases	6!						4		8		6	8
Actuated Green, G (s)		18.9			18.9			6.7	13.9		18.9	
Effective Green, g (s)		18.9			18.9			6.7	13.9		18.9	
Actuated g/C Ratio		0.36			0.36			0.13	0.26		0.36	
Clearance Time (s)		4.5			4.5			4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		535			657			224	453		536	
v/s Ratio Prot					0.01				0.09			
v/s Ratio Perm		c0.28						0.06			0.02	
v/c Ratio		0.79			0.02			0.44	0.33		0.05	
Uniform Delay, d1		15.3			11.0			21.4	15.8		11.2	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		7.9			0.0			1.4	0.4		0.0	
Delay (s)		23.1			11.1			22.8	16.2		11.2	
Level of Service		C			B			C	B		B	
Approach Delay (s)		23.1			11.1			22.8	14.5			
Approach LOS		C			B			C	B			

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	53.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	NWL	NWT
Lane Configurations		
Volume (vph)	201	235
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	4.5
Lane Util. Factor	1.00	1.00
Frt	1.00	1.00
Flt Protected	0.95	1.00
Satd. Flow (prot)	1770	1863
Flt Permitted	0.66	1.00
Satd. Flow (perm)	1221	1863
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	218	255
RTOR Reduction (vph)	0	0
Lane Group Flow (vph)	219	255
Turn Type	Perm	
Protected Phases		8
Permitted Phases	8	
Actuated Green, G (s)	13.9	13.9
Effective Green, g (s)	13.9	13.9
Actuated g/C Ratio	0.26	0.26
Clearance Time (s)	4.5	4.5
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	320	489
v/s Ratio Prot		0.14
v/s Ratio Perm	c0.18	
v/c Ratio	0.68	0.52
Uniform Delay, d1	17.6	16.7
Progression Factor	1.00	1.00
Incremental Delay, d2	5.9	1.0
Delay (s)	23.5	17.7
Level of Service	C	B
Approach Delay (s)		20.4
Approach LOS		C

Intersection Summary

APPENDIX L

Central Pressure Zone Pipeline (El Cerrito/Richmond) Level of Service Calculations

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	592	85	133	317	35	135	47	176	43	75	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3411	1863	1554	1767	1832		1770	3539	1540	1762	4862	
Flt Permitted	0.53	1.00	1.00	0.31	1.00		0.68	1.00	1.00	0.72	1.00	
Satd. Flow (perm)	1893	1863	1554	582	1832		1265	3539	1540	1339	4862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	643	92	145	345	38	147	51	191	47	82	28
RTOR Reduction (vph)	0	0	42	0	8	0	0	0	148	0	22	0
Lane Group Flow (vph)	22	643	50	145	375	0	147	51	43	47	88	0
Confl. Peds. (#/hr)	10		6	6		10			4	4		
Confl. Bikes (#/hr)			7			2			2			2
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	18.7	18.7	18.7	18.7	18.7		7.8	7.8	7.8	7.8	7.8	
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		7.8	7.8	7.8	7.8	7.8	
Actuated g/C Ratio	0.54	0.54	0.54	0.54	0.54		0.23	0.23	0.23	0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1026	1010	842	315	993		286	800	348	303	1099	
v/s Ratio Prot		c0.35			0.20			0.01			0.02	
v/s Ratio Perm	0.01		0.03	0.25			c0.12		0.03	0.04		
v/c Ratio	0.02	0.64	0.06	0.46	0.38		0.51	0.06	0.12	0.16	0.08	
Uniform Delay, d1	3.7	5.5	3.7	4.8	4.5		11.7	10.5	10.6	10.7	10.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	1.3	0.0	1.1	0.2		1.6	0.0	0.2	0.2	0.0	
Delay (s)	3.7	6.8	3.8	5.9	4.8		13.2	10.5	10.8	10.9	10.6	
Level of Service	A	A	A	A	A		B	B	B	B	B	
Approach Delay (s)		6.4			5.1			11.7			10.7	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	34.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	199	0	810	115	258	52	356	435	0	0	514	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.58		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	1080		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	216	0	880	125	280	57	387	473	0	0	559	189
RTOR Reduction (vph)	0	0	548	0	0	46	0	0	0	0	0	136
Lane Group Flow (vph)	216	0	332	125	280	11	387	473	0	0	559	53
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.2		19.8	10.5	10.5	10.5	4.1	22.8			15.7	15.7
Effective Green, g (s)	12.2		19.8	10.5	10.5	10.5	4.1	22.8			15.7	15.7
Actuated g/C Ratio	0.22		0.35	0.19	0.19	0.19	0.07	0.40			0.28	0.28
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	233		977	638	658	294	256	2052			983	440
v/s Ratio Prot					c0.08			0.09			c0.16	
v/s Ratio Perm	c0.20		0.12	0.04		0.01	c0.11					0.03
v/c Ratio	0.93		0.34	0.20	0.43	0.04	1.51	0.23			0.57	0.12
Uniform Delay, d1	21.7		13.5	19.4	20.3	18.9	26.2	11.1			17.5	15.2
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	39.1		0.2	0.2	0.4	0.1	249.4	0.1			0.8	0.1
Delay (s)	60.8		13.7	19.6	20.8	18.9	275.6	11.1			18.3	15.4
Level of Service	E		B	B	C	B	F	B			B	B
Approach Delay (s)		23.0			20.2			130.2			17.5	
Approach LOS		C			C			F			B	

Intersection Summary			
HCM Average Control Delay	50.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	56.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	16	33	24	2	43	40	5	72	33	8	509	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1833	1583				1779	1583		1770	3539	1583
Flt Permitted		0.24	1.00				0.70	1.00		0.08	1.00	1.00
Satd. Flow (perm)		449	1583				1301	1583		148	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	36	26	2	47	43	5	78	36	9	553	101
RTOR Reduction (vph)	0	0	2	0	0	0	0	71	0	0	0	63
Lane Group Flow (vph)	0	53	26	0	0	0	95	7	0	45	553	38
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		14.0	14.0				11.3	11.3		57.7	50.2	50.2
Effective Green, g (s)		14.0	14.0				11.3	11.3		57.7	50.2	50.2
Actuated g/C Ratio		0.11	0.11				0.09	0.09		0.43	0.38	0.38
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		47	167				111	135		156	1339	599
v/s Ratio Prot										0.02	0.16	
v/s Ratio Perm		c0.12	0.02				c0.07	0.00		0.11		0.02
v/c Ratio		1.13	0.16				0.86	0.05		0.29	0.41	0.06
Uniform Delay, d1		59.3	54.0				59.9	55.8		26.6	30.4	26.3
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		171.1	0.4				43.7	0.2		1.0	0.2	0.0
Delay (s)		230.4	54.4				103.6	55.9		27.6	30.6	26.3
Level of Service		F	D				F	E		C	C	C
Approach Delay (s)		169.6					82.1				29.8	
Approach LOS		F					F				C	

Intersection Summary			
HCM Average Control Delay	41.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	132.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	569	925	379	10	13	168	119	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		0.91
Frt	1.00	0.96				0.94		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3382				3298		1441
Flt Permitted	0.31	1.00				0.97		1.00
Satd. Flow (perm)	1136	3382				3298		1441
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	618	1005	412	11	14	183	129	17
RTOR Reduction (vph)	0	1	0	0	0	0	0	13
Lane Group Flow (vph)	618	1427	0	0	0	328	0	2
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	73.0	62.5				18.4		18.4
Effective Green, g (s)	73.0	62.5				18.4		18.4
Actuated g/C Ratio	0.55	0.47				0.14		0.14
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	950	1593				457		200
v/s Ratio Prot	c0.09	c0.42						
v/s Ratio Perm	0.27					0.10		0.00
v/c Ratio	0.65	0.90				0.72		0.01
Uniform Delay, d1	17.9	32.1				54.7		49.3
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	1.6	7.0				5.3		0.0
Delay (s)	19.5	39.1				60.0		49.3
Level of Service	B	D				E		D
Approach Delay (s)		33.2				59.5		
Approach LOS		C				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	288	192	108	403	105	132	437	15	116	858	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3430		1770	3522		1770	3539	1583
Flt Permitted	0.33	1.00	1.00	0.39	1.00		0.22	1.00		0.44	1.00	1.00
Satd. Flow (perm)	607	1863	1583	730	3430		413	3522		817	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	313	209	117	438	114	143	475	16	126	933	37
RTOR Reduction (vph)	0	0	148	0	42	0	0	3	0	0	0	21
Lane Group Flow (vph)	55	313	61	117	510	0	143	488	0	126	933	16
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	14.9	14.9	14.9	14.9	14.9		25.7	21.9		27.1	22.6	22.6
Effective Green, g (s)	14.9	14.9	14.9	14.9	14.9		25.7	21.9		27.1	22.6	22.6
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.50	0.43		0.53	0.44	0.44
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	176	541	460	212	996		307	1504		515	1559	697
v/s Ratio Prot		c0.17			0.15		c0.03	0.14		c0.02	c0.26	
v/s Ratio Perm	0.09		0.04	0.16			0.20			0.11		0.01
v/c Ratio	0.31	0.58	0.13	0.55	0.51		0.47	0.32		0.24	0.60	0.02
Uniform Delay, d1	14.2	15.5	13.4	15.4	15.2		7.4	9.8		6.2	10.9	8.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.0	1.5	0.1	3.1	0.4		1.1	0.1		0.2	0.6	0.0
Delay (s)	15.2	17.0	13.6	18.5	15.6		8.5	9.9		6.4	11.5	8.1
Level of Service	B	B	B	B	B		A	A		A	B	A
Approach Delay (s)		15.6			16.1			9.6			10.8	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	51.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	336	98	35	493	101	165	848
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.97		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1546	1770	3429		1767	3539
Flt Permitted	0.95	1.00	0.25	1.00		0.33	1.00
Satd. Flow (perm)	1770	1546	465	3429		621	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	365	107	38	536	110	179	922
RTOR Reduction (vph)	0	74	0	24	0	0	0
Lane Group Flow (vph)	365	33	38	622	0	179	922
Confl. Peds. (#/hr)	1	20			10	10	
Confl. Bikes (#/hr)					2		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	15.2	15.2	23.1	21.7		26.3	23.3
Effective Green, g (s)	15.2	15.2	23.1	21.7		26.3	23.3
Actuated g/C Ratio	0.30	0.30	0.46	0.43		0.53	0.47
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	539	471	252	1491		396	1652
v/s Ratio Prot	c0.21		0.00	0.18		c0.03	c0.26
v/s Ratio Perm		0.02	0.07			0.21	
v/c Ratio	0.68	0.07	0.15	0.42		0.45	0.56
Uniform Delay, d1	15.2	12.3	7.5	9.7		6.4	9.6
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.4	0.1	0.3	0.2		0.8	0.4
Delay (s)	18.6	12.4	7.8	9.9		7.3	10.0
Level of Service	B	B	A	A		A	B
Approach Delay (s)	17.2			9.8			9.6
Approach LOS	B			A			A

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	272	101	109	306	38	19	495	75	38	650	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1765	1583		3454		1770	3469		1770	3415	
Flt Permitted	0.47	0.97	1.00		0.55		0.16	1.00		0.24	1.00	
Satd. Flow (perm)	836	1708	1583		1918		291	3469		454	3415	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	296	110	118	333	41	21	538	82	41	707	215
RTOR Reduction (vph)	0	0	83	0	6	0	0	11	0	0	25	0
Lane Group Flow (vph)	142	312	27	0	486	0	21	609	0	41	897	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	21.9	21.9	21.9		26.4		27.7	25.6		28.9	26.2	
Effective Green, g (s)	21.9	21.9	21.9		26.4		27.7	25.6		28.9	26.2	
Actuated g/C Ratio	0.24	0.24	0.24		0.29		0.31	0.28		0.32	0.29	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	415	385		562		124	986		185	993	
v/s Ratio Prot							0.00	0.18		c0.01	c0.26	
v/s Ratio Perm	0.17	c0.18	0.02		c0.25		0.05			0.06		
v/c Ratio	0.70	0.75	0.07		1.30dl		0.17	0.62		0.22	0.90	
Uniform Delay, d1	31.1	31.6	26.3		30.2		23.9	28.0		22.0	30.7	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.1	7.5	0.1		13.0		0.6	1.2		0.6	11.3	
Delay (s)	41.2	39.1	26.3		43.2		24.6	29.2		22.6	42.0	
Level of Service	D	D	C		D		C	C		C	D	
Approach Delay (s)		37.1			43.2			29.0			41.2	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM Average Control Delay	37.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.1	Sum of lost time (s)	12.5
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	232	14	94	212	114	24	363	77	107	746	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.99			0.96		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1844			3316		1769	3407		1756	3524	
Flt Permitted	0.42	1.00			0.75		0.33	1.00		0.41	1.00	
Satd. Flow (perm)	772	1844			2499		605	3407		764	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	252	15	102	230	124	26	395	84	116	811	22
RTOR Reduction (vph)	0	4	0	0	64	0	0	24	0	0	2	0
Lane Group Flow (vph)	2	263	0	0	392	0	26	455	0	116	831	0
Confl. Peds. (#/hr)	43		22	22		43	10		37	37		10
Confl. Bikes (#/hr)			2						3			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	13.6	13.6			13.6		24.3	23.7		30.5	26.9	
Effective Green, g (s)	13.6	13.6			13.6		24.3	23.7		30.5	26.9	
Actuated g/C Ratio	0.26	0.26			0.26		0.47	0.45		0.59	0.52	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	481			652		296	1550		520	1819	
v/s Ratio Prot		0.14					0.00	0.13		c0.02	c0.24	
v/s Ratio Perm	0.00				c0.16		0.04			0.11		
v/c Ratio	0.01	0.55			0.60		0.09	0.29		0.22	0.46	
Uniform Delay, d1	14.3	16.6			16.9		7.5	8.9		4.9	8.0	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.3			1.6		0.1	0.1		0.2	0.2	
Delay (s)	14.3	17.9			18.4		7.7	9.0		5.2	8.2	
Level of Service	B	B			B		A	A		A	A	
Approach Delay (s)		17.8			18.4			9.0			7.8	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	7.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	592	85	133	317	35	135	47	176	43	75	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00			0.98			1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.99			0.93			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)	3393	1863	1517	1770	1830			1678			1783	
Flt Permitted	0.41	1.00	1.00	0.18	1.00			0.98			0.99	
Satd. Flow (perm)	1479	1863	1517	340	1830			1678			1783	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	643	92	145	345	38	147	51	191	47	82	28
RTOR Reduction (vph)	0	0	50	0	4	0	0	38	0	0	9	0
Lane Group Flow (vph)	22	643	42	145	379	0	0	351	0	0	148	0
Confl. Peds. (#/hr)	10		6	6		10			4	4		
Confl. Bikes (#/hr)			7			2			2			2
Turn Type	Perm		Perm	Perm			Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)	41.0	41.0	41.0	41.0	41.0			21.0			16.0	
Effective Green, g (s)	41.0	41.0	41.0	41.0	41.0			21.0			16.0	
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46			0.23			0.18	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	674	849	691	155	834			392			317	
v/s Ratio Prot		0.35			0.21			c0.21			c0.08	
v/s Ratio Perm	0.01		0.03	c0.43								
v/c Ratio	0.03	0.76	0.06	0.94	0.45			0.89			0.47	
Uniform Delay, d1	13.5	20.4	13.7	23.2	16.8			33.4			33.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	6.3	0.2	56.9	1.8			25.4			4.9	
Delay (s)	13.6	26.6	13.9	80.1	18.6			58.8			38.0	
Level of Service	B	C	B	F	B			E			D	
Approach Delay (s)		24.7			35.5			58.8			38.0	
Approach LOS		C			D			E			D	

Intersection Summary			
HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	436	117	229	837	97	321	105	284	31	59	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00		1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00		0.96	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	1863	1515	1747	1828		1706	3539	1518	1741	4755	
Flt Permitted	0.10	1.00	1.00	0.41	1.00		0.69	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	368	1863	1515	757	1828		1241	3539	1518	1246	4755	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	474	127	249	910	105	349	114	309	34	64	29
RTOR Reduction (vph)	0	0	54	0	6	0	0	0	214	0	20	0
Lane Group Flow (vph)	36	474	73	249	1009	0	349	114	95	34	73	0
Confl. Peds. (#/hr)	12		24	24		12	19		9	9		19
Confl. Bikes (#/hr)			3			8			2			1
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	39.3	39.3	39.3	39.3	39.3		21.1	21.1	21.1	21.1	21.1	
Effective Green, g (s)	39.3	39.3	39.3	39.3	39.3		21.1	21.1	21.1	21.1	21.1	
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57		0.31	0.31	0.31	0.31	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	211	1070	870	435	1050		383	1092	468	384	1467	
v/s Ratio Prot		0.25			c0.55			0.03			0.02	
v/s Ratio Perm	0.10		0.05	0.33			c0.28		0.06	0.03		
v/c Ratio	0.17	0.44	0.08	0.57	0.96		0.91	0.10	0.20	0.09	0.05	
Uniform Delay, d1	6.9	8.3	6.5	9.2	13.8		22.7	16.9	17.5	16.8	16.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.3	0.0	1.8	19.0		25.3	0.0	0.2	0.1	0.0	
Delay (s)	7.2	8.6	6.5	11.0	32.8		48.0	16.9	17.7	16.9	16.6	
Level of Service	A	A	A	B	C		D	B	B	B	B	
Approach Delay (s)		8.1			28.5			31.3			16.7	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	68.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	209	0	620	108	545	96	513	951	0	0	625	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5	3.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00	0.97	0.91			0.95	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787	3433	3539	1583	3433	5085			3539	1583
Flt Permitted	0.43		1.00	0.95	1.00	1.00	0.98	1.00			1.00	1.00
Satd. Flow (perm)	798		2787	3433	3539	1583	3526	5085			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	227	0	674	117	592	104	558	1034	0	0	679	232
RTOR Reduction (vph)	0	0	481	0	0	33	0	0	0	0	0	141
Lane Group Flow (vph)	227	0	193	117	592	71	558	1034	0	0	679	91
Turn Type	custom		custom	Perm		Perm	custom					Perm
Protected Phases					3			2			6	
Permitted Phases	4		4 5	3		3	5					6
Actuated Green, G (s)	12.2		19.8	19.3	19.3	19.3	4.1	26.7			19.6	19.6
Effective Green, g (s)	12.2		19.8	19.3	19.3	19.3	4.1	26.7			19.6	19.6
Actuated g/C Ratio	0.18		0.29	0.28	0.28	0.28	0.06	0.39			0.28	0.28
Clearance Time (s)	3.5			3.5	3.5	3.5	3.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	141		797	957	987	442	209	1962			1002	448
v/s Ratio Prot					c0.17			0.20			c0.19	
v/s Ratio Perm	c0.28		0.07	0.03		0.04	c0.16					0.06
v/c Ratio	1.61		0.24	0.12	0.60	0.16	2.67	0.53			0.68	0.20
Uniform Delay, d1	28.5		18.9	18.6	21.6	18.8	32.6	16.4			22.0	18.9
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	304.8		0.2	0.1	1.0	0.2	765.0	0.3			1.8	0.2
Delay (s)	333.3		19.1	18.7	22.6	19.0	797.5	16.6			23.8	19.1
Level of Service	F		B	B	C	B	F	B			C	B
Approach Delay (s)		98.3			21.6			290.3			22.6	
Approach LOS		F			C			F			C	

Intersection Summary			
HCM Average Control Delay	139.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	69.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	50	35	38	2	32	34	16	258	66	26	1016	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00		1.00	0.95	1.00
Frt		1.00	0.85				1.00	0.85		1.00	1.00	0.85
Flt Protected		0.97	1.00				0.96	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1810	1583				1790	1583		1770	3539	1583
Flt Permitted		0.15	1.00				0.71	1.00		0.09	1.00	1.00
Satd. Flow (perm)		276	1583				1313	1583		173	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	38	41	2	35	37	17	280	72	28	1104	135
RTOR Reduction (vph)	0	0	1	0	0	0	0	265	0	0	0	87
Lane Group Flow (vph)	0	92	42	0	0	0	89	15	0	100	1104	48
Turn Type	Perm		Perm		Perm	Perm		Perm	pm+pt	pm+pt		Perm
Protected Phases		3					7		5	5	2	
Permitted Phases	3		3		7	7		7	2	2		2
Actuated Green, G (s)		42.0	42.0				8.0	8.0		53.0	43.0	43.0
Effective Green, g (s)		42.0	42.0				8.0	8.0		53.0	43.0	43.0
Actuated g/C Ratio		0.29	0.29				0.05	0.05		0.36	0.29	0.29
Clearance Time (s)		4.0	4.0				4.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		79	453				72	86		171	1037	464
v/s Ratio Prot										0.04	0.31	
v/s Ratio Perm		c0.33	0.03				c0.07	0.01		0.17		0.03
v/c Ratio		1.16	0.09				1.24	0.18		0.58	1.06	0.10
Uniform Delay, d1		52.4	38.4				69.4	66.3		37.2	51.9	37.8
Progression Factor		1.00	1.00				1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		152.4	0.1				182.5	1.0		5.0	46.8	0.1
Delay (s)		204.8	38.5				251.9	67.2		42.3	98.7	37.9
Level of Service		F	D				F	E		D	F	D
Approach Delay (s)		151.8					111.8				88.4	
Approach LOS		F					F				F	

Intersection Summary			
HCM Average Control Delay	103.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	146.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	350	732	255	9	15	296	122	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0				4.0		4.0
Lane Util. Factor	0.97	0.95				0.97		1.00
Frt	1.00	0.96				0.96		0.85
Flt Protected	0.95	1.00				0.97		1.00
Satd. Flow (prot)	3433	3399				3341		1583
Flt Permitted	0.09	1.00				0.97		1.00
Satd. Flow (perm)	336	3399				3341		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	380	796	277	10	16	322	133	54
RTOR Reduction (vph)	0	1	0	0	0	0	0	45
Lane Group Flow (vph)	380	1082	0	0	0	471	0	9
Turn Type	pm+pt				Perm			Perm
Protected Phases	1	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)	52.0	43.0				24.8		24.8
Effective Green, g (s)	52.0	43.0				24.8		24.8
Actuated g/C Ratio	0.35	0.29				0.17		0.17
Clearance Time (s)	4.0	4.0				4.0		4.0
Vehicle Extension (s)	3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	309	996				564		267
v/s Ratio Prot	c0.08	0.32						
v/s Ratio Perm	c0.36					0.14		0.01
v/c Ratio	1.23	1.09				0.84		0.03
Uniform Delay, d1	40.4	51.9				59.0		51.0
Progression Factor	1.00	1.00				1.00		1.00
Incremental Delay, d2	128.5	55.0				10.3		0.1
Delay (s)	168.9	106.9				69.4		51.0
Level of Service	F	F				E		D
Approach Delay (s)		123.0				67.5		
Approach LOS		F				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	114	206	167	75	200	67	149	1037	28	88	661	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3406		1770	3525		1770	3539	1583
Flt Permitted	0.56	1.00	1.00	0.51	1.00		0.32	1.00		0.17	1.00	1.00
Satd. Flow (perm)	1036	1863	1583	953	3406		590	3525		324	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	224	182	82	217	73	162	1127	30	96	718	111
RTOR Reduction (vph)	0	0	135	0	54	0	0	3	0	0	0	60
Lane Group Flow (vph)	124	224	47	82	236	0	162	1154	0	96	718	51
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	12.9	12.9	12.9	12.9	12.9		27.6	23.8		26.0	23.0	23.0
Effective Green, g (s)	12.9	12.9	12.9	12.9	12.9		27.6	23.8		26.0	23.0	23.0
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26		0.56	0.48		0.52	0.46	0.46
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		3.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	269	484	411	247	884		418	1688		257	1638	733
v/s Ratio Prot		c0.12			0.07		c0.03	c0.33		0.02	0.20	
v/s Ratio Perm	0.12		0.03	0.09			0.19			0.17		0.03
v/c Ratio	0.46	0.46	0.11	0.33	0.27		0.39	0.68		0.37	0.44	0.07
Uniform Delay, d1	15.5	15.5	14.0	14.9	14.6		5.6	10.0		6.9	9.0	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.3	0.7	0.1	0.8	0.2		0.6	1.2		0.9	0.2	0.0
Delay (s)	16.7	16.2	14.2	15.7	14.8		6.2	11.2		7.8	9.2	7.5
Level of Service	B	B	B	B	B		A	B		A	A	A
Approach Delay (s)		15.6			15.0			10.6			8.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	49.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Volume (vph)	226	72	65	1173	147	155	682
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	0.99		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00	0.98		1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1519	1770	3460		1769	3539
Flt Permitted	0.95	1.00	0.37	1.00		0.11	1.00
Satd. Flow (perm)	1770	1519	684	3460		206	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	78	71	1275	160	168	741
RTOR Reduction (vph)	0	61	0	11	0	0	0
Lane Group Flow (vph)	246	17	71	1424	0	168	741
Confl. Peds. (#/hr)		41			18	18	
Confl. Bikes (#/hr)					8		
Turn Type		Perm	pm+pt			pm+pt	
Protected Phases	4		5	2		1	6
Permitted Phases		4	2			6	
Actuated Green, G (s)	13.8	13.8	35.5	33.3		41.3	36.2
Effective Green, g (s)	13.8	13.8	35.5	33.3		41.3	36.2
Actuated g/C Ratio	0.22	0.22	0.57	0.54		0.66	0.58
Clearance Time (s)	3.0	3.0	3.0	4.0		3.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	393	337	429	1852		265	2060
v/s Ratio Prot	c0.14		0.01	c0.41		c0.05	0.21
v/s Ratio Perm		0.01	0.09			0.37	
v/c Ratio	0.63	0.05	0.17	0.77		0.63	0.36
Uniform Delay, d1	21.9	19.0	6.0	11.4		8.9	6.9
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.1	0.1	0.2	2.0		4.9	0.1
Delay (s)	25.0	19.1	6.2	13.4		13.8	7.0
Level of Service	C	B	A	B		B	A
Approach Delay (s)	23.6			13.0			8.2
Approach LOS	C			B			A

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	62.2	Sum of lost time (s)	13.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	413	247	165	56	226	82	172	935	61	48	622	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	0.95	0.95	1.00		0.95		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85		0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1741	1583		3394		1770	3507		1770	3398	
Flt Permitted	0.52	0.74	1.00		0.52		0.09	1.00		0.10	1.00	
Satd. Flow (perm)	917	1305	1583		1765		171	3507		184	3398	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	449	268	179	61	246	89	187	1016	66	52	676	246
RTOR Reduction (vph)	0	0	117	0	18	0	0	3	0	0	25	0
Lane Group Flow (vph)	319	398	62	0	378	0	187	1079	0	52	897	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			3		1	6		5	2	
Permitted Phases	4		4	3			6			2		
Actuated Green, G (s)	50.5	50.5	50.5		30.0		54.5	48.3		43.7	40.5	
Effective Green, g (s)	50.5	50.5	50.5		30.0		54.5	48.3		43.7	40.5	
Actuated g/C Ratio	0.35	0.35	0.35		0.21		0.37	0.33		0.30	0.28	
Clearance Time (s)	3.5	3.5	3.5		3.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	453	549		364		185	1164		90	946	
v/s Ratio Prot							c0.08	0.31		0.01	0.26	
v/s Ratio Perm	c0.35	0.30	0.04		c0.21		c0.30			0.16		
v/c Ratio	1.00	0.88	0.11		1.04		1.01	0.93		0.58	0.95	
Uniform Delay, d1	47.5	44.6	32.3		57.8		39.7	46.9		40.7	51.5	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	51.3	17.3	0.1		57.3		69.0	12.4		8.7	17.8	
Delay (s)	98.8	61.9	32.4		115.0		108.7	59.3		49.4	69.3	
Level of Service	F	E	C		F		F	E		D	E	
Approach Delay (s)		69.1			115.0			66.6			68.2	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM Average Control Delay	73.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	145.5	Sum of lost time (s)	9.5
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	183	17	118	184	60	77	1106	131	96	866	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99			0.98		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1756	1834			3365		1768	3470		1769	3531	
Flt Permitted	0.46	1.00			0.74		0.22	1.00		0.15	1.00	
Satd. Flow (perm)	859	1834			2531		406	3470		273	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	199	18	128	200	65	84	1202	142	104	941	12
RTOR Reduction (vph)	0	5	0	0	28	0	0	11	0	0	1	0
Lane Group Flow (vph)	12	212	0	0	365	0	84	1333	0	104	952	0
Confl. Peds. (#/hr)	21		30	30		21	30		10	10		30
Confl. Bikes (#/hr)			3			2			4			1
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	13.7	13.7			13.7		31.7	28.0		30.3	27.3	
Effective Green, g (s)	13.7	13.7			13.7		31.7	28.0		30.3	27.3	
Actuated g/C Ratio	0.25	0.25			0.25		0.57	0.50		0.54	0.49	
Clearance Time (s)	4.0	4.0			4.0		3.0	4.0		3.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	211	451			623		322	1744		229	1731	
v/s Ratio Prot		0.12					c0.02	c0.38		c0.02	0.27	
v/s Ratio Perm	0.01				c0.14		0.13			0.22		
v/c Ratio	0.06	0.47			0.59		0.26	0.76		0.45	0.55	
Uniform Delay, d1	16.1	17.9			18.5		6.1	11.2		8.1	9.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.8			1.4		0.4	2.0		1.4	0.4	
Delay (s)	16.2	18.7			19.9		6.5	13.2		9.5	10.3	
Level of Service	B	B			B		A	B		A	B	
Approach Delay (s)		18.5			19.9			12.8			10.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	55.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	199	0	810	115	258	52	356	435	0	0	514	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5		4.0			4.0	
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00		1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95		1.00	0.95	1.00	1.00		0.98			1.00	
Satd. Flow (prot)	1770		2787	3433	3539	1583		1822			1799	
Flt Permitted	0.48		1.00	0.95	1.00	1.00		0.98			1.00	
Satd. Flow (perm)	901		2787	3433	3539	1583		1822			1799	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	216	0	880	125	280	57	387	473	0	0	559	189
RTOR Reduction (vph)	0	0	655	0	0	42	0	0	0	0	8	0
Lane Group Flow (vph)	216	0	225	125	280	15	0	860	0	0	740	0
Turn Type	custom		custom	Perm		Perm	Split			Split		
Protected Phases					8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	37.0		37.0	37.0	37.0	37.0		51.5			45.0	
Effective Green, g (s)	37.0		37.0	37.0	37.0	37.0		51.5			45.0	
Actuated g/C Ratio	0.26		0.26	0.26	0.26	0.26		0.36			0.31	
Clearance Time (s)	3.5		3.5	3.5	3.5	3.5		4.0			4.0	
Lane Grp Cap (vph)	230		711	876	903	404		647			558	
v/s Ratio Prot					0.08			c0.47			c0.41	
v/s Ratio Perm	c0.24		0.08	0.04		0.01						
v/c Ratio	0.94		0.32	0.14	0.31	0.04		1.33			1.33	
Uniform Delay, d1	52.9		43.7	41.7	43.7	40.6		46.8			50.0	
Progression Factor	1.00		1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	45.4		1.2	0.3	0.9	0.2		158.6			158.7	
Delay (s)	98.3		44.9	42.1	44.6	40.8		205.4			208.7	
Level of Service	F		D	D	D	D		F			F	
Approach Delay (s)		55.4			43.4			205.4			208.7	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM Average Control Delay	130.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	16	33	24	2	43	40	5	72	33	8	509	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	0.85			0.98	
Flt Protected		0.98	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1833	1583				1779	1583			1821	
Flt Permitted		0.31	1.00				0.70	1.00			0.89	
Satd. Flow (perm)		577	1583				1301	1583			1625	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	36	26	2	47	43	5	78	36	9	553	101
RTOR Reduction (vph)	0	0	2	0	0	0	0	74	0	0	4	0
Lane Group Flow (vph)	0	53	26	0	0	0	95	4	0	0	695	0
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm	Perm		
Protected Phases		3					7				2	
Permitted Phases	3		3		7	7		7	2	2		
Actuated Green, G (s)		21.0	21.0				8.0	8.0			28.0	
Effective Green, g (s)		21.0	21.0				8.0	8.0			28.0	
Actuated g/C Ratio		0.14	0.14				0.05	0.05			0.19	
Clearance Time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Grp Cap (vph)		81	222				69	84			303	
v/s Ratio Prot												
v/s Ratio Perm		c0.09	0.02				c0.07	0.00			c0.43	
v/c Ratio		0.65	0.12				1.38	0.05			2.29	
Uniform Delay, d1		61.1	56.4				71.0	67.4			61.0	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		34.4	1.1				237.6	1.1			592.4	
Delay (s)		95.5	57.5				308.6	68.5			653.4	
Level of Service		F	E				F	E			F	
Approach Delay (s)		82.4					200.3				653.4	
Approach LOS		F					F				F	

Intersection Summary			
HCM Average Control Delay	968.0	HCM Level of Service	F
HCM Volume to Capacity ratio	2.12		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	172.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	569	925	379	10	13	168	119	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0				4.0		4.0
Lane Util. Factor		1.00				0.97		0.91
Frt		0.97				0.94		0.85
Flt Protected		0.99				0.97		1.00
Satd. Flow (prot)		1784				3298		1441
Flt Permitted		0.99				0.97		1.00
Satd. Flow (perm)		1784				3298		1441
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	618	1005	412	11	14	183	129	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	12
Lane Group Flow (vph)	0	2046	0	0	0	328	0	3
Turn Type	Split				Perm			Perm
Protected Phases	6	6				4		
Permitted Phases					4			4
Actuated Green, G (s)		45.0				28.0		28.0
Effective Green, g (s)		45.0				28.0		28.0
Actuated g/C Ratio		0.30				0.19		0.19
Clearance Time (s)		4.0				4.0		4.0
Lane Grp Cap (vph)		535				616		269
v/s Ratio Prot		c1.15						
v/s Ratio Perm						0.10		0.00
v/c Ratio		3.82				0.53		0.01
Uniform Delay, d1		52.5				55.1		49.7
Progression Factor		1.00				1.00		1.00
Incremental Delay, d2		1275.5				3.3		0.1
Delay (s)		1328.0				58.4		49.8
Level of Service		F				E		D
Approach Delay (s)		1328.0				58.0		
Approach LOS		F				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	288	192	108	403	105	132	437	15	116	858	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.97			1.00			1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1863	1583	1770	3430			1836			1844	
Flt Permitted	0.18	1.00	1.00	0.19	1.00			0.99			0.99	
Satd. Flow (perm)	332	1863	1583	355	3430			1836			1844	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	313	209	117	438	114	143	475	16	126	933	37
RTOR Reduction (vph)	0	0	164	0	17	0	0	1	0	0	1	0
Lane Group Flow (vph)	55	313	45	117	535	0	0	633	0	0	1095	0
Turn Type	Perm		Perm	Perm			Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)	29.0	29.0	29.0	29.0	29.0			37.0			58.0	
Effective Green, g (s)	29.0	29.0	29.0	29.0	29.0			37.0			58.0	
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21			0.27			0.43	
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0			4.0			4.0	
Lane Grp Cap (vph)	71	400	340	76	737			503			792	
v/s Ratio Prot		0.17			0.16			c0.34			c0.59	
v/s Ratio Perm	0.17		0.03	c0.33								
v/c Ratio	0.77	0.78	0.13	1.54	0.73			1.26			1.38	
Uniform Delay, d1	49.9	50.0	42.8	53.0	49.3			49.0			38.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	56.1	14.1	0.8	297.8	6.2			131.9			179.9	
Delay (s)	106.0	64.2	43.6	350.8	55.4			180.9			218.4	
Level of Service	F	E	D	F	E			F			F	
Approach Delay (s)		60.7			107.1			180.9			218.4	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	154.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	336	98	493	136	165	848
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frpb, ped/bikes	1.00	0.92	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	0.97			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1770	1462	1785			1848
Flt Permitted	0.95	1.00	1.00			0.99
Satd. Flow (perm)	1770	1462	1785			1848
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	365	107	536	148	179	922
RTOR Reduction (vph)	0	78	7	0	0	0
Lane Group Flow (vph)	365	29	677	0	0	1101
Confl. Peds. (#/hr)	1	20		10	10	
Confl. Bikes (#/hr)				2		
Turn Type		Perm			Split	
Protected Phases	4		2		6	6
Permitted Phases		4				
Actuated Green, G (s)	26.0	26.0	46.0			67.0
Effective Green, g (s)	26.0	26.0	46.0			67.0
Actuated g/C Ratio	0.17	0.17	0.31			0.45
Clearance Time (s)	3.0	3.0	4.0			4.0
Lane Grp Cap (vph)	307	253	547			825
v/s Ratio Prot	c0.21		c0.38			c0.60
v/s Ratio Perm		0.02				
v/c Ratio	1.19	0.12	1.24			1.33
Uniform Delay, d1	62.0	52.3	52.0			41.5
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	112.8	0.9	122.0			158.8
Delay (s)	174.8	53.2	174.0			200.3
Level of Service	F	D	F			F
Approach Delay (s)	147.3		174.0			200.3
Approach LOS	F		F			F

Intersection Summary			
HCM Average Control Delay	181.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	119.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	272	101	0	0	453	0	514	75	0	688	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5				3.0		4.0			4.0	
Lane Util. Factor		1.00				0.88		1.00			1.00	
Frt		0.97				0.85		0.98			0.97	
Flt Protected		0.99				1.00		1.00			1.00	
Satd. Flow (prot)		1789				2787		1831			1807	
Flt Permitted		0.99				1.00		1.00			1.00	
Satd. Flow (perm)		1789				2787		1831			1807	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	296	110	0	0	492	0	559	82	0	748	215
RTOR Reduction (vph)	0	7	0	0	0	368	0	4	0	0	8	0
Lane Group Flow (vph)	0	557	0	0	0	124	0	637	0	0	955	0
Turn Type	Perm					custom						
Protected Phases		4						6			2	
Permitted Phases	4					8						
Actuated Green, G (s)		33.5				34.0		36.0			54.0	
Effective Green, g (s)		33.5				34.0		36.0			54.0	
Actuated g/C Ratio		0.25				0.25		0.27			0.40	
Clearance Time (s)		3.5				3.0		4.0			4.0	
Lane Grp Cap (vph)		444				702		488			723	
v/s Ratio Prot								c0.35			c0.53	
v/s Ratio Perm		0.31				0.04						
v/c Ratio		1.26				0.18		1.31			1.32	
Uniform Delay, d1		50.8				39.5		49.5			40.5	
Progression Factor		1.00				1.00		1.00			1.00	
Incremental Delay, d2		132.1				0.5		152.0			154.1	
Delay (s)		182.8				40.1		201.5			194.6	
Level of Service		F				D		F			F	
Approach Delay (s)		182.8			40.1			201.5			194.6	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	165.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	232	14	94	212	114	24	363	77	107	746	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00			0.97			0.98			1.00	
Flpb, ped/bikes	0.96	1.00			0.99			1.00			1.00	
Frt	1.00	0.99			0.96			0.98			1.00	
Flt Protected	0.95	1.00			0.99			1.00			0.99	
Satd. Flow (prot)	1693	1839			3227			1779			1845	
Flt Permitted	0.28	1.00			0.61			1.00			0.99	
Satd. Flow (perm)	502	1839			1994			1779			1845	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	252	15	102	230	124	26	395	84	116	811	22
RTOR Reduction (vph)	0	2	0	0	32	0	0	6	0	0	1	0
Lane Group Flow (vph)	2	265	0	0	424	0	0	499	0	0	948	0
Confl. Peds. (#/hr)	43		22	22		43	10		37	37		10
Confl. Bikes (#/hr)			2						3			1
Turn Type	Perm			Perm			Split			Split		
Protected Phases		4			8		6	6		2	2	
Permitted Phases	4			8								
Actuated Green, G (s)	25.0	25.0			25.0			29.0			54.0	
Effective Green, g (s)	25.0	25.0			25.0			29.0			54.0	
Actuated g/C Ratio	0.21	0.21			0.21			0.24			0.45	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	105	383			415			430			830	
v/s Ratio Prot		0.14						c0.28			c0.51	
v/s Ratio Perm	0.00				c0.21							
v/c Ratio	0.02	0.69			1.02			1.16			1.14	
Uniform Delay, d1	37.8	43.9			47.5			45.5			33.0	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	0.3	9.9			49.5			95.1			78.4	
Delay (s)	38.1	53.8			97.0			140.6			111.4	
Level of Service	D	D			F			F			F	
Approach Delay (s)		53.7			97.0			140.6			111.4	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	108.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	127.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	436	117	229	837	97	321	105	284	31	59	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.87	1.00	0.99			0.97			0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.95			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)	3433	1863	1374	1770	1825			1679			1737	
Flt Permitted	0.06	1.00	1.00	0.30	1.00			0.98			0.99	
Satd. Flow (perm)	216	1863	1374	565	1825			1679			1737	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	474	127	249	910	105	349	114	309	34	64	29
RTOR Reduction (vph)	0	0	70	0	3	0	0	16	0	0	7	0
Lane Group Flow (vph)	36	474	57	249	1012	0	0	756	0	0	120	0
Confl. Peds. (#/hr)	12		24	24		12	19		9	9		19
Confl. Bikes (#/hr)			3			8			2			1
Turn Type	Perm		Perm	Perm			Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)	67.0	67.0	67.0	67.0	67.0			55.0			16.0	
Effective Green, g (s)	67.0	67.0	67.0	67.0	67.0			55.0			16.0	
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.45			0.37			0.11	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	96	832	614	252	815			616			185	
v/s Ratio Prot		0.25			c0.55			c0.45			c0.07	
v/s Ratio Perm	0.17		0.04	0.44								
v/c Ratio	0.38	0.57	0.09	0.99	1.24			1.23			0.65	
Uniform Delay, d1	27.6	30.8	24.0	41.1	41.5			47.5			64.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	10.8	2.8	0.3	53.7	119.3			116.3			16.2	
Delay (s)	38.4	33.6	24.2	94.8	160.8			163.8			80.5	
Level of Service	D	C	C	F	F			F			F	
Approach Delay (s)		32.0			147.8			163.8			80.5	
Approach LOS		C			F			F			F	

Intersection Summary			
HCM Average Control Delay	122.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	209	0	620	108	545	96	513	951	0	0	625	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5		3.5	3.5	3.5	3.5		4.0			4.0	
Lane Util. Factor	1.00		0.88	0.97	0.95	1.00		1.00			1.00	
Frt	1.00		0.85	1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95		1.00	0.95	1.00	1.00		0.98			1.00	
Satd. Flow (prot)	1770		2787	3433	3539	1583		1831			1799	
Flt Permitted	0.23		1.00	0.95	1.00	1.00		0.98			1.00	
Satd. Flow (perm)	436		2787	3433	3539	1583		1831			1799	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	227	0	674	117	592	104	558	1034	0	0	679	232
RTOR Reduction (vph)	0	0	486	0	0	58	0	0	0	0	9	0
Lane Group Flow (vph)	227	0	188	117	592	46	0	1592	0	0	902	0
Turn Type	custom		custom	Perm		Perm	Split			Split		
Protected Phases					8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	40.5		40.5	40.5	40.5	40.5		54.0			39.0	
Effective Green, g (s)	40.5		40.5	40.5	40.5	40.5		54.0			39.0	
Actuated g/C Ratio	0.28		0.28	0.28	0.28	0.28		0.37			0.27	
Clearance Time (s)	3.5		3.5	3.5	3.5	3.5		4.0			4.0	
Lane Grp Cap (vph)	122		778	959	988	442		682			484	
v/s Ratio Prot					0.17			c0.87			c0.50	
v/s Ratio Perm	c0.52		0.07	0.03		0.03						
v/c Ratio	1.86		0.24	0.12	0.60	0.10		2.33			1.86	
Uniform Delay, d1	52.2		40.4	39.0	45.2	38.8		45.5			53.0	
Progression Factor	1.00		1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	416.9		0.7	0.3	2.7	0.5		605.0			396.7	
Delay (s)	469.2		41.1	39.2	47.9	39.2		650.5			449.7	
Level of Service	F		D	D	D	D		F			F	
Approach Delay (s)		149.0			45.6			650.5			449.7	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	383.3	HCM Level of Service	F
HCM Volume to Capacity ratio	2.05		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	164.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	50	35	38	2	32	34	16	258	66	26	1016	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	0.85			0.99	
Flt Protected		0.97	1.00				0.96	1.00			1.00	
Satd. Flow (prot)		1810	1583				1790	1583			1831	
Flt Permitted		0.12	1.00				0.71	1.00			1.00	
Satd. Flow (perm)		227	1583				1313	1583			1831	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	38	41	2	35	37	17	280	72	28	1104	135
RTOR Reduction (vph)	0	0	1	0	0	0	0	265	0	0	2	0
Lane Group Flow (vph)	0	92	42	0	0	0	89	15	0	0	1337	0
Turn Type	Perm		Perm		Perm	Perm		Perm	custom	custom		
Protected Phases		3					7		2	2	2	
Permitted Phases	3		3		7	7		7	2	2		
Actuated Green, G (s)		26.0	26.0				8.0	8.0			33.0	
Effective Green, g (s)		26.0	26.0				8.0	8.0			33.0	
Actuated g/C Ratio		0.17	0.17				0.05	0.05			0.22	
Clearance Time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Grp Cap (vph)		39	274				70	84			403	
v/s Ratio Prot											c0.73	
v/s Ratio Perm		c0.40	0.03				c0.07	0.01				
v/c Ratio		2.36	0.15				1.27	0.18			3.32	
Uniform Delay, d1		62.0	52.7				71.0	67.9			58.5	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		683.2	1.2				196.9	4.6			1048.9	
Delay (s)		745.2	53.8				267.9	72.4			1107.4	
Level of Service		F	D				F	E			F	
Approach Delay (s)		525.0					119.6				1107.4	
Approach LOS		F					F				F	

Intersection Summary			
HCM Average Control Delay	879.8	HCM Level of Service	F
HCM Volume to Capacity ratio	2.49		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	177.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBL	SBT	SBR	SBR2	NEL2	NEL	NER	NER2
Lane Configurations								
Volume (vph)	350	732	255	9	15	296	122	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0				4.0		4.0
Lane Util. Factor		1.00				0.97		1.00
Frt		0.97				0.96		0.85
Flt Protected		0.99				0.97		1.00
Satd. Flow (prot)		1790				3341		1583
Flt Permitted		0.99				0.97		1.00
Satd. Flow (perm)		1790				3341		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	380	796	277	10	16	322	133	54
RTOR Reduction (vph)	0	0	0	0	0	0	0	44
Lane Group Flow (vph)	0	1463	0	0	0	471	0	10
Turn Type	custom				Perm			Perm
Protected Phases	6	6				4		
Permitted Phases	6				4			4
Actuated Green, G (s)		35.0				28.0		28.0
Effective Green, g (s)		35.0				28.0		28.0
Actuated g/C Ratio		0.23				0.19		0.19
Clearance Time (s)		4.0				4.0		4.0
Lane Grp Cap (vph)		418				624		295
v/s Ratio Prot		c0.82						
v/s Ratio Perm						0.14		0.01
v/c Ratio		3.50				0.75		0.03
Uniform Delay, d1		57.5				57.8		49.9
Progression Factor		1.00				1.00		1.00
Incremental Delay, d2		1131.0				8.3		0.2
Delay (s)		1188.5				66.0		50.1
Level of Service		F				E		D
Approach Delay (s)		1188.5				64.4		
Approach LOS		F				E		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	114	206	167	75	200	67	149	1037	28	88	661	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.96			1.00			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1863	1583	1770	3406			1846			1823	
Flt Permitted	0.40	1.00	1.00	0.29	1.00			0.99			0.99	
Satd. Flow (perm)	740	1863	1583	536	3406			1846			1823	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	224	182	82	217	73	162	1127	30	96	718	111
RTOR Reduction (vph)	0	0	149	0	23	0	0	1	0	0	3	0
Lane Group Flow (vph)	124	224	33	82	267	0	0	1318	0	0	922	0
Turn Type	Perm		Perm	Perm			Split			Split		
Protected Phases		4			8		2	2		6	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)	26.0	26.0	26.0	26.0	26.0			62.0			46.0	
Effective Green, g (s)	26.0	26.0	26.0	26.0	26.0			62.0			46.0	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18			0.43			0.32	
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0			4.0			4.0	
Lane Grp Cap (vph)	133	334	284	96	611			789			578	
v/s Ratio Prot		0.12			0.08			c0.71			c0.51	
v/s Ratio Perm	c0.17		0.02	0.15								
v/c Ratio	0.93	0.67	0.11	0.85	0.44			1.67			1.59	
Uniform Delay, d1	58.6	55.5	49.9	57.7	53.0			41.5			49.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	61.7	10.3	0.8	58.2	2.3			307.5			275.6	
Delay (s)	120.3	65.8	50.7	115.9	55.2			349.0			325.1	
Level of Service	F	E	D	F	E			F			F	
Approach Delay (s)		73.3			68.6			349.0			325.1	
Approach LOS		E			E			F			F	

Intersection Summary			
HCM Average Control Delay	262.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	115.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	226	72	1173	212	155	682
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frpb, ped/bikes	1.00	0.86	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1770	1368	1799			1846
Flt Permitted	0.95	1.00	1.00			0.99
Satd. Flow (perm)	1770	1368	1799			1846
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	78	1275	230	168	741
RTOR Reduction (vph)	0	64	4	0	0	0
Lane Group Flow (vph)	246	14	1501	0	0	909
Confl. Peds. (#/hr)		41		18	18	
Confl. Bikes (#/hr)				8		
Turn Type		Perm			Split	
Protected Phases	4		2		6	6
Permitted Phases		4				
Actuated Green, G (s)	26.0	26.0	69.0			44.0
Effective Green, g (s)	26.0	26.0	69.0			44.0
Actuated g/C Ratio	0.17	0.17	0.46			0.29
Clearance Time (s)	3.0	3.0	4.0			4.0
Lane Grp Cap (vph)	307	237	828			541
v/s Ratio Prot	c0.14		c0.83			c0.49
v/s Ratio Perm		0.01				
v/c Ratio	0.80	0.06	1.81			1.68
Uniform Delay, d1	59.5	51.8	40.5			53.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	19.4	0.5	370.4			314.1
Delay (s)	78.9	52.2	410.9			367.1
Level of Service	E	D	F			F
Approach Delay (s)	72.5		410.9			367.1
Approach LOS	E		F			F

Intersection Summary			
HCM Average Control Delay	356.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.58		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	151.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	413	247	165	0	0	364	0	1107	61	0	670	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5				3.0		4.0			4.0	
Lane Util. Factor		1.00				0.88		1.00			1.00	
Frt		0.97				0.85		0.99			0.97	
Flt Protected		0.98				1.00		1.00			1.00	
Satd. Flow (prot)		1768				2787		1850			1799	
Flt Permitted		0.98				1.00		1.00			1.00	
Satd. Flow (perm)		1768				2787		1850			1799	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	449	268	179	0	0	396	0	1203	66	0	728	246
RTOR Reduction (vph)	0	6	0	0	0	279	0	1	0	0	9	0
Lane Group Flow (vph)	0	890	0	0	0	117	0	1268	0	0	965	0
Turn Type	Perm					custom						
Protected Phases		4						6			2	
Permitted Phases	4					8						
Actuated Green, G (s)		42.5				43.0		49.0			42.0	
Effective Green, g (s)		42.5				43.0		49.0			42.0	
Actuated g/C Ratio		0.29				0.30		0.34			0.29	
Clearance Time (s)		3.5				3.0		4.0			4.0	
Lane Grp Cap (vph)		518				826		625			521	
v/s Ratio Prot								c0.69			c0.54	
v/s Ratio Perm		0.50				0.04						
v/c Ratio		1.72				0.14		2.03			1.85	
Uniform Delay, d1		51.2				37.5		48.0			51.5	
Progression Factor		1.00				1.00		1.00			1.00	
Incremental Delay, d2		331.0				0.4		468.3			391.3	
Delay (s)		382.2				37.8		516.3			442.8	
Level of Service		F				D		F			F	
Approach Delay (s)		382.2			37.8			516.3			442.8	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	408.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.87		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	130.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	183	17	118	184	60	77	1106	131	96	866	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			0.95			1.00			1.00	
Frpb, ped/bikes	1.00	0.99			0.99			0.99			1.00	
Flpb, ped/bikes	0.97	1.00			0.98			1.00			1.00	
Frt	1.00	0.99			0.98			0.99			1.00	
Flt Protected	0.95	1.00			0.98			1.00			1.00	
Satd. Flow (prot)	1721	1822			3294			1822			1850	
Flt Permitted	0.27	1.00			0.59			1.00			1.00	
Satd. Flow (perm)	481	1822			1972			1822			1850	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	199	18	128	200	65	84	1202	142	104	941	12
RTOR Reduction (vph)	0	3	0	0	11	0	0	2	0	0	0	0
Lane Group Flow (vph)	12	215	0	0	382	0	0	1426	0	0	1057	0
Confl. Peds. (#/hr)	21		30	30		21	30		10	10		30
Confl. Bikes (#/hr)			3			2			4			1
Turn Type	Perm			Perm			Split			Split		
Protected Phases		4			8		6	6		2	2	
Permitted Phases	4			8								
Actuated Green, G (s)	25.0	25.0			25.0			60.0			53.0	
Effective Green, g (s)	25.0	25.0			25.0			60.0			53.0	
Actuated g/C Ratio	0.17	0.17			0.17			0.40			0.35	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	80	304			329			729			654	
v/s Ratio Prot		0.12						c0.78			c0.57	
v/s Ratio Perm	0.02				c0.19							
v/c Ratio	0.15	0.71			1.28dl			1.96			1.62	
Uniform Delay, d1	53.4	59.0			62.5			45.0			48.5	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	3.9	12.9			101.0			435.0			284.3	
Delay (s)	57.3	72.0			163.5			480.0			332.8	
Level of Service	E	E			F			F			F	
Approach Delay (s)		71.2			163.5			480.0			332.8	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	359.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.68		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	134.9%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

APPENDIX M

Central Pressure Zone Pipeline (Richmond/San Pablo) Level of Service Calculations

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	362	316	74	8	238	15	82	224	53	25	386	343
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1761	1583		1860	1583	1770	3438		1770	3539	1583
Flt Permitted	0.95	0.99	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1681	1761	1583		1860	1583	1770	3438		1770	3539	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	430	375	88	10	283	18	97	266	63	30	458	407
RTOR Reduction (vph)	0	0	66	0	0	15	0	0	0	0	0	0
Lane Group Flow (vph)	387	418	22	0	293	3	97	329	0	30	458	407
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	19.6	19.6	19.6		15.1	15.1	5.3	25.3		2.0	22.0	22.0
Effective Green, g (s)	19.6	19.6	19.6		15.1	15.1	5.3	25.3		2.0	22.0	22.0
Actuated g/C Ratio	0.25	0.25	0.25		0.19	0.19	0.07	0.32		0.03	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	422	443	398		360	306	120	1115		45	998	446
v/s Ratio Prot	0.23	c0.24			c0.16		c0.05	0.10		0.02	0.13	
v/s Ratio Perm			0.01			0.00						c0.26
v/c Ratio	0.92	0.94	0.06		0.81	0.01	0.81	0.30		0.67	0.46	0.91
Uniform Delay, d1	28.4	28.7	22.2		30.1	25.4	35.8	19.7		37.7	23.1	27.1
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		0.70	0.65	0.69
Incremental Delay, d2	24.4	28.8	0.1		13.2	0.0	31.5	0.7		30.5	1.5	24.9
Delay (s)	52.8	57.4	22.2		43.3	25.4	67.4	20.4		56.8	16.4	43.5
Level of Service	D	E	C		D	C	E	C		E	B	D
Approach Delay (s)		52.0			42.2			31.1			30.1	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	39.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	196	93	208	165	27	102	318	95	29	527	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		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	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1824		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1824		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	176	243	115	258	204	33	126	394	118	36	653	93
RTOR Reduction (vph)	0	0	96	0	7	0	0	0	66	0	0	17
Lane Group Flow (vph)	176	243	19	258	230	0	126	394	52	36	653	76
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	14.5	14.5	14.5	15.1	15.1		7.1	38.0	38.0	3.4	34.3	34.3
Effective Green, g (s)	14.5	14.5	14.5	15.1	15.1		7.1	38.0	38.0	3.4	34.3	34.3
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17		0.08	0.44	0.44	0.04	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	311	264	307	317		144	814	691	69	734	624
v/s Ratio Prot	0.10	c0.13		c0.15	0.13		c0.07	c0.21		0.02	c0.35	
v/s Ratio Perm			0.01						0.03			0.05
v/c Ratio	0.60	0.78	0.07	0.84	0.73		0.88	0.48	0.07	0.52	0.89	0.12
Uniform Delay, d1	33.5	34.7	30.6	34.8	34.0		39.5	17.5	14.3	41.0	24.6	16.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.2	12.0	0.1	18.3	8.1		40.4	0.5	0.0	6.9	12.7	0.1
Delay (s)	36.8	46.7	30.7	53.1	42.1		79.9	18.0	14.3	47.9	37.3	16.9
Level of Service	D	D	C	D	D		E	B	B	D	D	B
Approach Delay (s)		40.0			47.8			29.5			35.4	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM Average Control Delay	37.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	181	128	127	157	35	60	464	138	33	551	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.95		0.99		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00		1.00		0.99	1.00		0.98	1.00	
Frt	1.00	1.00	0.85		0.99		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1751	1863	1509		1779		1744	3340		1731	3477	
Flt Permitted	0.54	1.00	1.00		0.78		0.35	1.00		0.34	1.00	
Satd. Flow (perm)	1002	1863	1509		1415		639	3340		624	3477	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	95	215	152	151	186	42	71	551	164	39	654	51
RTOR Reduction (vph)	0	0	53	0	12	0	0	65	0	0	13	0
Lane Group Flow (vph)	95	215	99	0	367	0	71	650	0	39	692	0
Confl. Peds. (#/hr)	29		48	14		82	34		67	53		63
Confl. Bikes (#/hr)			3			5			1			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	13.3	13.3	13.3		13.3		16.6	16.6		16.6	16.6	
Effective Green, g (s)	13.3	13.3	13.3		13.3		16.6	16.6		16.6	16.6	
Actuated g/C Ratio	0.35	0.35	0.35		0.35		0.44	0.44		0.44	0.44	
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	352	654	530		497		280	1463		273	1523	
v/s Ratio Prot		0.12						0.19			c0.20	
v/s Ratio Perm	0.09		0.07		c0.26		0.11			0.06		
v/c Ratio	0.27	0.33	0.19		0.74		0.25	0.44		0.14	0.45	
Uniform Delay, d1	8.8	9.0	8.5		10.8		6.7	7.4		6.4	7.5	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3	0.2		5.7		2.2	1.0		1.1	1.0	
Delay (s)	9.2	9.3	8.7		16.4		8.9	8.4		7.5	8.5	
Level of Service	A	A	A		B		A	A		A	A	
Approach Delay (s)		9.1			16.4			8.5			8.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	395	0	0	447	102	111	461	64	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.91				
Frt	1.00	1.00			0.97			0.98				
Flt Protected	0.95	1.00			1.00			0.99				
Satd. Flow (prot)	1770	3539			3440			4965				
Flt Permitted	0.95	1.00			1.00			0.99				
Satd. Flow (perm)	1770	3539			3440			4965				
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	140	518	0	0	586	134	145	604	84	0	0	0
RTOR Reduction (vph)	0	0	0	0	41	0	0	26	0	0	0	0
Lane Group Flow (vph)	140	518	0	0	679	0	0	807	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	4.5	22.4			13.9			16.4				
Effective Green, g (s)	4.5	22.4			13.9			16.4				
Actuated g/C Ratio	0.10	0.48			0.30			0.35				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	170	1694			1022			1740				
v/s Ratio Prot	c0.08	0.15			c0.20							
v/s Ratio Perm								0.16				
v/c Ratio	0.82	0.31			0.66			0.46				
Uniform Delay, d1	20.8	7.5			14.4			11.8				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	26.4	0.1			1.6			0.9				
Delay (s)	47.2	7.6			16.1			12.7				
Level of Service	D	A			B			B				
Approach Delay (s)		16.0			16.1			12.7			0.0	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	46.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Macdonald Ave & 23rd St NB

5/23/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	241	0	0	265	59	70	589	148	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0				
Lane Util. Factor		0.95			0.95	1.00		0.91				
Frt		1.00			1.00	0.85		0.97				
Flt Protected		0.99			1.00	1.00		1.00				
Satd. Flow (prot)		3502			3539	1583		4924				
Flt Permitted		0.81			1.00	1.00		1.00				
Satd. Flow (perm)		2882			3539	1583		4924				
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	85	319	0	0	351	78	93	781	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	80	0	0	0	0
Lane Group Flow (vph)	0	404	0	0	351	23	0	990	0	0	0	0
Turn Type	Perm					Perm	Perm					
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		10.3			10.3	10.3		16.1				
Effective Green, g (s)		10.3			10.3	10.3		16.1				
Actuated g/C Ratio		0.30			0.30	0.30		0.47				
Clearance Time (s)		4.0			4.0	4.0		4.0				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		863			1060	474		2305				
v/s Ratio Prot					0.10							
v/s Ratio Perm		c0.14				0.01		0.20				
v/c Ratio		0.47			0.33	0.05		0.43				
Uniform Delay, d1		9.8			9.4	8.6		6.1				
Progression Factor		1.00			1.00	1.00		1.00				
Incremental Delay, d2		0.4			0.2	0.0		0.6				
Delay (s)		10.2			9.6	8.6		6.7				
Level of Service		B			A	A		A				
Approach Delay (s)		10.2			9.4			6.7			0.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	25	6	28	28	24	0	384	11	33	611	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97		0.99			1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00			1.00		0.99	1.00	1.00
Frt	1.00	1.00	0.85		0.96			1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.98			1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1539		1737			3518		1751	3539	1583
Flt Permitted	0.72	1.00	1.00		0.91			1.00		0.46	1.00	1.00
Satd. Flow (perm)	1338	1863	1539		1614			3518		843	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	328	31	7	35	35	30	0	476	14	41	757	310
RTOR Reduction (vph)	0	0	5	0	20	0	0	2	0	0	0	131
Lane Group Flow (vph)	328	31	2	0	80	0	0	488	0	41	757	179
Confl. Peds. (#/hr)			11	7		9	9		16	9		
Confl. Bikes (#/hr)						1			1			
Turn Type	Perm		Perm	Perm						Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)	24.9	24.9	24.9		24.9			45.1		45.1	45.1	45.1
Effective Green, g (s)	24.9	24.9	24.9		24.9			45.1		45.1	45.1	45.1
Actuated g/C Ratio	0.32	0.32	0.32		0.32			0.58		0.58	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	427	595	491		515			2034		487	2046	915
v/s Ratio Prot		0.02						0.14			c0.21	
v/s Ratio Perm	c0.25		0.00		0.05					0.05		0.11
v/c Ratio	0.77	0.05	0.00		0.15			0.24		0.08	0.37	0.20
Uniform Delay, d1	23.9	18.4	18.1		19.0			8.1		7.3	8.8	7.8
Progression Factor	1.00	1.00	1.00		1.00			0.22		1.00	1.00	1.00
Incremental Delay, d2	8.1	0.0	0.0		0.1			0.2		0.3	0.5	0.5
Delay (s)	32.0	18.4	18.1		19.2			2.0		7.6	9.3	8.3
Level of Service	C	B	B		B			A		A	A	A
Approach Delay (s)		30.6			19.2			2.0			9.0	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	92	32	160	78	64	42	445	145	56	625	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1759	1782		1770	1720		1770	3386		1770	3498	
Flt Permitted	0.63	1.00		0.65	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1167	1782		1206	1720		1770	3386		1770	3498	
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	44	129	45	225	110	90	59	626	204	79	880	59
RTOR Reduction (vph)	0	23	0	0	55	0	0	57	0	0	9	0
Lane Group Flow (vph)	44	151	0	225	145	0	59	773	0	79	930	0
Confl. Peds. (#/hr)	9		6			11			5	2		12
Confl. Bikes (#/hr)			1									
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	13.3	13.3		13.3	13.3		2.0	18.3		2.0	18.3	
Effective Green, g (s)	13.3	13.3		13.3	13.3		2.0	18.3		2.0	18.3	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.04	0.40		0.04	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	340	520		352	502		78	1359		78	1404	
v/s Ratio Prot		0.08			0.08		0.03	0.23		c0.04	c0.27	
v/s Ratio Perm	0.04			c0.19								
v/c Ratio	0.13	0.29		0.64	0.29		0.76	0.57		1.01	0.66	
Uniform Delay, d1	11.9	12.5		14.1	12.5		21.6	10.6		21.8	11.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		3.8	0.3		33.5	0.5		105.5	1.2	
Delay (s)	12.1	12.8		17.9	12.8		55.0	11.1		127.3	12.3	
Level of Service	B	B		B	B		E	B		F	B	
Approach Delay (s)		12.7			15.5			14.1			21.2	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	45.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	249	45	384	353	24	35	34	221	21	26	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.95	1.00	1.00			1.00	0.97		1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85	1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00			0.98	1.00		0.98	1.00
Satd. Flow (prot)		1862	1502	1770	3500			1813	1542		1822	1555
Flt Permitted		1.00	1.00	0.95	1.00			0.82	1.00		0.84	1.00
Satd. Flow (perm)		1860	1502	1770	3500			1528	1542		1573	1555
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	1	330	60	509	468	32	46	45	293	28	34	5
RTOR Reduction (vph)	0	0	45	0	7	0	0	0	243	0	0	4
Lane Group Flow (vph)	0	331	15	509	493	0	0	91	50	0	62	1
Confl. Peds. (#/hr)	1		18	13		1	5		13			6
Confl. Bikes (#/hr)			1						1			
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		Perm
Protected Phases		4		3				2			6	
Permitted Phases	4		4		8		2		2	6		6
Actuated Green, G (s)		13.9	13.9	19.4	37.3			9.3	9.3		9.3	9.3
Effective Green, g (s)		13.9	13.9	19.4	37.3			9.3	9.3		9.3	9.3
Actuated g/C Ratio		0.25	0.25	0.36	0.68			0.17	0.17		0.17	0.17
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		474	382	629	2391			260	263		268	265
v/s Ratio Prot				c0.29								
v/s Ratio Perm		c0.18	0.01		0.14			c0.06	0.03		0.04	0.00
v/c Ratio		0.70	0.04	0.81	0.21			0.35	0.19		0.23	0.00
Uniform Delay, d1		18.4	15.3	15.9	3.2			20.0	19.4		19.6	18.8
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		4.5	0.0	7.6	0.0			0.8	0.4		0.4	0.0
Delay (s)		22.9	15.4	23.5	3.2			20.8	19.8		20.0	18.8
Level of Service		C	B	C	A			C	B		C	B
Approach Delay (s)		21.8			13.5			20.0			19.9	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	54.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	149	31	63	161	48	130	256	98	79	327	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	0.99		1.00	1.00	0.94		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1490	1770	1775		1770	1863	1486		3495	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1490	1770	1775		1770	1863	1486		3495	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	30	193	40	82	209	62	168	332	127	102	424	8
RTOR Reduction (vph)	0	0	31	0	15	0	0	0	97	0	2	0
Lane Group Flow (vph)	30	193	9	82	256	0	168	332	30	0	532	0
Confl. Peds. (#/hr)			41			18			40			19
Confl. Bikes (#/hr)						2			4			3
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	1.4	13.8	13.8	3.7	16.1		14.8	14.8	14.8		13.9	
Effective Green, g (s)	1.4	13.8	13.8	3.7	16.1		14.8	14.8	14.8		13.9	
Actuated g/C Ratio	0.02	0.22	0.22	0.06	0.26		0.24	0.24	0.24		0.22	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	40	413	331	105	459		421	443	354		781	
v/s Ratio Prot	0.02	0.10		c0.05	c0.14		0.09	c0.18			c0.15	
v/s Ratio Perm			0.01						0.02			
v/c Ratio	0.75	0.47	0.03	0.78	0.56		0.40	0.75	0.09		0.68	
Uniform Delay, d1	30.2	21.0	18.9	28.9	20.0		20.0	22.0	18.4		22.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	55.2	0.8	0.0	30.4	1.5		0.6	6.8	0.1		2.5	
Delay (s)	85.5	21.8	19.0	59.3	21.4		20.6	28.8	18.5		24.6	
Level of Service	F	C	B	E	C		C	C	B		C	
Approach Delay (s)		28.7			30.2			24.5			24.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	62.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	224	60	142	307	0	0	0	0	125	1049	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						0.95	
Frt		0.97			1.00						0.99	
Flt Protected		1.00			0.98						1.00	
Satd. Flow (prot)		3427			3484						3489	
Flt Permitted		1.00			0.74						1.00	
Satd. Flow (perm)		3427			2608						3489	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	0	272	73	172	372	0	0	0	0	152	1272	93
RTOR Reduction (vph)	0	39	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	306	0	0	544	0	0	0	0	0	1509	0
Turn Type				Perm						Perm		
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		14.6			14.6						31.0	
Effective Green, g (s)		14.6			14.6						31.0	
Actuated g/C Ratio		0.27			0.27						0.58	
Clearance Time (s)		4.0			4.0						4.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		933			710						2018	
v/s Ratio Prot		0.09										
v/s Ratio Perm					c0.21						0.43	
v/c Ratio		0.33			0.77						0.75	
Uniform Delay, d1		15.6			17.9						8.4	
Progression Factor		1.00			1.00						1.00	
Incremental Delay, d2		0.2			5.0						2.6	
Delay (s)		15.8			22.9						11.0	
Level of Service		B			C						B	
Approach Delay (s)		15.8			22.9			0.0			11.0	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	695	174	103	31	201	33	113	607	47	36	378	592
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.97	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1718	1583		1850	1583	1770	3501		1770	3539	1583
Flt Permitted	0.95	0.97	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1681	1718	1583		1850	1583	1770	3501		1770	3539	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	808	202	120	36	234	38	131	706	55	42	440	689
RTOR Reduction (vph)	0	0	73	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	501	509	47	0	270	18	131	761	0	42	440	689
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	35.0	35.0	35.0		17.0	17.0	9.0	54.4		5.6	51.0	51.0
Effective Green, g (s)	35.0	35.0	35.0		17.0	17.0	9.0	54.4		5.6	51.0	51.0
Actuated g/C Ratio	0.27	0.27	0.27		0.13	0.13	0.07	0.42		0.04	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	460	470	433		246	210	124	1488		77	1410	631
v/s Ratio Prot	c0.30	0.30			c0.15		c0.07	c0.22		0.02	0.12	
v/s Ratio Perm			0.03			0.01						c0.44
v/c Ratio	1.09	1.08	0.11		1.10	0.09	1.06	0.51		0.55	0.31	1.09
Uniform Delay, d1	46.5	46.5	34.8		55.5	48.7	59.5	27.0		60.0	26.4	38.5
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.20	0.74	0.76
Incremental Delay, d2	68.2	65.7	0.1		85.9	0.2	96.7	1.3		7.6	0.1	63.3
Delay (s)	114.7	112.2	34.9		141.4	48.9	156.2	28.3		79.5	19.6	92.5
Level of Service	F	F	C		F	D	F	C		E	B	F
Approach Delay (s)		105.1			130.0			47.1			64.6	
Approach LOS		F			F			D			E	

Intersection Summary			
HCM Average Control Delay	79.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	201	121	159	168	23	94	632	80	17	328	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		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	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1830		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1830		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	106	239	144	189	200	27	112	750	95	20	390	74
RTOR Reduction (vph)	0	0	119	0	6	0	0	0	29	0	0	22
Lane Group Flow (vph)	106	239	25	189	221	0	112	750	66	20	390	52
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	14.1	14.1	14.1	13.7	13.7		8.1	36.1	36.1	1.4	29.4	29.4
Effective Green, g (s)	14.1	14.1	14.1	13.7	13.7		8.1	36.1	36.1	1.4	29.4	29.4
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17		0.10	0.44	0.44	0.02	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	307	323	275	298	308		176	827	703	30	674	572
v/s Ratio Prot	0.06	c0.13		0.11	c0.12		c0.06	c0.40		0.01	0.21	
v/s Ratio Perm			0.02						0.04			0.03
v/c Ratio	0.35	0.74	0.09	0.63	0.72		0.64	0.91	0.09	0.67	0.58	0.09
Uniform Delay, d1	29.5	31.9	28.2	31.5	32.0		35.2	21.0	13.1	39.7	20.9	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	8.6	0.1	4.4	7.8		7.3	13.5	0.1	44.1	1.2	0.1
Delay (s)	30.2	40.5	28.4	35.8	39.7		42.5	34.5	13.2	83.9	22.2	17.2
Level of Service	C	D	C	D	D		D	C	B	F	C	B
Approach Delay (s)		34.7			38.0			33.3			24.0	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	81.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	143	91	116	155	64	55	909	178	31	624	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.94		0.99		1.00	0.98		1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00		1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85		0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1759	1863	1496		1757		1746	3399		1758	3496	
Flt Permitted	0.47	1.00	1.00		0.82		0.31	1.00		0.16	1.00	
Satd. Flow (perm)	876	1863	1496		1466		570	3399		295	3496	
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	53	172	109	139	186	77	66	1091	214	37	749	41
RTOR Reduction (vph)	0	0	74	0	18	0	0	31	0	0	8	0
Lane Group Flow (vph)	53	172	35	0	384	0	66	1274	0	37	782	0
Confl. Peds. (#/hr)	16		38	9		55	29		48	39		45
Confl. Bikes (#/hr)			14			9			3			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	15.4	15.4	15.4		15.4		25.1	25.1		25.1	25.1	
Effective Green, g (s)	15.4	15.4	15.4		15.4		25.1	25.1		25.1	25.1	
Actuated g/C Ratio	0.32	0.32	0.32		0.32		0.52	0.52		0.52	0.52	
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	278	592	475		465		295	1759		153	1809	
v/s Ratio Prot		0.09						c0.37			0.22	
v/s Ratio Perm	0.06		0.02		c0.26		0.12			0.13		
v/c Ratio	0.19	0.29	0.07		0.83		0.22	0.72		0.24	0.43	
Uniform Delay, d1	12.0	12.4	11.6		15.3		6.4	9.0		6.5	7.3	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3	0.1		11.4		1.7	2.6		3.7	0.8	
Delay (s)	12.4	12.7	11.6		26.8		8.1	11.7		10.2	8.0	
Level of Service	B	B	B		C		A	B		B	A	
Approach Delay (s)		12.3			26.8			11.5			8.1	
Approach LOS		B			C			B			A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	48.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	767	0	0	424	66	107	1131	94	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.91				
Frt	1.00	1.00			0.98			0.99				
Flt Protected	0.95	1.00			1.00			1.00				
Satd. Flow (prot)	1770	3539			3468			5011				
Flt Permitted	0.95	1.00			1.00			1.00				
Satd. Flow (perm)	1770	3539			3468			5011				
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	188	940	0	0	520	81	131	1386	115	0	0	0
RTOR Reduction (vph)	0	0	0	0	21	0	0	14	0	0	0	0
Lane Group Flow (vph)	188	940	0	0	580	0	0	1618	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	8.7	27.0			14.3			23.1				
Effective Green, g (s)	8.7	27.0			14.3			23.1				
Actuated g/C Ratio	0.15	0.46			0.25			0.40				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	265	1645			854			1992				
v/s Ratio Prot	0.11	c0.27			c0.17							
v/s Ratio Perm								0.32				
v/c Ratio	0.71	0.57			0.68			0.81				
Uniform Delay, d1	23.5	11.3			19.8			15.6				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	8.4	0.5			2.2			3.7				
Delay (s)	31.9	11.8			22.0			19.3				
Level of Service	C	B			C			B				
Approach Delay (s)		15.2			22.0			19.3			0.0	
Approach LOS		B			C			B			A	

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	99	355	0	0	384	147	150	1156	163	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0				
Lane Util. Factor		0.95			0.95	1.00		0.91				
Frt		1.00			1.00	0.85		0.98				
Flt Protected		0.99			1.00	1.00		0.99				
Satd. Flow (prot)		3501			3539	1583		4975				
Flt Permitted		0.77			1.00	1.00		0.99				
Satd. Flow (perm)		2738			3539	1583		4975				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	118	422	0	0	456	175	178	1373	194	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	7	0	36	0	0	0	0
Lane Group Flow (vph)	0	540	0	0	456	168	0	1709	0	0	0	0
Turn Type	Perm					Perm	Perm					
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		12.5			12.5	12.5		16.1				
Effective Green, g (s)		12.5			12.5	12.5		16.1				
Actuated g/C Ratio		0.34			0.34	0.34		0.44				
Clearance Time (s)		4.0			4.0	4.0		4.0				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		935			1209	541		2188				
v/s Ratio Prot					0.13							
v/s Ratio Perm		c0.20				0.11		0.34				
v/c Ratio		0.58			0.38	0.31		0.78				
Uniform Delay, d1		9.9			9.1	8.9		8.7				
Progression Factor		1.00			1.00	1.00		1.00				
Incremental Delay, d2		0.9			0.2	0.3		2.8				
Delay (s)		10.8			9.3	9.2		11.6				
Level of Service		B			A	A		B				
Approach Delay (s)		10.8			9.3			11.6			0.0	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	36.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	381	16	27	31	24	25	0	929	21	24	506	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.93		0.98			1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.99			1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		0.96			1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.98			1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1477		1705			3518		1770	3539	1583
Flt Permitted	0.70	1.00	1.00		0.90			1.00		0.15	1.00	1.00
Satd. Flow (perm)	1295	1863	1477		1567			3518		275	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	462	19	33	38	29	30	0	1127	25	29	614	263
RTOR Reduction (vph)	0	0	19	0	15	0	0	1	0	0	0	125
Lane Group Flow (vph)	462	19	14	0	82	0	0	1151	0	29	614	138
Confl. Peds. (#/hr)			23	12		15	11		27	15		
Confl. Bikes (#/hr)			2			5			3			
Turn Type	Perm		Perm	Perm						Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)	52.8	52.8	52.8		52.8			67.2		67.2	67.2	67.2
Effective Green, g (s)	52.8	52.8	52.8		52.8			67.2		67.2	67.2	67.2
Actuated g/C Ratio	0.41	0.41	0.41		0.41			0.52		0.52	0.52	0.52
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	534	768	609		646			1847		144	1858	831
v/s Ratio Prot		0.01						c0.33			0.17	
v/s Ratio Perm	c0.36		0.01		0.05					0.11		0.09
v/c Ratio	0.87	0.02	0.02		0.13			0.62		0.20	0.33	0.17
Uniform Delay, d1	34.3	22.3	22.3		23.3			21.5		16.1	17.5	15.8
Progression Factor	1.00	1.00	1.00		1.00			0.45		1.00	1.00	1.00
Incremental Delay, d2	13.7	0.0	0.0		0.1			0.9		3.1	0.5	0.4
Delay (s)	48.0	22.3	22.3		23.4			10.5		19.3	17.9	16.3
Level of Service	D	C	C		C			B		B	B	B
Approach Delay (s)		45.4			23.4			10.5			17.5	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	115	51	136	108	71	75	640	224	71	398	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
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	0.94		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1762	1758		1770	1736		1770	3367		1770	3454	
Flt Permitted	0.58	1.00		0.61	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1071	1758		1134	1736		1770	3367		1770	3454	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	90	137	61	162	128	84	89	760	266	84	473	66
RTOR Reduction (vph)	0	32	0	0	48	0	0	56	0	0	18	0
Lane Group Flow (vph)	90	166	0	162	164	0	89	970	0	84	521	0
Confl. Peds. (#/hr)	7		18			13			13	6		18
Confl. Bikes (#/hr)			7			1			2			2
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	9.3	9.3		9.3	9.3		5.0	20.9		2.4	18.3	
Effective Green, g (s)	9.3	9.3		9.3	9.3		5.0	20.9		2.4	18.3	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.11	0.47		0.05	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	367		236	362		198	1578		95	1417	
v/s Ratio Prot		0.09			0.09		0.05	c0.29		c0.05	0.15	
v/s Ratio Perm	0.08			c0.14								
v/c Ratio	0.40	0.45		0.69	0.45		0.45	0.61		0.88	0.37	
Uniform Delay, d1	15.3	15.4		16.3	15.4		18.5	8.8		21.0	9.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.9		8.0	0.9		1.6	0.7		56.2	0.2	
Delay (s)	16.4	16.3		24.3	16.3		20.1	9.6		77.2	9.3	
Level of Service	B	B		C	B		C	A		E	A	
Approach Delay (s)		16.3			19.8			10.4			18.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	44.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	256	44	252	252	32	26	56	444	20	29	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96	1.00	1.00			1.00	0.98		1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85	1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00			0.98	1.00		0.98	1.00
Satd. Flow (prot)		1861	1514	1770	3469			1829	1556		1825	1545
Flt Permitted		0.99	1.00	0.95	1.00			0.90	1.00		0.87	1.00
Satd. Flow (perm)		1846	1514	1770	3469			1670	1556		1616	1545
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	6	314	54	309	309	39	32	69	544	25	36	6
RTOR Reduction (vph)	0	0	40	0	15	0	0	0	428	0	0	5
Lane Group Flow (vph)	0	320	14	309	333	0	0	101	116	0	61	1
Confl. Peds. (#/hr)	5		15			5	9		6			14
Confl. Bikes (#/hr)			1									
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		Perm
Protected Phases		4		3				2			6	
Permitted Phases	4		4		8		2		2	6		6
Actuated Green, G (s)		12.8	12.8	13.2	30.0			10.3	10.3		10.3	10.3
Effective Green, g (s)		12.8	12.8	13.2	30.0			10.3	10.3		10.3	10.3
Actuated g/C Ratio		0.27	0.27	0.27	0.62			0.21	0.21		0.21	0.21
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		489	401	484	2155			356	332		345	329
v/s Ratio Prot				c0.17								
v/s Ratio Perm		c0.17	0.01		0.10			0.06	c0.07		0.04	0.00
v/c Ratio		0.65	0.04	0.64	0.15			0.28	0.35		0.18	0.00
Uniform Delay, d1		15.8	13.2	15.4	3.8			15.9	16.2		15.5	15.0
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		3.1	0.0	2.8	0.0			0.4	0.6		0.2	0.0
Delay (s)		18.9	13.2	18.2	3.9			16.4	16.8		15.8	15.0
Level of Service		B	B	B	A			B	B		B	B
Approach Delay (s)		18.1			10.6			16.7			15.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	180	33	73	236	120	64	326	128	112	283	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.92	1.00	0.97		1.00	1.00	0.92		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1770	1863	1450	1770	1712		1770	1863	1450		3455	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.99	
Satd. Flow (perm)	1770	1863	1450	1770	1712		1770	1863	1450		3455	
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	32	221	40	89	289	147	78	400	157	137	347	21
RTOR Reduction (vph)	0	0	32	0	23	0	0	0	117	0	4	0
Lane Group Flow (vph)	32	221	8	89	413	0	78	400	40	0	501	0
Confl. Peds. (#/hr)			56			34	12		52			38
Confl. Bikes (#/hr)						1			7			3
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	1.4	14.7	14.7	7.4	20.7		17.8	17.8	17.8		14.2	
Effective Green, g (s)	1.4	14.7	14.7	7.4	20.7		17.8	17.8	17.8		14.2	
Actuated g/C Ratio	0.02	0.21	0.21	0.11	0.30		0.25	0.25	0.25		0.20	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	35	391	304	187	506		449	473	368		700	
v/s Ratio Prot	0.02	c0.12		0.05	c0.24		0.04	c0.21			c0.15	
v/s Ratio Perm			0.01						0.03			
v/c Ratio	0.91	0.57	0.03	0.48	0.82		0.17	0.85	0.11		0.72	
Uniform Delay, d1	34.3	24.8	22.0	29.5	22.9		20.4	24.8	20.1		26.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	116.7	1.9	0.0	1.9	9.8		0.2	13.1	0.1		3.5	
Delay (s)	151.0	26.7	22.1	31.4	32.7		20.6	37.9	20.2		29.6	
Level of Service	F	C	C	C	C		C	D	C		C	
Approach Delay (s)		39.6			32.5			31.4			29.6	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	70.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	372	88	115	426	0	0	0	0	98	883	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						0.95	
Frt		0.97			1.00						0.99	
Flt Protected		1.00			0.99						1.00	
Satd. Flow (prot)		3438			3502						3481	
Flt Permitted		1.00			0.72						1.00	
Satd. Flow (perm)		3438			2533						3481	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	0	433	102	134	496	0	0	0	0	114	1027	99
RTOR Reduction (vph)	0	38	0	0	0	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	497	0	0	630	0	0	0	0	0	1226	0
Turn Type				Perm						Perm		
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		14.4			14.4						21.1	
Effective Green, g (s)		14.4			14.4						21.1	
Actuated g/C Ratio		0.33			0.33						0.49	
Clearance Time (s)		4.0			4.0						4.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1138			839						1688	
v/s Ratio Prot		0.14										
v/s Ratio Perm					c0.25						0.35	
v/c Ratio		0.44			0.75						0.73	
Uniform Delay, d1		11.4			13.0						8.9	
Progression Factor		1.00			1.00						1.00	
Incremental Delay, d2		0.3			3.8						2.8	
Delay (s)		11.6			16.8						11.7	
Level of Service		B			B						B	
Approach Delay (s)		11.6			16.8			0.0			11.7	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	43.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	362	316	74	8	238	15	82	224	53	25	386	343
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected		0.97	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1814	1583		1860	1583	1770	3438		1770	3539	1583
Flt Permitted		0.97	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1814	1583		1860	1583	1770	3438		1770	3539	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	430	375	88	10	283	18	97	266	63	30	458	407
RTOR Reduction (vph)	0	0	54	0	0	15	0	0	0	0	0	0
Lane Group Flow (vph)	0	805	34	0	293	3	97	329	0	30	458	407
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)		24.9	24.9		15.1	15.1	4.0	20.0		2.0	18.0	18.0
Effective Green, g (s)		24.9	24.9		15.1	15.1	4.0	20.0		2.0	18.0	18.0
Actuated g/C Ratio		0.32	0.32		0.19	0.19	0.05	0.26		0.03	0.23	0.23
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		579	505		360	306	91	882		45	817	365
v/s Ratio Prot		c0.44			c0.16		c0.05	0.10		0.02	0.13	
v/s Ratio Perm			0.02			0.00						c0.26
v/c Ratio		1.39	0.07		0.81	0.01	1.07	0.37		0.67	0.56	1.12
Uniform Delay, d1		26.6	18.5		30.1	25.4	37.0	23.8		37.7	26.5	30.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.70	0.69	0.73
Incremental Delay, d2		186.1	0.1		13.2	0.0	113.4	1.2		30.5	2.7	81.2
Delay (s)		212.6	18.5		43.3	25.4	150.4	25.1		57.0	20.9	103.0
Level of Service		F	B		D	C	F	C		E	C	F
Approach Delay (s)		193.5			42.2			53.6			59.5	
Approach LOS		F			D			D			E	

Intersection Summary			
HCM Average Control Delay	103.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	196	93	208	165	27	102	318	95	29	527	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	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			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.98			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1824			1798			1829	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.68			0.96	
Satd. Flow (perm)	1770	1863	1583	1770	1824			1238			1752	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	176	243	115	258	204	33	126	394	118	36	653	93
RTOR Reduction (vph)	0	0	96	0	7	0	0	9	0	0	5	0
Lane Group Flow (vph)	176	243	19	258	230	0	0	629	0	0	777	0
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Perm			Perm		
Protected Phases	4	4		8	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	14.6	14.6	14.6	15.2	15.2			46.1			46.1	
Effective Green, g (s)	14.6	14.6	14.6	15.2	15.2			46.1			46.1	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17			0.52			0.52	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	294	309	263	306	315			649			919	
v/s Ratio Prot	0.10	c0.13		c0.15	0.13							
v/s Ratio Perm			0.01					c0.51			0.44	
v/c Ratio	0.60	0.79	0.07	0.84	0.73			0.97			0.85	
Uniform Delay, d1	33.9	35.2	30.9	35.2	34.4			20.2			17.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.3	12.4	0.1	18.6	8.5			27.4			7.2	
Delay (s)	37.2	47.5	31.1	53.8	42.9			47.6			25.1	
Level of Service	D	D	C	D	D			D			C	
Approach Delay (s)		40.6			48.6			47.6			25.1	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	87.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	108.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	181	128	127	157	35	60	464	138	33	551	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.92		0.99			0.98			0.99	
Flpb, ped/bikes	0.98	1.00	1.00		1.00			1.00			1.00	
Frt	1.00	1.00	0.85		0.99			0.97			0.99	
Flt Protected	0.95	1.00	1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1739	1863	1459		1766			1763			1827	
Flt Permitted	0.54	1.00	1.00		0.78			0.90			0.95	
Satd. Flow (perm)	996	1863	1459		1405			1595			1745	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	95	215	152	151	186	42	71	551	164	39	654	51
RTOR Reduction (vph)	0	0	52	0	12	0	0	23	0	0	6	0
Lane Group Flow (vph)	95	215	100	0	367	0	0	763	0	0	738	0
Confl. Peds. (#/hr)	29		48	14		82	34		67	53		63
Confl. Bikes (#/hr)			3			5			1			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	13.4	13.4	13.4		13.4			16.6			16.6	
Effective Green, g (s)	13.4	13.4	13.4		13.4			16.6			16.6	
Actuated g/C Ratio	0.35	0.35	0.35		0.35			0.44			0.44	
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)	351	657	514		495			697			762	
v/s Ratio Prot		0.12										
v/s Ratio Perm	0.10		0.07		c0.26			c0.48			0.42	
v/c Ratio	0.27	0.33	0.19		0.74			1.10			0.97	
Uniform Delay, d1	8.8	9.0	8.5		10.8			10.7			10.4	
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2	0.4	0.3	0.2		5.9			63.1			25.7	
Delay (s)	9.2	9.3	8.7		16.7			73.8			36.2	
Level of Service	A	A	A		B			E			D	
Approach Delay (s)		9.1			16.7			73.8			36.2	
Approach LOS		A			B			E			D	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	395	0	0	447	102	111	461	64	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.95				
Frt	1.00	1.00			0.97			0.98				
Flt Protected	0.95	1.00			1.00			0.99				
Satd. Flow (prot)	1770	3539			3440			3456				
Flt Permitted	0.95	1.00			1.00			0.99				
Satd. Flow (perm)	1770	3539			3440			3456				
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	140	518	0	0	586	134	145	604	84	0	0	0
RTOR Reduction (vph)	0	0	0	0	41	0	0	16	0	0	0	0
Lane Group Flow (vph)	140	518	0	0	679	0	0	817	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	4.5	22.4			13.9			16.4				
Effective Green, g (s)	4.5	22.4			13.9			16.4				
Actuated g/C Ratio	0.10	0.48			0.30			0.35				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	170	1694			1022			1211				
v/s Ratio Prot	c0.08	0.15			c0.20							
v/s Ratio Perm								0.24				
v/c Ratio	0.82	0.31			0.66			0.67				
Uniform Delay, d1	20.8	7.5			14.4			12.9				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	26.4	0.1			1.6			3.0				
Delay (s)	47.2	7.6			16.1			15.9				
Level of Service	D	A			B			B				
Approach Delay (s)		16.0			16.1			15.9			0.0	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	46.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	241	0	0	265	59	70	589	148	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor		0.95			0.95	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.99			1.00	1.00		0.99	1.00			
Satd. Flow (prot)		3502			3539	1583		3520	1583			
Flt Permitted		0.81			1.00	1.00		0.99	1.00			
Satd. Flow (perm)		2882			3539	1583		3520	1583			
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	85	319	0	0	351	78	93	781	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	104	0	0	0
Lane Group Flow (vph)	0	404	0	0	351	23	0	874	92	0	0	0
Turn Type	Perm					Perm	Perm		Perm			
Protected Phases		4			8			2				
Permitted Phases	4					8	2		2			
Actuated Green, G (s)		10.3			10.3	10.3		16.1	16.1			
Effective Green, g (s)		10.3			10.3	10.3		16.1	16.1			
Actuated g/C Ratio		0.30			0.30	0.30		0.47	0.47			
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		863			1060	474		1647	741			
v/s Ratio Prot					0.10							
v/s Ratio Perm		c0.14				0.01		0.25	0.06			
v/c Ratio		0.47			0.33	0.05		0.53	0.12			
Uniform Delay, d1		9.8			9.4	8.6		6.5	5.2			
Progression Factor		1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.4			0.2	0.0		1.2	0.3			
Delay (s)		10.2			9.6	8.6		7.7	5.5			
Level of Service		B			A	A		A	A			
Approach Delay (s)		10.2			9.4			7.3			0.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	695	174	103	31	201	33	113	607	47	36	378	592
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1791	1583		1850	1583	1770	3501		1770	3539	1583
Flt Permitted		0.96	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1791	1583		1850	1583	1770	3501		1770	3539	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	808	202	120	36	234	38	131	706	55	42	440	689
RTOR Reduction (vph)	0	0	37	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	0	1010	83	0	270	18	131	761	0	42	440	689
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)		35.0	35.0		17.0	17.0	9.0	54.4		5.6	51.0	51.0
Effective Green, g (s)		35.0	35.0		17.0	17.0	9.0	54.4		5.6	51.0	51.0
Actuated g/C Ratio		0.27	0.27		0.13	0.13	0.07	0.42		0.04	0.40	0.40
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		490	433		246	210	124	1488		77	1410	631
v/s Ratio Prot		c0.56			c0.15		c0.07	c0.22		0.02	0.12	
v/s Ratio Perm			0.05			0.01						c0.44
v/c Ratio		2.06	0.19		1.10	0.09	1.06	0.51		0.55	0.31	1.09
Uniform Delay, d1		46.5	35.7		55.5	48.7	59.5	27.0		60.0	26.4	38.5
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.20	0.74	0.76
Incremental Delay, d2		484.6	0.2		85.9	0.2	96.7	1.3		7.6	0.1	63.3
Delay (s)		531.1	35.9		141.4	48.9	156.2	28.3		79.5	19.6	92.5
Level of Service		F	D		F	D	F	C		E	B	F
Approach Delay (s)		478.5			130.0			47.1			64.6	
Approach LOS		F			F			D			E	

Intersection Summary			
HCM Average Control Delay	199.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	105.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	201	121	159	168	23	94	632	80	17	328	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	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			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.99			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1830			1827			1821	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.88			0.95	
Satd. Flow (perm)	1770	1863	1583	1770	1830			1624			1735	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	106	239	144	189	200	27	112	750	95	20	390	74
RTOR Reduction (vph)	0	0	120	0	6	0	0	4	0	0	7	0
Lane Group Flow (vph)	106	239	24	189	221	0	0	953	0	0	477	0
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Perm			Perm		
Protected Phases	4	4		8	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	14.5	14.5	14.5	14.1	14.1			46.1			46.1	
Effective Green, g (s)	14.5	14.5	14.5	14.1	14.1			46.1			46.1	
Actuated g/C Ratio	0.17	0.17	0.17	0.16	0.16			0.53			0.53	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	296	312	265	288	298			864			923	
v/s Ratio Prot	0.06	c0.13		0.11	c0.12							
v/s Ratio Perm			0.02					c0.59			0.27	
v/c Ratio	0.36	0.77	0.09	0.66	0.74			1.10			0.52	
Uniform Delay, d1	32.0	34.5	30.5	34.0	34.6			20.3			13.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	10.7	0.1	5.3	9.6			62.7			0.5	
Delay (s)	32.7	45.2	30.7	39.3	44.1			83.0			13.6	
Level of Service	C	D	C	D	D			F			B	
Approach Delay (s)		38.2			42.0			83.0			13.6	
Approach LOS		D			D			F			B	

Intersection Summary			
HCM Average Control Delay	52.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	86.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	143	91	116	155	64	55	909	178	31	624	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.91		0.98			0.99			1.00	
Flpb, ped/bikes	0.99	1.00	1.00		1.00			1.00			1.00	
Frt	1.00	1.00	0.85		0.97			0.98			0.99	
Flt Protected	0.95	1.00	1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1751	1863	1436		1739			1791			1838	
Flt Permitted	0.47	1.00	1.00		0.82			0.94			0.93	
Satd. Flow (perm)	861	1863	1436		1448			1690			1705	
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	53	172	109	139	186	77	66	1091	214	37	749	41
RTOR Reduction (vph)	0	0	75	0	17	0	0	13	0	0	4	0
Lane Group Flow (vph)	53	172	34	0	385	0	0	1358	0	0	823	0
Confl. Peds. (#/hr)	16		38	9		55	29		48	39		45
Confl. Bikes (#/hr)			14			9			3			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	15.2	15.2	15.2		15.2			26.1			26.1	
Effective Green, g (s)	15.2	15.2	15.2		15.2			26.1			26.1	
Actuated g/C Ratio	0.31	0.31	0.31		0.31			0.53			0.53	
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)	265	574	443		446			895			903	
v/s Ratio Prot		0.09										
v/s Ratio Perm	0.06		0.02		c0.27			c0.80			0.48	
v/c Ratio	0.20	0.30	0.08		0.86			1.52			0.91	
Uniform Delay, d1	12.6	13.0	12.1		16.1			11.6			10.6	
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2	0.4	0.3	0.1		15.7			238.5			15.0	
Delay (s)	12.9	13.3	12.1		31.7			250.1			25.5	
Level of Service	B	B	B		C			F			C	
Approach Delay (s)		12.9			31.7			250.1			25.5	
Approach LOS		B			C			F			C	

Intersection Summary			
HCM Average Control Delay	129.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	134.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	767	0	0	424	66	107	1131	94	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.95				
Frt	1.00	1.00			0.98			0.99				
Flt Protected	0.95	1.00			1.00			1.00				
Satd. Flow (prot)	1770	3539			3468			3488				
Flt Permitted	0.95	1.00			1.00			1.00				
Satd. Flow (perm)	1770	3539			3468			3488				
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	188	940	0	0	520	81	131	1386	115	0	0	0
RTOR Reduction (vph)	0	0	0	0	21	0	0	9	0	0	0	0
Lane Group Flow (vph)	188	940	0	0	580	0	0	1623	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	6.1	24.4			14.3			26.0				
Effective Green, g (s)	6.1	24.4			14.3			26.0				
Actuated g/C Ratio	0.10	0.42			0.24			0.45				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	185	1479			849			1553				
v/s Ratio Prot	c0.11	c0.27			0.17							
v/s Ratio Perm								0.47				
v/c Ratio	1.02	0.64			0.68			1.05				
Uniform Delay, d1	26.2	13.5			20.0			16.2				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	70.5	0.9			2.3			35.6				
Delay (s)	96.6	14.4			22.3			51.8				
Level of Service	F	B			C			D				
Approach Delay (s)		28.1			22.3			51.8			0.0	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	99	355	0	0	384	147	150	1156	163	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor		0.95			0.95	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.99			1.00	1.00		0.99	1.00			
Satd. Flow (prot)		3501			3539	1583		3519	1583			
Flt Permitted		0.77			1.00	1.00		0.99	1.00			
Satd. Flow (perm)		2738			3539	1583		3519	1583			
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	118	422	0	0	456	175	178	1373	194	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	7	0	0	109	0	0	0
Lane Group Flow (vph)	0	540	0	0	456	168	0	1551	85	0	0	0
Turn Type	Perm					Perm	Perm		Perm			
Protected Phases		4			8			2				
Permitted Phases	4					8	2		2			
Actuated Green, G (s)		12.5			12.5	12.5		16.1	16.1			
Effective Green, g (s)		12.5			12.5	12.5		16.1	16.1			
Actuated g/C Ratio		0.34			0.34	0.34		0.44	0.44			
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		935			1209	541		1548	696			
v/s Ratio Prot					0.13							
v/s Ratio Perm		c0.20				0.11		0.44	0.05			
v/c Ratio		0.58			0.38	0.31		1.00	0.12			
Uniform Delay, d1		9.9			9.1	8.9		10.2	6.1			
Progression Factor		1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.9			0.2	0.3		23.3	0.4			
Delay (s)		10.8			9.3	9.2		33.6	6.4			
Level of Service		B			A	A		C	A			
Approach Delay (s)		10.8			9.3			30.6			0.0	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	36.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	302	316	74	8	238	15	82	224	53	25	386	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1818	1583		1860	1583	1770	3438		1770	3539	1583
Flt Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1818	1583		1860	1583	1770	3438		1770	3539	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	359	375	88	10	283	18	97	266	63	30	458	289
RTOR Reduction (vph)	0	0	49	0	0	12	0	0	0	0	0	0
Lane Group Flow (vph)	0	734	39	0	293	6	97	329	0	30	458	289
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)		39.0	39.0		16.0	16.0	7.6	22.0		3.0	17.4	17.4
Effective Green, g (s)		39.0	39.0		16.0	16.0	7.6	22.0		3.0	17.4	17.4
Actuated g/C Ratio		0.41	0.41		0.17	0.17	0.08	0.23		0.03	0.18	0.18
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		739	643		310	264	140	788		55	641	287
v/s Ratio Prot		c0.40			c0.16		c0.05	0.10		0.02	0.13	
v/s Ratio Perm			0.02			0.00						c0.18
v/c Ratio		0.99	0.06		0.95	0.02	0.69	0.42		0.55	0.71	1.01
Uniform Delay, d1		28.4	17.3		39.6	33.5	43.1	31.5		45.8	37.0	39.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.70	0.68	0.70
Incremental Delay, d2		31.2	0.0		36.5	0.0	13.8	1.6		10.4	6.5	54.2
Delay (s)		59.6	17.4		76.1	33.5	56.9	33.2		42.2	31.6	81.7
Level of Service		E	B		E	C	E	C		D	C	F
Approach Delay (s)		55.1			73.6			38.6			50.7	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM Average Control Delay	53.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	96.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	196	93	208	165	27	102	258	95	29	427	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	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			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.97			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1824			1790			1822	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.69			0.95	
Satd. Flow (perm)	1770	1863	1583	1770	1824			1248			1743	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	176	243	115	258	204	33	126	320	118	36	529	93
RTOR Reduction (vph)	0	0	94	0	7	0	0	12	0	0	7	0
Lane Group Flow (vph)	176	243	21	258	230	0	0	552	0	0	651	0
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Perm			Perm		
Protected Phases	4	4		8	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	13.9	13.9	13.9	14.4	14.4			36.2			36.2	
Effective Green, g (s)	13.9	13.9	13.9	14.4	14.4			36.2			36.2	
Actuated g/C Ratio	0.18	0.18	0.18	0.19	0.19			0.47			0.47	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	322	339	288	333	343			591			825	
v/s Ratio Prot	0.10	c0.13		c0.15	0.13							
v/s Ratio Perm			0.01					c0.44			0.37	
v/c Ratio	0.55	0.72	0.07	0.77	0.67			0.93			0.79	
Uniform Delay, d1	28.4	29.4	26.0	29.5	28.8			19.0			16.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.9	7.1	0.1	10.7	4.9			22.1			5.1	
Delay (s)	30.3	36.5	26.1	40.2	33.7			41.1			22.0	
Level of Service	C	D	C	D	C			D			C	
Approach Delay (s)		32.2			37.1			41.1			22.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	181	128	127	157	35	60	404	138	33	451	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.90		0.98			0.97			0.99	
Flpb, ped/bikes	0.98	1.00	1.00		0.99			1.00			1.00	
Frt	1.00	1.00	0.85		0.99			0.97			0.99	
Flt Protected	0.95	1.00	1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1734	1863	1432		1758			1743			1817	
Flt Permitted	0.50	1.00	1.00		0.74			0.90			0.94	
Satd. Flow (perm)	913	1863	1432		1336			1582			1711	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	95	215	152	151	186	42	71	480	164	39	536	51
RTOR Reduction (vph)	0	0	105	0	9	0	0	21	0	0	6	0
Lane Group Flow (vph)	95	215	47	0	370	0	0	694	0	0	620	0
Confl. Peds. (#/hr)	29		48	14		82	34		67	53		63
Confl. Bikes (#/hr)			3			5			1			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	15.3	15.3	15.3		15.3			26.0			26.0	
Effective Green, g (s)	15.3	15.3	15.3		15.3			26.0			26.0	
Actuated g/C Ratio	0.31	0.31	0.31		0.31			0.53			0.53	
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)	283	578	444		415			834			902	
v/s Ratio Prot		0.12										
v/s Ratio Perm	0.10		0.03		c0.28			c0.44			0.36	
v/c Ratio	0.34	0.37	0.11		0.89			0.83			0.69	
Uniform Delay, d1	13.1	13.3	12.1		16.2			9.8			8.6	
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2	0.7	0.4	0.1		20.7			9.5			4.3	
Delay (s)	13.8	13.7	12.2		36.9			19.3			12.9	
Level of Service	B	B	B		D			B			B	
Approach Delay (s)		13.2			36.9			19.3			12.9	
Approach LOS		B			D			B			B	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	395	0	0	447	102	111	401	64	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.95				
Frt	1.00	1.00			0.97			0.98				
Flt Protected	0.95	1.00			1.00			0.99				
Satd. Flow (prot)	1770	3539			3440			3447				
Flt Permitted	0.95	1.00			1.00			0.99				
Satd. Flow (perm)	1770	3539			3440			3447				
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	140	518	0	0	586	134	145	525	84	0	0	0
RTOR Reduction (vph)	0	0	0	0	41	0	0	18	0	0	0	0
Lane Group Flow (vph)	140	518	0	0	679	0	0	736	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	4.5	22.4			13.9			16.4				
Effective Green, g (s)	4.5	22.4			13.9			16.4				
Actuated g/C Ratio	0.10	0.48			0.30			0.35				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	170	1694			1022			1208				
v/s Ratio Prot	c0.08	0.15			c0.20							
v/s Ratio Perm								0.21				
v/c Ratio	0.82	0.31			0.66			0.61				
Uniform Delay, d1	20.8	7.5			14.4			12.6				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	26.4	0.1			1.6			2.3				
Delay (s)	47.2	7.6			16.1			14.8				
Level of Service	D	A			B			B				
Approach Delay (s)		16.0			16.1			14.8			0.0	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	46.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	241	0	0	265	59	130	529	148	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor		0.95			0.95	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.99			1.00	1.00		0.99	1.00			
Satd. Flow (prot)		3502			3539	1583		3505	1583			
Flt Permitted		0.81			1.00	1.00		0.99	1.00			
Satd. Flow (perm)		2882			3539	1583		3505	1583			
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	85	319	0	0	351	78	172	701	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	104	0	0	0
Lane Group Flow (vph)	0	404	0	0	351	23	0	873	92	0	0	0
Turn Type	Perm					Perm	Perm		Perm			
Protected Phases		4			8			2				
Permitted Phases	4					8	2		2			
Actuated Green, G (s)		10.3			10.3	10.3		16.1	16.1			
Effective Green, g (s)		10.3			10.3	10.3		16.1	16.1			
Actuated g/C Ratio		0.30			0.30	0.30		0.47	0.47			
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		863			1060	474		1640	741			
v/s Ratio Prot					0.10							
v/s Ratio Perm		c0.14				0.01		0.25	0.06			
v/c Ratio		0.47			0.33	0.05		0.53	0.12			
Uniform Delay, d1		9.8			9.4	8.6		6.5	5.2			
Progression Factor		1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.4			0.2	0.0		1.2	0.3			
Delay (s)		10.2			9.6	8.6		7.7	5.5			
Level of Service		B			A	A		A	A			
Approach Delay (s)		10.2			9.4			7.3			0.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	325	25	6	28	28	24	0	324	11	33	511	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97		0.99			1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00			1.00		0.99	1.00	1.00
Frt	1.00	1.00	0.85		0.96			0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.98			1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1534		1734			3513		1745	3539	1583
Flt Permitted	0.71	1.00	1.00		0.91			1.00		0.49	1.00	1.00
Satd. Flow (perm)	1314	1863	1534		1612			3513		895	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	403	31	7	35	35	30	0	401	14	41	633	434
RTOR Reduction (vph)	0	0	4	0	19	0	0	2	0	0	0	202
Lane Group Flow (vph)	403	31	3	0	81	0	0	413	0	41	633	232
Confl. Peds. (#/hr)			11	7		9	9		16	9		
Confl. Bikes (#/hr)						1			1			
Turn Type	Perm		Perm	Perm						Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)	36.6	36.6	36.6		36.6			51.4		51.4	51.4	51.4
Effective Green, g (s)	36.6	36.6	36.6		36.6			51.4		51.4	51.4	51.4
Actuated g/C Ratio	0.38	0.38	0.38		0.38			0.54		0.54	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	501	710	585		615			1881		479	1895	848
v/s Ratio Prot		0.02						0.12			c0.18	
v/s Ratio Perm	c0.31		0.00		0.05					0.05		0.15
v/c Ratio	0.80	0.04	0.00		0.13			0.22		0.09	0.33	0.27
Uniform Delay, d1	26.5	18.7	18.4		19.4			11.7		10.9	12.6	12.1
Progression Factor	1.00	1.00	1.00		1.00			0.23		1.00	1.00	1.00
Incremental Delay, d2	9.1	0.0	0.0		0.1			0.2		0.4	0.5	0.8
Delay (s)	35.6	18.7	18.4		19.5			2.9		11.2	13.1	12.9
Level of Service	D	B	B		B			A		B	B	B
Approach Delay (s)		34.1			19.5			2.9			13.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	96.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	92	32	160	78	64	42	505	145	56	725	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1759	1782		1770	1720		1770	3400		1770	3503	
Flt Permitted	0.62	1.00		0.65	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1149	1782		1206	1720		1770	3400		1770	3503	
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	44	129	45	225	110	90	59	711	204	79	1020	59
RTOR Reduction (vph)	0	23	0	0	55	0	0	48	0	0	8	0
Lane Group Flow (vph)	44	151	0	225	145	0	59	867	0	79	1071	0
Confl. Peds. (#/hr)	9		6			11			5	2		12
Confl. Bikes (#/hr)			1									
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	13.3	13.3		13.3	13.3		2.0	20.0		2.0	20.0	
Effective Green, g (s)	13.3	13.3		13.3	13.3		2.0	20.0		2.0	20.0	
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.04	0.42		0.04	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	323	501		339	484		75	1438		75	1481	
v/s Ratio Prot		0.08			0.08		0.03	0.26		c0.04	c0.31	
v/s Ratio Perm	0.04			c0.19								
v/c Ratio	0.14	0.30		0.66	0.30		0.79	0.60		1.05	0.72	
Uniform Delay, d1	12.7	13.4		15.0	13.3		22.4	10.6		22.6	11.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		4.8	0.4		40.6	0.7		119.3	1.8	
Delay (s)	12.9	13.7		19.9	13.7		63.0	11.3		142.0	13.1	
Level of Service	B	B		B	B		E	B		F	B	
Approach Delay (s)		13.5			17.0			14.4			21.9	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	47.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	249	45	484	353	24	35	34	281	21	26	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.94	1.00	1.00			1.00	0.97		1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85	1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00			0.98	1.00		0.98	1.00
Satd. Flow (prot)		1862	1493	1770	3500			1812	1538		1822	1553
Flt Permitted		1.00	1.00	0.95	1.00			0.82	1.00		0.84	1.00
Satd. Flow (perm)		1860	1493	1770	3500			1524	1538		1571	1553
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	1	330	60	642	468	32	46	45	372	28	34	5
RTOR Reduction (vph)	0	0	46	0	6	0	0	0	315	0	0	4
Lane Group Flow (vph)	0	331	14	642	494	0	0	91	57	0	62	1
Confl. Peds. (#/hr)	1		18	13		1	5		13			6
Confl. Bikes (#/hr)			1						1			
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		Perm
Protected Phases		4		3				2			6	
Permitted Phases	4		4		8		2		2	6		6
Actuated Green, G (s)		15.1	15.1	27.1	46.2			9.9	9.9		9.9	9.9
Effective Green, g (s)		15.1	15.1	27.1	46.2			9.9	9.9		9.9	9.9
Actuated g/C Ratio		0.24	0.24	0.42	0.72			0.15	0.15		0.15	0.15
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		438	352	748	2523			235	238		243	240
v/s Ratio Prot				c0.36								
v/s Ratio Perm		c0.18	0.01		0.14			c0.06	0.04		0.04	0.00
v/c Ratio		0.76	0.04	0.86	0.20			0.39	0.24		0.26	0.00
Uniform Delay, d1		22.8	18.9	16.8	2.9			24.4	23.8		23.9	22.9
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		7.3	0.0	9.6	0.0			1.1	0.5		0.6	0.0
Delay (s)		30.1	19.0	26.4	2.9			25.4	24.3		24.4	22.9
Level of Service		C	B	C	A			C	C		C	C
Approach Delay (s)		28.4			16.1			24.5			24.3	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	149	31	63	161	108	130	256	98	179	327	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	0.98		1.00	1.00	0.94		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1488	1770	1710		1770	1863	1484		3470	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)	1770	1863	1488	1770	1710		1770	1863	1484		3470	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	30	193	40	82	209	140	168	332	127	232	424	8
RTOR Reduction (vph)	0	0	31	0	33	0	0	0	97	0	2	0
Lane Group Flow (vph)	30	193	9	82	316	0	168	332	30	0	662	0
Confl. Peds. (#/hr)			41			18			40			19
Confl. Bikes (#/hr)						2			4			3
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	1.4	14.3	14.3	3.7	16.6		14.9	14.9	14.9		15.2	
Effective Green, g (s)	1.4	14.3	14.3	3.7	16.6		14.9	14.9	14.9		15.2	
Actuated g/C Ratio	0.02	0.22	0.22	0.06	0.26		0.23	0.23	0.23		0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	39	416	332	102	443		411	433	345		823	
v/s Ratio Prot	0.02	0.10		c0.05	c0.18		0.09	c0.18			c0.19	
v/s Ratio Perm			0.01						0.02			
v/c Ratio	0.77	0.46	0.03	0.80	0.71		0.41	0.77	0.09		0.80	
Uniform Delay, d1	31.2	21.6	19.5	29.8	21.6		20.9	23.0	19.3		23.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	60.6	0.8	0.0	35.2	5.4		0.7	7.9	0.1		5.8	
Delay (s)	91.8	22.4	19.5	65.0	26.9		21.5	30.9	19.4		28.8	
Level of Service	F	C	B	E	C		C	C	B		C	
Approach Delay (s)		29.9			34.2			26.1			28.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	224	160	142	367	0	0	0	0	125	949	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						0.95	
Frt		0.94			1.00						0.99	
Flt Protected		1.00			0.99						0.99	
Satd. Flow (prot)		3318			3491						3485	
Flt Permitted		1.00			0.70						0.99	
Satd. Flow (perm)		3318			2477						3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	0	272	194	172	445	0	0	0	0	152	1151	93
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	0	0	10	0
Lane Group Flow (vph)	0	432	0	0	617	0	0	0	0	0	1386	0
Turn Type				Perm						Perm		
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		15.6			15.6						25.1	
Effective Green, g (s)		15.6			15.6						25.1	
Actuated g/C Ratio		0.32			0.32						0.52	
Clearance Time (s)		4.0			4.0						4.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1063			793						1796	
v/s Ratio Prot		0.13										
v/s Ratio Perm					c0.25						0.40	
v/c Ratio		0.41			0.78						0.77	
Uniform Delay, d1		12.9			15.0						9.5	
Progression Factor		1.00			1.00						1.00	
Incremental Delay, d2		0.3			4.8						3.3	
Delay (s)		13.2			19.8						12.8	
Level of Service		B			B						B	
Approach Delay (s)		13.2			19.8			0.0			12.8	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	565	174	103	31	201	33	113	607	47	36	378	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1794	1583		1850	1583	1770	3501		1770	3539	1583
Flt Permitted		0.96	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1794	1583		1850	1583	1770	3501		1770	3539	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	657	202	120	36	234	38	131	706	55	42	440	619
RTOR Reduction (vph)	0	0	46	0	0	21	0	0	0	0	0	0
Lane Group Flow (vph)	0	859	74	0	270	17	131	761	0	42	440	619
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)		43.0	43.0		16.0	16.0	7.8	39.4		5.6	37.2	37.2
Effective Green, g (s)		43.0	43.0		16.0	16.0	7.8	39.4		5.6	37.2	37.2
Actuated g/C Ratio		0.36	0.36		0.13	0.13	0.06	0.33		0.05	0.31	0.31
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		643	567		247	211	115	1149		83	1097	491
v/s Ratio Prot		c0.48			c0.15		c0.07	0.22		0.02	0.12	
v/s Ratio Perm			0.05			0.01						c0.39
v/c Ratio		1.34	0.13		1.09	0.08	1.14	0.66		0.51	0.40	1.26
Uniform Delay, d1		38.5	25.9		52.0	45.6	56.1	34.6		55.8	32.6	41.4
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.92	0.71	0.80
Incremental Delay, d2		161.6	0.1		84.4	0.2	126.2	3.0		4.7	0.2	132.8
Delay (s)		200.1	26.0		136.4	45.7	182.3	37.6		56.0	23.6	166.1
Level of Service		F	C		F	D	F	D		E	C	F
Approach Delay (s)		178.7			125.2			58.9			104.9	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	116.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	201	121	159	168	23	94	502	80	17	268	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	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			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.98			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1830			1820			1813	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.88			0.95	
Satd. Flow (perm)	1770	1863	1583	1770	1830			1621			1733	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	106	239	144	189	200	27	112	596	95	20	318	74
RTOR Reduction (vph)	0	0	120	0	6	0	0	5	0	0	9	0
Lane Group Flow (vph)	106	239	24	189	221	0	0	798	0	0	403	0
Confl. Peds. (#/hr)				27								
Turn Type	Split		Perm	Split			Perm			Perm		
Protected Phases	4	4		8	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	14.4	14.4	14.4	14.1	14.1			44.3			44.3	
Effective Green, g (s)	14.4	14.4	14.4	14.1	14.1			44.3			44.3	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17			0.52			0.52	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	301	316	269	294	304			847			905	
v/s Ratio Prot	0.06	c0.13		0.11	c0.12							
v/s Ratio Perm			0.02					c0.49			0.23	
v/c Ratio	0.35	0.76	0.09	0.64	0.73			0.94			0.45	
Uniform Delay, d1	31.1	33.5	29.7	33.0	33.5			19.0			12.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	9.9	0.1	4.8	8.4			18.3			0.4	
Delay (s)	31.8	43.4	29.8	37.8	41.9			37.3			13.0	
Level of Service	C	D	C	D	D			D			B	
Approach Delay (s)		36.9			40.0			37.3			13.0	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM Average Control Delay	33.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	84.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	143	91	116	155	64	55	779	178	31	564	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.88		0.97			0.98			0.99	
Flpb, ped/bikes	0.99	1.00	1.00		0.99			1.00			1.00	
Frt	1.00	1.00	0.85		0.97			0.98			0.99	
Flt Protected	0.95	1.00	1.00		0.98			1.00			1.00	
Satd. Flow (prot)	1749	1863	1392		1724			1772			1832	
Flt Permitted	0.40	1.00	1.00		0.74			0.93			0.91	
Satd. Flow (perm)	732	1863	1392		1297			1654			1674	
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	53	172	109	139	186	77	66	935	214	37	677	41
RTOR Reduction (vph)	0	0	83	0	12	0	0	11	0	0	3	0
Lane Group Flow (vph)	53	172	26	0	390	0	0	1204	0	0	752	0
Confl. Peds. (#/hr)	16		38	9		55	29		48	39		45
Confl. Bikes (#/hr)			14			9			3			1
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	17.0	17.0	17.0		17.0			45.0			45.0	
Effective Green, g (s)	17.0	17.0	17.0		17.0			45.0			45.0	
Actuated g/C Ratio	0.24	0.24	0.24		0.24			0.64			0.64	
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)	178	452	338		315			1063			1076	
v/s Ratio Prot		0.09										
v/s Ratio Perm	0.07		0.02		c0.30			c0.73			0.45	
v/c Ratio	0.30	0.38	0.08		1.24			1.13			0.70	
Uniform Delay, d1	21.6	22.1	20.5		26.5			12.5			8.1	
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2	0.9	0.5	0.1		131.2			71.7			3.8	
Delay (s)	22.6	22.6	20.6		157.7			84.2			11.9	
Level of Service	C	C	C		F			F			B	
Approach Delay (s)		21.9			157.7			84.2			11.9	
Approach LOS		C			F			F			B	

Intersection Summary			
HCM Average Control Delay	67.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	125.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	767	0	0	424	66	107	1001	94	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0				
Lane Util. Factor	1.00	0.95			0.95			0.95				
Frt	1.00	1.00			0.98			0.99				
Flt Protected	0.95	1.00			1.00			1.00				
Satd. Flow (prot)	1770	3539			3468			3482				
Flt Permitted	0.95	1.00			1.00			1.00				
Satd. Flow (perm)	1770	3539			3468			3482				
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	188	940	0	0	520	81	131	1227	115	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	9	0	0	0	0
Lane Group Flow (vph)	188	940	0	0	582	0	0	1464	0	0	0	0
Turn Type	Prot						Perm					
Protected Phases	7	4			8			2				
Permitted Phases							2					
Actuated Green, G (s)	8.0	26.7			14.7			29.0				
Effective Green, g (s)	8.0	26.7			14.7			29.0				
Actuated g/C Ratio	0.13	0.42			0.23			0.46				
Clearance Time (s)	4.0	4.0			4.0			4.0				
Vehicle Extension (s)	3.0	3.0			3.0			3.0				
Lane Grp Cap (vph)	222	1483			800			1585				
v/s Ratio Prot	c0.11	0.27			c0.17							
v/s Ratio Perm								0.42				
v/c Ratio	0.85	0.63			0.73			0.92				
Uniform Delay, d1	27.3	14.6			22.6			16.3				
Progression Factor	1.00	1.00			1.00			1.00				
Incremental Delay, d2	24.6	0.9			3.3			10.5				
Delay (s)	51.8	15.5			26.0			26.8				
Level of Service	D	B			C			C				
Approach Delay (s)		21.6			26.0			26.8			0.0	
Approach LOS		C			C			C			A	

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	99	355	0	0	384	147	280	1026	163	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0			
Lane Util. Factor		0.95			0.95	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.99			1.00	1.00		0.99	1.00			
Satd. Flow (prot)		3501			3539	1583		3502	1583			
Flt Permitted		0.71			1.00	1.00		0.99	1.00			
Satd. Flow (perm)		2519			3539	1583		3502	1583			
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	118	422	0	0	456	175	332	1218	194	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	68	0	0	0
Lane Group Flow (vph)	0	540	0	0	456	131	0	1550	126	0	0	0
Turn Type	Perm					Perm	Perm		Perm			
Protected Phases		4			8			2				
Permitted Phases	4					8	2		2			
Actuated Green, G (s)		14.7			14.7	14.7		31.0	31.0			
Effective Green, g (s)		14.7			14.7	14.7		31.0	31.0			
Actuated g/C Ratio		0.27			0.27	0.27		0.58	0.58			
Clearance Time (s)		4.0			4.0	4.0		4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		690			969	433		2022	914			
v/s Ratio Prot					0.13							
v/s Ratio Perm		c0.21				0.08		0.44	0.08			
v/c Ratio		0.78			0.47	0.30		0.77	0.14			
Uniform Delay, d1		18.0			16.3	15.4		8.6	5.2			
Progression Factor		1.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		5.8			0.4	0.4		2.8	0.3			
Delay (s)		23.8			16.6	15.8		11.5	5.5			
Level of Service		C			B	B		B	A			
Approach Delay (s)		23.8			16.4			10.8			0.0	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	53.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	511	16	27	31	24	25	0	799	21	24	446	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.94		0.99			1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.99			1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		0.96			1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.98			1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1483		1707			3515		1770	3539	1583
Flt Permitted	0.71	1.00	1.00		0.91			1.00		0.13	1.00	1.00
Satd. Flow (perm)	1320	1863	1483		1576			3515		247	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	620	19	33	38	29	30	0	969	25	29	541	336
RTOR Reduction (vph)	0	0	15	0	11	0	0	1	0	0	0	203
Lane Group Flow (vph)	620	19	18	0	86	0	0	993	0	29	541	133
Confl. Peds. (#/hr)			23	12		15	11		27	15		
Confl. Bikes (#/hr)			2			5			3			
Turn Type	Perm		Perm	Perm						Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)	64.4	64.4	64.4		64.4			47.6		47.6	47.6	47.6
Effective Green, g (s)	64.4	64.4	64.4		64.4			47.6		47.6	47.6	47.6
Actuated g/C Ratio	0.54	0.54	0.54		0.54			0.40		0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	708	1000	796		846			1394		98	1404	628
v/s Ratio Prot		0.01						c0.28			0.15	
v/s Ratio Perm	c0.47		0.01		0.05					0.12		0.08
v/c Ratio	0.88	0.02	0.02		0.10			0.71		0.30	0.39	0.21
Uniform Delay, d1	24.3	13.0	13.0		13.6			30.4		24.7	25.8	23.8
Progression Factor	1.00	1.00	1.00		1.00			0.45		1.00	1.00	1.00
Incremental Delay, d2	11.7	0.0	0.0		0.1			1.0		7.5	0.8	0.8
Delay (s)	36.0	13.0	13.0		13.7			14.7		32.3	26.6	24.6
Level of Service	D	B	B		B			B		C	C	C
Approach Delay (s)		34.2			13.7			14.7			26.0	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	115	51	136	108	71	75	770	224	71	458	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
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	0.94		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1761	1757		1770	1734		1770	3387		1770	3463	
Flt Permitted	0.56	1.00		0.58	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1033	1757		1089	1734		1770	3387		1770	3463	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	90	137	61	162	128	84	89	914	266	84	544	66
RTOR Reduction (vph)	0	27	0	0	41	0	0	44	0	0	16	0
Lane Group Flow (vph)	90	171	0	162	171	0	89	1136	0	84	594	0
Confl. Peds. (#/hr)	7		18			13			13	6		18
Confl. Bikes (#/hr)			7			1			2			2
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	12.4	12.4		12.4	12.4		6.9	24.5		3.6	21.2	
Effective Green, g (s)	12.4	12.4		12.4	12.4		6.9	24.5		3.6	21.2	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.13	0.47		0.07	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	244	415		257	410		233	1581		121	1398	
v/s Ratio Prot		0.10			0.10		0.05	c0.34		c0.05	0.17	
v/s Ratio Perm	0.09			c0.15								
v/c Ratio	0.37	0.41		0.63	0.42		0.38	0.72		0.69	0.42	
Uniform Delay, d1	16.8	17.0		18.0	17.0		20.9	11.2		23.9	11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.7		5.0	0.7		1.0	1.6		15.9	0.2	
Delay (s)	17.7	17.6		23.0	17.7		21.9	12.8		39.8	11.5	
Level of Service	B	B		C	B		C	B		D	B	
Approach Delay (s)		17.7			20.0			13.5			14.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	256	44	312	252	32	26	56	574	20	29	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.95	1.00	1.00			1.00	0.98		1.00	0.97
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85	1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00			0.98	1.00		0.98	1.00
Satd. Flow (prot)		1861	1512	1770	3469			1829	1555		1825	1543
Flt Permitted		0.99	1.00	0.95	1.00			0.90	1.00		0.87	1.00
Satd. Flow (perm)		1846	1512	1770	3469			1678	1555		1629	1543
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	6	314	54	382	309	39	32	69	704	25	36	6
RTOR Reduction (vph)	0	0	40	0	15	0	0	0	498	0	0	5
Lane Group Flow (vph)	0	320	14	382	333	0	0	101	206	0	61	1
Confl. Peds. (#/hr)	5		15			5	9		6			14
Confl. Bikes (#/hr)			1									
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		Perm
Protected Phases		4		3				2			6	
Permitted Phases	4		4		8		2		2	6		6
Actuated Green, G (s)		13.2	13.2	14.6	31.8			11.8	11.8		11.8	11.8
Effective Green, g (s)		13.2	13.2	14.6	31.8			11.8	11.8		11.8	11.8
Actuated g/C Ratio		0.26	0.26	0.28	0.62			0.23	0.23		0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		472	387	501	2138			384	356		373	353
v/s Ratio Prot				c0.22								
v/s Ratio Perm		c0.17	0.01		0.10			0.06	c0.13		0.04	0.00
v/c Ratio		0.68	0.04	0.76	0.16			0.26	0.58		0.16	0.00
Uniform Delay, d1		17.3	14.4	16.9	4.2			16.3	17.7		15.9	15.4
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		3.8	0.0	6.8	0.0			0.4	2.3		0.2	0.0
Delay (s)		21.1	14.5	23.7	4.2			16.7	20.0		16.2	15.4
Level of Service		C	B	C	A			B	B		B	B
Approach Delay (s)		20.2			14.4			19.5			16.1	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	51.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	180	33	73	236	250	64	326	128	172	283	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.95	
Frpb, ped/bikes	1.00	1.00	0.90	1.00	0.94		1.00	1.00	0.90		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85		0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1423	1770	1621		1770	1863	1425		3441	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)	1770	1863	1423	1770	1621		1770	1863	1425		3441	
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
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	32	221	40	89	289	306	78	400	157	211	347	21
RTOR Reduction (vph)	0	0	31	0	42	0	0	0	119	0	3	0
Lane Group Flow (vph)	32	221	9	89	553	0	78	400	38	0	576	0
Confl. Peds. (#/hr)			56			34	12		52			38
Confl. Bikes (#/hr)						1			7			3
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	2.3	20.3	20.3	13.2	31.2		21.2	21.2	21.2		16.0	
Effective Green, g (s)	2.3	20.3	20.3	13.2	31.2		21.2	21.2	21.2		16.0	
Actuated g/C Ratio	0.03	0.23	0.23	0.15	0.36		0.24	0.24	0.24		0.18	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	47	436	333	269	583		433	456	348		635	
v/s Ratio Prot	0.02	c0.12		0.05	c0.34		0.04	c0.21			c0.17	
v/s Ratio Perm			0.01						0.03			
v/c Ratio	0.68	0.51	0.03	0.33	0.95		0.18	0.88	0.11		0.91	
Uniform Delay, d1	41.8	28.9	25.6	32.8	27.0		25.9	31.5	25.4		34.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	33.6	0.9	0.0	0.7	24.9		0.2	17.1	0.1		16.6	
Delay (s)	75.5	29.8	25.6	33.5	51.9		26.1	48.6	25.6		51.2	
Level of Service	E	C	C	C	D		C	D	C		D	
Approach Delay (s)		34.2			49.5			40.1			51.2	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM Average Control Delay	45.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	86.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	372	148	115	556	0	0	0	0	98	823	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						0.95	
Frt		0.96			1.00						0.99	
Flt Protected		1.00			0.99						1.00	
Satd. Flow (prot)		3388			3509						3477	
Flt Permitted		1.00			0.75						1.00	
Satd. Flow (perm)		3388			2662						3477	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor (vph)	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Adj. Flow (vph)	0	433	172	134	647	0	0	0	0	114	957	99
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	0	578	0	0	781	0	0	0	0	0	1153	0
Turn Type				Perm						Perm		
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		14.9			14.9						16.0	
Effective Green, g (s)		14.9			14.9						16.0	
Actuated g/C Ratio		0.38			0.38						0.41	
Clearance Time (s)		4.0			4.0						4.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1298			1020						1430	
v/s Ratio Prot		0.17										
v/s Ratio Perm					c0.29						0.33	
v/c Ratio		0.45			0.77						0.81	
Uniform Delay, d1		8.9			10.5						10.1	
Progression Factor		1.00			1.00						1.00	
Incremental Delay, d2		0.2			3.5						5.0	
Delay (s)		9.2			14.0						15.0	
Level of Service		A			B						B	
Approach Delay (s)		9.2			14.0			0.0			15.0	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	38.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX N
Secondary Effects of Growth

Summary of Secondary Effects of Growth

Table N-1 summarizes the secondary effects of growth in the area served by the West of Hills Northern Pipelines Project. The information presented in Table N-1 is derived from the following environmental documents:

- City of Albany: *Albany General Plan Update and Revision Program Draft Environmental Impact Report and Final Environmental Impact Report: Response to Comments*, State Clearinghouse # 89022809, September 1992 (City of Albany, 1992)
- City of Berkeley: *City of Berkeley Draft General Plan Final Environmental Impact Report*, State Clearinghouse # 2000102107, June 2001 (City of Berkeley, 2001)
- City of El Cerrito: *City of El Cerrito: Draft Environmental Impact Report for the City of El Cerrito General Plan Update*, State Clearinghouse #99022058 (City of El Cerrito, 1999)
- City of Hercules: *City of Hercules General Plan Land Use and Circulation Elements Update and Redevelopment Plan Amendments Environmental Impact Report* (City of Hercules, 1995)
- City of Pinole: *City of Pinole General Plan Update Draft and Final Environmental Impact Report* (City of Pinole, 2010)
- City of Richmond: *Richmond General Plan Update Final Environmental Impact Report* (City of Richmond, 2011)
- City of San Pablo: *San Pablo General Plan 2030 Draft and Final Environmental Impact Report* (City of San Pablo, 2011)
- Contra Costa County: *Findings Related to Certification of the Environmental Impact Report for the General Plan and Adoption of the General Plan* (Contra Costa County, 1991), and Notice of Determination, Negative Declaration prepared for Reconsolidation of the Contra Costa County General Plan (Contra Costa County, 2005)

TABLE N-1
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
2010 Census Population	18,539	112,580	23,549	24,060	18,390	103,701	29,139	1,049,025
AESTHETICS								
Impacts								
• Alteration of visual setting or degradation and/or obstruction of existing views			S	S		U		U
• Conflict with adjoining development relative to height, mass and scale			PS					
• Introduction of new sources of light and glare		PS		S		U		
• Impacts on scenic corridors								U
Mitigation Measures								
• Conduct site-specific environmental review of sports field lighting projects.		X						
• Implement identified general plan community design policies to mitigate impacts on neighborhood character and community design.			X					
• Retain or replace, to the extent feasible, site features having aesthetic significance.				X				
• Retain or replace vegetation and trees that screen residential development, while retaining important view corridors.				X				
• Retain or replace vegetation and trees on proposed hiking/biking trail.				X				
• Implement identified measures to preserve view corridors, site buildings to minimize obstruction of sensitive viewpoints, and preserve identified views to the extent feasible during evaluation of site-specific proposals.				X				
• Require developers to restore natural contours and vegetation at project sites and preserve various natural features of positive scenic value.								X
• Screen parking areas; use hooded lights where needed for nighttime lighting; encourage use of regular windows instead of glass walls or massive reflective windows in research and development and office projects.				X				
• Shield street lighting and direct it downward, restrict use of high level outdoor lighting (especially on hillside ridges), and incorporate screening landscaping along roads and near residences to reduce spill light from vehicles and buildings.						X		
• Conduct design review of projects containing extensive reflective glass or metal on building surfaces.						X		
AESTHETICS (cont.)								

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
Mitigation Measures (cont.)								
• Implement identified general plan polices to protect resources of particular scenic value.								X
• Continue implementation of Measure C to centralize and contain urban development and preserve open space and protect areas of high scenic value within areas to be urbanized.								X
• Identify scenic ridgelines, discourage hillside and ridgetop development, and, to the extent development is allowed, minimize the visual impact of such development.								X
• Implement measures to exclude development from some scenic shoreline areas and promulgate and enforce guidelines for development that maintains visual quality along scenic waterways.								X
• Conduct a visual analysis of proposed scenic routes to identify views of significant visual and cultural value.								X
AGRICULTURAL RESOURCES								
Impacts								
• Conversion of agricultural land and open space to urban use								U
Mitigation Measures								
• Implement identified measures to promote continued agricultural production, discourage conversion of agricultural land, and provide mechanisms for insuring that urban development occurs in areas designated by the general plan for urban development.								X
AIR QUALITY								
Impacts								
• Conflict with or obstruction of the implementation of an applicable air quality attainment plan.		U		U	U	U		
• Inconsistency with region's congestion management program					PS			
• Result in an increase in vehicle miles traveled (VMT) at a rate that exceeds the rate of population increase.							U	
• Generation of short term air pollutant emissions from construction activities and/or equipment			PS	S	PS	S		

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
AIR QUALITY (cont.)								
Impacts (cont.)								
• Increased operational emissions that contribute to an existing or projected air quality violation			U		U	U		
• Increases in air emissions and degradation of air quality				U				U
• Exposure of sensitive land uses to toxic air contaminants and fine particulate matter					U			
• Inconsistency with air district significance criteria for odors and toxic air contaminants		S						
• Exposure of substantial numbers of people to new odor sources and exposure of new residents to existing odor sources					PS			
• Cumulative increase in criteria pollutant emissions, degradation of regional air quality, and/or conflict with air quality plan			U		U [j]		U	
Mitigation Measures								
• Promote use of public transportation and encourage use of alternative modes of travel (to single-passenger vehicles) including implementing improvements to bicycle and pedestrian routes and cooperation between all modes of transportation.						X		X
• Continue implementation of normal City permit and review procedures.			X					
• Implement identified general plan policies addressing public transit, pedestrian and bicycle use and circulation, and air quality.			X					
• Implement identified general plan policies and programs.				X			X	
• Implement dust abatement program for construction and demolition activities.				X				
• Require BAAQMD best management practices for all construction projects.					X	X		
• Implement measures to reduce emissions from construction equipment and vehicles.				X				
• Prepare a general plan air quality element that includes: the City's air quality goals, measures to mitigate impacts from mobile and stationary sources, and BAAQMD recommendations incorporated into general plan polices; coordinate with BAAQMD in planning future growth and implementing regional transportation plans and trip reduction measures.				X				

PS= Potentially significant impact   S = Significant mitigable impact   U = Significant and unavoidable impact   X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
AIR QUALITY (cont.)								
Mitigation Measures (cont.)								
• Update of zoning code to identify location of existing odor sources and require adequate buffers, ventilation systems, and other measures to reduce impacts of odors or toxic emissions.					X			
• Adopt West Berkeley Plan as amendment to general plan and protect new development from odors and toxic air pollutants through environmental review.		X						
• Implement identified measures to reduce the number of vehicles on county roadways, reduce emissions from each vehicle, reduce the distance vehicles travel, and reduce the amount of congestion encountered.								X
• Screen development to ensure appropriate design and siting of high-level-emissions sources to avoid impacts on neighboring uses and regional air quality.						X		
BIOLOGICAL RESOURCES								
Impacts								
• Impacts on/loss of special-status animal or plant species and/or their habitats			PS	S				U
• Cumulative impacts on wildlife from loss of open space				S				
• Impacts on sensitive species or sensitive/local habitats		S						
• Impacts on native habitats from the introduction of invasive non-native species				S	PS			
• Loss of or damage to wetlands or degradation of salt marsh or riparian habitat				S	PS			U
• Impacts on riparian and wetland communities from pollutants in urban runoff				S				
• Additional bird-strikes and electrocutions from wind farm development								U
• Impacts on significant ecological resources within the urban limit line								U
• Conduct project-specific environmental review and implement mitigation.		X		X	X			
• Consult with natural resources agencies prior to conversion of any natural area to historic coastal grasslands to prevent loss of wildlife breeding or foraging habitat.		X						
• Require projects to avoid wetlands, include adequate buffer zones, and replace wetlands that cannot be avoided in accordance with resource agency requirements.				X				X

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
BIOLOGICAL RESOURCES (cont.)								
Mitigation Measures								
• Locate projects along riparian corridors outside specified buffer zones and implement measures to protect sensitive riparian areas.				X	X			
• Require project-specific surveys as specified to determine on-site resources and appropriate site-specific mitigation measures.				X	X			X
• Plant native species for revegetation and landscaping purposes.				X				
• Implement specified general plan policies and programs to protect biological resources and habitats.			X	X				
• If needed, provide, in consultation with the U.S. Army Corps of Engineers, flood control area wide enough to establish native vegetation and provide wildlife habitat.				X				
• Require appropriate facility design and mitigation measures to prevent degradation of sensitive areas from polluted runoff.				X				
• Locate new development in existing developed or graded areas where practicable. Work with resource agencies to determine adequate buffer to protect tidal habitat in designing bay access trail links; limit and if possible avoid public access and paths within the buffer area; encourage bicyclists to stay on bike paths; require developers to provide signage and fencing and to enforce leash laws near sensitive habitats.				X				
• Provide open space and habitat linkages within and between properties; limit public access to wildlife habitat; and locate any trails to avoid disturbing wildlife nesting/denning areas.				X				
• Implement identified measures to mitigate effects of development on significant ecological Resources areas.								X
CULTURAL RESOURCES								
Impacts								
• Disturbance of historical resource(s)			PS	S		U		U
• Disturbance of archaeological/buried cultural resource(s)		PS	PS	S		S		U
• Potential disturbance of cultural resources and human remains					PS			
• Disturbance of paleontological resource(s)					PS	PS		
• Cumulative impacts on cultural and paleontological resources					S[k]	U		

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
CULTURAL RESOURCES (cont.)								
Mitigation Measures								
• Conduct project-specific review and implement identified mitigation consistent with general plan cultural resource policies and applicable ordinances.				X		X		
• Establish standard conditions of approval and criteria for determining which projects are likely to have archaeological resources and warrant additional site-specific evaluation as part of project development.		X						
• Include in the general plan update the specified studies to be undertaken for areas that have not been surveyed and/or are sensitive for cultural resources and procedures to be followed in the event that cultural resources, paleontological resources, or human remains are encountered during development activities.					X			
• Implement CEQA Guidelines Section 15064.5 provisions for the accidental discovery of historic or archeological resources.					X			
• Implement measures to evaluate and protect historic, archaeological, and paleontological resources including previously unknown cultural resources.				X	X	X		X
• Implement specified general plan policies concerning historical and/or archaeological resources.			X					X
GEOLOGY AND SOILS								
Impacts								
• Exposure of more people or structures to hazards from strong seismic ground shaking, ground failure, ground rupture, liquefaction, and/or differential settlement	S	PS	S	S				U
• Exposure to hazards associated with expansive soils	S			S				
• Soil compaction and/or increased potential for soil erosion				S				U
• Exposure to landslide and/or mudslide hazards			S	S				U
Mitigation Measures								
• Implement general plan policies and programs to mitigate potential geologic and seismic hazards.		X	X	X				X
• Maintain and improve an earthquake disaster preparedness plan	X			X				

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
GEOLOGY AND SOILS (cont.)								
Mitigation Measures (cont.)								
• Design and construct critical facilities to resist effects of maximum credible earthquake; strengthen existing critical facilities and specified residential buildings to meet this standard.	X							
• Design and construct critical facilities consistent with State of California requirements and the recommendations. Evaluate the feasibility of alternative sites for critical facilities.				X				
• Require site specific geotechnical evaluation for new development.	X			X				X
• Design buried utility infrastructure in vicinity of debris landfill to accommodate expected ground surface displacement.	X							
• Design all cut-and-fill slopes, engineered fills, roads, structural foundations and underground utilities to accommodate estimated settlement without failure.								X
• Implement measures to minimize erosion and provide appropriate drainage.				X				X
• Include slope repair contingency plans for existing landslide areas.								X
GREENHOUSE GAS EMISSIONS & CLIMATE CHANGE								
Impacts								
• Construction and operational generation of GHGs.						U		
Mitigation Measures								
• Implement the BAAQMD best management practices for greenhouse gas emissions						X		
• Implement general plan policies to reduce GHG emissions						X		
• Require large developments and retrofits to exceed Title 24 standards as specified.						X		
HAZARDS AND HAZARDOUS MATERIALS								
Impacts								
• Accidental release of or exposure to hazardous materials			S	S				U
• Increased number of residents exposed to possible disasters/hazardous substances	S							U
• Cumulative impacts associated with waste cleanup and disposal capacity from generation of hazardous waste by new industries				U				
• Increased risks associated with increased transportation of hazards substances.								U

PS= Potentially significant impact S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
HAZARDS AND HAZARDOUS MATERIALS (cont.)								
Mitigation Measures								
• Review and revise emergency preparedness plan, conduct preparedness drills, and initiate emergency preparedness program for residents and employees.	X							
• Implement identified general plan hazards policies addressing hazardous soils, hazardous waste management, and hazardous materials usage and storage.			X					
• Implement measures requiring strict regulation of hazardous waste storage and require industries to have up to date safety and design features in storage areas.								X
• Implement identified policies to encourage waste minimization.				X				
• Implement identified measures requiring site assessment, notification, remediation, and follow-up investigation, prior to development of or near a hazardous material site.				X				
• Prohibit residential development in identified cancer risk areas.				X				
• Prohibit urban and suburban development in areas subject to safety hazards from oil and gas wells.								X
• Prepare a risk management and prevention plan for acutely hazardous chemicals handling at wastewater treatment plant if required by and to the specifications of the county health services department.				X				
• Implement identified measures addressing access to pipelines and safety procedures for construction on parcels that include or are bordered by a pipeline, and consider notification requirements for sponsors of residential developments near pipelines.				X				
• Require that the transport of hazardous materials provides greater separation from the general public and that the Office of Emergency Services be notified immediately in the event of a release.								X
HYDROLOGY AND WATER QUALITY								
Impacts								
• Degradation of surface water quality from construction activities, post-construction activities and uses, and /or pollutants in urban runoff			S	S	PS			U
• Cumulative increase in pollutants in urban runoff			PS					
• Cumulative degradation of water quality from construction activities and increased urban runoff					S[k]			

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TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact / Mitigation	City of Albany[a]	City of Berkeley[b]	City of El Cerrito[c]	City of Hercules[d]	City of Pinole[e]	City of Richmond[f]	City of San Pablo[g]	Contra Costa County[h,i]
HYDROLOGY AND WATER QUALITY (cont.)								
Impacts (cont.)								
• Contamination of well water from neighboring septic tanks or agricultural chemicals								U
• Degradation of water quality from industrial spills								U
• Diminished water quality from increased water diversions from the Delta, sea water intrusion, and sea level rise								U
• Increased flooding and erosion hazards associated with creek restoration.		PS						
• Increased exposure of people and property to flooding				S	PS			U
• Increased flooding risk due to increased runoff from impermeable surfaces			PS	S				
• Cumulative flood conditions from increases in impermeable surfaces					U [j]			
Mitigation Measures								
• Require review and approval by public works department staff or qualified consultant of hydraulic design and maintenance program of applicable creek restoration projects.		X						
• Implement specified general plan policies that address storm drain monitoring and maintenance, development design and review, sea level rise, and runoff water quality.			X					
• Ensure adequate new drainage and pollution prevention and control infrastructure.				X				
• Calculate runoff from proposed development to ensure no flooding will result.				X				
• Develop a master water quality control plan to address existing contaminated water resources, manage stormwater runoff, and prevent further pollution.				X				
• Develop best management practices for developers to follow.				X				
• Implement identified measures and land use controls for land bordering Pinole Creek to minimize potential conflicts between flood, resource protection and recreational goals.					X			
• Work with BCDC to implement strategies to adapt to Bay-related impacts of climate change and develop a vulnerability analysis for the City's shoreline.					X			
• Implement Municipal Code flood protection standards for development within a FEMA-designated special flood hazard area and coordinate with FEMA and other agencies in the evaluation and mitigation of future flooding hazards resulting from sea level rise.					X			

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POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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HYDROLOGY AND WATER QUALITY (cont.)								
Mitigation Measures (cont.)								
• Pursue funding for adequate protection from sea level rise and continued subsidence and construction in areas threatened by level rise and/or settlement.					X			
• Implement identified measures requiring protection of groundwater from contamination and limiting the number of new wells that are drilled.								X
• Identify point sources of pollution and prohibit underground discharge of toxic liquid waste.								X
• Support water quality standards and participate in review of regional, state and federal programs that affect water quality and water supply safety.								X
• Direct development away from areas at risk of flooding and outside the 100-year flood plain; require all land uses proposed within special flood hazard areas to conform to the requirements of the County Flood Plain Management ordinance.								X
• Oppose efforts to construct any water diversion system that reduces Delta water flows unless conclusively demonstrated the diversions will not adversely impact water quality and fisheries.								X
LAND USE & PLANNING								
Impacts								
• Land use incompatibilities			PS	S				U
• Land use impacts from creation of satellite parking facilities		PS						
• Substantial changes in land use density, scale, pattern, and/or character			PS					U
• Conflicts with existing zoning								U
• Constrained growth in unincorporated areas and intensified growth in urban areas								S
Mitigation Measures								
• Implement specified general plan land use and community design policies.			X					
• Conduct project-specific environmental review.		X						
• Implement mixed use development provisions and applicable general plan policies.				X				

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TABLE N-1 (Continued)
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LAND USE & PLANNING (cont.)								
Mitigation Measures (cont.)								
• Revise the land use element to include policies that enhance the compatibility of new development with surrounding areas; provide adequate buffers between potentially incompatible uses; protect sensitive areas from new development; and require new development to demonstrate prior to approval that potential conflicts can be mitigated.				X				
• Create a memorandum of understanding with local governments regarding consistency of proposed annexations with the urban limit line and growth management standards.								X
• Implement identified measure regarding changes to the Zoning Ordinance.								X
• Conduct annual land supply review and 5-year infrastructures constraints review and coordinate with local governments on growth within city spheres of influence.								X
NOISE								
Impacts								
• Exposure to short-term construction noise and/or ground borne vibration			PS	S	PS	U		U
• Exposure to or generation of excessive ambient noise levels				S	S	U		U
• Increased noise levels particularly from vehicular traffic and/or cumulative noise impacts from increased traffic				S	U[j]	U		
• Exposure to or generation of cumulative noise levels that are excessive.			PS			U		
Mitigation Measures								
• Implement general plan programs and policies that reduce noise impacts.			X	X				X
• Implement/require measures to reduce construction noise.				X	X			X
• Conduct project-level environmental review and implement identified mitigation.				X		X		
• Conduct and analyze data from general and specific noise sources and develop regulatory process to address then.								X
• Adopt a noise ordinance.				X				X
• Incorporate general plan policies requiring site-specific noise studies for noise-sensitive projects that may be affected by railroad noise and requiring incorporation of noise attenuation measures into the project design.					X			

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NOISE (cont.)								
Mitigation Measures (cont.)								
• Incorporate general plan policies not to permit new noise-sensitive develop in areas subject to existing or planned transportation noise sources unless project design reduces exterior and interior noise levels as specified.					X			
POPULATION AND HOUSING								
Impacts								
• Substantial induced growth or concentration of population			PS					
Mitigation Measures								
• Implement specified general plan land use policies.			X					
PUBLIC SERVICES								
Impacts								
• Increased demand for police/law enforcement protection services		PS	PS	S				U
• Increased demand for fire protection services		PS		S				U
• Increased demand for fire protection service and potential interference with emergency response services			PS					
• Increased demand for schools	S	PS	PS	U				U
• Potential impacts from construction of new fire station		PS						
• Increased demand for child care facilities								U
• Increased demand for libraries and other public facilities								U
Mitigation Measures								
• Implement identified general plan policies addressing provision of fire and police protection services.			X	X				
• Review new development for potential increases in fire hazards and potential adverse impacts on fire services.		X						
• Conduct project-specific review to assess impacts of fire station construction.		X						

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PUBLIC SERVICES (cont.)								
Mitigation Measures (cont.)								
• Require new development to pay fair share of costs of new fire protection facilities and services.								X
• Implement identified measures to establish standards for provision of police protection services.								X
• Conduct annual review of fire department staffing levels and new development to determine whether additional staffing or impact fee is warranted.		X						
• Work with school district to evaluate impact of new development on district facilities.		X		X				
• Require major residential developments to prepare analysis of project impact on schools	X							
• Implement identified measure to provide for school impact fee or other financing option.				X				
• Implement identified measures to encourage the development of child care facilities.								X
RECREATION								
Impacts								
• Increased demand for new or expanded parks and/or recreational facilities			PS	U				U
Mitigation Measures								
• Implement general plan policies and programs to improve, expand, acquire, and/or develop park and recreational facilities			X	X				X
• Implement identified measures to ensure that new development funds its share of costs associated with providing park facilities.				X				
TRAFFIC AND TRANSPORTATION								
Impacts								
• Unacceptable levels of service due to increased traffic volumes			S					U
• Increased traffic and unacceptable levels of service at area intersections	S	PS		S, U	S			
• Cumulative traffic impacts on roadway segments and/or intersections				U	S	U		
• Cumulative transportation impacts and cumulative impacts on bus service operations					S[k]			

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TRAFFIC AND TRANSPORTATION (cont.)								
Impacts (cont.)								
• Conflict of cumulative projects with the West County Action Plan's multimodal transportation service objectives					U[j]			
• Impacts and cumulative impacts on emergency response times due to increased traffic and congestion						U		
• Increased in freeway traffic volumes during peak commute periods					U			
• Possible diversion of freeway traffic to city streets	S							
• Increased traffic congestion and demands on public transit		PS						
• Generation of parking demand in excess of supply		PS						
• Greater conflicts between cyclists and pedestrians from growth in motorized and bicycle traffic.								U
• Growth inducement caused by planned airport expansion								U
Mitigation Measures								
• Implement general plan and/or local or regional transportation plan programs, policies, and measures to mitigate traffic and circulation impacts.				X				
• Revise general plan policies to: clarify that transit corridors would not be modified unless such modifications will not cause adverse impacts related to street capacity or the benefits outweigh potential level of service impacts; require that related CEQA findings be supported by analysis demonstrating the project area's transportation level of service will not significantly deteriorate; require the City to set traffic volume guidelines for all streets.		X						
• Implement identified general plan growth management and circulation and transportation policies.			X					
• Monitor specified intersections, complete roadway projects, and implement highway improvements to discourage traffic from diverting onto local streets.				X				
• Monitor critical intersections for congestion and potential improvements.	X							
• Implement operational and other measures to improve levels of service and reduce congestion at intersections.	X			X				

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TRAFFIC AND TRANSPORTATION (cont.)								
Mitigation Measures (cont.)								
• Through the Congestion Management Agency coordinate street and highway improvements with other jurisdictions and Caltrans.	X							
• Implement measures to encourage the use of alternative modes of travel and reduce vehicle trips.		X						
• Pursue adoption of a transportation impact fee		X						
• Monitor potentially affected roadways, prepare an action plan to improve levels of service as specified, and prepare a deficiency plan for specified routes when deficient conditions occur.		X						
• Evaluate potential impacts on transit service or parking before approving new development or zoning amendment that would allow car free development		X						
• Minimize diversions of freeway traffic to local streets and implement measures to discourage such diversions and/or to encourage traffic to return to the freeway.	X			X				
• Work transportation advisory committee and transportation authority to revise action plan levels of service standards and multimodal traffic service objectives as specified.					X			
• Work with transportation advisory committee and AC Transit to construct additional bus turnouts on specified roadways.					X			
• Conduct project-specific environmental review and implement mitigation.						X		
• Implement identified measures to construct bikeways and incorporate the needs of bicyclists in major roadway construction projects and other improvements.								X
• Limit growth inducement potential at the planned East County Airport by providing appropriate amount of buffer land around the airport.								X
UTILITIES								
Impacts								
• Increased stormwater flows			PS					
• Increased water demand exceeding currently planned supplies.		PS		S				U

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UTILITIES (cont.)								
Impacts (cont.)								
• Need for new or expanded wastewater collection and/or treatment facilities and/or cumulative impact on wastewater treatment capacity						U		U
• Impacts associated with landfill capacity and siting solid waste facilities								U
• Cumulative impact on landfill capacity						U		
Mitigation Measures								
• Encourage the implementation of water conservation measures.				X				
• Implement identified general plan policies to maintain and monitor storm drain needs.			X					
• Adopt recycled water ordinance upon notification by EBMUD that recycled water is available to serve new development in the City.		X						
• Condition new development on assurances that adequate water quantity and quality is available and encourage water agencies to establish service boundaries to meet future water needs.								X
• Condition new development on the assurances of adequate sewer capacity and sewage treatment facilities in compliance with applicable waste water discharge requirements.								X
• Implement general plan policies to encourage water conservation and reduce demand from current and future development.				X				
• Implement identified measures requiring new development to pay its share of costs associated with providing water and wastewater service, encouraging dual plumbing systems in large developments for future use of reclaimed water, requiring low flow toilets and plumbing fixtures, and to initiate a wastewater treatment study.				X				
• Cooperate with EBMUD water system planning efforts and implement a capital improvement program for selected wastewater treatment alternatives.				X				
• Implement policies and measures to mitigate effects of landfill siting.								X
• Implement measures to encourage and facilitate recycling and resource recovery.								X
ENERGY								
Impacts								
• Significant increase in energy consumption								U

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TABLE N-1 (Continued)
POTENTIALLY SIGNIFICANT (PS), SIGNIFICANT MITIGABLE (S), AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED IN GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Increased demand for heating and cooling systems and potential for localized warming from increased lot coverage			PS					
• Increased demand for automobile fuel			PS					
Mitigation Measures								
• Implement identified general plan policies concerning energy conservation and alternative modes of transportation.			X					
• Require demonstration projects of cost-effective conservation techniques and conservation site planning, building design and landscaping.								X

a City of Albany, *Albany General Plan Update and Revision Program Draft Environmental Impact Report and Final Environmental Impact Report: Response to Comments*, State Clearinghouse # 89022809, Technical Appendix A of Albany General Plan and Final EIR, September 1992.
b City of Berkeley, City *of Berkeley Draft General Plan Final Environmental Impact Report*, SCH # 2000102107, June 2001.
c City of El Cerrito, *City of El Cerrito: Draft Environmental Impact Report for the City of El Cerrito General Plan Update*, State Clearinghouse #99022058, April 16, 1999.
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e City of Pinole, *City of Pinole General Plan Update Draft Environmental Impact Report* (July 2010) and *Final Environmental Impact Report*, prepared for City of Pinole, prepared by PMC, September 2010.
f City of Richmond, *Richmond General Plan Update Final Environmental Impact Report*, prepared for City of Richmond Development Services Department, prepared by Atkins, August 2011.
g City of San Pablo, *San Pablo General Plan 2030, Volume 3: Draft Environmental Impact Report* (November 2010) and *Volume 4: Final Environmental Impact Report* (February 2011), SCH No. 2008082069, Environmental Impact Report certified by the City Council April 18, 2011.
h County Contra Costa County, *Findings Related to Certification of the Environmental Impact Report for the General Plan and Adoption of the General Plan* (Contra Costa County, 1991), and Notice of Determination, Negative Declaration prepared for Reconsolidation of the Contra Costa County General Plan, Contra Costa County, 2005.
i Population shown includes cities and unincorporated areas.
J Identified as a cumulatively considerable impact that is considered significant and unavoidable.
K Identified as a cumulatively considerable or potentially cumulatively considerable impact that is reduced to less than cumulatively considerable with mitigation.

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References – Appendix N

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