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TECHNICAL MEMORANDUM #5

Exit 124 & 125 IAMP

Concept Evaluation

Date:	August 12, 2015	Project #:13049.7
To:	Project Management Team, TAC, CAC	
From:	Matt Hughart, AICP, Hermanus Steyn, PE, and Anais Malinge	

This memorandum contains documentation of initial concepts submitted to date from the project team, TAC, CAC, and the general public. This memorandum includes:

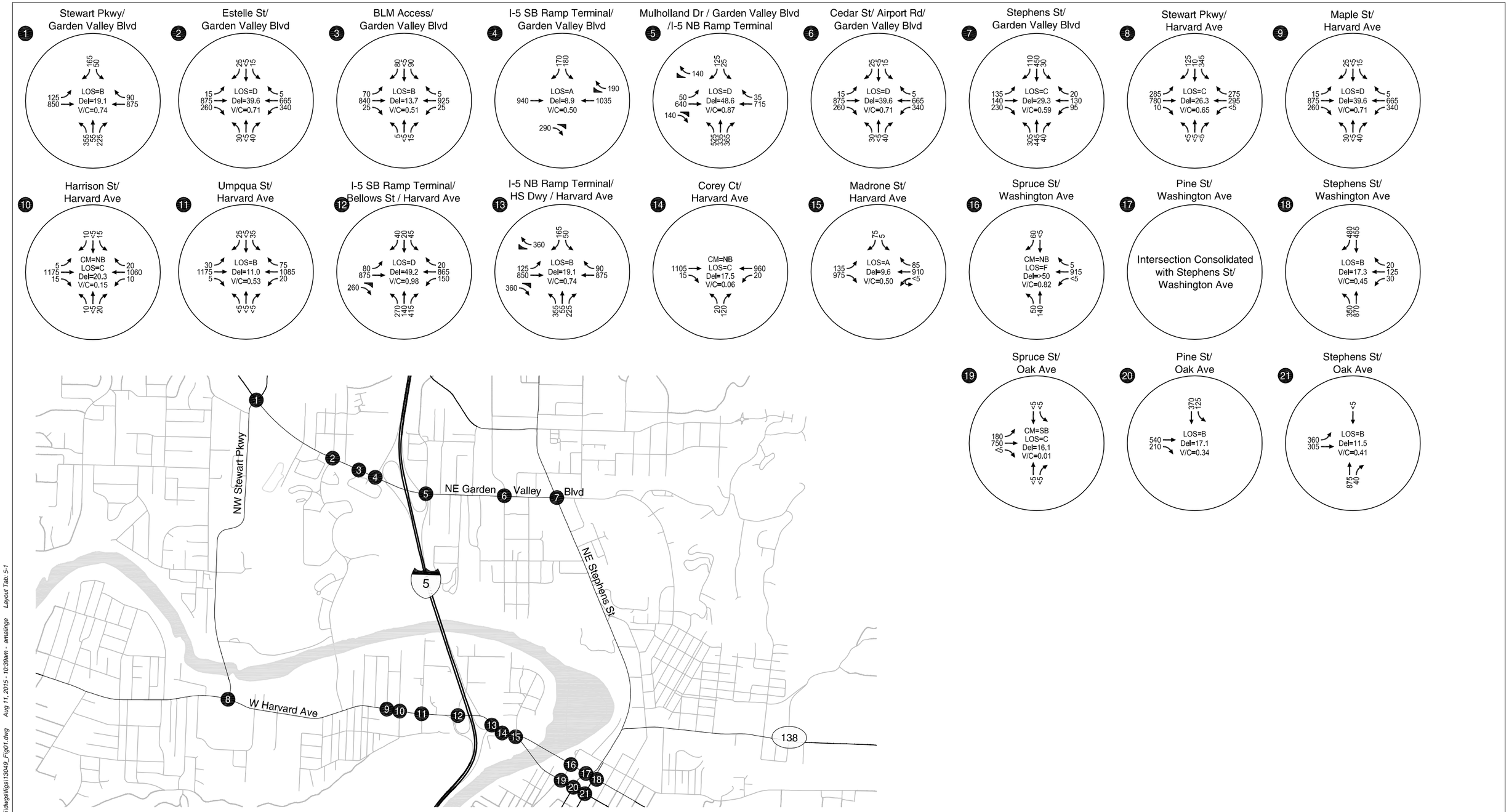
- Review of 2035 Future Traffic Operations
- Overview of the process used to develop initial concepts
- Qualitative assessment of initial concepts and preliminary recommendation for refinement

REVIEW OF 2035 BACKGROUND TRAFFIC CONDITIONS

As documented in Technical Memorandum #4, a future year 2035 "Background" traffic operations analysis was prepared for the two study interchanges. This forecast scenario assumes continued local and regional traffic growth. The results of this analysis are summarized in Table 5-1 and Figures 5-1 and 5-2.

Table 5-1: 2035 Future Traffic Operations Summary

Intersection	Weekday AM Peak Hour		Weekday PM Peak Hour		Mobility Target	Meets Target?
	LOS	V/C	LOS	V/C		
NW Garden Valley Blvd/NW Stewart Pkwy	B	0.74	B	0.88	0.85/LOS D	No
NW Garden Valley Blvd/Estelle St	D	0.71	C	0.86	0.85/LOS D	No
NW Garden Valley Blvd/BLM Access	B	0.51	C	0.98	0.85/LOS D	No
I-5 SB Ramp Terminal/NW Garden Valley Blvd	A	0.50	A	0.79	0.85	Yes
Mulholland Dr/I-5 NB Ramp Terminal/NW Garden Valley Blvd	D	0.87	D	0.99	0.85	No
Cedar St NW/NE Airport Rd/Garden Valley Blvd/	D	0.71	C	0.86	0.85/LOS D	No
NW Garden Valley Blvd/NE Stephens St	C	0.59	F	1.15	0.85/LOS D	No
W Harvard Ave/NW Stewart Pkwy	C	0.65	E	0.99	0.85/LOS D	No
W Harvard Ave/Maple St	C	0.71	C	0.86	LOS E	Yes
W Harvard Ave/Harrison St	C	0.15	D	0.33	LOS E	Yes
W Harvard Ave/Umpqua St	B	0.53	C	0.82	0.85/LOS D	Yes
I-5 SB Ramp Terminal/Harvard Ave/Bellows St	D	0.98	D	0.95	0.85	No
I-5 NB Ramp Terminal/Harvard Ave	C	0.74	B	0.88	0.85	No
Harvard Ave/Corey Ct (OR 138)	C	0.06	C	0.04	0.90	Yes
Harvard Ave/Madrone St (OR 138)	A	0.50	B	0.68	0.90	Yes
SE Washington St/SE Spruce St (OR 138)	F	0.82	F	2.51	0.90	No
SE Washington St/SE Pine St (OR 138)	-	-	-	-	0.90	NA
SE Washington St/SE Stephens S (OR 138)	B	0.45	C	0.77	0.90	Yes
SE Oak St/SE Spruce St (OR 138)	C	0.01	C	0.08	0.90	Yes
SE Oak St/SE Pine St (OR 138)	B	0.34	B	0.59	0.90	Yes
SE Oak St/Stephens St (OR 138)	B	0.41	B	0.56	0.90	Yes



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (AWSC) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWC = TWO-WAY STOP CONTROL

2035 Future Traffic Conditions With Funded TSP Projects
Weekday AM Peak Hour
Roseburg, OR

Figure
5-1

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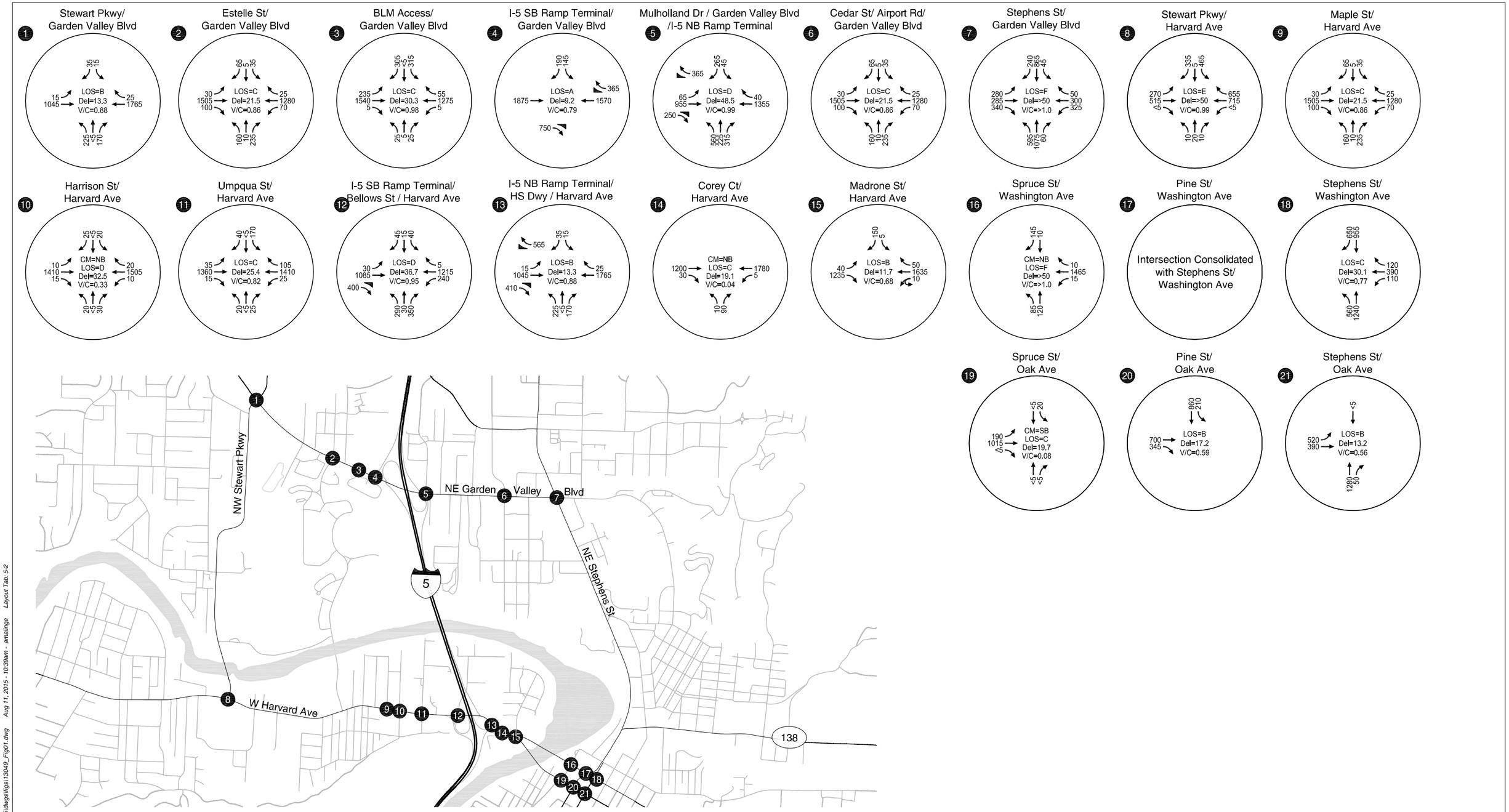

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2035 Future Traffic Conditions With Funded TSP Projects
Weekday PM Peak Hour
Roseburg, OR

Figure
5-2

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CONCEPT DEVELOPMENT PROCESS AND INITIAL CONCEPTS

In 2014, the project team hosted committee meetings and a public open house where members of the project team, the TAC, CAC and general public provided initial feedback and ideas regarding potential improvements to address existing and future deficiencies. A summary of this feedback is provided in Appendix "A".

To address the operational, safety, and geometric issues and deficiencies, a range of interchange improvement concepts were developed for the I-5/Exit 124 and I-5/Exit 125 interchanges based primarily on the committee and general public feedback. The interchange influence area was divided into three areas to allow for simplified development of concepts. The following summarizes the sub-areas considered to represent committee and public feedback comprehensively:

- Interchange Options – each concept considers distinct interchange forms
- West Options – each concept considers roadway access and local circulation options west of the interchange ramps
- East Options – each concept considers roadway access and local circulation options east of the interchange ramps

Each concept assumes the following will be incorporated in the planning and implementation phases of each:

- I-5 Mainline: Maintain auxiliary lane northbound between Exit 124 and 125, and add a southbound auxiliary lane to accommodate local north to south trips. The need for a southbound auxiliary lane between the two interchange ramp terminals
- Access Management: Consolidate access points and/or limit to right-in/right-out and provide connections to signalized intersections to reduce conflict points. Where dictated by a proposed reconfiguration of the interchange, some concepts address specific elements of access management on an individual basis.
- Multi-Modal: Design interchange ramps or local circulation roadways with appropriate pedestrian, bicycle, and transit treatments.

The concepts presented herein are intended to document suggestions presented to the project team to date. These concepts have the potential to be modified from what is currently shown. As such, this is not an exhaustive list of potential alternatives. Further, the concepts shown could be modified and/or elements blended together to incorporate elements of one or more concepts shown.

I-5/Exit 124 Interchange

Interchange

- I-1: Diamond
- I-2: Roundabout Corridor
- I-3: Single Point
- I-4: Harvard Avenue One-Way Couplet
- I-5: Diverging Diamond Interchange (DDI)
- I-6: Existing partial cloverleaf configuration
- I-7: Existing partial cloverleaf configuration on East side, Diamond configuration on West Side
- I-8: Existing partial cloverleaf configuration on East side, inverted cloverleaf on West side
- I-6: Existing partial cloverleaf configuration with the elimination of I-5 northbound on-ramp (westbound)

West Options

- W-1: Eliminate Bellows Street and provide more northerly east-west connection
- W-2: Eliminate Bellows Street without providing additional east-west connection from Roseburg High School
- W-3: Realign Bellows Street to eliminate intersection with I-5 ramp terminal and intersect with Umpqua Street

East Options

- E-1: Eliminate existing alignment of the Roseburg High School driveway opposite the I-5 ramp terminal and extend to Madrone Street
- E-2: Realign Roseburg High School driveway and consolidate with Corey Street intersection
- E-3: Provide additional east-west connection from Roseburg High School to Madrone Street, while retaining existing Roseburg High School driveway alignment
- E-4: Eliminate existing alignment of the Roseburg High School driveway opposite the I-5 ramp terminal

Simple single-line sketches of each concept are summarized in Table 5-2 along with a narrative that describes the various improvement components.

Table 5-2: I-5/Exit 124 Alternative Concepts Overview

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-1	
	• Would realign Harvard Avenue from Madrone Street to Umpqua Street, creating a smoother alignment through the interchange. • Due to the realignment, the interchange would be reconfigured from its current modified PARCLO AB form to a diamond form. • To accommodate existing and projected traffic demands, the diamond interchange would require dual left-turn lanes on both the NB and SB off-ramps. In addition, dual EB left-turn lanes would be needed on Harvard Avenue at the NB ramp terminal. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would eliminate the Roseburg High School access to/from Harvard Avenue and shift that access onto a new roadway connection to Madrone Street (see following bullet). • Due to the closure of Bellows Street and the Roseburg High School access, dual EB left-turn lanes would be needed on Harvard Avenue at the Madrone Street intersection. This would also require a widening of Madrone Street to two receiving lanes. • Would use a portion of the existing Harvard Avenue alignment to establish a new frontage road that would connect Madrone Street to Bellows Street and be the new primary access road to Roseburg High School. • Combination of the following subarea concepts: I-1, W-2, E-1
Concept H-2a	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a tight diamond interchange form. • To accommodate existing and projected traffic demands, the diamond interchange would require dual left-turn lanes on both the NB and SB off-ramps. In addition, dual EB left-turn lanes would be needed on Harvard Avenue at the NB ramp terminal. • Would maintain the Roseburg High School access to/from Harvard Avenue. • Would develop a new local circulation network on the south side of Harvard Road that would serve the existing motel and gas station. This circulation network would connect to Harvard Avenue opposite the Roseburg High School access. • Would eliminate the Bellows Street connection to Harvard Avenue and realign a portion of Bellows Street through the old hospital site to Umpqua Street. In order to maintain adequate vertical clearance, this new alignment of Bellows Street would need to be lowered beneath the new southbound off-ramp. • Combination of the following subarea concepts: I-1, W-3, E-2

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-2b	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a traditional diamond interchange form. • To accommodate existing and projected traffic demands, the diamond interchange would require dual left-turn lanes on both the NB and SB off-ramps. In addition, dual EB left-turn lanes would be needed on Harvard Avenue at the NB ramp terminal. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would extend Princeton Avenue underneath I-5 to Bellows Street to replace the Bellows Street connection to Harvard Avenue. • Would install a raised median along Harvard Avenue from the new NB Ramp Terminal to Madrone Street, thereby making the existing Roseburg High School access and Corey Court right-in/right-out intersections. • Would install a new double lane roundabout at the Harvard Avenue/Madrone Street intersection to better accommodate access to properties impacted by the raised median. • Combination of the following subarea concepts: I-1, W-1
Concept H-3	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a traditional diamond interchange form. • Installs double lane roundabouts at the two interchange ramp terminals as well as the Harvard Avenue/Umpqua Street and Harvard Avenue/Madrone Street intersections. • Limits all access along Harvard Avenue (with exception of the roundabout intersections) from Umpqua Street to Madrone Street to right-in/right-out access. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • This concept does not specifically define an alternative to Bellows Street, so it is assumed that the residential neighborhood behind Roseburg High School will gain access through the Roseburg High School campus. • Combination of the following subarea concepts: I-2, W-2

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-4	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a Single Point interchange. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would develop a new public street connection through the Roseburg High School parking lot to provide access to residences behind Roseburg High School. • Combination of the following subarea concepts: I-3, E-2, W-2
Concept H-5	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a split diamond interchange form. The interchange would be further modified by the establishment of a couplet that splits the eastbound and bound directions of Harvard Avenue into two distinct roadways. The eastbound roadway would remain on the existing Harvard Avenue alignment. The westbound roadway would be established on a new alignment offset approximately 150 feet to the north of the existing Harvard Avenue alignment. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would develop a new public street connection through the Roseburg High School parking lot to provide access to residences behind Roseburg High School. • Combination of the following subarea concepts: I-4, E-2

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-6	
	• Would reconfigure the existing looping southbound off-ramp into a more traditional diamond ramp configuration on the west side of the interchange. • To accommodate existing and projected traffic demands, the diamond ramp configuration would require dual left-turn lanes on the SB off-ramp. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would create an alternative local street crossing underneath I-5 near the existing pedestrian underpass. • Would establish a new local street connection between I-5 and the existing rehabilitation center. • Combination of the following subarea concepts: I-7, W-1
Concept H-7	
	• Would reconfigure the Exit 124 interchange from its current modified PARCLO AB form to a Diverging Diamond Interchange. • Would eliminate the Bellows Street connection to Harvard Avenue and realign a portion of Bellows Avenue through the old hospital site to Umpqua Street. • In order to obtain additional separation from the NB ramp terminal, the concept would realign the Roseburg High School access further to the east through the existing Church of LDS site. • Would develop a new connection between Roseburg High School and Madrone Street via Laurelwood Court. • Combination of the following subarea concepts: I-5,W-3

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-8	
	• Would reconfigure the existing southbound ramps to include a traditional southbound off-ramp and a looping southbound on-ramp. • To accommodate existing and projected traffic demands, the SB ramp terminal would require dual left-turn lanes on Harvard Avenue eastbound, and dual left-turn lanes on the SB off-ramp. • Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would develop a new public street connection through the Roseburg High School parking lot to provide access to residences behind Roseburg High School. • Combination of the following subarea concepts:I-8, W-2
Concept H-9a	
	• Would widen the southbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound), a single through lane (onto Bellows Avenue), and a separate right-turn lane (onto Harvard Avenue eastbound). • Incorporates a small westward shift of Bellows Avenue to align with the widening on the southbound looping off-ramp. • Would install a separate right-turn lane at the northbound on-ramp to better delineate right-turn maneuvers from the adjacent bike lane on Harvard Avenue. • Combination of the following subarea concepts: I-6

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-9b	
	• Would realign (slightly to the west to square up the ramp terminal with Harvard Avenue) and widen the southbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound), a single through lane (onto Bellows Avenue), and a separate right-turn lane (onto Harvard Avenue eastbound). • Incorporates a larger westward shift of Bellows Avenue to better align with the widening on the southbound looping off-ramp. Bellows Street would also be widened to include a separate southbound left-turn lane and a shared through/right-turn lane to better facilitate maneuvers onto Harvard Avenue. • Would install a westbound right-turn lane at the northbound on-ramp and an eastbound right-turn lane at the southbound on-ramp to better delineate right-turn maneuvers from the adjacent bike lane on Harvard Avenue. • Combination of the following subarea concepts: I-6
Concept H-10	
	• Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would install right-turn lanes at both northbound on-ramps to better delineate right-turn maneuvers from the adjacent bike lane on Harvard Avenue. • Would extend Princeton Avenue underneath I-5 to Bellows Street to replace the Bellows Street connection to Harvard Avenue. • Combination of the following subarea concepts: I-6, W-1

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-11	
	• Would eliminate the Bellows Street connection to Harvard Avenue and realign a portion of Bellows Avenue through the old hospital site to Umpqua Street. • Would eliminate the Roseburg High School access to Harvard Avenue to better conform with interchange design policies and access management policies. All Roseburg High School access would occur via Umpqua Street at the new Bellows Street alignment. • Combination of the following subarea concepts: I-6, W-1, E-4
Concept H-12	
	• Would eliminate the Bellows Street connection to Harvard Avenue and the Bellows Street underpass for vehicular trips. • Would limit the existing Roseburg High School access off of Harvard Avenue to right-out only movements. All other Roseburg High School access would occur via a new local street connection to Madrone Street. • Would extend Princeton Avenue underneath I-5 to Bellows Street to replace the Bellows Street connection to Harvard Avenue. • Due to the closure of Bellows Street and the restriction of the Roseburg High School access to right-out, dual EB left-turn lanes would be needed on Harvard Avenue at the Madrone Street intersection. This would also require a widening of Madrone Street to accommodate two northbound receiving lanes. • Combination of the following subarea concepts: I-6, W-1, E-3

I-5/Exit 124 (Harvard Avenue) Concepts	Description of Improvements Included in Each Concept
Concept H-13	
	• Would eliminate the existing Roseburg High School access off of Harvard Avenue. All Roseburg High School access would occur via a new local street connection to Madrone Street and the existing Bellows Street connection to Harvard Avenue. • Due to the closure of Bellows Street and the Roseburg High School access, dual EB left-turn lanes would be needed on Harvard Avenue at the Madrone Street intersection. This would also require a widening of Madrone Street to accommodate two northbound receiving lanes. • Combination of the following subarea concepts: I-6, W-3, E-1
Concept H-14	
	• Would eliminate the existing northbound on-ramp and require all NB on-ramp traffic to use a single ramp terminal at the Roseburg High School access. • To accommodate existing and projected traffic volumes, the reconfiguration of the NB ramp terminal would require dual westbound left-turn lanes to the northbound on-ramp. This would also require a major widening of the on-ramp. • Would reconfigure and reposition the SB ramp terminal further to the west. This would include a realignment of Bellows Street and its intersection with Harvard Avenue. • Combination of the following subarea concepts: I-9

I-5/Exit 125 Interchange

Interchange

- I-1: Existing partial cloverleaf configuration
- I-2: Partial cloverleaf eliminating free-flow rights
- I-3: Diamond
- I-4: Single Point
- I-5: Diverging Diamond Interchange (DDI)
- I-6: Roundabout Corridor
- I-7: Garden Valley Boulevard One-Way Couplet
- I-8: East-Side Jug Handle Ramp Terminal

West Options

- W-1: Black Avenue extension from Crouch Street to Goetz Street
- W-2: Removing Mall signal and change to right-in/right-out
- W-3 (also see E-4): East-west connection - Extension of Hill Avenue from Mountain View Street to Mulholland Drive

East Options

The majority of the East Options attempt to simplify the northbound ramp terminal by disconnecting Mulholland Avenue to Garden Valley Boulevard. Connections within the northeast interchange quadrant will then occur through providing and completing road connections that will depend on the outcome of the public engagement process and as redevelopment occurs; for example:

- Re-route traffic from Mulholland Avenue via Cecil Avenue to Fairmont Street
- Secondary connection extending Bethel Avenue to Eden Street
- Variations of east-west connection between Mulholland Drive, Eden Street, Beacon Street, and Fairmont Avenue.

Key East Options are:

- E-1: Align Fairmont Avenue and Highland Street to introduce potential new signalized intersection
- E-2: Align north connection with Hicks Street to introduce potential new signalized intersection

- E-3: Realign Mulholland Avenue to the east aligning with Highland Street or Hicks Street
- E-4 (also see W-3): East-west connection across I-5 - Extension of Hill Avenue from Mountain View Street to Mulholland Drive
- E-5: Retain existing Mulholland Drive connection – limited to one interchange configuration only.
- E-6: Limited Mulholland Drive connection at Garden Valley Boulevard to one-way (northbound only).
- E-7: Retain Mulholland Drive connection at Garden Valley Boulevard.

Simple single-line sketches of each concept are summarized in Table 5-3 along with a narrative that describes the various improvement components.

Table 5-3: I-5/Exit 124 Alternative Concepts Overview

I-5/ Exit 125 (Garden Valley Boulevard) Concepts	Description of Improvements Included in Each Concept
Concept GV-1	
	• Retain existing interchange configuration with minor modifications to ramps in northwest interchange quadrant to improve signal spacing on Garden Valley Boulevard. • Reduce speeds of right-turns onto loop on-ramps by providing right-turn lanes (i.e., EB right to NB loop on-ramp; and WB right to SB loop on-ramp). • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Disconnect Mulholland Drive at Garden Valley Boulevard and provide additional connectivity in road network to Fairmont Avenue. • Align Fairmont Avenue and Highland Street to introduce potential new signalized intersection. • Combination of the following subarea concepts: I-1, W-1, E-1.
Concept GV-2	
	• Retain existing interchange configuration. • Reduce speeds of right-turns onto loop on-ramps by providing right-turn lanes (i.e., EB right to NB loop on-ramp; and WB right to SB looping on-ramp). • Introduce right-turn lanes and tighten right-turns to slow speeds of free-flow right-turns (i.e., EB right to SB on-ramp; and WB right to NB on-ramp). • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Provide a new east-west connection (new I-5 underpass) between the east and west sides of I-5 by extending Hill Avenue from Mountain View Street to Mulholland Drive. • Limit Mulholland Drive connection at Garden Valley Boulevard to one-way northbound only and provide additional connectivity in road network to Fairmont Avenue. • Align Fairmont Avenue and Highland Street to introduce potential new signalized intersection. • Combination of the following subarea concepts: I-1, W-1, W-3, E-1, E-4, E-6.

I-5/ Exit 125 (Garden Valley Boulevard) Concepts	Description of Improvements Included in Each Concept
Concept GV-3	
	• Retain existing interchange configuration, but eliminate free-flow rights (i.e., EB right to SB on-ramp; and WB right to NB on-ramp) by converting right-turns to left-turns addressing multimodal needs. • Reduce speeds of right-turns onto loop on-ramps by providing right-turn lanes (i.e., EB right to NB loop on-ramp; and WB right to SB loop on-ramp). • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Remove the Garden Valley Boulevard/BLM access signalized intersection and change the NB and SB approaches to right-in/right-out. • Construct a new access connection from the BLM to the existing Veterans Hospital access. • Widen the Garden Valley Boulevard/Estelle Street intersection to include dual SB left-turn lanes and dual WB left-turn lanes. • Realign Mulholland Avenue to the east aligning with Highland Street and establish new road network in the northeast interchange quadrant. • Combination of the following subarea concepts: I-2, W-1, W-2, E-2.
Concept GV-4	
	• Convert interchange to a diamond configuration. • Introduce additional turn lanes (e.g., dual left-turns) at ramp terminal intersections. • Improve spacing between signalized intersections. • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Realign Mulholland Avenue to the east aligning with Highland Street and establish new road network in the northeast interchange quadrant. • Combination of the following subarea concepts: I-3, W-1, E-3

I-5/ Exit 125 (Garden Valley Boulevard) Concepts	Description of Improvements Included in Each Concept
Concept GV-5	
	• Convert interchange to single point configuration. • Improve spacing between signalized intersections. • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Realign Mulholland Avenue to the east aligning with Highland Street and establish new road network in the northeast interchange quadrant. • Combination of the following subarea concepts: I-4, W-1, E-3.
Concept GV-6	
	• Convert interchange to diverging diamond interchange (DDI) configuration. • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Realign Mulholland Avenue to the east aligning with Highland Street and establish new road network in the northeast interchange quadrant. • Combination of the following subarea concepts: I-5, W-1, E-3.

I-5/ Exit 125 (Garden Valley Boulevard) Concepts	Description of Improvements Included in Each Concept
Concept GV-7	
	• Convert interchange to typical diamond configuration with roundabouts at the ramp terminals. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Realign Mulholland Avenue to the east aligning with Hicks Street and establish new road network in the northeast interchange quadrant. • Provide roundabouts at the major intersections along this corridor. • Combination of the following subarea concepts: I-6, W-1, E-3.
Concept GV-8	
	• Provide a one-way couplet along Garden Valley Boulevard to simplify signal operations within the study area. • Convert interchange to typical diamond configuration with the one-way couplet at the ramp terminals. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • This concept changes the overall vision of the study area and requires major redevelopment. • Combination of the following subarea concepts: I-7, W-1, E-1.

I-5/ Exit 125 (Garden Valley Boulevard) Concepts	Description of Improvements Included in Each Concept
Concept GV-9	
	• Introduce an unconventional Jug Handle Ramp configuration on the east side of I-5. • Eliminate free-flow rights (i.e., EB right to SB on-ramp; and WB right to NB on-ramp), and reduce speeds of turning movements at ramp terminals. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Remove the Mall signal and change access to right-in/right-out, which improve spacing between signalized intersections. • Retain Mulholland Avenue that will now serve interstate traffic. • Widen the Garden Valley Boulevard/Mulholland Avenue intersection to include dual EB left-turn lanes and a WB right-turn lane. • Combination of the following subarea concepts: I-8, W-2, E-5
Concept GV-10	
	• Retain existing interchange configuration. • Widen the northbound off-ramp to include dual NB left-turn lanes. Widen the SB Mulholland Drive approach to include a channelizing SB right-turn lane. Add a WB right-turn lane on Garden Valley Boulevard to better accommodate right-turn movements onto Mulholland Drive. • Reduce speeds of right-turns onto loop on-ramps by providing right-turn lanes (i.e., EB right to NB loop on-ramp; and WB right to SB looping on-ramp). • Introduce right-turn lanes and tighten right-turns to slow speeds of free-flow right-turns (i.e., EB right to SB on-ramp; and WB right to NB on-ramp). • Widen the southbound approach at the Garden Valley Boulevard/BLM access to include dual southbound left-turn lanes. • Extend Black Avenue from Crouch Street to Goetz Street to provide parallel connectivity north of Garden Valley Boulevard. • Align Fairmont Avenue and Highland Street to introduce potential new signalized intersection.

The next section provides a qualitative assessment to help narrow the number of concepts to study in more detail.

PRELIMINARY QUALITATIVE EVALUATION OF INITIAL CONCEPTS

The consultant team conducted an evaluation and comparison of the initial concepts based primarily on qualitative measures. Some quantitative measures such as intersection capacity were preliminary evaluated at a planning level to help in the overall discovery process. The overall intent of the process is intended to identify those concepts that do not have any “fatal flaws” and warrant a more detailed evaluation.

To evaluate and assess each concept according to the project evaluation criteria (as originally documented in Technical Memorandum #1), a scoring system was developed. In essence, each evaluation criterion was assigned a range of values (+, 0, -). The concept that achieve each metric better than others receive a "+", those that do not impact the metric receive a "0", those that underperform compared to other concepts receive a "-" score. Table 5-4 outlines the elements considered in the initial evaluation and aspects of each element that characterized the variations between concepts.

Table 5-4: Alternatives Evaluation Criteria

Category	Evaluation Criteria	Scoring Key	
Transportation Operations	Safety	+	Contains elements proven to reduce crash frequency/severity
		0	No elements proven to reduce crash frequency/severity
		-	Contains elements proven to increase crash frequency/severity
	Mobility	+	Addresses failing future operations for both passenger cars and freight
		-	Does not address failing future operations for passenger cars and freight
Multimodal Accommodations	Pedestrian/Bicycle/Transit Mobility	+	Contains elements that will improve bicycle/pedestrian/transit mobility
		0	No elements proven to improve bicycle/pedestrian/transit mobility
		-	Contains elements that will negatively impact bicycle/pedestrian/transit mobility
Land Use	Right-of-Way Impacts	+	Minimal right-of-way impacts and
		0	Moderate right-of-way impacts
		-	Substantial right-of-way impacts
Environmental, Social, and Equity Factors	Environmental/Socio Impacts	+	No environmental/socio impacts
		0	Minimal environmental/socio impacts
		-	Moderate-Substantial environmental/socio impacts
Accessibility and Connectivity	Local roadway connectivity	+	Significantly improves local roadway connectivity
		0	No change from existing conditions
		-	Worsens local roadway connectivity
	Access spacing requirements	+	Meets ODOT's access spacing standards
		0	Works in the direction of meeting ODOT's access spacing standards
		-	No change from existing conditions
Cost	Relative Construction Cost	+	Low construction costs
		0	Moderate construction costs
		-	Substantial construction costs
Implementation	Ability to Construct	+	Can be constructed outright or in phases with little/no impacts on existing traffic flow.
		0	Would require some impacts and/or rerouting/closure to existing traffic patterns.
		-	Can't be constructed without substantial impacts and rerouting/closure of existing traffic patterns.

Table 5-5 provides a summary of the preliminary evaluation of initial concepts. Detailed notes regarding the associated scores are provided in Appendix "B".

Table 5-5: Preliminary Qualitative Evaluation of Initial Concepts

Concept	Transportation Operations	Multimodal Accessibility	Land Use	Enviro., Social, and Equity Factors	Accessibility & Connectivity	Cost	Implementation	Recommended for Additional Detailed Evaluation?
I-5/Exit 124 (Harvard Ave)								
H-1	+	+	-	-	-	-	-	No
H-2a	+	+	-	+	0	-	-	No
H-2b	+	+	-	+	0	-	-	No
H-3	+	-	-	0	+	-	-	No
H-4	+	-	-	0	-	-	-	No
H-5	+	-	-	-	-	-	-	No
H-6	+	0	-	-	0	-	-	No
H-7	+	-	-	-	+	-	-	No
H-8	+	0	-	-	-	-	-	No
H-9a	+	+	+	+	0	+	+	**Yes**
H-9b	+	+	0	+	0	0	+	**Yes**
H-10	+	+	+	0	+	-	+	**Yes**
H-11	+	-	-	+	0	-	+	No
H-12	+	-	-	-	+	-	+	**Yes**
H-13	+	0	-	-	+	-	+	No
H-14	+	+	0	+	0	0	+	**Yes**
I-5/Exit 125 (Garden Valley Blvd)								
GV-1	+	0	-	-	+	-	+	**Yes**
GV-2	+	+	-	-	+	-	0	**Yes**
GV-3	-	+	-	-	+	-	-	No
GV-4	-	+	-	-	+	-	-	No
GV-5	+	-	-	-	+	-	-	No
GV-6	+	-	-	-	+	-	-	No
GV-7	+	-	-	-	+	-	-	No
GV-8	+	0	-	-	+	-	-	No
GV-9	-	0	-	-	-	-	-	No
GV-10	+	+	0	0	0	0	+	**Yes**

Table 5-6 provides information on the primary reason a concept for Exit 124 was recommended for elimination and not considered for further evaluation. More detailed notes regarding the associated scores and supplemental to the information provided in Table 5-6 are provided in Appendix "B".

Table 5-6: I-5/Exit 124 Concept Elimination Discussion

Concept	Primary Reason for Concept Elimination
H-1	This concept introduces an expensive interchange form that does not efficiently address critical movements and would be difficult to construct/implement.
H-2a	This concept introduces an expensive interchange form that does not efficiently address critical movements and would be impactful to adjacent properties.
H-2b	This concept introduces an expensive interchange form that does not efficiently address critical movements and includes costly local circulation elements that would be impactful to adjacent properties.
H-3	This concept introduces an expensive interchange form with roundabout ramp terminals that would be impactful to adjacent properties.
H-4	This concept introduces an expensive interchange form that would be difficult to construct while trying to maintain existing traffic flow.
H-5	This concept introduces and expensive interchange form and a couplet that would be extremely impactful, costly, and difficult to implement.
H-6	This concept introduces an expensive interchange form that does not efficiently address critical movements, is impactful to adjacent properties, and contains local circulation elements that may not be feasible.
H-7	This concept introduces an expensive interchange form that would be difficult to construct while trying to maintain existing traffic flow.
H-8	This concept introduces an impactful interchange form that does not efficiently accommodate the most critical movements at the interchange.
H-11	This concept reroutes all Roseburg High School and Bellows Street traffic to Umpqua Street, requiring significant improvements to Umpqua Street that are too impactful to adjacent properties. The concept also does not address multi-modal needs along the Harvard Avenue corridor.
H-13	This concept would result in significant property impacts to the old hospital site and to properties fronting Madrone Street.

Table 5-7 provides information on the primary reason a concept for Exit 125 was recommended for elimination and not considered for further evaluation. More detailed notes regarding the associated scores and supplemental to the information provided in Table 5-7 are provided in Appendix "B".

Table 5-7: I-5/Exit 124 Concept Elimination Discussion

Concept	Primary Reason for Concept Elimination
GV-3	This concept introduces wide cross sections (i.e., four through lanes, dual left-turn, and exclusive right-turns [maybe dual]) to address operational needs, but does not necessarily address the multimodal, geometric design, and safety needs at this intersection. Critical movement analysis (CMA) indicates that the southbound ramp terminal is forecast to be over-capacity and can't realistically be mitigated with further widening. The rerouting of Mulholland Drive would be impactful and costly.
GV-4	This concept introduces wide cross sections (i.e., four through lanes, dual left-turn, and exclusive right-turns [maybe dual]) to address operational needs. Critical movement analysis indicates that the northbound ramp terminal is anticipated to be over-capacity and can't be mitigated with further widening. The rerouting of Mulholland Drive would be impactful and costly.
GV-5	The constructability and cost issues the associated with this concept are difficult to overcome. The rerouting of Mulholland Drive would be extremely impactful and costly.
GV-6	The constructability and cost issues the associated with this concept are difficult to overcome. The rerouting of Mulholland Drive would be extremely impactful and costly.
GV-7	Although the roundabout corridor results in narrower cross sections along the segment and allows great access management opportunities, it requires more right-of-way at the intersections impacting commercial properties and have uncertainty regarding the design for pedestrians at multilane roundabouts.
GV-8	This couplet concept has major impacts on existing land uses and properties that far outweigh all other operational benefits.
GV-9	This concept is inconsistent with desirable road hierarchy and undesirably mixes interstate traffic with neighborhood traffic.

DETAILED QUANTITATIVE ANALYSIS OF THE SCREENED CONCEPTS

As documented in the first half of this memorandum, the preliminary concept screening determined that five I-5/Exit 124 (Harvard Avenue) concepts and three I-5/Exit 125 (Garden Valley Boulevard) concepts were worthy of a more detailed quantitative evaluation. As a first step in this higher level evaluation process, the project team developed a more detailed double-line sketch of each remaining concept that more precisely takes into consideration geometric layouts, right-of-way needs, and travel lane needs. A description and illustration of the refined concepts are provided in the following sections.

It should be noted that during the detailed double-line sketching process, it was determined that a more realistic layout of Concepts H9a and H9b revealed marginal differences. As Concept H9b was determined to be a more realistic application, only this concept was sketched and evaluated as part of the detailed quantitative evaluation process.

The following sections summarize the modifications, the traffic operations analysis including a review of queuing, and safety analysis for each concept.

Exit 124 (Harvard Avenue) Interchange Descriptions

Concept H9b

Figure 5-3 shows the interchange and circulation design concept H9b as modified through a more refined sketch-level layout. Table 5-8 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-8 - Concept H9b Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Lengthening of the southbound off-ramp deceleration lane along I-5.	• Vehicle queues on the off-ramp can and are projected to continue to back-up on the off-ramp during some peak time periods. • Would reduce the potential for vehicle queue spillback to occur up to and within the I-5 southbound travel lanes.	• Deceleration lane would require lane widening and embankment modifications along the west side of I-5. • Existing Bellows Street overpass would need to be widened along with a possible widening of the Harvard Avenue overpass.	• $$$ - Costly to Bellows Street and Harvard Avenue overpass modifications.
2. Widening of the southbound off-ramp approach to Harvard Avenue to include dual left-turn lanes, a single through lane (onto Bellows Avenue), and a separate right-turn lane.	• Increase capacity of the ramp terminal and better manage existing and projected vehicle queue lengths.	• Lane widening would shift the ramp terminal slightly to the west requiring a matching shift of Bellows Street. This will require some right-of-way acquisition from the old hospital property. • Lane widening would require a westward shift of the SB on-ramp alignment and likely some embankment/retaining wall improvements.	• $$ - Primarily due roadway widening of the off-ramp and associated embankment/retaining wall at the base of Mt Nebo.
3. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp and a yield modification of the right-turn maneuver on the on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• The right-turn lane would require lane widening and some limited embankment/retaining wall improvements along the south side of Harvard Avenue. • The existing driveway to the pool company would likely need to be closed and new access provided via Umpqua Street.	• $ - Primarily due to right-turn lane construction and embankment/retaining wall improvements.
4. Realignment and widening of Bellows Street at Harvard Avenue to include a left-turn lane and shared through/right-turn lane. This improvement is associated with project #2.	• Match the shifting and widening of the SB looping off-ramp. • Add capacity to the intersection.	• Westward shift and widening of Bellows Street would require the acquisition of right-of-way from the old hospital site.	• $ - Primarily due to shifting of Bellows Street, the associated acquisition of right-of-way from the old hospital site, and signal modifications.

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
5. Widening of the northbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound).	• Increase the capacity of the ramp terminal and better manage existing and projected vehicle queue lengths (particularly during the weekday a.m. time period when school buses are accessing the ramp terminal).	• Widening would result in the through lane feeding Roseburg High School to be off-set through the intersection. • The off-ramp widening would likely require embankment/retaining wall improvements in order to avoid impacts to the adjacent paved recreational path.	• $$ - Primarily due to off-ramp widening, ramp terminal signal reconstruction, and the associated embankment/retaining wall improvements.
6. Restrict Corey Court to right-in/right-out movements with the installation of a raised median and intersection channelization treatments.	• Intersection is too close to the I-5 SB ramp terminal intersection. • Improved access management.	• The City of Roseburg does not typically restrict left-turn maneuvers to/from public streets unless there is a specific safety or operational concern. • Would likely necessitate the allowance of u-turn maneuvers at the Harvard Avenue/Madrone Street intersection.	• <$ - Raised median cost is relatively low.
7. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp and modification to the loop ramp that would increase the size of the radius.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Vertical and horizontal profile of the larger loop ramp radius.	• $ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
8. Construction of a westbound right-turn lane to the I-5 northbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• Would impact and require modifications to the high school parking area, circulation lanes, and sidewalk that fronts Harvard Avenue. Right-of-way acquisition is also needed from the high school.	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and modification to so Roseburg High School fence, sidewalk, and parking stalls/aisles.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT H9b
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-3

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Concept H10

Figure 5-4 shows the interchange and circulation design concept H10 as modified through a more refined sketch-level layout. Table 5-9 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-9 - Concept H10 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Lengthening of the southbound off-ramp deceleration lane along I-5.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$$ - Costly Bellows Street and Harvard Avenue overpass modifications.
2. Widening of the southbound off-ramp approach to Harvard Avenue to include a second left-turn lane.	• Increase capacity of the ramp terminal and better manage existing and projected vehicle queue lengths.	• Lane widening would shift the ramp terminal slightly to the west. • Lane widening would require a westward shift of the SB on-ramp alignment and likely some embankment/retaining wall improvements.	• $$ - Primarily due roadway widening of the off-ramp and associated embankment/retaining wall at the base of Mt Nebo.
3. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• The right-turn lane would require lane widening and some limited embankment/retaining wall improvements along the south side of Harvard Avenue. • The existing driveway to the pool company would likely need to be closed and new access provided via Umpqua Street.	• $ - Primarily due to right-turn lane construction and embankment/retaining wall improvements.
4. Elimination of the Bellows Street connection to Harvard Avenue.	• Addresses FHWA and ODOT policy of not allowing a local street connection opposite a freeway ramp terminal.	• Would require a new I-5 underpass along the Princeton Avenue corridor. • Places increased traffic demand on the Harvard Avenue/Roseburg High School and the Harvard Avenue/Umpqua Street intersections.	• $ - Pavement removal costs.
5. Princeton Avenue underpass connecting to Bellows Street	• Necessary to reconnect the neighborhood north of Roseburg High School due to the loss of the Bellows Street connection to Harvard Avenue.	• Underpass vertical clearance and profile. Will impact some existing driveways along the north and south sides of Princeton. • Eliminates some high school parking.	• $$$ - Challenging structural and retaining wall costs, maintenance of travel, and property impacts (along Princeton Avenue).
6. Widening of the northbound and southbound approaches to the Harvard Avenue/Umpqua Street intersection to include separate left-turn and through/right-turn lanes.	• Address intersection capacity needs.	• Would require right-of-way acquisition from adjacent properties on the east and west sides of Umpqua Street. • Widening would impact several existing structures and parking lots.	• $$$ - Costly right-of-way acquisition and associated private property parking/access modifications, signal reconstruction, and roadway widening.

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
7. Widening of the northbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound).	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Primarily due to off-ramp widening, ramp terminal signal reconstruction, and the associated embankment/retaining wall improvements.
8. Restrict Corey Court to right-in/right-out movements with the installation of a raised median and intersection channelization treatments.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• <$ - Raised median cost is relatively low.
9. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp and modification to the loop ramp that would increase the size of the radius.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
10. Construction of a westbound right-turn lane to the I-5 northbound on-ramp.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and modification to so Roseburg High School fence, sidewalk, and parking stalls/aisles.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT H10
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-4

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Concept H12

Figure 5-5 shows the interchange and circulation design concept H12 as modified through a more refined sketch-level layout. Table 5-10 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-10 - Concept H12 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Lengthening of the southbound off-ramp deceleration lane along I-5.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$$ - Costly Bellows Street and Harvard Avenue overpass modifications.
2. Widening of the southbound off-ramp approach to Harvard Avenue to include a second left-turn lane.	• Same as identified under Concept H10	• Same as identified under Concept H10	• $$ - Primarily due roadway widening of the off-ramp and associated embankment/retaining wall at the base of Mt Nebo.
3. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp.	• Same as identified under Concept H10	• Same as identified under Concept H10	• $ - Primarily due to right-turn lane construction and embankment/retaining wall improvements.
4. Elimination of the Bellows Street connection to Harvard Avenue.	• Same as identified under Concept H10	• Same as identified under Concept H10	• $ - Pavement removal costs.
5. Princeton Avenue underpass connecting to Bellows Street	• Same as identified under Concept H10	• Same as identified under Concept H10	• $$$ - Challenging structural and retaining wall costs, maintenance of travel, and property impacts (along Princeton Avenue).
6. Widening of the northbound and southbound approaches to the Harvard Avenue/Umpqua Street intersection to include separate left-turn and through/right-turn lanes.	• Same as identified under Concept H10	• Same as identified under Concept H10	• $$$ - Costly right-of-way acquisition and associated private property parking/access modifications, signal reconstruction, and roadway widening.
7. Widening of the northbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound).	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Primarily due to off-ramp widening, ramp terminal signal reconstruction, and the associated embankment/retaining wall improvements.
8. Restrict Corey Court to right-in/right-out movements with the installation of a raised median and intersection channelization treatments.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• <$ - Raised median cost is relatively low.

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
9. Elimination of the Roseburg High School approach at the I-5 NB/Harvard Avenue ramp terminal. Construction of new public access road to Princeton underpass.	• Addresses FHWA and ODOT policy of not allowing a local street connection opposite a freeway ramp terminal.	• Forces all Roseburg High School traffic to reroute to Madrone or Umpqua. • Requires a new public street through the high school parking area which displaces the majority of existing parking.	• $$$ - Primarily due to new public street connection through the high school parking area and development of new parking along Bellows Street.
10. Widening of the eastbound approach to Harvard Avenue/Madrone Street to include dual eastbound left-turn lanes.	• Dual eastbound turn lanes are needed to address capacity needs.	• Widening would require additional right-of-way along the north and south sides of Harvard Avenue, impacting existing businesses and structures.	• $$$ - Costly right-of-way acquisition and associated private property parking/access modifications, signal reconstruction, and roadway widening.
11. Widen Madrone Street to a four-lane cross section.	• Accommodate Roseburg High School traffic demand.	• Widening would require additional right-of-way along the east and west sides of Madrone Street, impacting existing businesses and structures. • Coupled with Project #10, this may require a complete purchase of the adjacent gas station.	• $$$ - Costly right-of-way acquisition and associated private property parking/access modifications, signal reconstruction, roadway widening, and overhead utility relocation.
12. New Roseburg High School connection to Madrone Street.	• Accommodate the loss of the school's existing direct access to Harvard Avenue.	• Widening would require additional right-of-way along the north and south sides of the new connection, impacting existing businesses and residences. • New roadway may impact residences/structures within the Laurelwood Historic District.	• $$$ - Costly right-of-way acquisition and associated roadway construction. May require complete purchase of the motel site.
13. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp and modification to the loop ramp that would increase the size of the radius.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
14. Construction of a westbound right-turn lane to the I-5 northbound on-ramp.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and modification to so Roseburg High School fence, sidewalk, and parking stalls/aisles.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT H12
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-5

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Concept H14

Figure 5-6 shows the interchange and circulation design concept H14 as modified through a more refined sketch-level layout. Table 5-11 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-11 - Concept H14 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Lengthening of the southbound off-ramp deceleration lane along I-5.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$$ - Costly Bellows Street and Harvard Avenue overpass modifications.
2. Widening of the southbound off-ramp approach to Harvard Avenue to include dual left-turn lanes, a single through lane (onto Bellows Avenue), and a separate right-turn lane.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Primarily due roadway widening of the off-ramp and associated embankment/retaining wall at the base of Mt Nebo.
3. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp and a yield modification of the right-turn maneuver on the on-ramp.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $ - Primarily due to right-turn lane construction and embankment/retaining wall improvements.
4. Widening of the northbound off-ramp to include dual left-turn lanes (onto Harvard Avenue westbound).	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $$ - Primarily due to off-ramp widening, ramp terminal signal reconstruction, and the associated embankment/retaining wall improvements.
5. Eliminate the northbound on-ramp.	• Move all freeway access to a single ramp terminal and eliminate the existing vehicle/bicycle interaction point at the northbound on-ramp from Harvard Avenue westbound.	• See projects #6 and #7 below.	• $ - pavement removal costs
6. Widen the I-5 NB/Harvard Avenue ramp terminal to include new dual westbound left-turn lanes on Harvard Avenue.	• Increase the capacity of the ramp terminal.	• Dual westbound left-turn lanes will likely require additional right-way along the north and south sides of Harvard Avenue.	• $$ - Primarily due to roadway widening, right-of-way acquisition, signal reconstruction.
7. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp and modification to the loop ramp that would increase the size of the radius.	• Same as identified under Concept H9b	• Same as identified under Concept H9b	• $ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
8. Widen the I-5 northbound looping on-ramp to accommodate a second lane.	• Accommodate the dual eastbound left-turn lanes.	• Vertical and horizontal profile of the larger loop ramp radius. • To eliminate the lane merge within the on-ramp curve, the on-ramp would need to be lengthened. This would likely require additional widening to the Harvard Avenue and Bellows Avenue overpass structures.	• $$$ - Costly loop ramp reconstruction/widening, Harvard Avenue and Bellows overpass widening, and on-ramp acceleration lengthening.
9. Restrict Corey Court to right-in/right-out movements with the installation of a raised median and intersection channelization treatments.	• Access restriction would be necessary with the inclusion of dual westbound left-turn lanes at the adjacent northbound ramp terminal intersection.	• Restriction Same as identified under Concept H9b	• <$ - Raised median cost is relatively low.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT H14
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-6

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Exit 124 (Harvard Avenue) Concept Operations Assessment

A future year 2035 traffic analysis was prepared for each concept to determine the operational impacts associated with the proposed interchange, intersection, and local circulation modifications. Figure 5-7 illustrates the assumed lane configurations and traffic control devices at each intersection for each of the four interchange concepts. To more clearly illustrate the shifting of traffic volumes related to the concept modifications, Figures 5-8 and 5-9 illustrate the assumed forecast 2035 weekday a.m. and p.m. peak hour traffic volumes and operations at the key study intersections. Table 12 provides a comparison of the resulting operations to the 2035 background traffic conditions. *Appendix "C" includes the Synchro operations worksheets.*

As shown in Table 5-12, the operations analysis resulted in the following key findings:

- Under concept H9b, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours, with the exception of the Harvard Ave/Umpqua Ave intersection during the weekday PM peak hour. The intersection operates worse than the no-build scenario, but within mobility targets.
- Under concept H10, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours, with the exception of the Harvard Ave/Umpqua Ave intersection during both the weekday AM and PM peak hours. The intersection operates worse than the no-build scenario, but within mobility targets.
- Under concept H12, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours, with the exception of the Harvard Ave/Umpqua Ave and Harvard Ave/Madronne St intersections during both the weekday AM and PM peak hours. The intersections operate worse than the no-build scenario, but within mobility targets.
- Under concept H14, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours.

In addition to the operations assessment, a 95th percentile queuing analysis was prepared for each of the study intersections under the different concepts.[1] Table 5-13 summarizes the resulting projected queues. As shown in the Table, the queuing analysis resulting in the following findings. The estimated queue lengths summarized in the Table are within the storage lengths allocated to the double-line sketches illustrated in Figures 5-3 through 5-6.

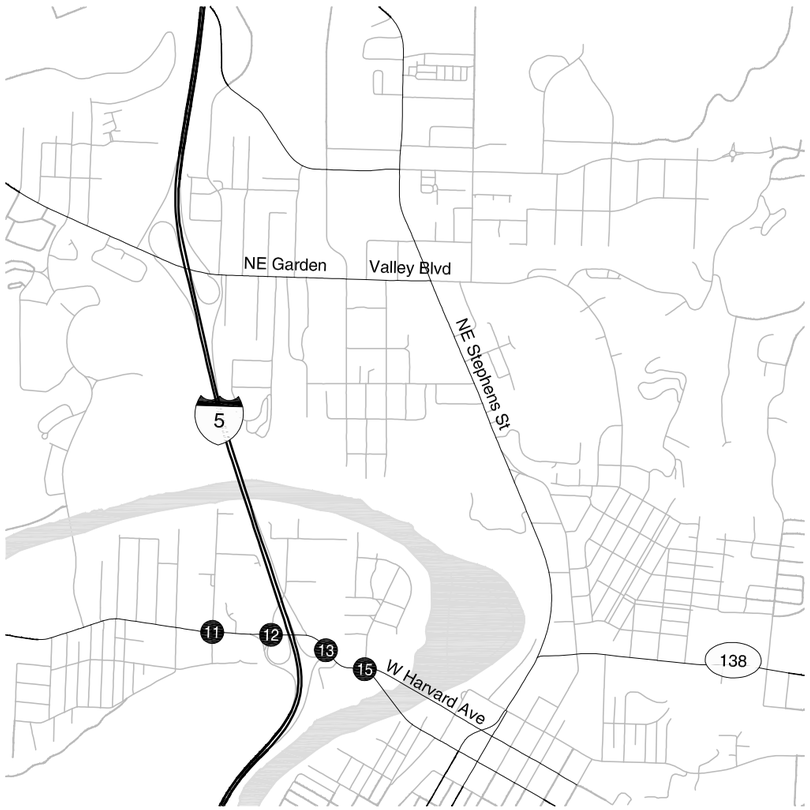
[1] The 95th percentile queuing estimated for each alternative was development using Synchro 8 software.

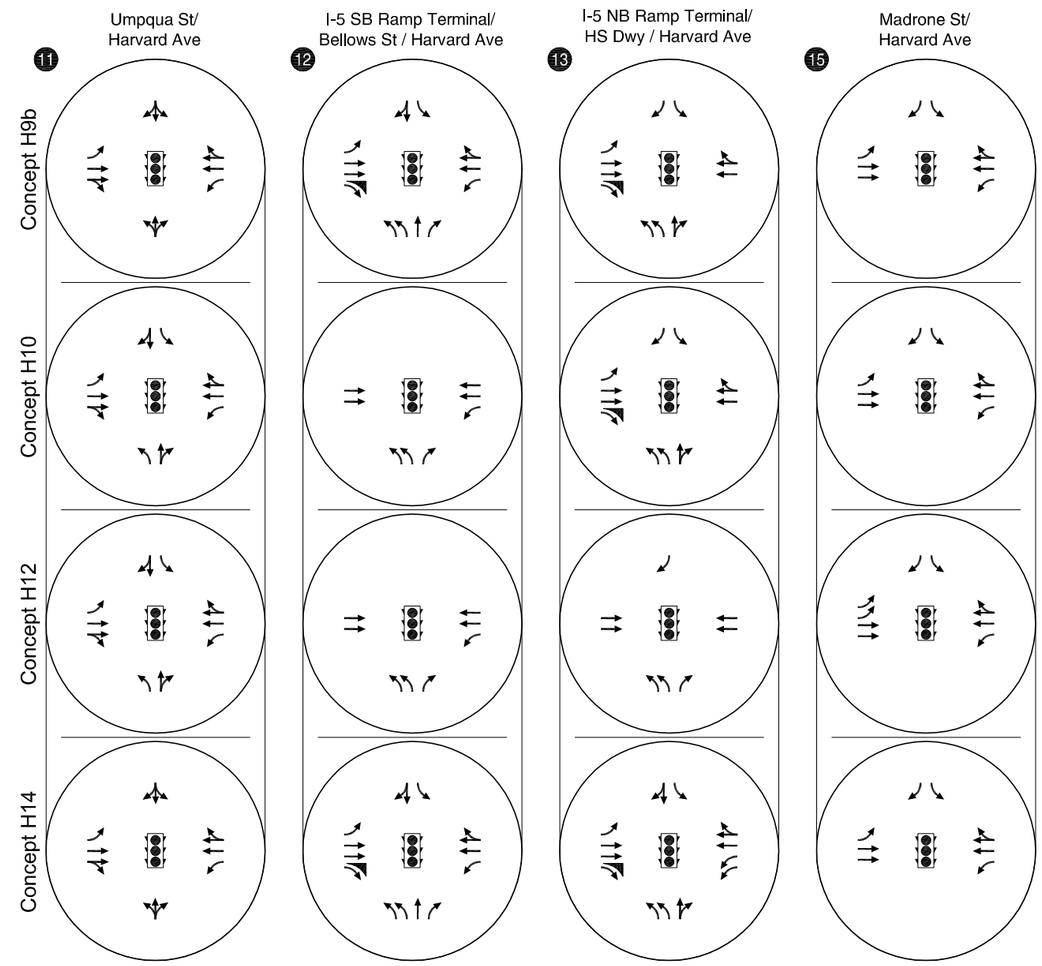
Table 5-12 – Exit 124 (Harvard Avenue) 2035 Study Intersection Operations Comparison

Intersection	2035 Background Traffic Conditions				2035 Build Conditions (Concept H9b)				2035 Build Conditions (Concept H10)				2035 Build Conditions (Concept H12)				2035 Build Conditions (Concept H14)			
	Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour	
	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
W Harvard Ave/ Umpqua St	B	0.53	C	0.82	A	0.53	C	0.84	B	0.72	C	0.90	B	0.72	D	0.88	B	0.52	C	0.82
I-5 SB Ramp Terminal/Harvard Ave/Bellows St	D	0.98	D	0.95	C	0.58	C	0.73	C	0.61	C	0.70	C	0.61	C	0.70	C	0.58	C	0.71
I-5 NB Ramp Terminal/ Harvard Ave	C	0.74	B	0.88	C	0.71	B	0.83	C	0.59	B	0.82	C	0.60	B	0.76	D	0.67	C	0.72
Harvard Ave/ Madrone St (OR 138)	A	0.50	B	0.68	B	0.50	B	0.68	A	0.50	B	0.68	B	0.60	B	0.75	A	0.50	B	0.68

Table 5-13: Harvard Ave 95th Percentile Queuing Estimate by Concept

Intersection	Approach	Movement	H9b		H10		H12		H14	
			AM	PM	AM	PM	AM	PM	AM	PM
Harvard Ave/Umpqua St	EB	Left	50	50	125	100	125	100	50	50
		Through	350	450	325	525	325	525	350	450
	WB	Left	25	50	50	50	50	50	25	50
		Through	375	600	575	750	575	750	375	600
	NB	Left/Through/Right	<25	50	<25*	50	<25*	50	<25	50
	SB	Left/Through/Right	50	250	125*	50	125*	50	50	50
Harvard Ave/Bellows St/I-5 SB Ramp Terminal	EB	Left	100	50	NA	NA	NA	NA	125	50
		Through	375	400	425	450	425	450	400	525
		Right	150	50	NA	NA	NA	NA	175	225
	WB	Left	150	250	150	250	150	250	175	250
		Through	275	325	175	225	175	225	225	175
	NB	Left	100	150	175	175	175	175	125	150
		Through	125	50	NA	NA	NA	NA	150	50
		Right	100	75	150	100	150	100	125	100
	SB	Left	50	<25	NA	NA	NA	NA	50	50
		Through/Right	50	100	NA	NA	NA	NA	50	50
Harvard Ave/I-5 NB Ramp Terminal	EB	Left	150	50	125	50	NA	NA	150	20
		Through	200	200	225	250	325	250	325	325
		Right	50	25	50	50	NA	NA	150	125
	WB	Through	400	775	275	900	300	600	225*	200*
	NB	Left	175	125	175	125	175	125	175	125
		Through/Right	150	100	175	100	175	325	150	<25
	SB	Left	75	50	75	50	NA	NA	75	50
		Right	50	<25	125	<25	125	<25	<25	<25
Harvard Ave/Madrone St	EB	Left	125	50	150	50	150	50	150	50
		Through	175	25	25	25	25	25	25	25
	WB	Through	300	675	325	675	350	675	325	675
	SB	Through	<25	<25	<25	<25	50	50	<25	<25
		Right	25	50	25	50	25	100	25	50





- TRAFFIC SIGNAL

Exit 124 (Harvard Ave) Concept Evaluation
Assumed Lane Configuations & Traffic Control Devices
Roseburg, Oregon

Figure
5-7

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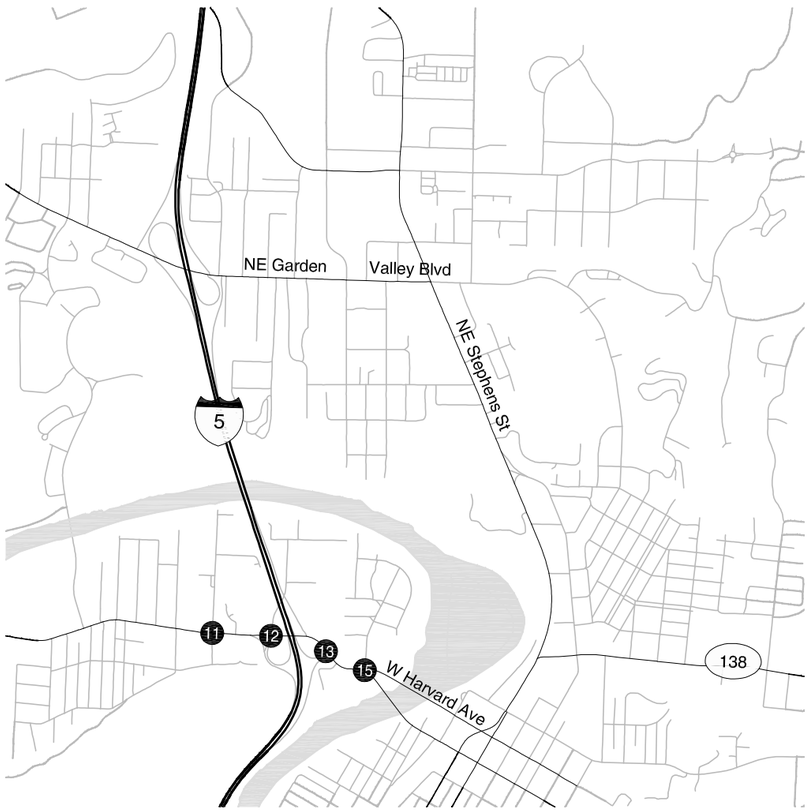

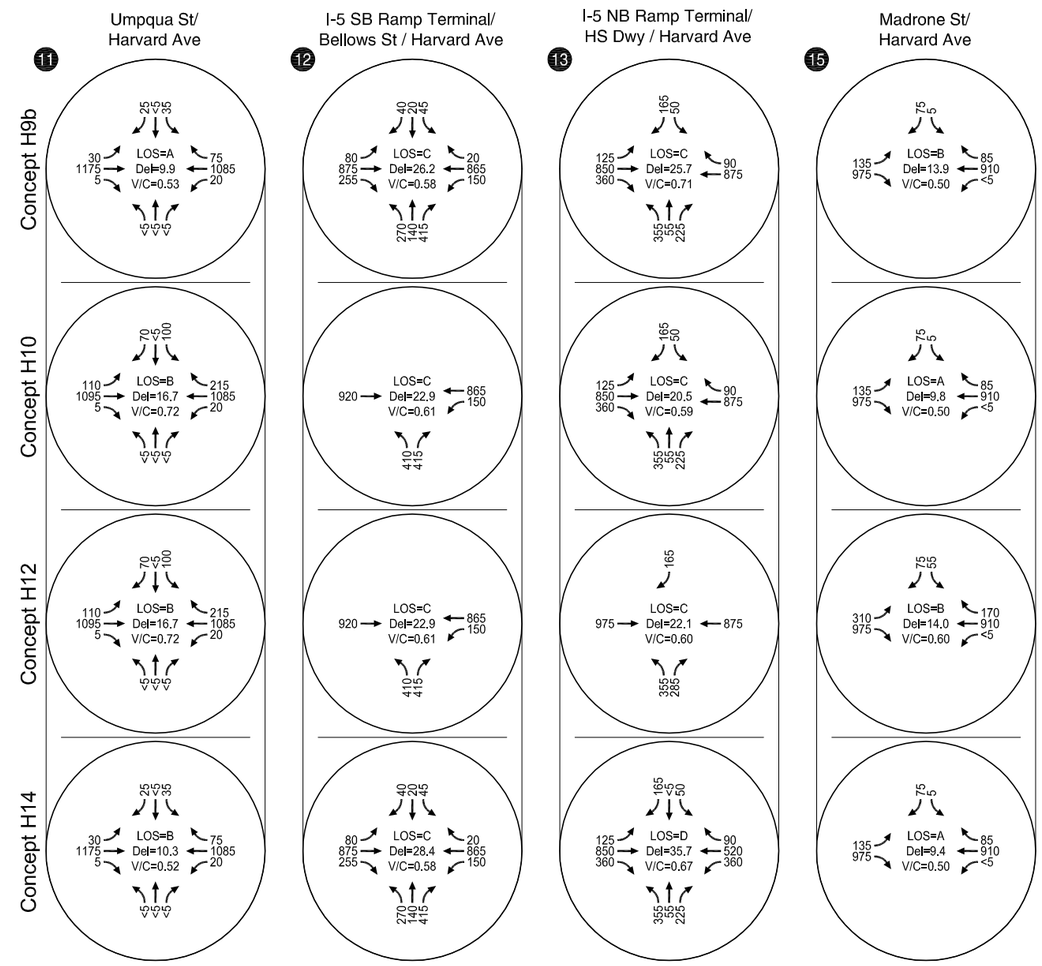

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (AWSC) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWC = TWO-WAY STOP CONTROL

Exit 124 (Harvard Ave) Concept Evaluation
Forecast 2035 Weekday AM Peak Period Traffic Conditions
Roseburg, Oregon

Figure
5-8

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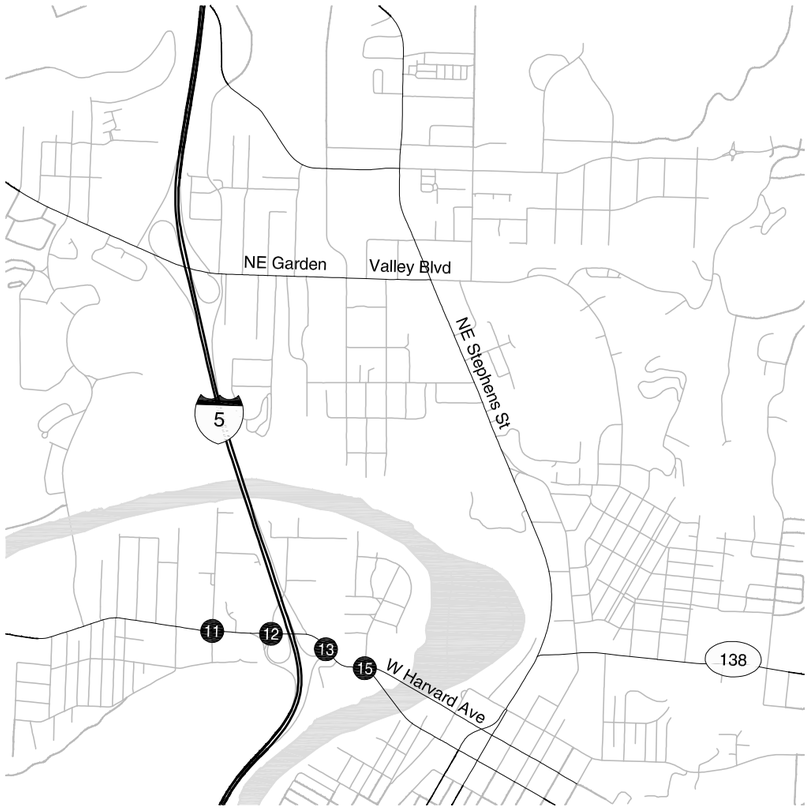

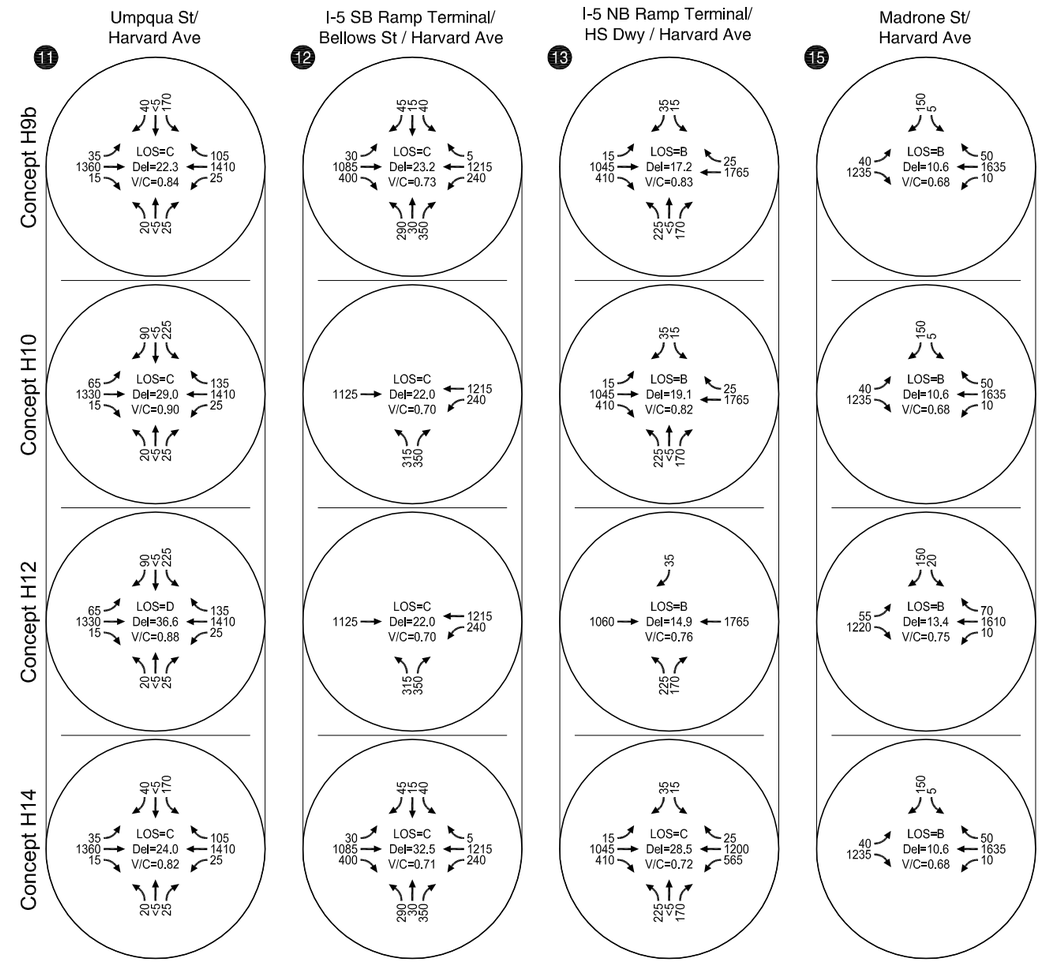

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (AWSC) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWC = TWO-WAY STOP CONTROL

Exit 124 (Harvard Ave) Concept Evaluations
Forecast 2035 Weekday PM Peak Period Traffic Conditions
Roseburg, Oregon

Figure
5-9

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Exit 124 (Harvard Avenue) Interchange Descriptions

Concept GV1

Figure 5-10 shows the interchange and circulation design concept GV1 as modified through a more refined sketch-level layout. Table 5-14 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-14 - Concept GV1 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Disconnect Mullholland Drive at Garden Valley Boulevard.	• Addresses FHWA and ODOT policy of not allowing a local street connection opposite a freeway ramp terminal. • Increase the capacity of the I-5 NB/Garden Valley Boulevard intersection.	• Would shift a significant amount of traffic to Airport Road and Fairmount Avenue, thereby requiring improvements at these intersections. • Shift in circulation patterns may be too dramatic and significant for local streets. • Would significantly impact accessibility to existing motel, restaurant, and other freeway oriented businesses along Mulholland Drive.	• $ - Limited costs to close the connection.
2. Align Fairmount Avenue and Highland Street at Garden Valley Parkway and signalize the intersection.	• Provides a north-south alternative west of the railroad tracks that would help offset the impact of losing the Mulholland Street connection. • Addresses negatively offset intersections.	• Would require a significant amount of right-of-way in the northwest and southeast quadrants of the Garden Valley Parkway/Fairmount Avenue/Highland Street intersection. • May require complete property purchase in order to obtain sufficient right-of-way for the Highland/Fairmount realignment.	• $$$ - Costly right-of-way acquisition, roadway construction, and signal installation.
3. Construction of a new east-west local circulation road between Eden Street and Fairmount Avenue	• Provides a long-term access for properties that front the north side of Garden Valley Boulevard, thereby allowing long-term access management along this section of Garden Valley Boulevard.	• No right-of-way exists for such an alignment. Would impact upwards of 8 different properties and multiple existing structures.	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.
4. Construction of a new east-west local circulation road between Ellan Street and Highland Avenue.	• Provides a connection between Ellan Street and Highland Street, thereby allowing long-term access management along Garden Valley Boulevard.	• No right-of-way exists for such an alignment. Would impact two properties and at least one residence.	• $$$ - Costly right-of-way acquisition and roadway construction costs.

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
5. Widening of the northbound off-ramp approach to Garden Valley Boulevard to include dual left-turn lanes and dual right-turn lanes.	• Increase capacity of the ramp terminal and better manage existing and projected vehicle queue lengths on the off-ramp.	• Would require widening and embankment/retaining wall improvements along the east side of the off-ramp. • Vertical curve challenges within the intersection due to adjacent Garden Valley overpass. • Maintenance of traffic would be difficult during construction.	• $$$ - Costly embankment/retaining wall challenges along the off-ramp, likely vertical profile reconstruction through the intersection (along Garden Valley Boulevard).
6. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Would require embankment/retaining wall improvements. • Would likely require a lengthening of the already short acceleration lane/merge area to I-5 northbound.	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.
7. Construction of a westbound right-turn lane on Garden Valley Boulevard to a realigned I-5 northbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• Would require a new/redesigned on-ramp. • Would likely require a lengthening of the already short acceleration lane/merge area to I-5 northbound.	• $$$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.
8. Construction of a westbound right-turn lane to the I-5 southbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Would require embankment/retaining wall improvements.	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
9. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Would require embankment/retaining wall improvements.	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
10. Construction of a westbound right-turn lane at the Garden Valley Boulevard/Garden Valley Shopping Center intersection	• Accommodate right-turn access into the shopping center and improve traffic flow along Garden Valley Boulevard westbound.	• Would require elimination of the existing right-in/right-out driveway to the Garden Valley Boulevard shopping center.	• $ - Construction costs include lane widening, curb/sidewalk reconstruction, and elimination of existing right-in/right-out driveway.
11. Widening the northbound and southbound approaches to the Garden Valley Boulevard/BLM/Garden Valley Shopping Center intersection.	• Increase the capacity of the intersection.	• Would require some right-of-way and a reconfiguration of driveway access and internal circulation to adjacent businesses. • Would have a significant impact to adjacent gas station and coffee kiosk access.	• $$$ - Costly right-of-way acquisition, roadway widening, and signal reconstruction.
12. Extend Black Avenue from Crouch Street to Goetz Street.	• Improved local east-west circulation along the north side of Garden Valley Boulevard.	• Would require right-of-way from at least three existing properties.	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT GV1
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-10

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TRANSPORTATION ENGINEERING/PLANNING

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Concept GV2

Figure 5-11 shows the interchange and circulation design concept GV2 as modified through a more refined sketch-level layout. Table 5-15 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-15 - Concept GV2 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Reduction of Mullholland Drive at Garden Valley Boulevard to one-way northbound traffic.	• Increase the capacity of the I-5 NB/Garden Valley Boulevard intersection.	• Would shift a significant amount of traffic to Airport Road and Fairmount Avenue, thereby requiring improvements at these intersections. • Shift in circulation patterns may be too dramatic and significant for local streets. • Would not completely address FHWA and ODOT policy of having a local street opposite a freeway ramp terminal.	• $ - Limited costs to partially close the intersection.
2. Align Fairmount Avenue and Highland Street at Garden Valley Parkway and signalize the intersection.	• Provides a north-south alternative west of the railroad tracks. • Addresses negatively offset intersections.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, roadway construction, and signal installation.
3. Construction of a new east-west local circulation road between Mulholland Drive and Fairmount Avenue.	• Provides a long-term access for properties that front the north side of Garden Valley Boulevard, thereby allowing long-term access management along this section of Garden Valley Boulevard.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.
4. Construction of a new east-west local circulation road between Ellan Street and Highland Avenue.	• Provides a connection between Ellan Street and Highland Street, thereby allowing long-term access management along Garden Valley Boulevard.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition and roadway construction costs.
5. Widening of the northbound off-ramp approach to Garden Valley Boulevard to include dual left-turn lanes.	• Increase capacity of the ramp terminal and better manage existing and projected vehicle queue lengths.	• Same as identified under Concept GV1	• $$$ - Costly embankment/retaining wall challenges along the off-ramp, likely vertical profile reconstruction through the intersection (along Garden Valley Boulevard).
6. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.

7. Construction of a westbound right-turn lane on Garden Valley Boulevard to a realigned I-5 northbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• Same as identified under Concept GV1	• $$$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.
8. Construction of a westbound right-turn lane to the I-5 southbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
9. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
10. Limit the existing right-in/right-out driveway to the Garden Valley shopping center to right-in only.	• Eliminate some mid-block access to Garden Valley Boulevard, thereby improving traffic flow along Garden Valley Boulevard westbound.	• No known design challenges. • Would shift some egress traffic to adjacent signalized access.	• $ - Construction costs include reconstruction of existing right-in/right-out driveway.
11. Widening the northbound and southbound approaches to the Garden Valley Boulevard/BLM/Garden Valley Shopping Center intersection.	• Increase the capacity of the intersection.	• Same ad identified under Concept GV1	• $$$ - Costly right-of-way acquisition, roadway widening, and signal reconstruction.
12. Extend Black Avenue from Crouch Street to Goetz Street.	• Improved local east-west circulation along the north side of Garden Valley Boulevard.	• Same ad identified under Concept GV1	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT GV2
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-11

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Concept GV10

Figure 5-10 shows the interchange and circulation design concept GV10 as modified through a more refined sketch-level layout. Table 5-16 provides a detailed outline of the various modifications, the reasoning behind the modifications, and the likely design challenges of each modification.

Table 5-16 - Concept GV10 Modification Details

Proposed Modifications	Reason for Proposed Modification	Design Challenges	Cost[1]
1. Align Fairmount Avenue and Highland Street at Garden Valley Parkway and signalize the intersection.	• Provides a north-south alternative west of the railroad tracks. • Addresses negatively offset intersections.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, roadway construction, and signal installation.
2. Construction of a new east-west local circulation road between Mulholland Drive and Fairmount Avenue.	• Provides a long-term access for properties that front the north side of Garden Valley Boulevard, thereby allowing long-term access management along this section of Garden Valley Boulevard.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.
3. Widening of the northbound off-ramp approach to Garden Valley Boulevard to include dual left-turn lanes.	• Increase capacity of the ramp terminal and better manage existing and projected vehicle queue lengths.	• Same as identified under Concept GV1	• $$$ - Costly embankment/retaining wall challenges along the off-ramp, likely vertical profile reconstruction through the intersection (along Garden Valley Boulevard).
4. Construction of an eastbound right-turn lane to the I-5 northbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$$ - Costly embankment/retaining wall challenges along the off-ramp, likely vertical profile reconstruction through the intersection (along Garden Valley Boulevard).
5. Construction of a westbound right-turn lane on Garden Valley Boulevard to a realigned I-5 northbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane.	• Same as identified under Concept GV1	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.
6. Construction of a westbound right-turn lane to the I-5 southbound looping on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$$ - Construction costs include lane widening, curb and sidewalk reconstruction, some embankment/retaining wall improvements, and acceleration/merge area lengthening.

7. Construction of an eastbound right-turn lane to the I-5 southbound on-ramp.	• Improved pedestrian and bicyclist safety. Eliminates the existing free-flow right-turn movement across the adjacent bike lane and crosswalk.	• Same as identified under Concept GV1	• $$ - Construction costs include lane widening, curb and sidewalk reconstruction, and some embankment/retaining wall improvements.
8. Construction of a westbound right-turn lane at the Garden Valley Boulevard/Garden Valley Shopping Center intersection	• Accommodate right-turn access into the shopping center and improve traffic flow along Garden Valley Boulevard westbound.	• Same as identified under Concept GV1	• $ - Construction costs include lane widening, curb/sidewalk reconstruction, and elimination of existing right-in/right-out driveway.
9. Widening the northbound and southbound approaches to the Garden Valley Boulevard/BLM/Garden Valley Shopping Center intersection.	• Increase the capacity of the intersection.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, roadway widening, and signal reconstruction.
10. Extend Black Avenue from Crouch Street to Goetz Street.	• Improved local east-west circulation along the north side of Garden Valley Boulevard.	• Same as identified under Concept GV1	• $$$ - Costly right-of-way acquisition, business relocation, and roadway construction.

[1] Planning Level Construction Cost Estimates
$ - $100k - $0.5M
$$ - $0.5M - $1.0M
$$$ - >$1.0M

SCALE

0 300 600

CONCEPT GV10
REFINED DOUBLE-LINE SKETCH
ROSEBURG, OREGON

FIGURE
5-12

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Exit 125 (Garden Valley Boulevard) Concept Operations Assessment

A future year 2035 traffic analysis was prepared for each concept to determine the operational impacts associated with the proposed interchange, intersection, and local circulation modifications. Figure 5-13 illustrates the assumed lane configurations and traffic control devices at each intersection for each of the four interchange concepts. To more clearly illustrate the shifting of traffic volumes related to the concept modifications, Figures 5-14 and 5-15 illustrate the assumed forecast 2035 weekday a.m. and p.m. peak hour traffic volumes and operations at the key study intersections. Table 16 provides a comparison of the resulting operations to the 2035 background traffic conditions. *Appendix "C" includes the Synchro operations worksheets.*

As shown in Table 5-17, the operations analysis resulted in the following key findings:

- Under concept GV1, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours.
- Under concept GV2, all intersections operate within the mobility targets and better than the no-build scenario during both the weekday AM and PM peak hours.
- Under concept GV10, all intersections operate better than the no-build scenario during both the weekday AM and PM peak hours. However, the Mulholland Dr/I-5 NB Ramp Terminal/NW Garden Valley Blvd intersection is almost over capacity during the weekday PM peak hour (v/c = 0.97).

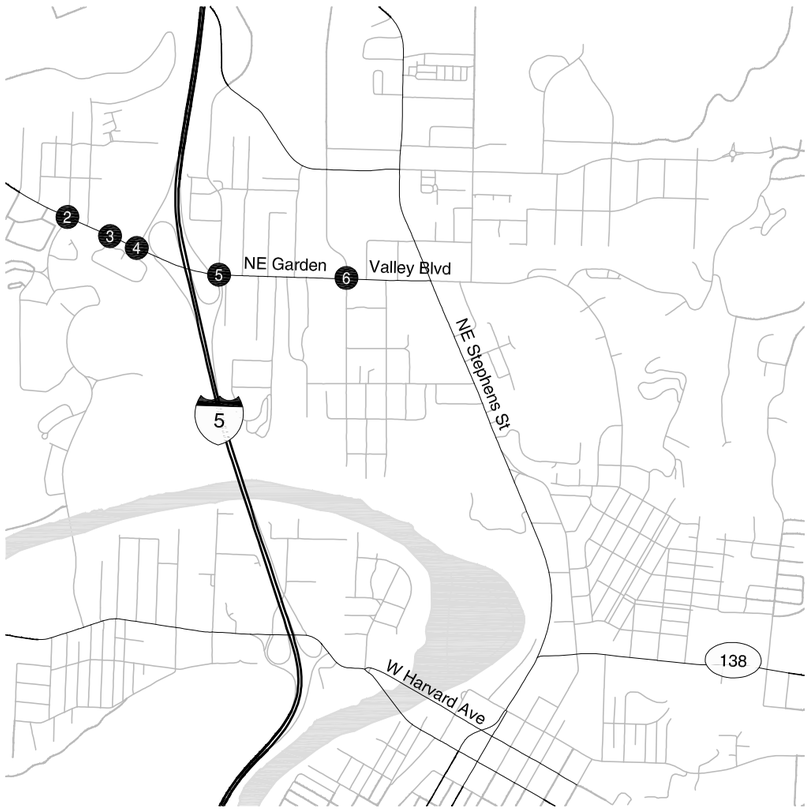
In addition to the operations assessment, a 95th percentile queuing analysis was prepared for each of the study intersections under the different concepts. Table 5-18 summarizes the resulting projected queues. The estimated queue lengths summarized in the Table are within the storage lengths allocated to the double-line sketches illustrated in Figures 5-9 through 5-11, with the exception of the westbound left turn movement at the NW Garden Valley Blvd/Estelle St intersection. The westbound left-turn movement is over 400 feet during the weekday AM peak hour, under all concepts. As shown in Figures 5-14 and 5-15, over 300 vehicles are estimated to make the left-turn movement. The long projected queue could be mitigated a number of ways, including employer-driven transportation demand management strategies and improved internal connectivity between the VA facility and the BLM access. A dual-left turn lane would also accommodate the left-turning volume; however, coordination with the VA facility would be needed to accommodate the right-of-way needs.

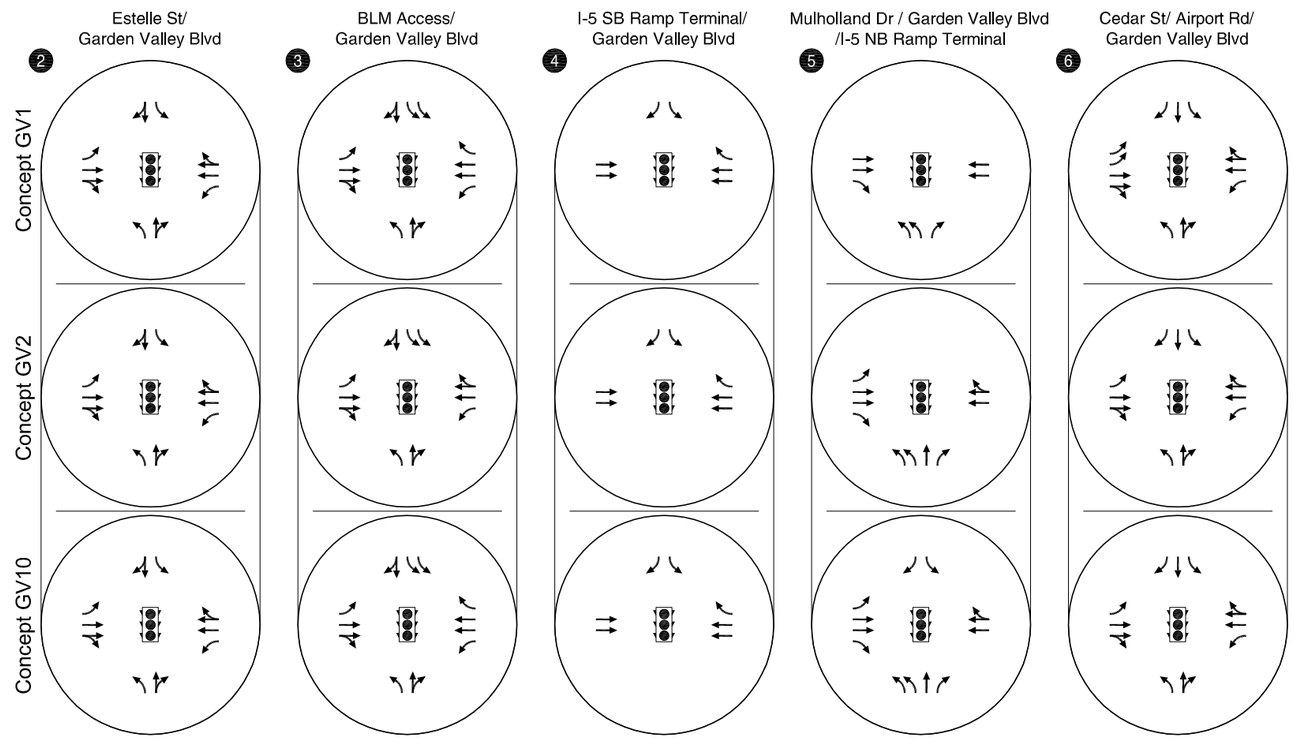
Table 17 - Exit 125 (Garden Valley Boulevard) 2035 Study Intersection Operations Comparison

Intersection	2035 Background Traffic Conditions				2035 Build Conditions (Concept GV1)				2035 Build Conditions (Concept GV2)				2035 Build Conditions (Concept GV10)			
	Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour		Weekday AM Peak Hour		Weekday PM Peak Hour	
	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
NW Garden Valley Blvd/ Estelle St	D	0.71	C	0.86	C	0.70	C	0.82	C	0.70	C	0.82	C	0.70	C	0.82
NW Garden Valley Blvd/ BLM Access	B	0.51	C	0.98	B	0.44	C	0.80	B	0.46	C	0.82	B	0.46	C	0.82
I-5 SB Ramp Terminal/ NW Garden Valley Blvd	A	0.50	A	0.79	B	0.49	B	0.78	A	0.49	B	0.78	A	0.49	B	0.79
Mulholland Dr/ I-5 NB Ramp Terminal/ NW Garden Valley Blvd	D	0.87	D	0.99	C	0.81	C	0.89	C	0.58	C	0.83	C	0.60	D	0.97
Cedar St NW/NE Airport Rd/Garden Valley Blvd/	D	0.71	C	0.86	C	0.50	D	0.80	C	0.47	C	0.77	C	0.48	C	0.72

Table 5-18: Garden Valley Blvd 95th Percentile Queuing Estimate by Alternative

Intersection	Approach	Movement	GV1		GV2		GV10	
			AM	PM	AM	PM	AM	PM
Garden Valley Blvd/Estelle St	Eastbound	Left	50	75	50	75	50	75
		Through	550	725	550	725	550	725
	Westbound	Left	400	125	425	125	425	125
		Through	175	575	<25	575	<25	575
	Southbound	Left	50	25	25	25	25	25
		Through/Right	<25	<25	<25	<25	<25	<25
	Northbound	Left	25	175	50	175	50	175
		Through/Right	<25	150	<25	150	<25	150
Garden Valley Blvd/BLM Access	Eastbound	Left	100	350	100	350	100	325
		Through	275	550	25	550	<25	525
	Westbound	Left	50	<25	50	<25	50	<25
		Through	325	650	200	650	225	625
		Through/Right	25*	100*	NA	NA	50	75
	Southbound	Left	75	225	75	225	75	200
		Through/Right	<25	75	<25	75	<25	75
	Northbound	Left	25	50	<25	50	25	50
		Through/Right	25	50	<25	50	25	25
Garden Valley Blvd/I-5 SB Ramp Terminal	Eastbound	Through	200	75	50	75	50	300
	Westbound	Right	<25	25	<25	25	<25	50
		Through	175	225	275	225	275	475
	Southbound	Left	200	175	175	175	175	150
		Right	100	200	100	200	100	175
Garden Valley Blvd/ Mulholland Dr/I-5 NB Ramp-Terminal	Eastbound	Left	NA	NA	75	NA	100	150
		Through	250	325	175	325	250	275
		Right	50	75	50	75	75	25
	Westbound	Through	325	600	300	575	325	675
	Southbound	Left	NA	NA	NA	NA	50	75
		Right	NA	NA	NA	NA	50	300
	Northbound	Left	125	200	200	200	200	325
		Through/Right	650	575	300	575	300	300

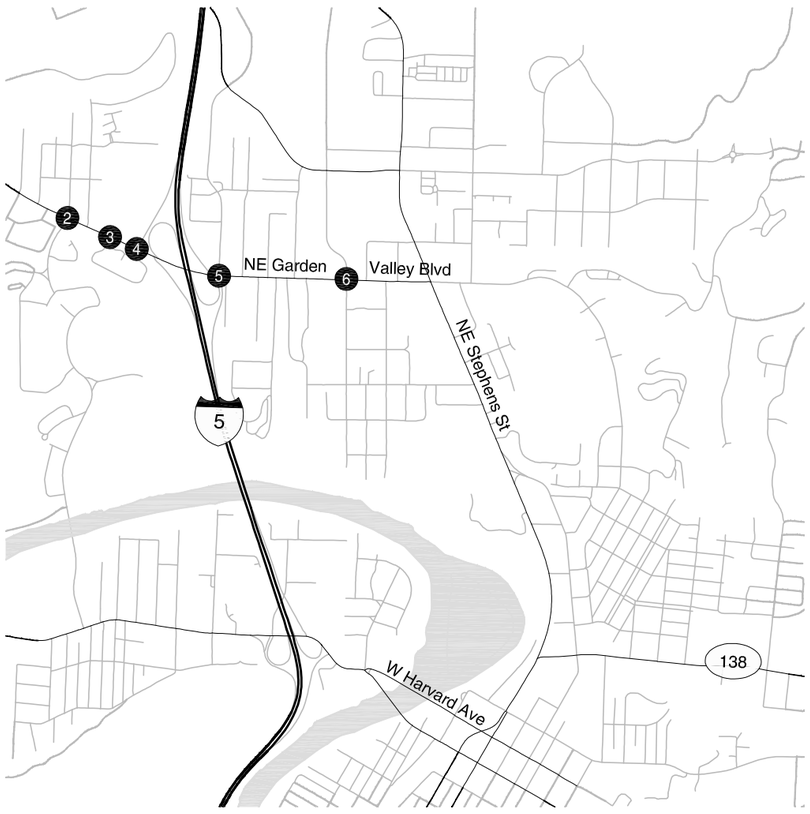


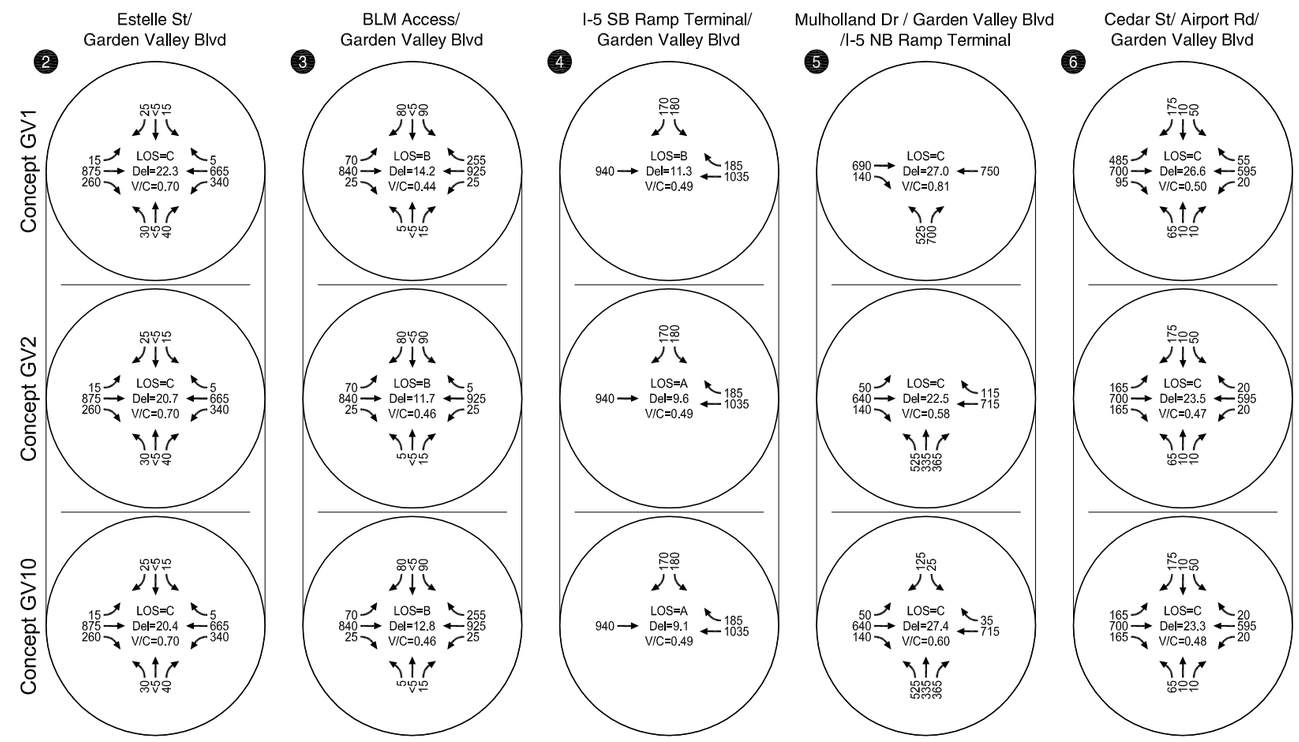


- TRAFFIC SIGNAL

Exit 125 (Garden Valleu Blvd) Concept Evaluation
Assumed Lane Configurations & Traffic Control Devices
Roseburg, Oregon

Figure
5-13

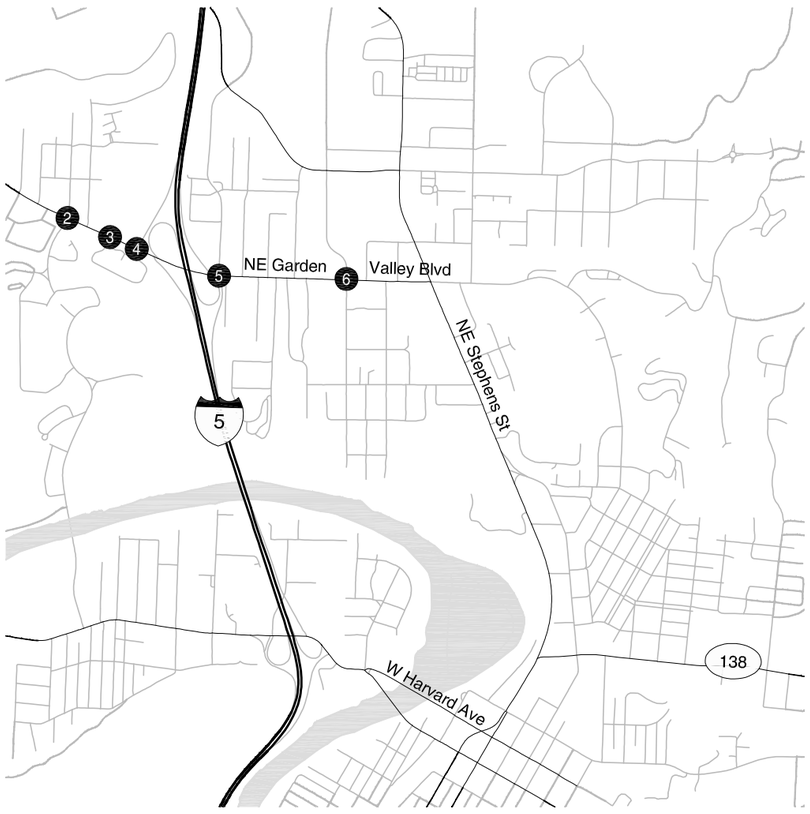


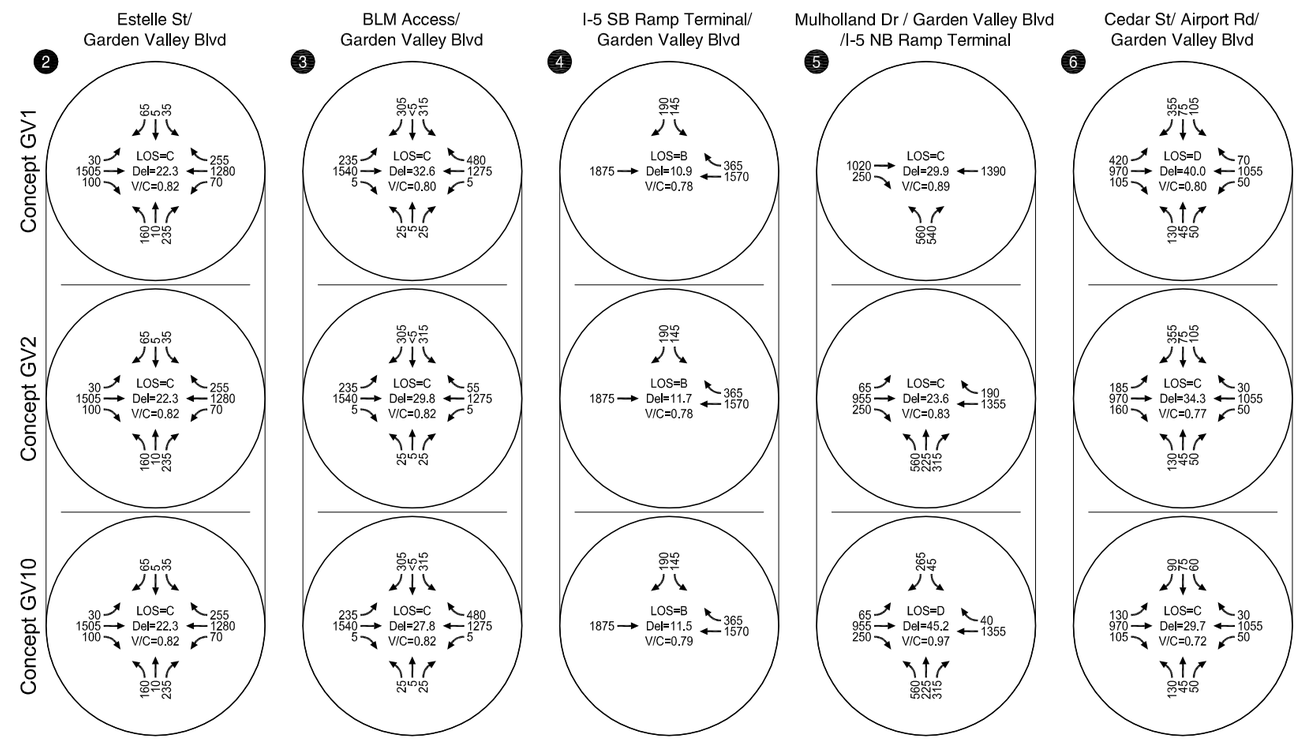


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (AWSC) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWC = TWO-WAY STOP CONTROL

Exit 125 (Garden Valley Blvd) Concept Evaluation
Forecast 2035 Weekday AM Peak Period Traffic Conditions
Roseburg, Oregon

Figure
5-14





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TWC = TWO-WAY STOP CONTROL

Exit 125 (Garden Valley Blvd) Concept Evaluation
Forecast 2035 Weekday PM Peak Period Traffic Conditions
Roseburg, Oregon

Figure
5-15

Crash Modification Factor Analysis

The following section provides a planning-level analysis of each alternative that indicates the relative safety benefits associated with the proposed changes in geometry and traffic control. The alternatives are generally expected to reduce crashes at intersections and through reducing the number of driveways along corridor segments.

The potential to reduce crash frequency and/or severity is determined from Crash Modification Factors (CMF) from the Federal Highway Administration (FHWA) CMF Clearinghouse[2] and ODOT's All Roads Transportation Safety (ARTS) CMF list.

A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. CMFs have been developed for a variety of countermeasures through decades of safety research; however, CMFs are not available for all countermeasures. Therefore, this analysis only applies to changes in the existing roadway that have been proven to influence crash frequency or severity. Ultimately, CMFs indicate the expected crash reduction potential of countermeasures (i.e., a CMF less than 1.0 indicates a crash reduction potential were the countermeasure implemented).

The ODOT ARTS approved CMF list is intended to provide consistency among projects; it does not prohibit other countermeasures and CMFs from being evaluated. The supporting information provides details about the area(s) a CMF applies to, applicable crash type(s), applicable severity type(s), standard error (if available), and a star rating. The star rating system is managed by the FHWA and denotes the CMF's quality on a one-to-five scale, where five indicates the highest or most reliable rating. CMFs with the highest star ratings were prioritized for use in this analysis, when possible. CMFs with lower star-ratings were used for several countermeasures where no other information was available. These lower-rated CMFs are generally more indicative of a crash reduction trend and should not be heavily relied on for specific crash reduction approximation.

Intersection Improvements

Table 5-19 and Table 5-20 document the countermeasures and associated CMFs by alternative and intersection.

[2] The FHWA CMF Clearinghouse is maintained by the University of North Carolina Highway Safety Research Center at the following web address: http://www.cmfclearinghouse.org/.

Table 5-19: Garden Valley Blvd Alternatives

Intersection	Countermeasure	Crash Modification Factor (CMF)	Confidence Interval (95th Percentile)	Crash Type Reduction
Alternative GV1				
Estelle Street/Garden Valley Blvd	-	-	-	-
BLM Access/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 SB Ramp Terminal/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 NB Ramp Terminal/Garden Valley Blvd	• Right Turn Lane on Single Major Road Approach at Signalized Intersection • Convert Four Leg intersection into three leg intersection	0.91; 0.75	(0.83 to 0.99); (0.67 to 0.83)	All
Cedar Street-Airport Road/Garden Valley Blvd	-	-	-	-
Alternative GV2				
Estelle Street/Garden Valley Blvd	-	-	-	-
BLM Access/Garden Valley Blvd	-	-	-	-
I-5 SB Ramp Terminal/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 NB Ramp Terminal/Garden Valley Blvd	• Right Turn Lane on Single Major Road Approach at Signalized Intersection • Convert Four Leg intersection into three leg intersection	0.91; 0.75	(0.83 to 0.99); (0.67 to 0.83)	All
Cedar Street-Airport Road/Garden Valley Blvd	-	-	-	-
Alternative GV10				
Estelle Street/Garden Valley Blvd	-	-	-	-
BLM Access/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 SB Ramp Terminal/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 NB Ramp Terminal/Garden Valley Blvd	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
Cedar Street-Airport Road/Garden Valley Blvd	-	-	-	-

Table 5-20 Harvard Ave Alternatives

Intersection	Countermeasure	Crash Modification Factor (CMF)	95th Percentile	Crash Type Reduction
Alternative H9b				
Umpqua Street/Harvard Avenue	-	-	-	-
I-5 SB Ramp Terminal/Harvard Avenue	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 NB Ramp Terminal/Harvard Avenue	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
Madrone Street/Harvard Avenue	-	-	-	-
Alternative H10				
Umpqua Street/Harvard Avenue	-	-	-	-
I-5 SB Ramp Terminal/Harvard Avenue	Convert Four Leg intersection into three leg intersection	0.75	(0.67 to 0.83)	All
I-5 NB Ramp Terminal/Harvard Avenue	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
Madrone Street/Harvard Avenue	-	-	-	-
Alternative H12				
Umpqua Street/Harvard Avenue	-	-	-	-
I-5 SB Ramp Terminal/Harvard Avenue	Convert Four Leg intersection into three leg intersection	0.75	(0.67 to 0.83)	All
I-5 NB Ramp Terminal/Harvard Avenue	• Right Turn Lane on Single Major Road Approach at Signalized Intersection • Convert Four Leg intersection into three leg intersection	0.91; 0.75	(0.83 to 0.99); (0.67 to 0.83)	All
Madrone Street/Harvard Avenue	-	-	-	-
Alternative H14				
Umpqua Street/Harvard Avenue	-	-	-	-
I-5 SB Ramp Terminal/Harvard Avenue	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
I-5 NB Ramp Terminal/Harvard Avenue	Right Turn Lane on Single Major Road Approach at Signalized Intersection	0.91	(0.83 to 0.99)	All
Madrone Street/Harvard Avenue	-	-	-	-

Access Management

KAI inventoried the total number of access points, both public and private, in the System Inventory Technical Memorandum. The following CMF analysis, shown in Table 5-21, applies the CMF to each alternative based on the number of access points per mile in existing and proposed conditions.

Table 5-21 Access Management CMF Analysis

Alternative	Existing[1]	Proposed[2]	CMF
Garden Valley Blvd			
GV1	59	13	49.5%
GV2	59	13	49.5%
GV10	59	16	51.6%
Harvard Ave			
H9b	55	13	52.6%
H10	55	11	50.6%
H12	55	8	48.6%
H14	55	13	52.6%

[1] The number of existing access points as documented in the System Inventory Technical Memorandum, estimated per mile.

[2] The number of proposed access points, estimated per mile.

Appendix A Initial Concept Feedback

MEMORANDUM

DATE: July 31, 2015

TO: Tom Guevara, ODOT

FROM: Nikki Messenger, City of Roseburg

SUBJECT: IAMP 124/125 Concepts

EXIT 124 CONCEPTS

As a general comment, it is difficult to consider some of the options listed with no corresponding data related to how the proposals impact the performance of each of the facilities. This is especially true when you look at concepts such as closing Bellows or moving the main entrance of the high school off of Harvard. Without data to addressing queuing and capacity, there is little to go on other than intuition. I am assuming one of the next steps will be to perform analysis on some of the concepts brought forth.

<u>Concept H9b</u>

- Restrict Corey Court to right-in/right-out only. The City does not currently restrict left turning access to public streets. If the City were to consider this measure, we would need additional information on the proposed u-turn movement at Harvard/Madrone. I am surprised that the volume of left turning traffic into and out of Corey Court would be high enough to make a significant impact to Harvard or the interchange. It seems as if the volume into adjoining businesses would be much higher and no changes are proposed those accesses. (This comment applies to all of the concepts that include a turn median at Corey Court).

<u>Concept H10</u>

- I do not believe the elimination of the Bellows Street connection to Harvard is a viable option given the proposed development of the vacant site west of Bellows. This change (as shown) would push all of that site traffic to the Harvard/Umpqua intersection.
- I believe even with the Bellows connection in place, there is value to adding the Princeton Avenue connection to the east side of the freeway. This would probably require some related widening and improvements to Umpqua Street north of Harvard. The consultant may want to look at closing Bellows at the freeway and providing access to the high school at Princeton. (Although the out of direction travel from SB I-5 may encourage more vehicles to use the main high school entrance).

<u>Concept H12</u>

- As previously stated – opposed to complete closure of Bellows connection at Harvard.
- As previously stated, even with Bellows connection there may be value to Princeton connection to east side of freeway.
- Eliminating the RHS approach at NB I-5/Harvard – in my mind this is moving the problem and creates its own issues.
    - This option has significant impacts Madrone intersection. A detailed analysis of the EB queuing would need to be performed. (Median at Corey Court may exacerbate this issue).

- The new entrance from Madrone to RHS appears to impact properties within a registered historic district.
- Widening of Harvard & Madrone in this area may require acquisition of businesses that would have to be relocated.
- The Laurelwood neighborhood off of Madrone Street is a historic district and is a politically and community active neighborhood.

Concept H14

- The merging of traffic on the NB off ramp and then a second merge with the I-5 traffic seems problematic. The merging on the ramp appears to happen within a curve.
- This may start to make more sense if you consider widening the structures over Harvard and Bellows to include an additional NB lane thus extending the merge distance and providing better connectivity to the existing third NB lane north of the Bellows structure.

EXIT 125 CONCEPTS

I have the same comments as above regarding analysis of queuing and capacity. One thing that I do not see in any of the options that I think should be included as a suggested improvement is an internal connection between the BLM property and the VA property. This may help with capacity at the Estelle Street intersection. I also believe that any solution at the NB I-5 off-ramp should involve addressing the vertical curve/cross slope/sight distance issues at this intersection. All of these concepts include signalizing the realigned intersection at Fairmount/Highland and Garden Valley. Additional analysis of Garden Valley would be needed to support a signal so close to the Airport Road signalized intersection. As discussed during the 7/24 conference call, we need to continue to look for opportunities for an additional east-west connection that does not have I-5 access to relieve traffic around both of these interchanges.

Concept GV1

- I do not believe that eliminating the Mulholland connection to Garden Valley is an option. Re-routing commercial traffic through local substandard streets is not an option. We have had pre-application meetings with the owner of the Windmill Inn and adjacent vacant property to the north. We expect a redevelopment application within the next couple of years.
- Third bullet point – should be between **Eden** and Fairmount
- Dual left turns NB I-5 to WB Garden Valley - will the existing cross slope allow this movement? Would you be proposing to reconstruct to lessen the cross slope? I think any solution to this particular intersection may have to involve the vertical curve issues around the NB off-ramp and Mulholland.

Concept GV2

- I do not believe we will be able to support the disconnection of SB Mulholland at Garden Valley. Again, this puts commercial traffic onto local streets. We would have to see significant benefit to Garden Valley Boulevard to consider this as an option.
- Fifth bullet – I have the same comment as above on grades on/around the NB off-ramp.

Concept GV 10

- No new comments from those included above. I think keeping the Mulholland connection is required.

Appendix B Detailed Concept Evaluation Notes

DETAILED CONCEPT REVIEW

This section provides more detailed evaluation notes for each concept presented in this memorandum.

I-5/Exit 124 (Harvard Avenue) Interchange

Concept H-1

Transportation Operations (+): The proposed diamond interchange would require dual left-turn lanes at both ramp terminals, on the off-ramps and the left-turn movement to the NB on-ramps). The relocation of all Roseburg High School and Bellows Street traffic to Madrone Street would require dual EB left-turn lanes onto at this intersection and a widening of Madrone Street. With these improvements, the interchange ramp terminals and the critical Harvard Avenue/Madrone Street intersection would operate with sufficient capacity.

Multimodal Accessibility (+): The smoother alignment of Harvard Avenue through the interchange will minimize the bicycle lane pinch points that currently exist on the sharp curves near Roseburg High School. The diamond interchange ramp terminals would be easier to navigate for bicycles and pedestrians.

Land Use (-): The realignment of Harvard Avenue would require minimal right-of-way and have few significant property impacts. However, the development of a new Bellows Street through Roseburg High School parking lot and connecting it to Madrone Street would have significant property impacts and require the acquisition of new right-of-way. The new southbound off ramp would require some property acquisition from the old hospital site. Madrone Street would need to be widened to accommodate all Roseburg High School traffic, which would require additional right-of-way and result in significant property impacts to the adjacent Douglas County Health Center, gas station, and motel.

Environmental, Social, and Equity Factors (-): The new connection to Madrone Street and the potential displacement of homes/businesses is anticipated some have some social impacts to the Laurelwood neighborhood. The widening of Madrone Street may impact the adjacent gas station and require some environmental mitigation.

Accessibility and Connectivity (-): The elimination of the Bellows Street and Roseburg High School accesses across from the interchange ramp terminals is a significant access management improvement that brings the interchange more in line with existing Federal and State policies on the placement of local streets opposite freeway ramp terminals. However, the neighborhood behind Roseburg High School will have reduced connectivity and accessibility.

Cost (-): Concept would require a complete reconstruction of the interchange and new local streets through and around Roseburg High School. The widening of Madrone Street would likely require the purchase of additional right-of-way from adjacent properties.

Implementation (-): Maintaining traffic operations during construction would be difficult due to the realignment of Harvard Avenue and the complete reconstruction of the interchange.

Concept H-2a

Transportation Operations (+): The proposed diamond interchange would require dual left-turn lanes at both ramp terminal intersections, on the off-ramps and the left-turn movements to the NB on-ramp. With these improvements, the interchange ramp terminals would operate with sufficient capacity.

Multimodal Accessibility (+): The diamond interchange ramp terminals and the narrower intersection openings would be easier to navigate for bicycles and pedestrians compared to the existing free-flowing right-turn entrances at the loop ramps.

Land Use (-): The new Bellows Street alignment and southbound off ramp would require substantial right-of-way acquisition from the old hospital site and significantly impact future redevelopment opportunities on that site.

Environmental, Social, and Equity Factors (+): Concept is not anticipated to have any significant environmental/social/equity impacts to adjacent properties or land uses.

Accessibility and Connectivity (0): Aside from the elimination of the Bellows Street access to Harvard Avenue, the concept as a whole does not substantially improve accessibility and connectivity within the interchange study area.

Cost (-): Concept would require a complete reconstruction of the interchange and a lowering of Bellows Street beneath the southbound off-ramp. As a result, costs are anticipated to be high.

Implementation (-): Construction of this concept could be completed in phases, however maintaining traffic flow could be difficult during peak time periods.

Concept H-2b

Transportation Operations (+): The proposed diamond interchange would require dual left-turn lanes at both ramp terminal intersections, on the off-ramps and the left-turn movements to the NB on-ramp. With these improvements, the interchange ramp terminals would operate with sufficient capacity.

Multimodal Accessibility (+): The diamond interchange ramp terminals and the narrower intersection openings would be easier to navigate for bicycles and pedestrians compared to the existing free-flowing right-turn entrances.

Land Use (-): The new southbound off ramp may require some right-of-way acquisition from the old hospital site and significantly impact future redevelopment opportunities on that site. The double lane roundabout at Madrone Street may require some right-of-way acquisition from the adjacent Douglas County Health Center, gas station, and motel.

Environmental, Social, and Equity Factors (0): The construction of a roundabout at the Harvard Avenue/Madrone Street intersection may have some property impacts to the adjacent gas station which in turn may require some environmental mitigation.

Accessibility and Connectivity (0): Right-in/right-out access along Harvard Avenue between the interchange and Madrone Street would improve access management along this stretch of roadway but significantly limit access to existing properties. An underpass connection of Princeton Avenue to Bellows Street would improve connectivity between the two sides of the interstate.

Cost (-): Concept would require a complete reconstruction of the interchange and costs are anticipated to be high compared to all of the other concepts. The Princeton Avenue underpass is likely to be expensive.

Implementation (-): Construction of this concept could be completed in phases, however maintaining traffic flow could be difficult during peak time periods.

Concept H-3

Transportation Operations (+): The proposed diamond interchange with roundabout terminals would require multi-lane roundabouts which would require a large footprint at the interchange ramps, but would enable high volumes to flow through ramp terminals.

Multimodal Accessibility (-): The multiple roundabout interchange and intersection configuration will make it more difficult for pedestrians and bicyclist to navigate the Harvard Avenue corridor.

Land Use (-): The new southbound off ramp may require some right-of-way acquisition from the old hospital site and significantly impact future redevelopment opportunities on that site. The double lane roundabout at Umpqua and Madrone Streets may require some right-of-way acquisition from the adjacent commercial properties.

Environmental, Social, and Equity Factors (0): The construction of a roundabout at the Harvard Avenue/Madrone Street intersection may have some property impacts to the adjacent gas station which in turn may require some environmental mitigation.

Accessibility and Connectivity (+): Right-in/right-out access along Harvard Avenue between Umpqua and Madrone Streets is offset by the roundabouts which provide the ability for trucks and vehicles to U-turn at the next downstream intersection.

Cost (-): Concept would require a complete reconstruction of the interchange. Roundabouts are more costly to construct than traditional signalized intersections.

Implementation (-): Construction of this concept could be completed in phases, however multiple roundabouts would make it difficult to maintaining traffic flow during peak time periods.

Concept H-4

Transportation Operations (+): The new single-point interchange will address the anticipated turning movements at the interchange.

Multimodal Accessibility (-): The Single Point interchange configuration will make it more difficult for pedestrians and bicyclists to navigate the interchange ramp terminal.

Land Use (-): The new southbound off ramp may require some right-of-way acquisition from the old hospital site and impact future redevelopment opportunities on that site. The construction of Bellows Street through the Roseburg High School Parking lot will impact school parking and operations.

Environmental, Social, and Equity Factors (0): A new Bellows Street alignment through the Roseburg High School parking will impact and disrupt pedestrian and parking within the Roseburg High School campus. Local neighborhood traffic will be rerouted through the campus.

Accessibility and Connectivity (-): The elimination of the Bellows Street access from Harvard Avenue is off set by the negative impacts created by the realignment of Bellows Street through the Roseburg High School campus parking lot.

Cost (-): Construction of the Single Point interchange would be substantial compared to the other interchange concepts.

Implementation (-): The Single Point interchange would require a substantially enlarged underpass that may be difficult to construct while maintaining traffic flow through the interchange.

Concept H-5

Transportation Operations (+): The one-way couplet corridor will address the anticipated traffic movements and improve operations by allowing for more efficient three-phase signal timing.

Multimodal Accessibility (-): This concept would increase the number of intersections, but is not anticipated to significantly enhance multi-modal travel conditions through the corridor.

Land Use (-): The establishment of a new couplet corridor would significantly impact multiple properties along the Harvard Avenue corridor and require the acquisition of new right-of-way. New southbound off ramp may require some right-of-way acquisition from the old hospital site and impact future redevelopment opportunities on that site.

Environmental, Social, and Equity Factors (-): The new roadway couplet would have significant environmental, social, and equity factors to existing businesses and properties along the north side of Harvard Avenue.

Accessibility and Connectivity (-): The strip of land created by the couplet would necessitate the need for new points of access both on the north and south sides of the roadway. This would increase the number of accesses comparable to existing conditions.

Cost (-): Construction of the couplet is anticipated to have substantially high costs in the form of property acquisition.

Implementation (-): Property acquisition to establish the couplet would take a substantial amount of time and would likely hold up implementation and construction.

Concept H-6

Transportation Operations (+): The proposed diamond configuration for the southbound ramp terminal would require dual left-turn lanes at the on-ramp which would create a large intersection. The relocation of all Bellows Street traffic to Umpqua Street is projected to be accommodated with existing lane configurations.

Multimodal Accessibility (0): The southbound diamond interchange ramp terminal would eliminate one of the free-flowing right-turn on-ramp movements, thereby making it safer to cross for bicycles and pedestrians. Existing bicycle and pedestrian concerns are not addressed at the remainder of the interchange.

Land Use (-): Construction of a new road that parallels I-5 on the west side of the interstate would likely have some land use impacts with existing properties. The development of a new Bellows Street through Roseburg High School parking lot would be disruptive and require the acquisition of new right-of-way. The new southbound off ramp would require some property acquisition from the old hospital site.

Environmental, Social, and Equity Factors (-): The I-5 frontage road and underpass may have some environmental and social impacts given the relatively tight alignment. A new Bellows Street alignment through the Roseburg High School parking lot will significantly disrupt campus operations, parking, and safety.

Accessibility and Connectivity (0): An underpass connection of Princeton Avenue to Bellows Street would improve connectivity between the two sides of the interstate.

Cost (-): The cost of the partial diamond interchange reconfiguration, I-5 underpass and other circulation improvements would be costly compared to other concepts.

Implementation (-): Constructing a partial interchange reconfiguration would be easier than other diamonds with full reconfigurations. The I-5 parallel road and underpass would likely to be difficult to construct without significant impacts and displacements to adjacent properties.

Concept H-7

Transportation Operations (+): The proposed diverging diamond interchange (DDI) will address the anticipated traffic movements at the interchange.

Land Use (-): The new Bellows Street alignment and southbound off ramp would require substantial right-of-way acquisition from the old hospital site and significantly impact future redevelopment opportunities on that site. A new local street connection from Roseburg High School to Madrone Street via Laurelwood Court would introduce some high school traffic through a neighborhood that is not currently accustomed to this.

Environmental, Social, and Equity Factors (-): The new Laurelwood Court connection would have some social and traffic disruptions to the existing Laurelwood neighborhood.

Accessibility and Connectivity (+): Opening up the Laurelwood Court connection to Madrone Street and the new Bellows Street connection to Umpqua Street would significantly improve connectivity to/from Roseburg High School.

Cost (-): Concept would require a complete reconstruction of the interchange and costs are anticipated to be high compared to all of the other concepts.

Implementation (-): Construction of this concept could be completed in phases, however maintaining traffic flow could be difficult during peak time periods.

Concept H-8

Transportation Operations (+): The two-quadrant PARCLO A interchange is not forecast to provide an adequate interchange form for existing and projected traffic demands. In particular, the interchange would require dual left-turn lanes at the SB off-ramp and the eastbound direction on Harvard Avenue thereby creating a large intersection.

Multimodal Accessibility (0): The southbound ramp terminal would eliminate some of the free-flowing right-turn on-ramp movements, thereby making it a little safer to cross for bicycles and pedestrians. Existing bicycle and pedestrian concerns are not addressed at the remainder of the interchange.

Land Use (-): The new southbound off ramp and looping on-ramp in the northwest quadrant of the interchange would require significant property acquisition from the old hospital site and potentially impact properties further to the north at the end of Princeton Lane. The development of a new Bellows Street through Roseburg High School parking lot would be disruptive and require the acquisition of new right-of-way.

Environmental, Social, and Equity Factors (-): A new Bellows Street alignment through the Roseburg High School parking lot will significantly disrupt campus operations, parking, and safety.

Accessibility and Connectivity (-): The elimination of the Bellows Street access from Harvard Avenue is off set by the negative impacts created by the realignment of Bellows Street through the Roseburg High School campus parking lot.

Cost (-): The cost of the PARCLO A ramp in the northwest quadrant would be significant, but less costly that some other concepts that call for a complete reconstruction of the interchange.

Implementation (+): Constructing the ramps in the northwest quadrant of the interchange could be done independently of the existing interchange, making this concept easier to phase and implement.

Concept H-9a

Transportation Operations (+): This concept would widen the southbound looping off-ramp to include additional turn lanes onto Harvard Avenue.

Multimodal Accessibility (+): Modifications to the westbound right-turn movements at the northbound ramp terminal would benefit both bicycle and pedestrians beyond current conditions.

Land Use (+): This concept would introduce no new land use impacts.

Environmental, Social, and Equity Factors (+): This concept would not create any environmental, social, or equity impacts.

Accessibility and Connectivity (0): This concept would not improve accessibility or connectivity above or beyond existing conditions.

Cost (+): The least costly of all of the concepts.

Implementation (+): Widening the southbound off-ramp can be conducted in phases with limited interruption to existing traffic flow.

Concept H-9b

Transportation Operations (+): This concept would widen the southbound looping off-ramp to include additional turn lanes onto Harvard Avenue. It would also widen the northbound off-ramp to include separate left-turn, through, and right-turn lanes.

Multimodal Accessibility (+): Modifications to all of the right-turn on-ramp movements would benefit both bicycle and pedestrians along Harvard Avenue.

Land Use (0): The shift of Bellows Street to the west would introduce some minor land use impacts to the old hospital site.

Environmental, Social, and Equity Factors (+): This concept would not create any environmental, social, or equity impacts.

Accessibility and Connectivity (0): This concept would not improve accessibility or connectivity above or beyond existing conditions.

Cost (0): Although relatively minor compared to other interchange reconfiguration concepts, the modifications to each of the ramp terminals and the Bellows Street realignment would have a higher cost.

Implementation (+): All ramp modifications could be conducted in phases with limited interruption to existing traffic flow.

Concept H-10

Transportation Operations (+): The relocation of all Bellows Street traffic to Umpqua Street is projected to be accommodated with existing lane configurations.

Multimodal Accessibility (+): Modifications to each of the right-turn on-ramp movements would benefit both bicycle and pedestrians beyond current conditions. The elimination of the Bellows Street connection to Harvard Avenue would also reduce conflict points.

Land Use (+): Concept does not have any major land use impacts.

Environmental, Social, and Equity Factors (0): The Princeton Avenue underpass will change the character of traffic flow on Princeton Avenue and likely have some social impacts to the adjacent businesses and neighborhood.

Accessibility and Connectivity (+): An underpass connection of Princeton Avenue to Bellows Street would significantly improve connectivity between the two sides of the interstate. The elimination of Bellows Street would improve access management along the Harvard Avenue corridor.

Cost (-): The cost of the Princeton Avenue underpass could be high.

Implementation (+): All improvements could be conducted in phases and with minimal impacts to existing traffic patterns and flow.

Concept H-11

Transportation Operations (+): This concept would eliminate the Bellows Street and Roseburg High School connection to Harvard Avenue. The operations assessment indicates that the combination of

both Bellows Street and Roseburg High School traffic will not overload the Harvard Avenue/Umpqua Street intersection.

Multimodal Accessibility (-): The elimination of the Bellows Street and Roseburg High School connection to Harvard Avenue would also reduce conflict points. No changes to existing bicycle/pedestrian conditions are included east of the interchange.

Land Use (-): The new Bellows Street alignment would require substantial right-of-way acquisition from the old hospital site and significantly impact future redevelopment opportunities on that site.

Environmental, Social, and Equity Factors (+): This concept would not introduce any new environmental, social, or equity impacts.

Accessibility and Connectivity (0): Roseburg High School would have decreased connectivity and accessibility in this concept.

Cost (-): The acquisition of right-of-way through the old hospital site could be costly, but not as costly as other concepts that call for the complete reconstruction of the interchange.

Implementation (+): All improvements could be conducted in phases and with minimal impacts to existing traffic patterns and flow.

Concept H-12

Transportation Operations (+): This concept would eliminate the Bellows Street connection to Harvard Avenue and restrict the Roseburg High School connection to right-in/right-out. The operations assessment indicates that the combination of both Bellows Street and Roseburg High School traffic will overload the Harvard Avenue/Madrone Street intersection. The intersection would require dual left-turn lanes eastbound on Harvard Avenue and two northbound receiving lanes on Madrone Street.

Multimodal Accessibility (-): The elimination of the Bellows Street and Roseburg High School connection to Harvard Avenue would also reduce conflict points.

Land Use (-): The new Roseburg High School connection to Madrone Street would require new right-of-way from either the adjacent commercial property or residential property. In addition, the widening of Madrone Street would require right-of-way, which would impact surrounding developments.

Environmental, Social, and Equity Factors (-): The Madrone Street connection may have some social impacts to the adjacent residential Laurelwood neighborhood.

Accessibility and Connectivity (+): The Madrone Street connection would improve accessibility to/from Roseburg High School.

Cost (-): The cost of the Princeton Avenue underpass could be high. The Madrone Street connection may require a substantial amount of right-of-way and displace at least one existing business.

Implementation (+): All improvements could be conducted in phases and with minimal impacts to existing traffic patterns and flow.

Concept H-13

Transportation Operations (+): This concept would eliminate the Bellows Street connection to Harvard Avenue and the Roseburg High School connection to Harvard Avenue. The operations assessment indicates that the combination of both Bellows Street and Roseburg High School traffic will overload the Harvard Avenue/Madrone Street intersection. The intersection would require dual left-turn lanes eastbound on Harvard Avenue and two northbound receiving lanes on Madrone Street.

Multimodal Accessibility (0): Modifications to each of the right-turn on-ramp movements would benefit both bicycle and pedestrians beyond current conditions. The elimination of the Bellows Street and Roseburg High School connection to Harvard Avenue would also reduce conflict points.

Land Use (-): The new Roseburg High School connection to Madrone Street would require new right-of-way from either the adjacent commercial property or residential property. The new Bellows Street connection would require right-of-way from the old hospital site. In addition, the widening of Madrone Street would require right-of-way, which would impact surrounding developments.

Environmental, Social, and Equity Factors (-): The Madrone Street connection may have some social impacts to the adjacent residential Laurelwood neighborhood.

Accessibility and Connectivity (+): The Madrone Street connection would improve accessibility to/from Roseburg High School. The elimination of Bellows Street and the Roseburg High School access from the Harvard Avenue corridor would better meet ODOT's access spacing policies and guidelines.

Cost (-): The Madrone Street connection may require a substantial amount of right-of-way and displace at least one existing business.

Implementation (+): All improvements could be conducted in phases and with minimal impacts to existing traffic patterns and flow.

Concept H-14

Transportation Operations (+): This concept would eliminate the existing northbound on-ramp and consolidate it with the ramp terminal located at the Roseburg High School access. The operations assessment indicates that the additional movement added at this ramp terminal will require dual westbound left-turn lanes on Harvard Avenue.

Multimodal Accessibility (+): Modifications to each of the right-turn on-ramp movements would benefit both bicycle and pedestrians beyond current conditions.

Land Use (0): This concept would not have any significant land use impacts outside of a slight realignment of Bellows Street.

Environmental, Social, and Equity Factors (+): This concept would not have any significant environmental, social, or equity impacts.

Accessibility and Connectivity (0): Would not significantly improve access and connectivity beyond existing conditions.

Cost (0): The reconfiguration of the ramp terminal intersections and associated traffic control will have a slightly lower cost compared to other concepts that reconfigure the interchange.

Implementation (+): All improvements could be conducted in phases and with minimal impacts to existing traffic patterns and flow.

I-5/Exit 125 (Garden Valley Boulevard) Interchange

Concept GV-1

Transportation Operations (+): No change to travel patterns or configuration at the interchange ramp terminals, with the exception of reduced speeds of existing free-flow right turns with realignment of on-ramp curves. However, disconnecting Mulholland Drive and restricting access along Garden Valley boulevard to right-in/right-out will improve operations by allowing more green time to northbound off-ramp and limiting merging and overall delay.

Multimodal Accessibility (0): Limited change to interchange configuration for pedestrian/bicycle accessibility. The right-turn movements onto the loop ramps are improved by decreasing the curb-return radii while the westbound to northbound and eastbound to southbound free-flow movements still remain that result in undesirable bicycle and pedestrian movements across these vehicular travel paths.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Disconnecting Mulholland Drive and diverting traffic through the neighborhood via existing and new east-west connections will impact the existing land uses. The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties.

Environmental, Social, and Equity Factors (-): Disconnecting Mulholland Drive will result in increased traffic through older residential neighborhoods.

Accessibility and Connectivity (+): Improved access management along Garden Valley Boulevard and introduces east-west local street connectivity both north and south of Garden Valley Boulevard.

Cost (-): The reconstruction of the southbound ramp terminal will be costly. The establishment of new local street connections east of the interchange will require costly right-of-way purchase. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (+): All identified components are implementable.

Concept GV-2

Transportation Operations (+): No change to travel patterns or configuration at the interchange ramp terminals, with the exception of reduced speeds of all existing free-flow right turns. However, prohibiting the southbound connection of Mulholland Drive at Garden Valley Boulevard will improve operations by allowing more green time to northbound off-ramp and limiting merging and overall delay.

Multimodal Accessibility (+): Reduced speeds of existing free-flow right-turns with realignment of on-ramp curves improve pedestrian and bicycle accessibility.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Prohibiting Mulholland Drive southbound movements will divert traffic through the neighborhood via existing and new east-west connections will impact the existing land uses. The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties.

Environmental, Social, and Equity Factors (-): Prohibiting southbound movements of Mulholland Drive at Garden Valley Boulevard will result in increased traffic through older residential neighborhoods.

Accessibility and Connectivity (+): Improved access management along Garden Valley Boulevard and introduces east-west local street connectivity both north and south of Garden Valley Boulevard.

Cost (-): Limited reconstruction of the interchange with the exception of the new I-5 underpass. The establishment of new local street connections east of the interchange will require costly right-of-way purchase. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (0): All identified components are implementable with the exception of the new I-5 underpass that may be costly and impactful.

Concept GV-3

Transportation Operations (-): This concept introduces major left-turns at the ramp terminals - converting right-turns to left-turns – that will trigger dual left-turn lanes. Qualitative critical movement analysis (CMA) indicates that the southbound ramp terminal is anticipated to be over-capacity. Realigning Mulholland Drive and restricting access along Garden Valley boulevard to right-in/right-out will improve operations by allowing more green time to northbound off-ramp and limiting merging and overall delay.

Multimodal Accessibility (+): This concept tightens intersections by eliminating the free-flow right turns, thereby improving pedestrian and bicycle accessibility; however, intersections are larger with longer crossing times and exposure.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Disconnecting Mulholland Drive and diverting traffic through the neighborhood via existing and new east-west connections will impact the existing land uses. Limiting the northbound and southbound approaches at the Garden Valley Boulevard/BLM access intersection to right-in/right-out access will shift a lot of traffic to the Garden Valley Boulevard/Estelle Street intersection requiring significant widening of the intersection and impacts to adjacent commercial properties. A new BLM access road to Veterans Drive access will introduce new land use impacts to the Veterans Hospital property.

Environmental, Social, and Equity Factors (-): Realigning Mulholland Drive to the east will impact some older residential sensitive neighborhoods and businesses.

Accessibility and Connectivity (+): Improved access management along Garden Valley Boulevard and introduces east-west local street connectivity both north and south of Garden Valley Boulevard.

Cost (-): Some reconstruction of the interchange as well as the realignment of Mulholland Drive to the east. The establishment of new local street connections east of the interchange will require significantly higher levels of right-of-way purchase. The necessary widening of the Estelle Street access to Garden Valley Boulevard will require costly right-of-way purchase.

Implementation (-): All identified components are implementable but the establishment of a new Mulholland Drive access to Garden Valley Boulevard will be difficult to implement due to the amount of right-of-way acquisition.

Concept GV-4

Transportation Operations (-): This concept introduces major left-turns at the ramp terminals - converting right-turns to left-turns – that will trigger dual left-turn lanes. A critical movement analysis (CMA) indicates that the northbound ramp terminal is anticipated to be over-capacity under this configuration.

Multimodal Accessibility (+): This concept tightens intersections by eliminating the free-flow right turns, thereby improving pedestrian and bicycle accessibility; however, intersections are larger with longer crossing times and exposure.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Disconnecting Mulholland Drive and diverting traffic through the neighborhood on a new alignment will significantly impact the existing land uses. The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties.

Environmental, Social, and Equity Factors (-): Realigning Mulholland Drive to the east will impact some older residential sensitive neighborhoods and businesses.

Accessibility and Connectivity (+): Improved access spacing and provide access management along Garden Valley Boulevard.

Cost (-): Reconstruction of the existing interchange to a diamond configuration will be costly. The realignment of Mulholland Drive will require substantial right-of-way. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (-): Staging and implementation of new diamond interchange will have significant impacts on traffic flow through the interchange during construction. The establishment of a new Mulholland Drive access to Garden Valley Boulevard will be difficult to implement due to the amount of right-of-way acquisition.

Concept GV-5

Transportation Operations (+): The new single-point interchange will address the future turning movement needs at the interchange. Realigning Mulholland Drive and restricting access along Garden Valley boulevard to right-in/right-out will improve operations.

Multimodal Accessibility (-): The major intersection of the single-point interchange results in undesirable exposure time for pedestrians and bicycles; e.g., long crossing distance.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Disconnecting Mulholland Drive and diverting traffic through the neighborhood on a new alignment will significantly impact the existing land uses. The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties.

Environmental, Social, and Equity Factors (-): Realigning Mulholland Drive to the east will impact some older residential sensitive neighborhoods and businesses.

Accessibility and Connectivity (+): Improved access spacing and provide access management along Garden Valley Boulevard.

Cost (-): Reconstruction of the existing interchange to a single-point configuration will be expensive. The realignment of Mulholland Drive will require substantial right-of-way. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (-): Staging and implementation of new structure associated with the single-point interchange will be challenging. The establishment of a new Mulholland Drive access to Garden Valley Boulevard will be difficult to implement due to the amount of right-of-way acquisition.

Concept GV-6

Transportation Operations (+): The new diverging diamond interchange (DDI) will address the anticipated traffic movements at the interchange. Realigning Mulholland Drive and restricting access along Garden Valley boulevard to right-in/right-out will improve operations.

Multimodal Accessibility (-): The cross-over ramp terminal intersections of a DDI introduce unconventional pedestrian movements. The configuration either locates the pedestrians on the inside – between the two direction, or result in uncontrolled left-turns onto the on-ramps. There are ongoing national research efforts on how to best design for pedestrians and bicyclists through the DDI.

Land Use (-): Significant local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Disconnecting Mulholland Drive and diverting traffic through the neighborhood on a new alignment will significantly impact the existing land uses. The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties.

Environmental, Social, and Equity Factors (-): Realigning Mulholland Drive to the east will impact some older residential sensitive neighborhoods and businesses.

Accessibility and Connectivity (+): Improved access spacing and provide access management along Garden Valley Boulevard.

Cost (-): Reconstruction of the existing interchange to a single-point configuration. The realignment of Mulholland Drive will require substantial right-of-way. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (-): Staging and implementation of new structure associated with the single-point interchange will be challenging. The establishment of a new Mulholland Drive access to Garden Valley Boulevard will be difficult to implement due to the amount of right-of-way acquisition.

Concept GV-7

Transportation Operations (+): The new roundabout corridor will address the anticipated traffic movements at the interchange. Realigning Mulholland Drive and restricting access along Garden Valley boulevard to right-in/right-out will improve operations.

Multimodal Accessibility (-): At this stage, while awaiting decisions from the US Access Board, multi-lane roundabouts are undesirable for pedestrians. Multilane roundabouts introduce challenges for visually impaired pedestrians that may require additional treatments at the roundabout crosswalks.

Land Use (-): Local street circulation changes on the east side of the interchange that will have impacts to residences and businesses. Realigning Mulholland Drive will impact existing homes and businesses on the north side of Garden Valley Boulevard, but may provide a desirable transition from the

commercial/industrial uses to the residential area. The roundabouts will have more impact at the intersections, but less along the road segments.

Environmental, Social, and Equity Factors (-): Realigning Mulholland Drive to the east will impact some older residential sensitive neighborhoods and businesses.

Accessibility and Connectivity (+): Improved access spacing and roundabouts provide great opportunities for access management along Garden Valley Boulevard.

Cost (-): Reconstruction of a roundabout corridor will be expensive. The realignment of Mulholland Drive will require substantial right-of-way. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (-): Staging and implementation of new corridor will be challenging. The establishment of a new Mulholland Drive access to Garden Valley Boulevard will be difficult to implement due to the amount of right-of-way acquisition.

Concept GV-8

Transportation Operations (+): The one-way couplet corridor will address the anticipated traffic movements and improve operations by allowing for more efficient three-phase signal timing.

Multimodal Accessibility (0): The one-way streets will reduce the crossing distance for pedestrians, but will introduce some out of direction traveling for bicyclists.

Land Use (-): The couplet configuration has significant impact to commercial properties, especially on the north side of Garden Valley Boulevard.

Environmental, Social, and Equity Factors (-): The couplet will impact multiple sensitive properties and businesses.

Accessibility and Connectivity (+): Improved access spacing and provide access management opportunities along the one-way street by limiting access to right-in/right-outs or left-in/left-outs.

Cost (-): Reconstruction of the corridor and interchange will be expensive.

Implementation (-): The establishment of couplet will have significant property impacts and the acquisition of right-of-way will be extremely difficult to ascertain.

Concept GV-9

Transportation Operations (-): This concept introduces an unconventional Jug Handle Ramp configuration on the east side of I-5 that will place an undesirable burden on the Mulholland Drive/Garden Valley Boulevard intersection. This concept is inconsistent with desirable road hierarchy and undesirably mixes interstate traffic with neighborhood traffic.

Multimodal Accessibility (0): This concept tightens intersections by eliminating the free-flow right turns, thereby improving pedestrian and bicycle accessibility; however, intersections are larger with longer crossing times and exposure.

Land Use (-): The concept focuses interchange traffic along Mulholland Drive and increase volumes to levels that are undesirable for this facility and the adjacent residential neighborhood. Limiting the northbound and southbound approaches at the Garden Valley Boulevard/BLM access intersection to right-in/right-out access will shift a lot of traffic to the Garden Valley Boulevard/Estelle Street intersection requiring significant widening of the intersection and impacts to adjacent commercial properties. A new BLM access road to Veterans Drive access will introduce new land use impacts to the Veterans Hospital property.

Environmental, Social, and Equity Factors (-): Interchange traffic on Mulholland Drive will impact multiple sensitive properties, businesses, and the adjacent neighborhood.

Accessibility and Connectivity (-): This concept is inconsistent with desirable road hierarchy and undesirably mixes interstate traffic with local street traffic.

Cost (-): The reconstruction of the northbound ramps and the widening of Mulholland Drive will be costly. The necessary widening of the Estelle Street access to Garden Valley Boulevard will require costly right-of-way purchase.

Implementation (0): All identified components are implementable with the exception of the new northbound ramps that may be costly and impactful.

Concept GV-10

Transportation Operations (+): No change to travel patterns or configuration at the interchange ramp terminals, with the exception of reduced speeds of all existing free-flow right turns. However, increased capacity of the northbound off-ramp will improve operations.

Multimodal Accessibility (+): Reduced speeds of existing free-flow right-turns with realignment of on-ramp curves improve pedestrian and bicycle accessibility.

Land Use (0): The necessary widening of the access to Garden Valley Shopping Center access will impact the adjacent commercial properties. Widening of Mulholland Drive will impact some adjacent commercial properties.

Environmental, Social, and Equity Factors (0): Limited environmental and social impacts compared to all other concepts.

Accessibility and Connectivity (0): Improved access management along Garden Valley Boulevard; however, retaining Mulholland Drive connection at the northbound ramp terminal is undesirable.

Cost (0): Limited reconstruction of the interchange with the exception of the new northbound ramps. The necessary widening of the access to Garden Valley Shopping Center access will require costly right-of-way purchase.

Implementation (+): All identified components are implementable and have limited property impacts.

Appendix C Synchro Operations Worksheets

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	989	1089	197	189	177
v/c Ratio	0.40	0.44	0.17	0.71	0.54
Control Delay	2.7	5.3	0.8	54.6	23.9
Queue Delay	0.1	0.0	0.0	0.0	0.0
Total Delay	2.9	5.3	0.8	54.6	23.9
Queue Length 50th (ft)	43	35	0	122	49
Queue Length 95th (ft)	48	237	7	177	106
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)			300		625
Base Capacity (vph)	2448	2448	1126	500	529
Starvation Cap Reductn	440	0	0	0	0
Spillback Cap Reductn	0	29	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.45	0.17	0.38	0.33

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	940	1035	187	180	168
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1447	1568	1458
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1447	1568	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	989	1089	197	189	177
RTOR Reduction (vph)	0	0	0	50	0	79
Lane Group Flow (vph)	0	989	1089	147	189	98
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Prot
Protected Phases		2	6		7	4
Permitted Phases				6		
Actuated Green, G (s)		78.1	78.1	78.1	17.9	17.9
Effective Green, g (s)		78.1	78.1	78.1	17.9	17.9
Actuated g/C Ratio		0.74	0.74	0.74	0.17	0.17
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2448	2448	1076	267	248
v/s Ratio Prot		0.30	c0.33		c0.12	0.07
v/s Ratio Perm				0.10		
v/c Ratio		0.40	0.44	0.14	0.71	0.40
Uniform Delay, d1		4.9	5.1	3.8	41.1	38.7
Progression Factor		0.40	0.80	0.61	1.00	1.00
Incremental Delay, d2		0.5	0.5	0.2	7.7	0.8
Delay (s)		2.4	4.6	2.6	48.8	39.5
Level of Service		A	A	A	D	D
Approach Delay (s)		2.4	4.3		44.3	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBR
Lane Group Flow (vph)	54	674	148	791	553	364	384	27	134
v/c Ratio	0.49	0.39	0.18	0.57	0.55	0.67	0.56	0.24	0.59
Control Delay	66.3	17.7	6.4	27.5	31.2	37.1	7.6	50.7	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.3	17.7	6.4	27.5	31.2	37.1	7.6	50.7	22.3
Queue Length 50th (ft)	36	107	1	238	148	200	18	18	18
Queue Length 95th (ft)	#85	243	68	317	198	296	94	45	46
Internal Link Dist (ft)		44		1575		1019			
Turn Bay Length (ft)	75		300		775			150	
Base Capacity (vph)	115	1738	844	1396	1064	571	700	248	233
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.39	0.18	0.57	0.52	0.64	0.55	0.11	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	640	141	0	714	36	525	335	365	25	0	123
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5	4.5		4.5		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	1.00	0.98	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
Frt	1.00	1.00	0.85		0.99		1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1630	3260	1454		3266		3193	1716	1416	1630		1458
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1630	3260	1454		3266		3193	1716	1416	1630		1458
Peak-hour factor, PHF	0.92	0.95	0.95	0.95	0.95	0.92	0.95	0.92	0.95	0.92	0.92	0.92
Adj. Flow (vph)	54	674	148	0	752	39	553	364	384	27	0	134
RTOR Reduction (vph)	0	0	71	0	3	0	0	0	235	0	0	61
Lane Group Flow (vph)	54	674	77	0	788	0	553	364	149	27	0	73
Confl. Peds. (#/hr)			1	1			9		4			
Heavy Vehicles (%)	2%	2%	0%	0%	1%	2%	1%	2%	3%	2%	2%	2%
Turn Type	Prot	NA	Perm		NA		Split	NA	Perm	Prot		pm+ov
Protected Phases	5	2			6		8	8		4		5
Permitted Phases			2						8			4
Actuated Green, G (s)	7.2	54.3	54.3		43.1		33.2	33.2	33.2	5.0		12.2
Effective Green, g (s)	7.2	54.3	54.3		43.1		33.2	33.2	33.2	5.0		12.2
Actuated g/C Ratio	0.07	0.52	0.52		0.41		0.32	0.32	0.32	0.05		0.12
Clearance Time (s)	4.0	4.5	4.5		4.5		4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	6.1	6.1		6.1		3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	111	1685	751		1340		1009	542	447	77		169
v/s Ratio Prot	c0.03	0.21			c0.24		0.17	c0.21		0.02		c0.03
v/s Ratio Perm			0.05						0.11			0.02
v/c Ratio	0.49	0.40	0.10		0.59		0.55	0.67	0.33	0.35		0.43
Uniform Delay, d1	47.1	15.4	12.9		24.1		29.7	31.2	27.5	48.4		43.2
Progression Factor	1.10	1.01	1.95		1.00		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	3.1	0.7	0.3		1.9		0.6	3.3	0.4	2.8		1.8
Delay (s)	55.1	16.2	25.4		26.0		30.3	34.4	27.9	51.2		44.9
Level of Service	E	B	C		C		C	C	C	D		D
Approach Delay (s)		20.1			26.0			30.8			46.0	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	182	937	22	665	68	23	55	11	190
v/c Ratio	0.59	0.46	0.27	0.46	0.84	0.11	0.34	0.05	0.55
Control Delay	41.9	11.1	45.2	18.4	104.9	19.0	43.8	26.0	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	11.1	45.2	18.4	104.9	19.0	43.8	26.0	10.3
Queue Length 50th (ft)	81	75	11	113	35	6	24	5	0
Queue Length 95th (ft)	#229	284	34	206	#108	20	#87	15	42
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	311	2055	81	1440	81	524	160	557	602
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.46	0.27	0.46	0.84	0.04	0.34	0.02	0.32

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	167	698	164	20	593	18	63	11	10	51	10	175
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1630	3167		1630	3245		1630	1593		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1630	3167		1630	3245		1630	1593		1630	1716	1458
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)	182	759	178	22	645	20	68	12	11	55	11	190
RTOR Reduction (vph)	0	17	0	0	2	0	0	10	0	0	0	162
Lane Group Flow (vph)	182	920	0	22	663	0	68	13	0	55	11	28
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	15.3	46.5		1.6	32.8		3.2	7.8		7.1	11.7	11.7
Effective Green, g (s)	15.3	46.5		1.6	32.8		3.2	7.8		7.1	11.7	11.7
Actuated g/C Ratio	0.19	0.58		0.02	0.41		0.04	0.10		0.09	0.15	0.15
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	311	1840		32	1330		65	155		144	250	213
v/s Ratio Prot	c0.11	c0.29		0.01	c0.20		c0.04	0.01		0.03	0.01	
v/s Ratio Perm												c0.02
v/c Ratio	0.59	0.50		0.69	0.50		1.05	0.08		0.38	0.04	0.13
Uniform Delay, d1	29.5	9.9		39.0	17.5		38.4	32.9		34.4	29.3	29.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.3	1.0		43.8	1.3		125.0	0.2		1.2	0.1	0.2
Delay (s)	31.8	10.9		82.7	18.8		163.4	33.0		35.6	29.4	29.9
Level of Service	C	B		F	B		F	C		D	C	C
Approach Delay (s)		14.3			20.9			130.5			31.1	
Approach LOS		B			C			F			C	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	1196	356	706	34	42	17	27
v/c Ratio	0.20	0.68	0.92	0.27	0.25	0.07	0.13	0.07
Control Delay	52.5	21.3	64.4	0.6	44.0	0.2	39.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.5	21.3	64.4	0.6	44.0	0.2	39.9	0.3
Queue Length 50th (ft)	12	268	258	2	22	0	11	0
Queue Length 95th (ft)	36	#554	#420	10	43	0	27	0
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	94	1756	387	2615	329	719	326	588
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.68	0.92	0.27	0.10	0.06	0.05	0.05

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	877	259	338	664	7	32	0	40	16	0	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3155		1662	3286		1648	1458		1650	1456	
Flt Permitted	0.95	1.00		0.95	1.00		0.74	1.00		0.73	1.00	
Satd. Flow (perm)	1662	3155		1662	3286		1283	1458		1267	1456	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	923	273	356	699	7	34	0	42	17	0	27
RTOR Reduction (vph)	0	20	0	0	0	0	0	38	0	0	24	0
Lane Group Flow (vph)	18	1176	0	356	706	0	34	4	0	17	3	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Effective Green, g (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Actuated g/C Ratio	0.02	0.52		0.26	0.75		0.10	0.10		0.10	0.10	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	39	1631		430	2472		122	138		120	138	
v/s Ratio Prot	0.01	c0.37		c0.21	0.21			0.00			0.00	
v/s Ratio Perm							c0.03			0.01		
v/c Ratio	0.46	0.72		0.83	0.29		0.28	0.03		0.14	0.02	
Uniform Delay, d1	50.6	19.5		36.7	4.1		44.1	43.1		43.6	43.1	
Progression Factor	1.00	1.00		0.89	0.06		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.2	2.8		11.4	0.3		0.9	0.1		0.4	0.0	
Delay (s)	56.8	22.3		43.9	0.5		45.1	43.2		44.0	43.1	
Level of Service	E	C		D	A		D	D		D	D	
Approach Delay (s)		22.8			15.1			44.0			43.4	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	75	909	24	974	268	5	15	95	84
v/c Ratio	0.43	0.36	0.25	0.43	0.25	0.08	0.12	0.45	0.19
Control Delay	40.1	0.9	58.0	11.7	4.4	51.4	22.0	54.5	0.9
Queue Delay	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0
Total Delay	40.1	0.9	58.0	11.8	4.6	51.4	22.0	54.5	0.9
Queue Length 50th (ft)	53	2	17	188	34	3	1	32	0
Queue Length 95th (ft)	m80	19	m40	212	53	16	19	59	0
Internal Link Dist (ft)		526		296			109		204
Turn Bay Length (ft)	100		100			50		100	
Base Capacity (vph)	197	2551	105	2280	1088	63	265	215	557
Starvation Cap Reductn	0	0	0	377	286	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.36	0.23	0.51	0.33	0.08	0.06	0.44	0.15

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	838	26	23	925	255	5	1	13	90	0	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	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	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3274		1662	3292	1452	1658	1479		3225	1465	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3274		1662	3292	1452	1658	1479		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	75	882	27	24	974	268	5	1	14	95	0	84
RTOR Reduction (vph)	0	1	0	0	0	102	0	13	0	0	76	0
Lane Group Flow (vph)	75	908	0	24	974	166	5	2	0	95	8	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	11.8	74.1		2.8	65.1	65.1	0.8	5.5		5.6	10.3	
Effective Green, g (s)	11.8	74.1		2.8	65.1	65.1	0.8	5.5		5.6	10.3	
Actuated g/C Ratio	0.11	0.71		0.03	0.62	0.62	0.01	0.05		0.05	0.10	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.2		2.5	4.2	4.2	3.0	2.0		3.0	2.5	
Lane Grp Cap (vph)	186	2310		44	2041	900	12	77		172	143	
v/s Ratio Prot	0.05	c0.28		0.01	c0.30		0.00	0.00		c0.03	c0.01	
v/s Ratio Perm						0.11						
v/c Ratio	0.40	0.39		0.55	0.48	0.18	0.42	0.02		0.55	0.06	
Uniform Delay, d1	43.3	6.3		50.5	10.8	8.6	51.9	47.2		48.5	42.9	
Progression Factor	0.79	0.08		1.11	1.02	2.21	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.4		9.7	0.7	0.4	21.8	0.0		3.8	0.1	
Delay (s)	35.0	0.9		65.6	11.7	19.3	73.6	47.2		52.3	43.1	
Level of Service	D	A		E	B	B	E	D		D	D	
Approach Delay (s)		3.5			14.4			53.8			48.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	1976	1653	383	154	201
v/c Ratio	0.78	0.65	0.32	0.68	0.81
Control Delay	10.2	7.8	1.2	59.0	57.1
Queue Delay	0.3	0.1	0.0	0.0	17.7
Total Delay	10.5	7.9	1.2	59.0	74.7
Queue Length 50th (ft)	475	237	0	104	103
Queue Length 95th (ft)	m72	355	23	167	181
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)					625
Base Capacity (vph)	2546	2546	1205	292	305
Starvation Cap Reductn	157	0	0	0	0
Spillback Cap Reductn	0	134	0	0	90
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.83	0.69	0.32	0.53	0.93

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1877	1570	364	146	191
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	0.96
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1447	1568	1402
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1447	1568	1402
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1976	1653	383	154	201
RTOR Reduction (vph)	0	0	0	87	0	44
Lane Group Flow (vph)	0	1976	1653	296	154	157
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	6		7	
Permitted Phases				6		7
Actuated Green, G (s)		85.1	85.1	85.1	15.9	15.9
Effective Green, g (s)		85.1	85.1	85.1	15.9	15.9
Actuated g/C Ratio		0.77	0.77	0.77	0.14	0.14
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2546	2546	1119	226	202
v/s Ratio Prot		c0.60	0.50		0.10	
v/s Ratio Perm				0.20		c0.11
v/c Ratio		0.78	0.65	0.26	0.68	0.77
Uniform Delay, d1		7.1	5.7	3.5	44.6	45.3
Progression Factor		1.03	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.6	1.3	0.6	7.5	16.2
Delay (s)		8.9	7.0	4.1	52.2	61.5
Level of Service		A	A	A	D	E
Approach Delay (s)		8.9	6.4		57.5	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	70	1006	265	1632	591	246	333
v/c Ratio	0.63	0.44	0.20	0.83	0.84	0.65	0.76
Control Delay	70.7	7.5	0.5	20.8	49.7	44.8	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.7	7.5	0.5	20.8	49.7	44.8	31.2
Queue Length 50th (ft)	44	130	0	420	187	144	103
Queue Length 95th (ft)	#108	167	0	538	#272	229	#237
Internal Link Dist (ft)		44		1575		1019	
Turn Bay Length (ft)	75				775		
Base Capacity (vph)	114	2265	1344	1968	702	377	437
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.44	0.20	0.83	0.84	0.65	0.76

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	956	252	0	1353	191	561	226	316	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5	4.0		4.5		4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00	1.00			
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	1.00	0.98			
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00	1.00			
Frt	1.00	1.00	0.85		0.98		1.00	1.00	0.85			
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00	1.00			
Satd. Flow (prot)	1630	3260	1461		3225		3193	1716	1416			
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00	1.00			
Satd. Flow (perm)	1630	3260	1461		3225		3193	1716	1416			
Peak-hour factor, PHF	0.92	0.95	0.95	0.95	0.95	0.92	0.95	0.92	0.95	0.92	0.92	0.92
Adj. Flow (vph)	70	1006	265	0	1424	208	591	246	333	0	0	0
RTOR Reduction (vph)	0	0	0	0	11	0	0	0	126	0	0	0
Lane Group Flow (vph)	70	1006	265	0	1621	0	591	246	207	0	0	0
Confl. Peds. (#/hr)			1	1			9		4			
Heavy Vehicles (%)	2%	2%	0%	0%	1%	2%	1%	2%	3%	2%	2%	2%
Turn Type	Prot	NA	pm+ov		NA		Split	NA	Perm			
Protected Phases	5	2	8		6		8	8				
Permitted Phases			2						8			
Actuated Green, G (s)	5.6	69.5	91.5		59.9		22.0	22.0	22.0			
Effective Green, g (s)	5.6	69.5	91.5		59.9		22.0	22.0	22.0			
Actuated g/C Ratio	0.06	0.70	0.92		0.60		0.22	0.22	0.22			
Clearance Time (s)	4.0	4.5	4.0		4.5		4.0	4.0	4.0			
Vehicle Extension (s)	3.0	6.1	3.0		6.1		3.0	3.0	3.0			
Lane Grp Cap (vph)	91	2265	1395		1931		702	377	311			
v/s Ratio Prot	c0.04	0.31	0.04		c0.50		c0.19	0.14				
v/s Ratio Perm			0.14						0.15			
v/c Ratio	0.77	0.44	0.19		0.84		0.84	0.65	0.66			
Uniform Delay, d1	46.6	6.7	0.4		16.2		37.3	35.5	35.6			
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00			
Incremental Delay, d2	31.6	0.6	0.1		4.6		9.0	4.0	5.3			
Delay (s)	78.1	7.4	0.5		20.7		46.3	39.5	40.9			
Level of Service	E	A	A		C		D	D	D			
Approach Delay (s)		9.7			20.7			43.4			0.0	
Approach LOS		A			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	203	1228	53	1184	143	106	113	80	386
v/c Ratio	0.41	0.62	0.66	0.74	0.72	0.48	0.75	0.45	0.81
Control Delay	48.7	18.1	93.0	29.4	72.0	35.6	82.0	56.2	43.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.7	18.1	93.0	29.4	72.0	35.6	82.0	56.2	43.3
Queue Length 50th (ft)	73	297	41	377	109	47	86	60	215
Queue Length 95th (ft)	116	495	#107	#557	#211	91	#172	98	302
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	495	1974	81	1601	200	388	163	357	475
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.62	0.65	0.74	0.71	0.27	0.69	0.22	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	187	970	160	49	1057	32	132	47	51	104	74	355
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.0
Lane Util. Factor	0.97	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3162	3191		1630	3245		1630	1582		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3162	3191		1630	3245		1630	1582		1630	1716	1458
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)	203	1054	174	53	1149	35	143	51	55	113	80	386
RTOR Reduction (vph)	0	8	0	0	2	0	0	37	0	0	0	68
Lane Group Flow (vph)	203	1220	0	53	1182	0	143	69	0	113	80	318
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases												4
Actuated Green, G (s)	18.8	72.3		4.8	58.3		14.6	14.8		11.1	11.3	30.1
Effective Green, g (s)	18.8	72.3		4.8	58.3		14.6	14.8		11.1	11.3	30.1
Actuated g/C Ratio	0.16	0.60		0.04	0.49		0.12	0.12		0.09	0.09	0.25
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.0
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	495	1922		65	1576		198	195		150	161	365
v/s Ratio Prot	0.06	0.38		0.03	c0.36		c0.09	c0.04		0.07	0.05	c0.14
v/s Ratio Perm												0.08
v/c Ratio	0.41	0.63		0.82	0.75		0.72	0.35		0.75	0.50	0.87
Uniform Delay, d1	45.6	15.3		57.2	25.0		50.7	48.2		53.1	51.6	43.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	1.6		51.3	3.3		11.5	0.8		18.3	1.8	19.5
Delay (s)	46.0	17.0		108.4	28.3		62.3	49.0		71.4	53.4	62.6
Level of Service	D	B		F	C		E	D		E	D	E
Approach Delay (s)		21.1			31.7			56.6			63.1	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	1687	75	1614	169	256	39	71
v/c Ratio	0.35	0.80	0.73	0.75	0.75	0.69	0.44	0.22
Control Delay	57.8	19.5	85.9	16.8	60.5	28.0	52.1	10.2
Queue Delay	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Total Delay	57.8	19.5	85.9	17.5	60.5	28.0	52.1	10.2
Queue Length 50th (ft)	22	423	50	392	109	77	24	2
Queue Length 95th (ft)	#62	#719	#126	577	169	152	55	36
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	98	2113	104	2148	317	474	124	428
Starvation Cap Reductn	0	0	0	230	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.80	0.72	0.84	0.53	0.54	0.31	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	1505	98	71	1280	254	161	9	235	37	3	65
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3255		1662	3194		1648	1468		1655	1468	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.28	1.00	
Satd. Flow (perm)	1662	3255		1662	3194		1233	1468		485	1468	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	1584	103	75	1347	267	169	9	247	39	3	68
RTOR Reduction (vph)	0	4	0	0	13	0	0	107	0	0	56	0
Lane Group Flow (vph)	34	1683	0	75	1601	0	169	149	0	39	15	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Effective Green, g (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Actuated g/C Ratio	0.04	0.63		0.06	0.65		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	63	2052		98	2080		224	267		88	267	
v/s Ratio Prot	0.02	c0.52		0.05	c0.50			0.10			0.01	
v/s Ratio Perm							c0.14			0.08		
v/c Ratio	0.54	0.82		0.77	0.77		0.75	0.56		0.44	0.06	
Uniform Delay, d1	49.6	14.8		48.7	12.8		40.7	39.1		38.2	35.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	3.8		28.2	2.8		12.8	2.0		2.6	0.1	
Delay (s)	56.3	18.7		76.9	15.6		53.6	41.1		40.8	35.6	
Level of Service	E	B		E	B		D	D		D	D	
Approach Delay (s)		19.4			18.3			46.1			37.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	245	1625	6	1398	26	31	331	321
v/c Ratio	0.96	0.66	0.07	0.77	0.29	0.24	1.03	0.70
Control Delay	94.4	10.2	19.0	21.2	58.8	23.4	106.6	13.0
Queue Delay	0.0	0.7	0.0	1.4	0.0	0.0	0.0	0.0
Total Delay	94.4	10.9	19.0	22.7	58.8	23.4	106.6	13.0
Queue Length 50th (ft)	174	264	2	278	18	4	~128	0
Queue Length 95th (ft)	#332	518	m3	#666	48	30	#220	75
Internal Link Dist (ft)		526		296		109		204
Turn Bay Length (ft)	100		100		50		100	
Base Capacity (vph)	255	2459	92	1812	90	268	322	562
Starvation Cap Reductn	0	451	0	227	0	0	0	0
Spillback Cap Reductn	0	315	0	0	0	2	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.81	0.07	0.88	0.29	0.12	1.03	0.57

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	233	1538	6	6	1275	53	25	5	25	314	0	305
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		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	1.00		1.00	0.99		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3290		1660	3270		1662	1505		3225	1465	
Flt Permitted	0.95	1.00		0.10	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3290		168	3270		1662	1505		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	245	1619	6	6	1342	56	26	5	26	331	0	321
RTOR Reduction (vph)	0	0	0	0	2	0	0	25	0	0	282	0
Lane Group Flow (vph)	245	1625	0	6	1396	0	26	6	0	331	39	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases				6								
Actuated Green, G (s)	16.9	80.7		59.3	59.3		3.6	5.8		11.0	13.2	
Effective Green, g (s)	16.9	80.7		59.3	59.3		3.6	5.8		11.0	13.2	
Actuated g/C Ratio	0.15	0.73		0.54	0.54		0.03	0.05		0.10	0.12	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.2		4.2	4.2		3.0	2.0		3.0	2.5	
Lane Grp Cap (vph)	255	2413		90	1762		54	79		322	175	
v/s Ratio Prot	c0.15	0.49			c0.43		0.02	0.00		c0.10	c0.03	
v/s Ratio Perm				0.04								
v/c Ratio	0.96	0.67		0.07	0.79		0.48	0.08		1.03	0.22	
Uniform Delay, d1	46.2	7.7		12.1	20.4		52.3	49.6		49.5	43.7	
Progression Factor	1.00	1.00		1.04	0.86		1.00	1.00		1.00	1.00	
Incremental Delay, d2	45.3	1.5		1.1	2.9		6.6	0.2		57.5	0.5	
Delay (s)	91.6	9.2		13.7	20.4		58.9	49.7		107.0	44.2	
Level of Service	F	A		B	C		E	D		F	D	
Approach Delay (s)		20.0			20.4			53.9			76.1	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	989	1089	197	189	177
v/c Ratio	0.40	0.44	0.17	0.71	0.54
Control Delay	2.8	6.2	1.3	54.6	23.9
Queue Delay	0.1	0.0	0.0	0.0	0.0
Total Delay	2.9	6.2	1.3	54.6	23.9
Queue Length 50th (ft)	43	55	0	122	49
Queue Length 95th (ft)	48	277	19	177	106
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)			300		625
Base Capacity (vph)	2448	2448	1126	500	529
Starvation Cap Reductn	440	0	0	0	0
Spillback Cap Reductn	0	18	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.45	0.17	0.38	0.33

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	940	1035	187	180	168
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1447	1568	1458
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1447	1568	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	989	1089	197	189	177
RTOR Reduction (vph)	0	0	0	50	0	79
Lane Group Flow (vph)	0	989	1089	147	189	98
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Prot
Protected Phases		2	6		7	4
Permitted Phases				6		
Actuated Green, G (s)		78.1	78.1	78.1	17.9	17.9
Effective Green, g (s)		78.1	78.1	78.1	17.9	17.9
Actuated g/C Ratio		0.74	0.74	0.74	0.17	0.17
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2448	2448	1076	267	248
v/s Ratio Prot		0.30	c0.33		c0.12	0.07
v/s Ratio Perm				0.10		
v/c Ratio		0.40	0.44	0.14	0.71	0.40
Uniform Delay, d1		4.9	5.1	3.8	41.1	38.7
Progression Factor		0.40	0.94	1.05	1.00	1.00
Incremental Delay, d2		0.5	0.5	0.2	7.7	0.8
Delay (s)		2.4	5.4	4.3	48.8	39.5
Level of Service		A	A	A	D	D
Approach Delay (s)		2.4	5.2		44.3	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	54	674	148	879	553	364	384
v/c Ratio	0.44	0.35	0.16	0.54	0.54	0.66	0.64
Control Delay	62.6	10.0	3.2	21.1	30.6	36.1	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.6	10.0	3.2	21.1	30.6	36.1	16.9
Queue Length 50th (ft)	37	76	1	225	147	198	86
Queue Length 95th (ft)	79	173	40	302	193	288	182
Internal Link Dist (ft)		44		1575		1019	
Turn Bay Length (ft)	75		300		775		
Base Capacity (vph)	139	1949	929	1626	1185	637	662
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.35	0.16	0.54	0.47	0.57	0.58

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	640	141	0	714	117	525	335	365	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5	4.5		4.5		4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00	1.00			
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	1.00	0.98			
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00	1.00			
Frt	1.00	1.00	0.85		0.98		1.00	1.00	0.85			
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00	1.00			
Satd. Flow (prot)	1630	3260	1454		3216		3193	1716	1416			
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00	1.00			
Satd. Flow (perm)	1630	3260	1454		3216		3193	1716	1416			
Peak-hour factor, PHF	0.92	0.95	0.95	0.95	0.95	0.92	0.95	0.92	0.95	0.92	0.92	0.92
Adj. Flow (vph)	54	674	148	0	752	127	553	364	384	0	0	0
RTOR Reduction (vph)	0	0	59	0	11	0	0	0	147	0	0	0
Lane Group Flow (vph)	54	674	89	0	868	0	553	364	237	0	0	0
Confl. Peds. (#/hr)			1	1			9		4			
Heavy Vehicles (%)	2%	2%	0%	0%	1%	2%	1%	2%	3%	2%	2%	2%
Turn Type	Prot	NA	Perm		NA		Split	NA	Perm			
Protected Phases	5	2			6		8	8				
Permitted Phases			2						8			
Actuated Green, G (s)	6.8	62.8	62.8		52.0		33.7	33.7	33.7			
Effective Green, g (s)	6.8	62.8	62.8		52.0		33.7	33.7	33.7			
Actuated g/C Ratio	0.06	0.60	0.60		0.50		0.32	0.32	0.32			
Clearance Time (s)	4.0	4.5	4.5		4.5		4.0	4.0	4.0			
Vehicle Extension (s)	3.0	6.1	6.1		6.1		3.0	3.0	3.0			
Lane Grp Cap (vph)	105	1949	869		1592		1024	550	454			
v/s Ratio Prot	c0.03	0.21			c0.27		0.17	c0.21				
v/s Ratio Perm			0.06						0.17			
v/c Ratio	0.51	0.35	0.10		0.55		0.54	0.66	0.52			
Uniform Delay, d1	47.5	10.7	9.0		18.3		29.3	30.7	29.1			
Progression Factor	1.13	0.81	1.43		1.00		1.00	1.00	1.00			
Incremental Delay, d2	4.0	0.5	0.2		1.3		0.6	3.0	1.1			
Delay (s)	57.4	9.1	13.1		19.7		29.9	33.7	30.2			
Level of Service	E	A	B		B		C	C	C			
Approach Delay (s)		12.8			19.7			31.0			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	182	937	22	665	68	23	55	11	190
v/c Ratio	0.74	0.42	0.29	0.36	0.55	0.16	0.39	0.08	0.65
Control Delay	65.7	10.8	64.5	18.3	69.5	31.8	60.5	46.7	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.7	10.8	64.5	18.3	69.5	31.8	60.5	46.7	16.9
Queue Length 50th (ft)	136	152	17	136	51	9	42	8	0
Queue Length 95th (ft)	204	311	45	281	99	30	85	23	62
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	339	2226	81	1833	149	373	156	378	470
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.42	0.27	0.36	0.46	0.06	0.35	0.03	0.40

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	167	698	164	20	593	18	63	11	10	51	10	175
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1630	3167		1630	3245		1630	1593		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1630	3167		1630	3245		1630	1593		1630	1716	1458
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)	182	759	178	22	645	20	68	12	11	55	11	190
RTOR Reduction (vph)	0	11	0	0	1	0	0	10	0	0	0	173
Lane Group Flow (vph)	182	926	0	22	664	0	68	13	0	55	11	17
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	18.2	80.6		3.6	66.0		8.0	9.5		9.3	10.8	10.8
Effective Green, g (s)	18.2	80.6		3.6	66.0		8.0	9.5		9.3	10.8	10.8
Actuated g/C Ratio	0.15	0.67		0.03	0.55		0.07	0.08		0.08	0.09	0.09
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	247	2127		48	1784		108	126		126	154	131
v/s Ratio Prot	c0.11	c0.29		0.01	c0.20		c0.04	0.01		0.03	0.01	
v/s Ratio Perm												c0.01
v/c Ratio	0.74	0.44		0.46	0.37		0.63	0.10		0.44	0.07	0.13
Uniform Delay, d1	48.6	9.1		57.2	15.3		54.6	51.3		52.8	50.0	50.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	10.3	0.7		5.0	0.6		9.5	0.3		1.8	0.1	0.3
Delay (s)	58.9	9.8		62.2	15.9		64.1	51.6		54.6	50.2	50.6
Level of Service	E	A		E	B		E	D		D	D	D
Approach Delay (s)		17.8			17.4			60.9			51.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	1196	356	706	34	42	17	27
v/c Ratio	0.20	0.68	0.92	0.27	0.25	0.07	0.13	0.07
Control Delay	52.5	21.3	65.9	0.6	44.0	0.2	39.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.5	21.3	65.9	0.6	44.0	0.2	39.9	0.3
Queue Length 50th (ft)	12	268	258	2	22	0	11	0
Queue Length 95th (ft)	36	#554	#420	11	43	0	27	0
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	94	1756	387	2615	329	719	326	588
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.68	0.92	0.27	0.10	0.06	0.05	0.05

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	877	259	338	664	7	32	0	40	16	0	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3155		1662	3286		1648	1458		1650	1456	
Flt Permitted	0.95	1.00		0.95	1.00		0.74	1.00		0.73	1.00	
Satd. Flow (perm)	1662	3155		1662	3286		1283	1458		1267	1456	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	923	273	356	699	7	34	0	42	17	0	27
RTOR Reduction (vph)	0	20	0	0	0	0	0	38	0	0	24	0
Lane Group Flow (vph)	18	1176	0	356	706	0	34	4	0	17	3	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Effective Green, g (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Actuated g/C Ratio	0.02	0.52		0.26	0.75		0.10	0.10		0.10	0.10	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	39	1631		430	2472		122	138		120	138	
v/s Ratio Prot	0.01	c0.37		c0.21	0.21			0.00			0.00	
v/s Ratio Perm							c0.03			0.01		
v/c Ratio	0.46	0.72		0.83	0.29		0.28	0.03		0.14	0.02	
Uniform Delay, d1	50.6	19.5		36.7	4.1		44.1	43.1		43.6	43.1	
Progression Factor	1.00	1.00		0.93	0.06		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.2	2.8		11.4	0.3		0.9	0.1		0.4	0.0	
Delay (s)	56.8	22.3		45.4	0.5		45.1	43.2		44.0	43.1	
Level of Service	E	C		D	A		D	D		D	D	
Approach Delay (s)		22.8			15.6			44.0			43.4	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	75	909	24	979	5	15	95	84
v/c Ratio	0.43	0.36	0.24	0.43	0.08	0.12	0.45	0.19
Control Delay	39.9	0.9	59.0	11.0	51.4	22.0	54.5	0.9
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	39.9	0.9	59.0	11.1	51.4	22.0	54.5	0.9
Queue Length 50th (ft)	53	2	17	167	3	1	32	0
Queue Length 95th (ft)	m80	19	m40	191	16	19	59	0
Internal Link Dist (ft)		526		296		109		204
Turn Bay Length (ft)	100		100		50		100	
Base Capacity (vph)	197	2549	108	2278	63	265	215	557
Starvation Cap Reductn	0	0	0	375	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.36	0.22	0.51	0.08	0.06	0.44	0.15

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	838	26	23	925	5	5	1	13	90	0	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		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	1.00		1.00	1.00		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3274		1662	3289		1658	1479		3225	1465	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3274		1662	3289		1658	1479		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	75	882	27	24	974	5	5	1	14	95	0	84
RTOR Reduction (vph)	0	1	0	0	0	0	0	13	0	0	76	0
Lane Group Flow (vph)	75	908	0	24	979	0	5	2	0	95	8	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	11.8	74.1		2.8	65.1		0.8	5.5		5.6	10.3	
Effective Green, g (s)	11.8	74.1		2.8	65.1		0.8	5.5		5.6	10.3	
Actuated g/C Ratio	0.11	0.71		0.03	0.62		0.01	0.05		0.05	0.10	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.2		2.5	4.2		3.0	2.0		3.0	2.5	
Lane Grp Cap (vph)	186	2310		44	2039		12	77		172	143	
v/s Ratio Prot	0.05	c0.28		0.01	c0.30		0.00	0.00		c0.03	c0.01	
v/s Ratio Perm												
v/c Ratio	0.40	0.39		0.55	0.48		0.42	0.02		0.55	0.06	
Uniform Delay, d1	43.3	6.3		50.5	10.8		51.9	47.2		48.5	42.9	
Progression Factor	0.79	0.08		1.14	0.95		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.4		9.7	0.7		21.8	0.0		3.8	0.1	
Delay (s)	34.8	0.9		67.0	11.0		73.6	47.2		52.3	43.1	
Level of Service	C	A		E	B		E	D		D	D	
Approach Delay (s)		3.5			12.4			53.8			48.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	1976	1653	383	154	201
v/c Ratio	0.78	0.65	0.32	0.68	0.81
Control Delay	9.2	5.8	1.4	59.0	57.1
Queue Delay	0.3	0.3	0.0	0.0	103.9
Total Delay	9.5	6.1	1.4	59.0	161.0
Queue Length 50th (ft)	463	172	13	104	103
Queue Length 95th (ft)	m58	216	m19	167	181
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)					625
Base Capacity (vph)	2546	2546	1205	292	305
Starvation Cap Reductn	160	0	0	0	0
Spillback Cap Reductn	0	283	0	0	265
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.83	0.73	0.32	0.53	5.03

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1877	1570	364	146	191
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	0.96
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1447	1568	1402
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1447	1568	1402
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1976	1653	383	154	201
RTOR Reduction (vph)	0	0	0	87	0	44
Lane Group Flow (vph)	0	1976	1653	296	154	157
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	6		7	
Permitted Phases				6		7
Actuated Green, G (s)		85.1	85.1	85.1	15.9	15.9
Effective Green, g (s)		85.1	85.1	85.1	15.9	15.9
Actuated g/C Ratio		0.77	0.77	0.77	0.14	0.14
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2546	2546	1119	226	202
v/s Ratio Prot		c0.60	0.50		0.10	
v/s Ratio Perm				0.20		c0.11
v/c Ratio		0.78	0.65	0.26	0.68	0.77
Uniform Delay, d1		7.1	5.7	3.5	44.6	45.3
Progression Factor		0.90	0.74	1.78	1.00	1.00
Incremental Delay, d2		1.7	1.0	0.4	7.5	16.2
Delay (s)		8.0	5.2	6.8	52.2	61.5
Level of Service		A	A	A	D	E
Approach Delay (s)		8.0	5.5		57.5	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	1074	265	1464	591	571
v/c Ratio	0.63	0.30	0.86	0.46	0.95
Control Delay	20.6	4.8	29.8	25.5	54.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	4.8	29.8	25.5	54.7
Queue Length 50th (ft)	231	6	467	152	341
Queue Length 95th (ft)	325	m52	580	201	#570
Internal Link Dist (ft)	44		1575	1019	
Turn Bay Length (ft)				775	
Base Capacity (vph)	1693	882	1709	1320	623
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.30	0.86	0.45	0.92

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1020	252	0	1391	561	542
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	0.95	1.00		0.95	0.97	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3260	1454		3292	3193	1419
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3260	1454		3292	3193	1419
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1074	265	0	1464	591	571
RTOR Reduction (vph)	0	127	0	0	0	38
Lane Group Flow (vph)	1074	138	0	1464	591	533
Confl. Peds. (#/hr)		1	1		9	4
Heavy Vehicles (%)	2%	0%	0%	1%	1%	3%
Turn Type	NA	Perm		NA	Prot	Perm
Protected Phases	2			6	7	
Permitted Phases		2				7
Actuated Green, G (s)	57.1	57.1		57.1	43.9	43.9
Effective Green, g (s)	57.1	57.1		57.1	43.9	43.9
Actuated g/C Ratio	0.52	0.52		0.52	0.40	0.40
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	6.1	6.1		6.1	2.5	2.5
Lane Grp Cap (vph)	1692	754		1708	1274	566
v/s Ratio Prot	0.33			c0.44	0.19	
v/s Ratio Perm		0.09				c0.38
v/c Ratio	0.63	0.18		0.86	0.46	0.94
Uniform Delay, d1	19.0	14.1		22.9	24.4	31.8
Progression Factor	0.99	2.26		1.00	1.00	1.00
Incremental Delay, d2	1.2	0.4		5.8	0.2	24.2
Delay (s)	19.9	32.1		28.7	24.6	56.0
Level of Service	B	C		C	C	E
Approach Delay (s)	22.3			28.7	40.0	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	29.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	458	1168	53	1225	143	106	113	80	386
v/c Ratio	0.80	0.60	0.53	0.81	0.96	0.42	0.93	0.39	0.87
Control Delay	58.6	18.6	73.4	34.1	118.5	32.0	119.2	51.7	31.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.6	18.6	73.4	34.1	118.5	32.0	119.2	51.7	31.4
Queue Length 50th (ft)	172	285	40	424	112	46	89	59	59
Queue Length 95th (ft)	#289	451	84	#614	#244	91	#205	98	170
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	573	1932	108	1508	149	389	122	358	547
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.60	0.49	0.81	0.96	0.27	0.93	0.22	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	421	970	105	49	1057	70	132	47	51	104	74	355
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Lane Util. Factor	0.97	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3162	3212		1630	3229		1630	1582		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3162	3212		1630	3229		1630	1582		1630	1716	1458
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)	458	1054	114	53	1149	76	143	51	55	113	80	386
RTOR Reduction (vph)	0	5	0	0	4	0	0	36	0	0	0	270
Lane Group Flow (vph)	458	1163	0	53	1221	0	143	70	0	113	80	116
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	21.7	71.2		6.4	55.9		11.0	16.4		9.0	14.4	14.4
Effective Green, g (s)	21.7	71.2		6.4	55.9		11.0	16.4		9.0	14.4	14.4
Actuated g/C Ratio	0.18	0.59		0.05	0.47		0.09	0.14		0.08	0.12	0.12
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	571	1905		86	1504		149	216		122	205	174
v/s Ratio Prot	c0.14	0.36		0.03	c0.38		c0.09	0.04		0.07	0.05	
v/s Ratio Perm												c0.08
v/c Ratio	0.80	0.61		0.62	0.81		0.96	0.32		0.93	0.39	0.67
Uniform Delay, d1	47.1	15.6		55.6	27.5		54.3	46.8		55.2	48.7	50.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.8	1.5		10.7	4.9		60.8	0.6		58.5	0.9	8.4
Delay (s)	54.8	17.0		66.3	32.4		115.1	47.4		113.7	49.6	58.9
Level of Service	D	B		E	C		F	D		F	D	E
Approach Delay (s)		27.7			33.8			86.3			68.3	
Approach LOS		C			C			F			E	

Intersection Summary			
HCM 2000 Control Delay	40.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	1687	75	1614	169	256	39	71
v/c Ratio	0.35	0.80	0.73	0.75	0.75	0.69	0.44	0.22
Control Delay	57.8	19.5	85.9	16.8	60.5	28.0	52.1	10.2
Queue Delay	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Total Delay	57.8	19.5	85.9	17.5	60.5	28.0	52.1	10.2
Queue Length 50th (ft)	22	423	50	392	109	77	24	2
Queue Length 95th (ft)	#62	#719	#126	577	169	152	55	36
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	98	2113	104	2148	317	474	124	428
Starvation Cap Reductn	0	0	0	230	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.80	0.72	0.84	0.53	0.54	0.31	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	1505	98	71	1280	254	161	9	235	37	3	65
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3255		1662	3194		1648	1468		1655	1468	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.28	1.00	
Satd. Flow (perm)	1662	3255		1662	3194		1233	1468		485	1468	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	1584	103	75	1347	267	169	9	247	39	3	68
RTOR Reduction (vph)	0	4	0	0	13	0	0	107	0	0	56	0
Lane Group Flow (vph)	34	1683	0	75	1601	0	169	149	0	39	15	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Effective Green, g (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Actuated g/C Ratio	0.04	0.63		0.06	0.65		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	63	2052		98	2080		224	267		88	267	
v/s Ratio Prot	0.02	c0.52		0.05	c0.50			0.10			0.01	
v/s Ratio Perm							c0.14			0.08		
v/c Ratio	0.54	0.82		0.77	0.77		0.75	0.56		0.44	0.06	
Uniform Delay, d1	49.6	14.8		48.7	12.8		40.7	39.1		38.2	35.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	3.8		28.2	2.8		12.8	2.0		2.6	0.1	
Delay (s)	56.3	18.7		76.9	15.6		53.6	41.1		40.8	35.6	
Level of Service	E	B		E	B		D	D		D	D	
Approach Delay (s)		19.4			18.3			46.1			37.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	245	1625	6	1342	505	26	31	331	321
v/c Ratio	0.98	0.67	0.07	0.75	0.49	0.30	0.24	0.97	0.68
Control Delay	100.8	11.0	23.5	27.6	6.3	58.7	23.4	90.2	12.4
Queue Delay	0.0	0.7	0.0	1.4	0.3	0.0	0.0	0.0	0.0
Total Delay	100.8	11.7	23.5	29.0	6.6	58.7	23.4	90.2	12.4
Queue Length 50th (ft)	175	278	2	353	53	18	4	121	0
Queue Length 95th (ft)	#336	536	m4	#638	101	47	30	#212	74
Internal Link Dist (ft)		526		296			109		204
Turn Bay Length (ft)	100		100		300	50		100	
Base Capacity (vph)	249	2423	87	1798	1021	93	268	343	567
Starvation Cap Reductn	0	434	0	256	142	0	0	0	0
Spillback Cap Reductn	0	280	0	0	0	0	1	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.82	0.07	0.87	0.57	0.28	0.12	0.97	0.57

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	233	1538	6	6	1275	480	25	5	25	314	0	305
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.0		4.5	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	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	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3290		1660	3292	1451	1662	1505		3225	1465	
Flt Permitted	0.95	1.00		0.09	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3290		160	3292	1451	1662	1505		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	245	1619	6	6	1342	505	26	5	26	331	0	321
RTOR Reduction (vph)	0	0	0	0	0	237	0	25	0	0	280	0
Lane Group Flow (vph)	245	1625	0	6	1342	268	26	6	0	331	41	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases				6		6						
Actuated Green, G (s)	16.5	79.3		58.3	58.3	58.3	3.7	6.0		11.7	14.0	
Effective Green, g (s)	16.5	79.3		58.3	58.3	58.3	3.7	6.0		11.7	14.0	
Actuated g/C Ratio	0.15	0.72		0.53	0.53	0.53	0.03	0.05		0.11	0.13	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.0		4.5	4.0	
Vehicle Extension (s)	2.5	4.2		4.2	4.2	4.2	2.5	2.0		2.5	2.5	
Lane Grp Cap (vph)	249	2371		84	1744	769	55	82		343	186	
v/s Ratio Prot	c0.15	0.49			c0.41		0.02	0.00		c0.10	c0.03	
v/s Ratio Perm				0.04		0.18						
v/c Ratio	0.98	0.69		0.07	0.77	0.35	0.47	0.08		0.97	0.22	
Uniform Delay, d1	46.6	8.5		12.6	20.5	14.9	52.2	49.4		48.9	43.1	
Progression Factor	1.00	1.00		1.26	1.21	2.75	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.2	1.6		1.2	2.5	0.9	4.6	0.1		39.0	0.4	
Delay (s)	98.8	10.1		17.1	27.3	41.9	56.8	49.5		87.9	43.5	
Level of Service	F	B		B	C	D	E	D		F	D	
Approach Delay (s)		21.7			31.2			52.8			66.1	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	32.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	989	1089	197	189	177
v/c Ratio	0.40	0.44	0.17	0.71	0.54
Control Delay	6.1	7.0	2.1	55.1	22.6
Queue Delay	0.9	0.0	0.0	0.0	0.0
Total Delay	7.0	7.0	2.1	55.1	22.6
Queue Length 50th (ft)	105	108	3	122	44
Queue Length 95th (ft)	190	156	m14	180	103
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)			300		625
Base Capacity (vph)	2451	2451	1127	470	498
Starvation Cap Reductn	1100	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.73	0.44	0.17	0.40	0.36

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	940	1035	187	180	168
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	0.97
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1447	1568	1408
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1447	1568	1408
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	989	1089	197	189	177
RTOR Reduction (vph)	0	0	0	50	0	86
Lane Group Flow (vph)	0	989	1089	147	189	91
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	6		7	
Permitted Phases				6		7
Actuated Green, G (s)		78.2	78.2	78.2	17.8	17.8
Effective Green, g (s)		78.2	78.2	78.2	17.8	17.8
Actuated g/C Ratio		0.74	0.74	0.74	0.17	0.17
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2451	2451	1077	265	238
v/s Ratio Prot		0.30	c0.33		c0.12	
v/s Ratio Perm				0.10		0.06
v/c Ratio		0.40	0.44	0.14	0.71	0.38
Uniform Delay, d1		4.9	5.1	3.8	41.2	38.7
Progression Factor		1.00	1.11	2.05	1.00	1.00
Incremental Delay, d2		0.5	0.5	0.2	8.2	0.8
Delay (s)		5.4	6.2	8.0	49.4	39.5
Level of Service		A	A	A	D	D
Approach Delay (s)		5.4	6.5		44.6	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	726	148	788	553	737
v/c Ratio	0.65	0.25	0.70	0.30	0.89
Control Delay	29.4	5.6	34.8	11.8	32.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	29.4	5.6	34.8	11.8	32.3
Queue Length 50th (ft)	176	1	252	85	351
Queue Length 95th (ft)	255	42	325	114	#633
Internal Link Dist (ft)	44		1575	1019	
Turn Bay Length (ft)		300		775	
Base Capacity (vph)	1119	596	1130	1931	876
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.65	0.25	0.70	0.29	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	690	141	0	749	525	700
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	0.95	1.00		0.95	0.97	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3260	1454		3292	3193	1419
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3260	1454		3292	3193	1419
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	726	148	0	788	553	737
RTOR Reduction (vph)	0	97	0	0	0	20
Lane Group Flow (vph)	726	51	0	788	553	717
Confl. Peds. (#/hr)		1	1		9	4
Heavy Vehicles (%)	2%	0%	0%	1%	1%	3%
Turn Type	NA	Perm		NA	Prot	Perm
Protected Phases	2			6	7	
Permitted Phases		2				7
Actuated Green, G (s)	36.1	36.1		36.1	59.9	59.9
Effective Green, g (s)	36.1	36.1		36.1	59.9	59.9
Actuated g/C Ratio	0.34	0.34		0.34	0.57	0.57
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	6.1	6.1		6.1	2.5	2.5
Lane Grp Cap (vph)	1120	499		1131	1821	809
v/s Ratio Prot	0.22			c0.24	0.17	
v/s Ratio Perm		0.03				c0.51
v/c Ratio	0.65	0.10		0.70	0.30	0.89
Uniform Delay, d1	29.1	23.4		29.7	11.7	19.6
Progression Factor	0.87	1.02		1.00	1.00	1.00
Incremental Delay, d2	2.7	0.4		3.6	0.1	11.4
Delay (s)	28.2	24.4		33.3	11.8	31.0
Level of Service	C	C		C	B	C
Approach Delay (s)	27.5			33.3	22.8	
Approach LOS	C			C	C	

Intersection Summary			
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	525	862	22	704	68	23	55	11	190
v/c Ratio	0.83	0.36	0.29	0.40	0.46	0.16	0.48	0.08	0.38
Control Delay	57.5	9.6	64.5	20.2	61.2	32.6	67.3	47.5	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	9.6	64.5	20.2	61.2	32.6	67.3	47.5	8.5
Queue Length 50th (ft)	201	133	17	163	47	9	42	8	23
Queue Length 95th (ft)	255	282	45	313	99	30	85	23	55
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	738	2385	81	1780	171	354	135	358	546
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.36	0.27	0.40	0.40	0.06	0.41	0.03	0.35

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	483	698	95	20	593	54	63	11	10	51	10	175
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.0
Lane Util. Factor	0.97	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3162	3201		1630	3219		1630	1593		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3162	3201		1630	3219		1630	1593		1630	1716	1458
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)	525	759	103	22	645	59	68	12	11	55	11	190
RTOR Reduction (vph)	0	6	0	0	4	0	0	10	0	0	0	115
Lane Group Flow (vph)	525	856	0	22	700	0	68	13	0	55	11	75
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases												4
Actuated Green, G (s)	24.1	83.2		3.6	62.7		9.9	8.8		7.4	6.3	30.4
Effective Green, g (s)	24.1	83.2		3.6	62.7		9.9	8.8		7.4	6.3	30.4
Actuated g/C Ratio	0.20	0.69		0.03	0.52		0.08	0.07		0.06	0.05	0.25
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.0
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	635	2219		48	1681		134	116		100	90	369
v/s Ratio Prot	c0.17	0.27		0.01	c0.22		c0.04	0.01		0.03	0.01	c0.04
v/s Ratio Perm												0.01
v/c Ratio	0.83	0.39		0.46	0.42		0.51	0.11		0.55	0.12	0.20
Uniform Delay, d1	45.9	7.7		57.2	17.5		52.7	51.9		54.7	54.2	35.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.5	0.5		5.0	0.8		2.2	0.3		5.1	0.4	0.2
Delay (s)	54.4	8.2		62.2	18.2		54.9	52.3		59.8	54.7	35.5
Level of Service	D	A		E	B		D	D		E	D	D
Approach Delay (s)		25.7			19.6			54.2			41.5	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	1196	356	706	34	42	17	27
v/c Ratio	0.20	0.68	0.92	0.27	0.25	0.07	0.13	0.07
Control Delay	52.5	21.3	69.9	5.6	44.0	0.2	39.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.5	21.3	69.9	5.6	44.0	0.2	39.9	0.3
Queue Length 50th (ft)	12	268	235	35	22	0	11	0
Queue Length 95th (ft)	36	#554	#407	172	43	0	27	0
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	94	1756	387	2615	329	719	326	588
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.68	0.92	0.27	0.10	0.06	0.05	0.05

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	877	259	338	664	7	32	0	40	16	0	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3155		1662	3286		1648	1458		1650	1456	
Flt Permitted	0.95	1.00		0.95	1.00		0.74	1.00		0.73	1.00	
Satd. Flow (perm)	1662	3155		1662	3286		1283	1458		1267	1456	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	923	273	356	699	7	34	0	42	17	0	27
RTOR Reduction (vph)	0	20	0	0	0	0	0	38	0	0	24	0
Lane Group Flow (vph)	18	1176	0	356	706	0	34	4	0	17	3	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Effective Green, g (s)	2.5	54.3		27.2	79.0		10.0	10.0		10.0	10.0	
Actuated g/C Ratio	0.02	0.52		0.26	0.75		0.10	0.10		0.10	0.10	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	39	1631		430	2472		122	138		120	138	
v/s Ratio Prot	0.01	c0.37		c0.21	0.21			0.00			0.00	
v/s Ratio Perm							c0.03			0.01		
v/c Ratio	0.46	0.72		0.83	0.29		0.28	0.03		0.14	0.02	
Uniform Delay, d1	50.6	19.5		36.7	4.1		44.1	43.1		43.6	43.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.2	2.8		12.1	0.3		0.9	0.1		0.4	0.0	
Delay (s)	56.8	22.3		48.8	4.4		45.1	43.2		44.0	43.1	
Level of Service	E	C		D	A		D	D		D	D	
Approach Delay (s)		22.8			19.3			44.0			43.4	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	75	909	24	974	268	5	15	95	84
v/c Ratio	0.48	0.38	0.26	0.44	0.23	0.08	0.13	0.39	0.19
Control Delay	57.4	8.7	56.3	11.8	1.1	54.2	23.2	52.6	0.9
Queue Delay	0.0	0.0	0.0	1.1	0.3	0.0	0.0	0.0	0.0
Total Delay	57.4	8.7	56.3	12.9	1.3	54.2	23.2	52.6	0.9
Queue Length 50th (ft)	50	101	17	137	0	4	1	33	0
Queue Length 95th (ft)	98	264	44	322	17	16	20	59	0
Internal Link Dist (ft)		526		296			109		204
Turn Bay Length (ft)	100		100			50		100	
Base Capacity (vph)	173	2384	101	2215	1180	60	253	293	560
Starvation Cap Reductn	0	0	0	928	445	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.38	0.24	0.76	0.36	0.08	0.06	0.32	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	838	26	23	925	255	5	1	13	90	0	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	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	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3274		1662	3292	1455	1658	1478		3225	1465	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3274		1662	3292	1455	1658	1478		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	75	882	27	24	974	268	5	1	14	95	0	84
RTOR Reduction (vph)	0	1	0	0	0	79	0	13	0	0	74	0
Lane Group Flow (vph)	75	908	0	24	974	189	5	2	0	95	10	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	10.1	75.0		4.1	69.0	77.4	0.8	5.5		8.4	13.1	
Effective Green, g (s)	10.1	75.0		4.1	69.0	77.4	0.8	5.5		8.4	13.1	
Actuated g/C Ratio	0.09	0.68		0.04	0.63	0.70	0.01	0.05		0.08	0.12	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.2		2.5	4.2	3.0	3.0	2.0		3.0	2.5	
Lane Grp Cap (vph)	152	2232		61	2064	1023	12	73		246	174	
v/s Ratio Prot	0.05	c0.28		0.01	c0.30	0.01	0.00	0.00		c0.03	c0.01	
v/s Ratio Perm						0.12						
v/c Ratio	0.49	0.41		0.39	0.47	0.18	0.42	0.02		0.39	0.06	
Uniform Delay, d1	47.5	7.7		51.7	10.9	5.6	54.4	49.7		48.3	43.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.6		3.0	0.8	0.1	21.8	0.0		1.0	0.1	
Delay (s)	49.3	8.3		54.8	11.6	5.6	76.1	49.7		49.4	43.1	
Level of Service	D	A		D	B	A	E	D		D	D	
Approach Delay (s)		11.4			11.2			56.3			46.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	36	1446	26	1596	52	253
v/c Ratio	0.43	0.70	0.34	0.78	0.16	0.87
Control Delay	67.2	16.4	55.4	23.1	19.1	68.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.2	16.4	55.4	23.1	19.1	68.1
Queue Length 50th (ft)	25	381	19	403	13	162
Queue Length 95th (ft)	#66	477	m33	637	41	#257
Internal Link Dist (ft)		553		699	147	253
Turn Bay Length (ft)	150		175			
Base Capacity (vph)	83	2068	76	2041	367	330
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.70	0.34	0.78	0.14	0.77

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	1358	16	25	1409	107	19	1	25	172	2	42
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.96	
Satd. Flow (prot)	1662	3191		1662	3161			1560			1618	
Flt Permitted	0.95	1.00		0.95	1.00			0.87			0.77	
Satd. Flow (perm)	1662	3191		1662	3161			1383			1291	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	36	1429	17	26	1483	113	22	1	29	202	2	49
RTOR Reduction (vph)	0	1	0	0	4	0	0	23	0	0	8	0
Lane Group Flow (vph)	36	1445	0	26	1592	0	0	29	0	0	245	0
Confl. Peds. (#/hr)	2		5	5		2	9		7	7		9
Confl. Bikes (#/hr)			3									
Heavy Vehicles (%)	0%	4%	0%	0%	4%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	3.3	69.5		2.9	69.1			24.1			24.1	
Effective Green, g (s)	3.3	69.5		2.9	69.1			24.1			24.1	
Actuated g/C Ratio	0.03	0.63		0.03	0.63			0.22			0.22	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0			2.5			2.5	
Lane Grp Cap (vph)	49	2016		43	1985			303			282	
v/s Ratio Prot	c0.02	0.45		0.02	c0.50							
v/s Ratio Perm								0.02			c0.19	
v/c Ratio	0.73	0.72		0.60	0.80			0.10			0.87	
Uniform Delay, d1	52.9	13.6		53.0	15.3			34.3			41.4	
Progression Factor	1.00	1.00		0.88	1.26			1.00			1.00	
Incremental Delay, d2	41.4	2.2		15.8	3.0			0.1			23.4	
Delay (s)	94.3	15.9		62.2	22.3			34.4			64.8	
Level of Service	F	B		E	C			C			E	
Approach Delay (s)		17.8			22.9			34.4			64.8	
Approach LOS		B			C			C			E	

Intersection Summary			
HCM 2000 Control Delay	24.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	32	1141	420	251	1285	303	31	367	42	63
v/c Ratio	0.37	0.66	0.44	0.81	0.56	0.76	0.10	0.68	0.20	0.21
Control Delay	72.0	30.9	11.4	67.7	7.4	55.6	37.5	10.9	39.8	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.0	30.9	11.4	67.7	7.4	55.6	37.5	10.9	39.8	16.3
Queue Length 50th (ft)	24	415	114	159	153	106	19	0	26	9
Queue Length 95th (ft)	m34	512	m211	254	175	147	44	85	56	45
Internal Link Dist (ft)		699			207		278			279
Turn Bay Length (ft)	150		300	150					150	
Base Capacity (vph)	90	1740	957	374	2313	494	365	582	266	356
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	16	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.66	0.44	0.67	0.56	0.61	0.08	0.63	0.16	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	1084	399	238	1214	7	288	29	349	40	14	46
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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	1.00	0.95	1.00	1.00	0.95		0.97	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	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		0.98	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.89	
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)	1662	3260	1427	1646	3289		3140	1750	1396	1642	1521	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.72	1.00	1.00	0.74	1.00	
Satd. Flow (perm)	1662	3260	1427	1646	3289		2366	1750	1396	1274	1521	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	1141	420	251	1278	7	303	31	367	42	15	48
RTOR Reduction (vph)	0	0	195	0	0	0	0	0	305	0	40	0
Lane Group Flow (vph)	32	1141	225	251	1285	0	303	31	62	42	23	0
Confl. Peds. (#/hr)							7		8	8		7
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	2%	2%	1%	1%	0%	1%	0%	4%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.6	58.8	58.8	20.6	75.8		18.6	18.6	18.6	18.6	18.6	
Effective Green, g (s)	3.6	58.8	58.8	20.6	75.8		18.6	18.6	18.6	18.6	18.6	
Actuated g/C Ratio	0.03	0.53	0.53	0.19	0.69		0.17	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	4.0	4.0	
Vehicle Extension (s)	2.5	5.5	5.5	2.5	5.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	54	1742	762	308	2266		400	295	236	215	257	
v/s Ratio Prot	0.02	c0.35		c0.15	0.39			0.02			0.02	
v/s Ratio Perm			0.16				c0.13		0.04	0.03		
v/c Ratio	0.59	0.65	0.29	0.81	0.57		0.76	0.11	0.26	0.20	0.09	
Uniform Delay, d1	52.5	18.3	14.1	42.9	8.7		43.6	38.7	39.7	39.3	38.6	
Progression Factor	1.25	1.45	5.54	1.18	0.70		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.8	1.4	0.7	12.7	0.9		7.6	0.1	0.4	0.3	0.1	
Delay (s)	75.7	28.0	79.1	63.2	7.0		51.2	38.8	40.2	39.6	38.7	
Level of Service	E	C	E	E	A		D	D	D	D	D	
Approach Delay (s)		42.4			16.2			44.9			39.0	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	32.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBR
Lane Group Flow (vph)	16	1101	434	595	1289	235	180	18	40
v/c Ratio	0.17	0.71	0.46	0.79	0.55	0.67	0.36	0.30	0.17
Control Delay	41.2	23.9	6.6	47.8	10.4	56.6	2.0	64.5	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Total Delay	41.2	23.9	6.6	47.8	11.1	56.6	2.0	64.5	1.5
Queue Length 50th (ft)	12	151	6	204	198	82	0	13	0
Queue Length 95th (ft)	m17	#321	114	252	363	124	0	35	0
Internal Link Dist (ft)		421			104		647		
Turn Bay Length (ft)	125			300				100	
Base Capacity (vph)	93	1560	937	777	2326	381	565	60	321
Starvation Cap Reductn	0	0	0	0	633	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.71	0.46	0.77	0.76	0.62	0.32	0.30	0.12

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1046	412	565	1202	23	223	0	171	15	0	34
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0		4.0	4.5		4.0		4.5
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	1.00		1.00		1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	0.98		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
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1662	3197	1466	3225	3250		3225	1369		1662		1488
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	1662	3197	1466	3225	3250		3225	1369		1662		1488
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	16	1101	434	595	1265	24	235	0	180	18	0	40
RTOR Reduction (vph)	0	0	232	0	1	0	0	157	0	0	0	39
Lane Group Flow (vph)	16	1101	202	595	1288	0	235	23	0	18	0	1
Confl. Peds. (#/hr)	4		1	1		4	4		8	8		4
Confl. Bikes (#/hr)			2			2						
Heavy Vehicles (%)	0%	4%	0%	0%	2%	0%	0%	0%	6%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot		Prot
Protected Phases	5	2		1	6		3	8		7		4
Permitted Phases			2									
Actuated Green, G (s)	2.9	51.3	51.3	25.6	74.0		12.0	14.0		1.6		3.6
Effective Green, g (s)	2.9	51.3	51.3	25.6	74.0		12.0	14.0		1.6		3.6
Actuated g/C Ratio	0.03	0.47	0.47	0.23	0.67		0.11	0.13		0.01		0.03
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		4.0	4.5		4.0		4.5
Vehicle Extension (s)	2.5	5.9	5.9	3.0	5.9		3.0	2.5		3.0		2.5
Lane Grp Cap (vph)	43	1490	683	750	2186		351	174		24		48
v/s Ratio Prot	0.01	c0.34		c0.18	0.40		c0.07	c0.02		0.01		0.00
v/s Ratio Perm			0.14									
v/c Ratio	0.37	0.74	0.30	0.79	0.59		0.67	0.13		0.75		0.03
Uniform Delay, d1	52.7	23.9	18.2	39.7	9.8		47.1	42.6		54.0		51.5
Progression Factor	0.78	0.88	2.39	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	3.0	2.6	0.9	5.8	1.2		4.8	0.3		80.1		0.2
Delay (s)	43.9	23.6	44.2	45.5	10.9		51.9	42.9		134.1		51.7
Level of Service	D	C	D	D	B		D	D		F		D
Approach Delay (s)		29.6			21.8			48.0			77.3	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	43	1302	13	1773	8	174
v/c Ratio	0.32	0.55	0.07	0.75	0.06	0.62
Control Delay	44.5	1.3	0.7	12.8	35.3	15.9
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	44.5	1.5	0.7	12.8	35.3	15.9
Queue Length 50th (ft)	24	0	0	280	4	0
Queue Length 95th (ft)	55	23	0	#668	15	46
Internal Link Dist (ft)				770	226	
Turn Bay Length (ft)						
Base Capacity (vph)	286	2348	249	2367	286	388
Starvation Cap Reductn	0	322	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.64	0.05	0.75	0.03	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	41	0	1237	12	1635	49	7	148	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88	1.00	0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	0.96		
Flpb, ped/bikes	1.00		1.00	0.90	1.00		1.00	1.00		
Frt	1.00		0.85	1.00	1.00		1.00	0.85		
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1662		2618	1492	3241		1662	1418		
Flt Permitted	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1662		2618	1492	3241		1662	1418		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	43	0	1302	13	1721	52	8	174	0	0
RTOR Reduction (vph)	0	0	312	13	1	0	0	159	0	0
Lane Group Flow (vph)	43	0	990	0	1772	0	8	15	0	0
Confl. Peds. (#/hr)	8		4	4		8	10	20		
Confl. Bikes (#/hr)						1				
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	1%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Effective Green, g (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Actuated g/C Ratio	0.06		0.76	0.01	0.71		0.09	0.09		
Clearance Time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0	1.5	5.0		2.5	2.5		
Lane Grp Cap (vph)	94		1989	13	2308		144	122		
v/s Ratio Prot	c0.03		0.38	0.00	c0.55		0.00			
v/s Ratio Perm								c0.01		
v/c Ratio	0.46		0.50	0.01	0.77		0.06	0.12		
Uniform Delay, d1	41.1		4.2	44.2	8.2		37.7	37.9		
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	2.6		0.9	0.1	2.5		0.1	0.3		
Delay (s)	43.7		5.1	44.3	10.7		37.8	38.3		
Level of Service	D		A	D	B		D	D		
Approach Delay (s)		6.3			11.0		38.3		0.0	
Approach LOS		A			B		D		A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	31	1243	20	1222	5	75
v/c Ratio	0.29	0.50	0.20	0.50	0.03	0.47
Control Delay	51.0	7.4	44.7	13.0	30.2	34.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.0	7.4	44.7	13.0	30.2	34.5
Queue Length 50th (ft)	19	83	12	310	2	27
Queue Length 95th (ft)	49	342	m27	390	11	57
Internal Link Dist (ft)		553		699	147	253
Turn Bay Length (ft)	150		175			
Base Capacity (vph)	119	2481	111	2431	318	305
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.50	0.18	0.50	0.02	0.25

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	1175	6	19	1086	75	2	1	2	36	1	27
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.95			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1662	3135		1662	3170			1608			1542	
Flt Permitted	0.95	1.00		0.95	1.00			0.90			0.82	
Satd. Flow (perm)	1662	3135		1662	3170			1472			1306	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	31	1237	6	20	1143	79	2	1	2	42	1	32
RTOR Reduction (vph)	0	0	0	0	3	0	0	2	0	0	29	0
Lane Group Flow (vph)	31	1243	0	20	1219	0	0	3	0	0	46	0
Confl. Peds. (#/hr)			1	1			3		6	6		3
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	6%	0%	0%	4%	0%	0%	0%	0%	5%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.4	74.6		2.8	73.0			9.1			9.1	
Effective Green, g (s)	4.4	74.6		2.8	73.0			9.1			9.1	
Actuated g/C Ratio	0.04	0.75		0.03	0.73			0.09			0.09	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0			2.5			2.5	
Lane Grp Cap (vph)	73	2338		46	2314			133			118	
v/s Ratio Prot	c0.02	c0.40		0.01	0.38							
v/s Ratio Perm								0.00			c0.04	
v/c Ratio	0.42	0.53		0.43	0.53			0.02			0.39	
Uniform Delay, d1	46.6	5.3		47.8	5.9			41.4			42.8	
Progression Factor	1.00	1.00		0.91	1.66			1.00			1.00	
Incremental Delay, d2	2.9	0.9		4.3	0.8			0.1			1.5	
Delay (s)	49.4	6.2		48.0	10.6			41.5			44.4	
Level of Service	D	A		D	B			D			D	
Approach Delay (s)		7.3			11.2			41.5			44.4	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	86	921	271	156	936	282	149	438	45	65
v/c Ratio	0.55	0.52	0.33	0.69	0.48	0.67	0.47	0.76	0.27	0.24
Control Delay	64.0	24.6	10.8	58.8	13.7	45.4	40.3	15.1	36.9	16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.0	24.6	10.8	58.8	13.7	45.4	40.3	15.1	36.9	16.6
Queue Length 50th (ft)	51	177	0	106	176	87	86	26	25	12
Queue Length 95th (ft)	111	401	163	m163	222	117	132	125	52	44
Internal Link Dist (ft)		699			207		278			200
Turn Bay Length (ft)	150		300	150					150	
Base Capacity (vph)	174	1788	813	283	1965	651	490	675	261	400
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.52	0.33	0.55	0.48	0.43	0.30	0.65	0.17	0.16

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	875	257	148	867	22	268	142	416	43	21	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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	1.00	0.95	1.00	1.00	0.95		0.97	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	0.98	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.98	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.90	
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)	1458	3228	1250	1554	3217		3093	1750	1411	1648	1312	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.71	1.00	1.00	0.54	1.00	
Satd. Flow (perm)	1458	3228	1250	1554	3217		2327	1750	1411	934	1312	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	86	921	271	156	913	23	282	149	438	45	22	43
RTOR Reduction (vph)	0	0	121	0	1	0	0	0	319	0	35	0
Lane Group Flow (vph)	86	921	150	156	935	0	282	149	119	45	30	0
Confl. Peds. (#/hr)	1					1	10		8	8		10
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	14%	3%	19%	7%	3%	0%	2%	0%	3%	0%	0%	27%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	9.6	55.4	55.4	14.5	60.3		18.1	18.1	18.1	18.1	18.1	
Effective Green, g (s)	9.6	55.4	55.4	14.5	60.3		18.1	18.1	18.1	18.1	18.1	
Actuated g/C Ratio	0.10	0.55	0.55	0.14	0.60		0.18	0.18	0.18	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	4.0	
Vehicle Extension (s)	2.5	5.5	5.5	2.5	5.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	139	1788	692	225	1939		421	316	255	169	237	
v/s Ratio Prot	0.06	c0.29		c0.10	0.29			0.09			0.02	
v/s Ratio Perm			0.12				c0.12		0.08	0.05		
v/c Ratio	0.62	0.52	0.22	0.69	0.48		0.67	0.47	0.47	0.27	0.13	
Uniform Delay, d1	43.4	13.9	11.3	40.6	11.1		38.2	36.7	36.6	35.2	34.3	
Progression Factor	1.24	1.48	4.27	1.11	1.01		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.1	0.9	0.6	7.2	0.7		3.6	0.8	1.0	0.6	0.2	
Delay (s)	59.9	21.5	48.8	52.5	12.0		41.8	37.5	37.6	35.9	34.5	
Level of Service	E	C	D	D	B		D	D	D	D	C	
Approach Delay (s)		29.9			17.8			38.9			35.0	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	129	897	379	378	639	373	298	60	195
v/c Ratio	0.65	0.63	0.43	0.74	0.42	0.77	0.72	0.54	0.45
Control Delay	50.3	26.2	8.3	49.6	18.5	52.1	25.3	63.4	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.3	26.2	8.3	49.6	18.5	52.1	25.3	63.4	3.3
Queue Length 50th (ft)	81	166	16	118	126	117	68	38	0
Queue Length 95th (ft)	m136	321	133	170	209	168	153	75	0
Internal Link Dist (ft)		421			104		647		121
Turn Bay Length (ft)	125							100	
Base Capacity (vph)	249	1435	872	539	1512	516	470	116	491
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.63	0.43	0.70	0.42	0.72	0.63	0.52	0.40

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	852	360	359	518	89	354	56	227	51	0	166
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0		4.0	4.5		4.0	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	0.98		1.00	0.98	
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	0.98		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3228	1488	3225	3105		3225	1511		1662	1408	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3228	1488	3225	3105		3225	1511		1662	1408	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	129	897	379	378	545	94	373	59	239	60	0	195
RTOR Reduction (vph)	0	0	213	0	12	0	0	154	0	0	179	0
Lane Group Flow (vph)	129	897	166	378	627	0	373	144	0	60	16	0
Confl. Peds. (#/hr)	3					3	1		8	8		1
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	0%	3%	0%	0%	5%	0%	0%	0%	0%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	12.0	43.7	43.7	15.8	47.5		15.0	17.4		5.6	8.0	
Effective Green, g (s)	12.0	43.7	43.7	15.8	47.5		15.0	17.4		5.6	8.0	
Actuated g/C Ratio	0.12	0.44	0.44	0.16	0.48		0.15	0.17		0.06	0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)	2.5	5.9	5.9	3.0	5.9		3.0	2.5		3.0	2.5	
Lane Grp Cap (vph)	199	1410	650	509	1474		483	262		93	112	
v/s Ratio Prot	0.08	c0.28		c0.12	c0.20		c0.12	c0.10		0.04	0.01	
v/s Ratio Perm			0.11									
v/c Ratio	0.65	0.64	0.25	0.74	0.43		0.77	0.55		0.65	0.14	
Uniform Delay, d1	42.0	22.0	17.8	40.2	17.3		40.9	37.7		46.2	42.8	
Progression Factor	0.89	1.07	2.95	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.4	1.9	0.8	5.8	0.9		7.5	2.0		14.3	0.4	
Delay (s)	42.8	25.3	53.3	46.0	18.2		48.4	39.7		60.6	43.2	
Level of Service	D	C	D	D	B		D	D		E	D	
Approach Delay (s)		34.5			28.5			44.5			47.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBT	SBL	SBR
Lane Group Flow (vph)	140	1028	1044	4	86
v/c Ratio	0.64	0.46	0.52	0.03	0.39
Control Delay	49.8	0.9	10.6	35.3	8.8
Queue Delay	0.0	0.1	0.0	0.0	0.0
Total Delay	49.8	1.0	10.6	35.3	8.8
Queue Length 50th (ft)	76	0	140	2	0
Queue Length 95th (ft)	132	15	286	10	20
Internal Link Dist (ft)			869	226	
Turn Bay Length (ft)					
Base Capacity (vph)	283	2254	2027	286	339
Starvation Cap Reductn	0	349	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.54	0.52	0.01	0.25

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	133	0	977	0	909	83	3	73	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5		4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88		0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00		1.00		1.00	0.98		
Flpb, ped/bikes	1.00		1.00		1.00		1.00	1.00		
Frt	1.00		0.85		0.99		1.00	0.85		
Flt Protected	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (prot)	1646		2470		3052		1662	1420		
Flt Permitted	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (perm)	1646		2470		3052		1662	1420		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	140	0	1028	0	957	87	4	86	0	0
RTOR Reduction (vph)	0	0	174	0	5	0	0	80	0	0
Lane Group Flow (vph)	140	0	854	0	1039	0	4	6	0	0
Confl. Peds. (#/hr)	4		3	3		4	5	4		
Heavy Vehicles (%)	1%	0%	6%	0%	8%	0%	0%	3%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	12.0		74.8		58.8		6.2	6.2		
Effective Green, g (s)	12.0		74.8		58.8		6.2	6.2		
Actuated g/C Ratio	0.13		0.83		0.65		0.07	0.07		
Clearance Time (s)	4.0		4.5		4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0		5.0		2.5	2.5		
Lane Grp Cap (vph)	219		2052		1993		114	97		
v/s Ratio Prot	c0.09		0.35		c0.34		0.00			
v/s Ratio Perm								c0.00		
v/c Ratio	0.64		0.42		0.52		0.04	0.06		
Uniform Delay, d1	36.9		2.0		8.2		39.1	39.2		
Progression Factor	1.00		1.00		1.00		1.00	1.00		
Incremental Delay, d2	5.3		0.6		1.0		0.1	0.2		
Delay (s)	42.2		2.6		9.2		39.2	39.4		
Level of Service	D		A		A		D	D		
Approach Delay (s)		7.3			9.2		39.4		0.0	
Approach LOS		A			A		D		A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	67	1415	26	1626	22	30	266	106
v/c Ratio	0.42	0.72	0.25	0.95	0.25	0.25	0.93	0.26
Control Delay	54.9	20.7	54.2	38.0	54.6	22.1	84.5	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.9	20.7	54.2	38.0	54.6	22.1	84.5	12.3
Queue Length 50th (ft)	45	411	18	~640	15	1	187	15
Queue Length 95th (ft)	92	#582	46	#808	38	28	#313	51
Internal Link Dist (ft)		553		442		147		253
Turn Bay Length (ft)	150		175				150	
Base Capacity (vph)	161	1957	105	1717	201	237	287	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.72	0.25	0.95	0.11	0.13	0.93	0.19

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	1328	16	25	1409	136	19	1	25	226	2	88
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3191		1662	3153		1642	1463		1662	1455	
Flt Permitted	0.95	1.00		0.95	1.00		0.80	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3191		1662	3153		1383	1463		1662	1455	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	67	1398	17	26	1483	143	22	1	29	266	2	104
RTOR Reduction (vph)	0	1	0	0	6	0	0	28	0	0	57	0
Lane Group Flow (vph)	67	1414	0	26	1620	0	22	2	0	266	49	0
Confl. Peds. (#/hr)	2		5	5		2	9		7	7		9
Confl. Bikes (#/hr)			3									
Heavy Vehicles (%)	0%	4%	0%	0%	4%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8					
Actuated Green, G (s)	10.7	63.9		4.7	57.9		5.0	5.0		18.9	27.9	
Effective Green, g (s)	10.7	63.9		4.7	57.9		5.0	5.0		18.9	27.9	
Actuated g/C Ratio	0.10	0.58		0.04	0.53		0.05	0.05		0.17	0.25	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5		3.0	2.5	
Lane Grp Cap (vph)	161	1853		71	1659		62	66		285	369	
v/s Ratio Prot	c0.04	c0.44		0.02	c0.51			0.00		c0.16	0.03	
v/s Ratio Perm							c0.02					
v/c Ratio	0.42	0.76		0.37	0.98		0.35	0.04		0.93	0.13	
Uniform Delay, d1	46.7	17.4		51.2	25.4		50.9	50.2		44.9	31.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	3.0		2.3	17.2		2.5	0.2		35.8	0.1	
Delay (s)	48.0	20.4		53.5	42.5		53.5	50.4		80.7	31.8	
Level of Service	D	C		D	D		D	D		F	C	
Approach Delay (s)		21.6			42.7			51.7			66.8	
Approach LOS		C			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	36.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1183	251	1278	334	367
v/c Ratio	0.66	0.80	0.50	0.71	0.70
Control Delay	21.4	60.8	5.6	52.8	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	60.8	5.6	52.8	12.2
Queue Length 50th (ft)	298	170	141	117	0
Queue Length 95th (ft)	458	247	219	157	88
Internal Link Dist (ft)	177		207	278	
Turn Bay Length (ft)		150			
Base Capacity (vph)	1792	380	2558	655	582
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	0.66	0.50	0.51	0.63

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1124	0	238	1214	317	349
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00		1.00	1.00	0.98	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3260		1646	3292	3135	1396
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3260		1646	3292	3135	1396
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1183	0	251	1278	334	367
RTOR Reduction (vph)	0	0	0	0	0	312
Lane Group Flow (vph)	1183	0	251	1278	334	55
Confl. Peds. (#/hr)					7	8
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%
Turn Type	NA		Prot	NA	Perm	Perm
Protected Phases	2		1	6		
Permitted Phases					8	8
Actuated Green, G (s)	60.5		21.0	85.5	16.5	16.5
Effective Green, g (s)	60.5		21.0	85.5	16.5	16.5
Actuated g/C Ratio	0.55		0.19	0.78	0.15	0.15
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	5.5		2.5	5.5	2.5	2.5
Lane Grp Cap (vph)	1793		314	2558	470	209
v/s Ratio Prot	c0.36		c0.15	0.39		
v/s Ratio Perm					c0.11	0.04
v/c Ratio	0.66		0.80	0.50	0.71	0.26
Uniform Delay, d1	17.5		42.5	4.5	44.5	41.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9		12.9	0.7	4.7	0.5
Delay (s)	19.4		55.4	5.2	49.2	41.9
Level of Service	B		E	A	D	D
Approach Delay (s)	19.4			13.4	45.3	
Approach LOS	B			B	D	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBR	SBR
Lane Group Flow (vph)	1117	1860	235	180	40
v/c Ratio	0.47	0.77	0.62	0.57	0.31
Control Delay	7.2	12.6	53.5	23.6	10.9
Queue Delay	0.0	3.5	0.0	0.0	0.0
Total Delay	7.2	16.1	53.5	23.6	10.9
Queue Length 50th (ft)	162	409	82	44	0
Queue Length 95th (ft)	233	590	119	109	13
Internal Link Dist (ft)	203	104			
Turn Bay Length (ft)					
Base Capacity (vph)	2382	2428	615	456	131
Starvation Cap Reductn	0	466	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.95	0.38	0.39	0.31

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1061	0	0	1767	0	223	0	171	0	0	34
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			5.0		4.5		4.5			4.5
Lane Util. Factor		0.95			0.95		0.97		1.00			1.00
Frpb, ped/bikes		1.00			1.00		1.00		0.98			1.00
Flpb, ped/bikes		1.00			1.00		1.00		1.00			1.00
Frt		1.00			1.00		1.00		0.85			0.86
Flt Protected		1.00			1.00		0.95		1.00			1.00
Satd. Flow (prot)		3197			3260		3225		1369			1514
Flt Permitted		1.00			1.00		0.95		1.00			1.00
Satd. Flow (perm)		3197			3260		3225		1369			1514
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	0	1117	0	0	1860	0	235	0	180	0	0	40
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	86	0	0	39
Lane Group Flow (vph)	0	1117	0	0	1860	0	235	0	94	0	0	1
Confl. Peds. (#/hr)	4		1	1		4	4		8	8		4
Confl. Bikes (#/hr)			2			2						
Heavy Vehicles (%)	0%	4%	0%	0%	2%	0%	0%	0%	6%	0%	0%	0%
Turn Type		NA			NA		Prot		Perm			Prot
Protected Phases		2			6		8					4
Permitted Phases									7			
Actuated Green, G (s)		80.2			80.2		12.8		20.3			3.0
Effective Green, g (s)		80.2			80.2		12.8		20.3			3.0
Actuated g/C Ratio		0.73			0.73		0.12		0.18			0.03
Clearance Time (s)		5.0			5.0		4.5		4.5			4.5
Vehicle Extension (s)		5.9			5.9		2.5		2.5			2.5
Lane Grp Cap (vph)		2330			2376		375		252			41
v/s Ratio Prot		0.35			c0.57		c0.07					0.00
v/s Ratio Perm									c0.07			
v/c Ratio		0.48			0.78		0.63		0.37			0.03
Uniform Delay, d1		6.2			9.4		46.3		39.3			52.1
Progression Factor		1.00			1.00		1.00		1.00			1.00
Incremental Delay, d2		0.7			2.7		2.8		0.7			0.2
Delay (s)		6.9			12.1		49.1		39.9			52.3
Level of Service		A			B		D		D			D
Approach Delay (s)		6.9			12.1			45.2			52.3	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	59	1286	13	1773	26	174
v/c Ratio	0.29	0.56	0.09	0.81	0.12	0.68
Control Delay	44.7	1.5	1.3	16.3	32.1	33.0
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	44.7	1.7	1.3	16.3	32.1	33.0
Queue Length 50th (ft)	16	0	0	355	13	52
Queue Length 95th (ft)	#40	27	0	#654	31	96
Internal Link Dist (ft)				770	226	
Turn Bay Length (ft)						
Base Capacity (vph)	202	2285	141	2202	393	395
Starvation Cap Reductn	0	248	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.63	0.09	0.81	0.07	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	56	0	1222	12	1612	72	22	148	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Lane Util. Factor	0.97		0.88	1.00	0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	0.96		
Flpb, ped/bikes	1.00		1.00	0.90	1.00		1.00	1.00		
Frt	1.00		0.85	1.00	0.99		1.00	0.85		
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	3225		2618	1492	3234		1662	1418		
Flt Permitted	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)	3225		2618	1492	3234		1662	1418		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	59	0	1286	13	1697	76	26	174	0	0
RTOR Reduction (vph)	0	0	367	13	3	0	0	68	0	0
Lane Group Flow (vph)	59	0	919	0	1770	0	26	106	0	0
Confl. Peds. (#/hr)	8		4	4		8	10	20		
Confl. Bikes (#/hr)						1				
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	1%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	4.6		64.3	0.7	60.4		12.0	12.0		
Effective Green, g (s)	4.6		64.3	0.7	60.4		12.0	12.0		
Actuated g/C Ratio	0.05		0.71	0.01	0.67		0.13	0.13		
Clearance Time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0	1.5	5.0		2.5	2.5		
Lane Grp Cap (vph)	164		1870	11	2170		221	189		
v/s Ratio Prot	c0.02		c0.35	0.00	c0.55		0.02			
v/s Ratio Perm								c0.08		
v/c Ratio	0.36		0.49	0.01	0.82		0.12	0.56		
Uniform Delay, d1	41.3		5.7	44.3	10.8		34.3	36.5		
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	1.0		0.9	0.1	3.5		0.2	3.1		
Delay (s)	42.3		6.6	44.4	14.3		34.5	39.6		
Level of Service	D		A	D	B		C	D		
Approach Delay (s)		8.1			14.5		39.0		0.0	
Approach LOS		A			B		D		A	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	117	1157	20	1371	2	3	118	81
v/c Ratio	0.57	0.48	0.19	0.67	0.02	0.03	0.96	0.41
Control Delay	51.7	6.9	42.6	15.9	41.0	32.0	114.7	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	6.9	42.6	15.9	41.0	32.0	114.7	15.0
Queue Length 50th (ft)	71	53	13	205	1	1	~99	1
Queue Length 95th (ft)	124	314	m32	#564	8	9	109	34
Internal Link Dist (ft)		553		699		147		253
Turn Bay Length (ft)	150		175					
Base Capacity (vph)	211	2432	107	2059	366	327	123	482
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.48	0.19	0.67	0.01	0.01	0.96	0.17

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	1093	6	19	1086	217	2	1	2	100	1	68
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		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	1.00		1.00	0.98		1.00	0.90		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3135		1662	3127		1656	1554		1576	1467	
Flt Permitted	0.95	1.00		0.95	1.00		1.00	1.00		0.61	1.00	
Satd. Flow (perm)	1662	3135		1662	3127		1743	1554		1006	1467	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	117	1151	6	20	1143	228	2	1	2	118	1	80
RTOR Reduction (vph)	0	0	0	0	12	0	0	2	0	0	70	0
Lane Group Flow (vph)	117	1157	0	20	1359	0	2	1	0	118	11	0
Confl. Peds. (#/hr)			1	1			3		6	6		3
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	6%	0%	0%	4%	0%	0%	0%	0%	5%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	12.4	71.3		3.0	61.9		2.6	2.6		12.2	12.2	
Effective Green, g (s)	12.4	71.3		3.0	61.9		2.6	2.6		12.2	12.2	
Actuated g/C Ratio	0.12	0.71		0.03	0.62		0.03	0.03		0.12	0.12	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5		3.0	2.5	
Lane Grp Cap (vph)	206	2235		49	1935		45	40		154	178	
v/s Ratio Prot	c0.07	0.37		0.01	c0.43			0.00		c0.04	0.01	
v/s Ratio Perm							0.00			c0.05		
v/c Ratio	0.57	0.52		0.41	0.70		0.04	0.03		0.77	0.06	
Uniform Delay, d1	41.3	6.5		47.6	12.8		47.5	47.5		42.2	38.8	
Progression Factor	1.00	1.00		0.88	1.13		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	0.9		3.7	2.0		0.3	0.2		20.1	0.1	
Delay (s)	44.2	7.4		45.7	16.5		47.8	47.7		62.3	38.9	
Level of Service	D	A		D	B		D	D		E	D	
Approach Delay (s)		10.8			16.9			47.7			52.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	966	156	913	431	438
v/c Ratio	0.55	0.69	0.39	0.72	0.77
Control Delay	22.7	55.6	6.4	44.4	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	55.6	6.4	44.4	17.0
Queue Length 50th (ft)	174	95	96	134	40
Queue Length 95th (ft)	m413	154	174	168	145
Internal Link Dist (ft)	699		207	278	
Turn Bay Length (ft)		150			
Base Capacity (vph)	1742	285	2342	895	668
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.55	0.39	0.48	0.66

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	918	0	148	867	409	416
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00		1.00	1.00	0.98	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3228		1554	3228	3087	1411
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3228		1554	3228	3087	1411
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	966	0	156	913	431	438
RTOR Reduction (vph)	0	0	0	0	0	294
Lane Group Flow (vph)	966	0	156	913	431	144
Confl. Peds. (#/hr)					10	8
Heavy Vehicles (%)	3%	19%	7%	3%	2%	3%
Turn Type	NA		Prot	NA	Perm	Perm
Protected Phases	2		1	6		
Permitted Phases					8	8
Actuated Green, G (s)	54.0		14.6	72.6	19.4	19.4
Effective Green, g (s)	54.0		14.6	72.6	19.4	19.4
Actuated g/C Ratio	0.54		0.15	0.73	0.19	0.19
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	5.5		2.5	5.5	2.5	2.5
Lane Grp Cap (vph)	1743		226	2343	598	273
v/s Ratio Prot	c0.30		c0.10	0.28		
v/s Ratio Perm					c0.14	0.10
v/c Ratio	0.55		0.69	0.39	0.72	0.53
Uniform Delay, d1	15.1		40.6	5.2	37.8	36.2
Progression Factor	1.25		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		8.1	0.5	4.0	1.4
Delay (s)	20.0		48.6	5.7	41.8	37.6
Level of Service	B		D	A	D	D
Approach Delay (s)	20.0			12.0	39.7	
Approach LOS	B			B	D	

Intersection Summary			
HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBR	SBR
Lane Group Flow (vph)	1025	923	373	298	195
v/c Ratio	0.55	0.51	0.72	0.55	0.75
Control Delay	16.3	15.6	48.2	23.6	41.5
Queue Delay	0.0	0.3	0.0	0.0	0.0
Total Delay	16.3	15.9	48.2	23.6	41.5
Queue Length 50th (ft)	205	178	117	118	71
Queue Length 95th (ft)	324	283	163	173	125
Internal Link Dist (ft)	203	104			
Turn Bay Length (ft)					
Base Capacity (vph)	1849	1814	581	675	361
Starvation Cap Reductn	0	332	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.62	0.64	0.44	0.54

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	974	0	0	877	0	354	0	283	0	0	166
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			5.0		4.0		4.0			4.5
Lane Util. Factor		0.95			0.95		0.97		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		1.00			1.00		1.00		0.85			0.86
Flt Protected		1.00			1.00		0.95		1.00			1.00
Satd. Flow (prot)		3228			3167		3215		1488			1456
Flt Permitted		1.00			1.00		0.95		1.00			1.00
Satd. Flow (perm)		3228			3167		3215		1488			1456
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	0	1025	0	0	923	0	373	0	298	0	0	195
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	42	0	0	69
Lane Group Flow (vph)	0	1025	0	0	923	0	373	0	256	0	0	126
Confl. Peds. (#/hr)	3					3	1		8	8		1
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	0%	3%	0%	0%	5%	0%	0%	0%	0%	0%	0%	4%
Turn Type		NA			NA		Perm		Prot			Prot
Protected Phases		2			6				7			4
Permitted Phases							8					
Actuated Green, G (s)		57.2			57.2		16.1		33.8			13.2
Effective Green, g (s)		57.2			57.2		16.1		33.8			13.2
Actuated g/C Ratio		0.57			0.57		0.16		0.34			0.13
Clearance Time (s)		5.0			5.0		4.0		4.0			4.5
Vehicle Extension (s)		5.9			5.9		3.0		3.0			2.5
Lane Grp Cap (vph)		1846			1811		517		502			192
v/s Ratio Prot		c0.32			0.29				0.17			c0.09
v/s Ratio Perm							c0.12					
v/c Ratio		0.56			0.51		0.72		0.51			0.66
Uniform Delay, d1		13.4			12.9		39.8		26.5			41.3
Progression Factor		1.00			1.00		1.00		1.00			1.00
Incremental Delay, d2		1.2			1.0		4.9		0.9			7.1
Delay (s)		14.6			14.0		44.8		27.4			48.3
Level of Service		B			B		D		C			D
Approach Delay (s)		14.6			14.0			37.0			48.3	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBT	SBL	SBR
Lane Group Flow (vph)	328	1028	1137	64	86
v/c Ratio	0.71	0.47	0.60	0.34	0.33
Control Delay	45.8	1.1	13.9	39.3	6.4
Queue Delay	0.0	0.1	0.0	0.0	0.0
Total Delay	45.8	1.2	13.9	39.3	6.4
Queue Length 50th (ft)	91	0	187	35	0
Queue Length 95th (ft)	137	20	350	59	18
Internal Link Dist (ft)			869	226	
Turn Bay Length (ft)					
Base Capacity (vph)	487	2207	1888	389	420
Starvation Cap Reductn	0	292	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.67	0.54	0.60	0.16	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	312	0	977	0	909	171	54	73	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5		4.5		4.5	4.5		
Lane Util. Factor	0.97		0.88		0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00		1.00		1.00	0.98		
Flpb, ped/bikes	1.00		1.00		1.00		1.00	1.00		
Frt	1.00		0.85		0.98		1.00	0.85		
Flt Protected	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (prot)	3193		2470		3033		1662	1420		
Flt Permitted	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (perm)	3193		2470		3033		1662	1420		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	328	0	1028	0	957	180	64	86	0	0
RTOR Reduction (vph)	0	0	208	0	13	0	0	77	0	0
Lane Group Flow (vph)	328	0	820	0	1124	0	64	9	0	0
Confl. Peds. (#/hr)	4		3	3		4	5	4		
Heavy Vehicles (%)	1%	0%	6%	0%	8%	0%	0%	3%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	13.0		71.8		54.8		9.2	9.2		
Effective Green, g (s)	13.0		71.8		54.8		9.2	9.2		
Actuated g/C Ratio	0.14		0.80		0.61		0.10	0.10		
Clearance Time (s)	4.0		4.5		4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0		5.0		2.5	2.5		
Lane Grp Cap (vph)	461		1970		1846		169	145		
v/s Ratio Prot	c0.10		0.33		c0.37		c0.04			
v/s Ratio Perm								0.01		
v/c Ratio	0.71		0.42		0.61		0.38	0.06		
Uniform Delay, d1	36.7		2.8		10.9		37.7	36.5		
Progression Factor	1.00		1.00		1.00		1.00	1.00		
Incremental Delay, d2	4.8		0.7		1.5		1.0	0.1		
Delay (s)	41.5		3.4		12.4		38.8	36.6		
Level of Service	D		A		B		D	D		
Approach Delay (s)		12.6			12.4		37.5		0.0	
Approach LOS		B			B		D		A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	67	1415	26	1626	22	30	266	106
v/c Ratio	0.42	0.68	0.26	0.89	0.25	0.25	0.95	0.29
Control Delay	56.9	17.0	55.2	28.3	54.6	22.1	83.4	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	17.0	55.2	28.3	54.6	22.1	83.4	11.6
Queue Length 50th (ft)	45	370	18	538	15	1	171	9
Queue Length 95th (ft)	#105	520	46	#732	38	28	#259	47
Internal Link Dist (ft)		553		442		147		253
Turn Bay Length (ft)	150		175				150	
Base Capacity (vph)	158	2076	100	1833	177	212	280	500
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.68	0.26	0.89	0.12	0.14	0.95	0.21

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	1328	16	25	1409	136	19	1	25	226	2	88
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3191		1662	3153		1642	1463		1656	1455	
Flt Permitted	0.95	1.00		0.95	1.00		0.80	1.00		0.44	1.00	
Satd. Flow (perm)	1662	3191		1662	3153		1383	1463		775	1455	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	67	1398	17	26	1483	143	22	1	29	266	2	104
RTOR Reduction (vph)	0	1	0	0	6	0	0	28	0	0	70	0
Lane Group Flow (vph)	67	1414	0	26	1620	0	22	2	0	266	36	0
Confl. Peds. (#/hr)	2		5	5		2	9		7	7		9
Confl. Bikes (#/hr)			3									
Heavy Vehicles (%)	0%	4%	0%	0%	4%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	10.5	68.0		4.5	62.0		5.0	5.0		24.0	24.0	
Effective Green, g (s)	10.5	68.0		4.5	62.0		5.0	5.0		24.0	24.0	
Actuated g/C Ratio	0.10	0.62		0.04	0.56		0.05	0.05		0.22	0.22	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5		3.0	2.5	
Lane Grp Cap (vph)	158	1972		67	1777		62	66		289	317	
v/s Ratio Prot	c0.04	c0.44		0.02	c0.51			0.00		c0.13	0.03	
v/s Ratio Perm							0.02			c0.08		
v/c Ratio	0.42	0.72		0.39	0.91		0.35	0.04		0.92	0.11	
Uniform Delay, d1	46.9	14.4		51.4	21.5		50.9	50.2		40.5	34.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	2.3		2.7	8.6		2.5	0.2		32.8	0.1	
Delay (s)	48.2	16.7		54.1	30.1		53.5	50.4		73.3	34.6	
Level of Service	D	B		D	C		D	D		E	C	
Approach Delay (s)		18.1			30.5			51.7			62.3	
Approach LOS		B			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1183	251	1278	334	367
v/c Ratio	0.66	0.80	0.50	0.71	0.70
Control Delay	21.4	60.8	5.6	52.8	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	60.8	5.6	52.8	12.2
Queue Length 50th (ft)	298	170	141	117	0
Queue Length 95th (ft)	458	247	219	157	88
Internal Link Dist (ft)	177		207	278	
Turn Bay Length (ft)		150			
Base Capacity (vph)	1792	380	2558	655	582
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	0.66	0.50	0.51	0.63

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1124	0	238	1214	317	349
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00		1.00	1.00	0.98	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3260		1646	3292	3135	1396
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3260		1646	3292	3135	1396
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1183	0	251	1278	334	367
RTOR Reduction (vph)	0	0	0	0	0	312
Lane Group Flow (vph)	1183	0	251	1278	334	55
Confl. Peds. (#/hr)					7	8
Confl. Bikes (#/hr)		2				
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%
Turn Type	NA		Prot	NA	Perm	Perm
Protected Phases	2		1	6		
Permitted Phases					8	8
Actuated Green, G (s)	60.5		21.0	85.5	16.5	16.5
Effective Green, g (s)	60.5		21.0	85.5	16.5	16.5
Actuated g/C Ratio	0.55		0.19	0.78	0.15	0.15
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	5.5		2.5	5.5	2.5	2.5
Lane Grp Cap (vph)	1793		314	2558	470	209
v/s Ratio Prot	c0.36		c0.15	0.39		
v/s Ratio Perm					c0.11	0.04
v/c Ratio	0.66		0.80	0.50	0.71	0.26
Uniform Delay, d1	17.5		42.5	4.5	44.5	41.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9		12.9	0.7	4.7	0.5
Delay (s)	19.4		55.4	5.2	49.2	41.9
Level of Service	B		E	A	D	D
Approach Delay (s)	19.4			13.4	45.3	
Approach LOS	B			B	D	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBR
Lane Group Flow (vph)	16	1101	434	1884	235	180	18	40
v/c Ratio	0.17	0.47	0.37	0.85	0.62	0.62	0.23	0.24
Control Delay	53.1	7.9	1.5	20.7	53.5	20.6	57.7	3.4
Queue Delay	0.0	0.0	0.0	22.2	0.0	0.0	0.0	0.0
Total Delay	53.1	7.9	1.5	42.9	53.5	20.6	57.7	3.4
Queue Length 50th (ft)	11	160	0	426	82	19	13	0
Queue Length 95th (ft)	34	231	30	#888	119	87	35	0
Internal Link Dist (ft)		203		104		647		
Turn Bay Length (ft)	125						100	
Base Capacity (vph)	93	2319	1172	2226	624	386	79	168
Starvation Cap Reductn	0	0	0	413	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.47	0.37	1.04	0.38	0.47	0.23	0.24

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1046	412	0	1767	23	223	0	171	15	0	34
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	5.0	5.0		5.0		4.5	4.5		4.5		4.5
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00		1.00		1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	0.98		1.00		0.96
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00		0.99		1.00
Frt	1.00	1.00	0.85		1.00		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1662	3197	1452		3253		3225	1369		1648		1424
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	1662	3197	1452		3253		3225	1369		1652		1424
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	16	1101	434	0	1860	24	235	0	180	18	0	40
RTOR Reduction (vph)	0	0	122	0	1	0	0	133	0	0	0	38
Lane Group Flow (vph)	16	1101	312	0	1883	0	235	47	0	18	0	2
Confl. Peds. (#/hr)	4		1	1		4	4		8	8		4
Confl. Bikes (#/hr)			2			2						
Heavy Vehicles (%)	0%	4%	0%	0%	2%	0%	0%	0%	6%	0%	0%	0%
Turn Type	Prot	NA	Perm		NA		Split	NA		Perm		Perm
Protected Phases	5	2			6		8	8				
Permitted Phases			2							4		4
Actuated Green, G (s)	2.9	79.0	79.0		72.1		12.8	12.8		4.2		4.2
Effective Green, g (s)	2.9	79.0	79.0		72.1		12.8	12.8		4.2		4.2
Actuated g/C Ratio	0.03	0.72	0.72		0.66		0.12	0.12		0.04		0.04
Clearance Time (s)	4.0	5.0	5.0		5.0		4.5	4.5		4.5		4.5
Vehicle Extension (s)	2.5	5.9	5.9		5.9		2.5	2.5		2.5		2.5
Lane Grp Cap (vph)	43	2296	1042		2132		375	159		63		54
v/s Ratio Prot	0.01	c0.34			c0.58		c0.07	0.03				
v/s Ratio Perm			0.21							c0.01		0.00
v/c Ratio	0.37	0.48	0.30		0.88		0.63	0.30		0.29		0.03
Uniform Delay, d1	52.7	6.7	5.6		15.5		46.3	44.5		51.4		50.9
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	3.9	0.7	0.7		5.8		2.8	0.8		1.8		0.2
Delay (s)	56.6	7.4	6.3		21.3		49.1	45.3		53.3		51.1
Level of Service	E	A	A		C		D	D		D		D
Approach Delay (s)		7.6			21.3			47.5			51.8	
Approach LOS		A			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	43	1302	13	1773	8	174
v/c Ratio	0.32	0.55	0.07	0.75	0.06	0.62
Control Delay	44.5	1.3	0.7	12.8	35.3	15.9
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	44.5	1.5	0.7	12.8	35.3	15.9
Queue Length 50th (ft)	24	0	0	280	4	0
Queue Length 95th (ft)	55	23	0	#668	15	46
Internal Link Dist (ft)				770	226	
Turn Bay Length (ft)						
Base Capacity (vph)	286	2348	249	2367	286	388
Starvation Cap Reductn	0	322	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.64	0.05	0.75	0.03	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	41	0	1237	12	1635	49	7	148	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88	1.00	0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	0.96		
Flpb, ped/bikes	1.00		1.00	0.90	1.00		1.00	1.00		
Frt	1.00		0.85	1.00	1.00		1.00	0.85		
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1662		2618	1492	3241		1662	1418		
Flt Permitted	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1662		2618	1492	3241		1662	1418		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	43	0	1302	13	1721	52	8	174	0	0
RTOR Reduction (vph)	0	0	312	13	1	0	0	159	0	0
Lane Group Flow (vph)	43	0	990	0	1772	0	8	15	0	0
Confl. Peds. (#/hr)	8		4	4		8	10	20		
Confl. Bikes (#/hr)						1				
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	1%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Effective Green, g (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Actuated g/C Ratio	0.06		0.76	0.01	0.71		0.09	0.09		
Clearance Time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0	1.5	5.0		2.5	2.5		
Lane Grp Cap (vph)	94		1989	13	2308		144	122		
v/s Ratio Prot	c0.03		0.38	0.00	c0.55		0.00			
v/s Ratio Perm								c0.01		
v/c Ratio	0.46		0.50	0.01	0.77		0.06	0.12		
Uniform Delay, d1	41.1		4.2	44.2	8.2		37.7	37.9		
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	2.6		0.9	0.1	2.5		0.1	0.3		
Delay (s)	43.7		5.1	44.3	10.7		37.8	38.3		
Level of Service	D		A	D	B		D	D		
Approach Delay (s)		6.3			11.0		38.3		0.0	
Approach LOS		A			B		D		A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	117	1157	20	1371	2	3	118	81
v/c Ratio	0.57	0.48	0.19	0.67	0.02	0.03	0.96	0.41
Control Delay	51.7	6.9	42.6	15.9	41.0	32.0	114.7	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	6.9	42.6	15.9	41.0	32.0	114.7	15.0
Queue Length 50th (ft)	71	53	13	205	1	1	~99	1
Queue Length 95th (ft)	124	314	m32	#564	8	9	109	34
Internal Link Dist (ft)		553		699		147		253
Turn Bay Length (ft)	150		175					
Base Capacity (vph)	211	2432	107	2059	366	327	123	482
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.48	0.19	0.67	0.01	0.01	0.96	0.17

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	1093	6	19	1086	217	2	1	2	100	1	68
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		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	1.00		1.00	0.98		1.00	0.90		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3135		1662	3127		1656	1554		1576	1467	
Flt Permitted	0.95	1.00		0.95	1.00		1.00	1.00		0.61	1.00	
Satd. Flow (perm)	1662	3135		1662	3127		1743	1554		1006	1467	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	117	1151	6	20	1143	228	2	1	2	118	1	80
RTOR Reduction (vph)	0	0	0	0	12	0	0	2	0	0	70	0
Lane Group Flow (vph)	117	1157	0	20	1359	0	2	1	0	118	11	0
Confl. Peds. (#/hr)			1	1			3		6	6		3
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	6%	0%	0%	4%	0%	0%	0%	0%	5%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	12.4	71.3		3.0	61.9		2.6	2.6		12.2	12.2	
Effective Green, g (s)	12.4	71.3		3.0	61.9		2.6	2.6		12.2	12.2	
Actuated g/C Ratio	0.12	0.71		0.03	0.62		0.03	0.03		0.12	0.12	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.0	4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	2.5		3.0	2.5	
Lane Grp Cap (vph)	206	2235		49	1935		45	40		154	178	
v/s Ratio Prot	c0.07	0.37		0.01	c0.43			0.00		c0.04	0.01	
v/s Ratio Perm							0.00			c0.05		
v/c Ratio	0.57	0.52		0.41	0.70		0.04	0.03		0.77	0.06	
Uniform Delay, d1	41.3	6.5		47.6	12.8		47.5	47.5		42.2	38.8	
Progression Factor	1.00	1.00		0.88	1.13		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	0.9		3.7	2.0		0.3	0.2		20.1	0.1	
Delay (s)	44.2	7.4		45.7	16.5		47.8	47.7		62.3	38.9	
Level of Service	D	A		D	B		D	D		E	D	
Approach Delay (s)		10.8			16.9			47.7			52.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	966	156	913	431	438
v/c Ratio	0.55	0.69	0.39	0.72	0.77
Control Delay	22.7	55.6	6.4	44.4	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	55.6	6.4	44.4	17.0
Queue Length 50th (ft)	174	95	96	134	40
Queue Length 95th (ft)	m413	154	174	168	145
Internal Link Dist (ft)	699		207	278	
Turn Bay Length (ft)		150			
Base Capacity (vph)	1742	285	2342	895	668
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.55	0.39	0.48	0.66

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	918	0	148	867	409	416
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00		1.00	1.00	0.98	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3228		1554	3228	3087	1411
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3228		1554	3228	3087	1411
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	966	0	156	913	431	438
RTOR Reduction (vph)	0	0	0	0	0	294
Lane Group Flow (vph)	966	0	156	913	431	144
Confl. Peds. (#/hr)					10	8
Heavy Vehicles (%)	3%	19%	7%	3%	2%	3%
Turn Type	NA		Prot	NA	Perm	Perm
Protected Phases	2		1	6		
Permitted Phases					8	8
Actuated Green, G (s)	54.0		14.6	72.6	19.4	19.4
Effective Green, g (s)	54.0		14.6	72.6	19.4	19.4
Actuated g/C Ratio	0.54		0.15	0.73	0.19	0.19
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	5.5		2.5	5.5	2.5	2.5
Lane Grp Cap (vph)	1743		226	2343	598	273
v/s Ratio Prot	c0.30		c0.10	0.28		
v/s Ratio Perm					c0.14	0.10
v/c Ratio	0.55		0.69	0.39	0.72	0.53
Uniform Delay, d1	15.1		40.6	5.2	37.8	36.2
Progression Factor	1.25		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		8.1	0.5	4.0	1.4
Delay (s)	20.0		48.6	5.7	41.8	37.6
Level of Service	B		D	A	D	D
Approach Delay (s)	20.0			12.0	39.7	
Approach LOS	B			B	D	

Intersection Summary			
HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBR
Lane Group Flow (vph)	129	897	379	1017	373	298	60	195
v/c Ratio	0.53	0.45	0.36	0.53	0.80	0.55	0.56	0.78
Control Delay	22.6	12.0	2.1	12.8	55.1	19.0	60.5	40.7
Queue Delay	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Total Delay	22.6	12.0	2.1	13.3	55.1	19.0	60.5	40.7
Queue Length 50th (ft)	45	153	0	182	119	82	37	53
Queue Length 95th (ft)	122	217	38	258	#182	158	72	115
Internal Link Dist (ft)		203		104		647		
Turn Bay Length (ft)	125						100	
Base Capacity (vph)	245	1976	1058	1921	483	597	145	299
Starvation Cap Reductn	0	0	0	407	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.45	0.36	0.67	0.77	0.50	0.41	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	852	360	0	877	89	354	56	227	51	0	166
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00		1.00		1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	0.98		1.00		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00		0.99		1.00
Frt	1.00	1.00	0.85		0.99		1.00	0.88		1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1661	3228	1488		3128		3225	1511		1650		1430
Flt Permitted	0.23	1.00	1.00		1.00		0.95	1.00		0.58		1.00
Satd. Flow (perm)	401	3228	1488		3128		3225	1511		1004		1430
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	129	897	379	0	923	94	373	59	239	60	0	195
RTOR Reduction (vph)	0	0	147	0	7	0	0	97	0	0	0	96
Lane Group Flow (vph)	129	897	232	0	1010	0	373	201	0	60	0	99
Confl. Peds. (#/hr)	3					3	1		8	8		1
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	0%	3%	0%	0%	5%	0%	0%	0%	0%	0%	0%	4%
Turn Type	Perm	NA	Perm		NA		Prot	NA		Perm		Prot
Protected Phases		2			6		3	8				4
Permitted Phases	2		2							4		
Actuated Green, G (s)	61.2	61.2	61.2		61.2		14.5	29.3		10.8		10.8
Effective Green, g (s)	61.2	61.2	61.2		61.2		14.5	29.3		10.8		10.8
Actuated g/C Ratio	0.61	0.61	0.61		0.61		0.14	0.29		0.11		0.11
Clearance Time (s)	5.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Vehicle Extension (s)	5.9	5.9	5.9		5.9		3.0	2.5		2.5		2.5
Lane Grp Cap (vph)	245	1975	910		1914		467	442		108		154
v/s Ratio Prot		0.28			c0.32		c0.12	0.13				c0.07
v/s Ratio Perm	0.32		0.16							0.06		
v/c Ratio	0.53	0.45	0.25		0.53		0.80	0.46		0.56		0.64
Uniform Delay, d1	11.1	10.4	8.9		11.1		41.3	28.8		42.3		42.7
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	7.9	0.8	0.7		1.0		9.2	0.5		4.9		7.8
Delay (s)	19.0	11.2	9.6		12.2		50.6	29.4		47.2		50.5
Level of Service	B	B	A		B		D	C		D		D
Approach Delay (s)		11.5			12.2			41.2			49.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBT	SBL	SBR
Lane Group Flow (vph)	140	1028	1044	4	86
v/c Ratio	0.67	0.46	0.52	0.03	0.37
Control Delay	52.8	1.0	11.3	32.7	7.5
Queue Delay	0.0	0.1	0.0	0.0	0.0
Total Delay	52.8	1.1	11.3	32.7	7.5
Queue Length 50th (ft)	76	0	140	2	0
Queue Length 95th (ft)	136	20	310	9	18
Internal Link Dist (ft)			869	226	
Turn Bay Length (ft)					
Base Capacity (vph)	243	2237	2006	389	420
Starvation Cap Reductn	0	325	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.58	0.54	0.52	0.01	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	133	0	977	0	909	83	3	73	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5		4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88		0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00		1.00		1.00	0.98		
Flpb, ped/bikes	1.00		1.00		1.00		1.00	1.00		
Frt	1.00		0.85		0.99		1.00	0.85		
Flt Protected	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (prot)	1646		2470		3052		1662	1420		
Flt Permitted	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (perm)	1646		2470		3052		1662	1420		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	140	0	1028	0	957	87	4	86	0	0
RTOR Reduction (vph)	0	0	186	0	5	0	0	79	0	0
Lane Group Flow (vph)	140	0	842	0	1039	0	4	7	0	0
Confl. Peds. (#/hr)	4		3	3		4	5	4		
Heavy Vehicles (%)	1%	0%	6%	0%	8%	0%	0%	3%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	11.5		73.7		58.2		7.3	7.3		
Effective Green, g (s)	11.5		73.7		58.2		7.3	7.3		
Actuated g/C Ratio	0.13		0.82		0.65		0.08	0.08		
Clearance Time (s)	4.0		4.5		4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0		5.0		2.5	2.5		
Lane Grp Cap (vph)	210		2022		1973		134	115		
v/s Ratio Prot	c0.09		0.34		c0.34		0.00			
v/s Ratio Perm								c0.00		
v/c Ratio	0.67		0.42		0.53		0.03	0.06		
Uniform Delay, d1	37.4		2.2		8.5		38.1	38.2		
Progression Factor	1.00		1.00		1.00		1.00	1.00		
Incremental Delay, d2	7.0		0.6		1.0		0.1	0.2		
Delay (s)	44.4		2.9		9.5		38.2	38.3		
Level of Service	D		A		A		D	D		
Approach Delay (s)		7.9			9.5		38.3		0.0	
Approach LOS		A			A		D		A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	36	1446	26	1596	52	253
v/c Ratio	0.30	0.72	0.23	0.83	0.16	0.89
Control Delay	45.8	15.5	43.8	21.1	17.0	65.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.8	15.5	43.8	21.1	17.0	65.2
Queue Length 50th (ft)	20	226	14	406	10	132
Queue Length 95th (ft)	49	447	39	#601	37	#240
Internal Link Dist (ft)		553		699	147	253
Turn Bay Length (ft)	150		175			
Base Capacity (vph)	138	2016	138	1919	338	300
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.72	0.19	0.83	0.15	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	1358	16	25	1409	107	19	1	25	172	2	42
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.96	
Satd. Flow (prot)	1662	3192		1662	3162			1562			1621	
Flt Permitted	0.95	1.00		0.95	1.00			0.87			0.76	
Satd. Flow (perm)	1662	3192		1662	3162			1389			1277	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	36	1429	17	26	1483	113	22	1	29	202	2	49
RTOR Reduction (vph)	0	1	0	0	5	0	0	23	0	0	9	0
Lane Group Flow (vph)	36	1445	0	26	1591	0	0	29	0	0	244	0
Confl. Peds. (#/hr)	2		5	5		2	9		7	7		9
Confl. Bikes (#/hr)			3									
Heavy Vehicles (%)	0%	4%	0%	0%	4%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.4	54.2		2.9	52.7			19.4			19.4	
Effective Green, g (s)	4.4	54.2		2.9	52.7			19.4			19.4	
Actuated g/C Ratio	0.05	0.60		0.03	0.59			0.22			0.22	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0			2.5			2.5	
Lane Grp Cap (vph)	81	1922		53	1851			299			275	
v/s Ratio Prot	c0.02	0.45		0.02	c0.50							
v/s Ratio Perm								0.02			c0.19	
v/c Ratio	0.44	0.75		0.49	0.86			0.10			0.89	
Uniform Delay, d1	41.6	13.0		42.8	15.6			28.3			34.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.8	2.8		5.1	5.5			0.1			26.8	
Delay (s)	44.4	15.8		47.9	21.0			28.4			61.0	
Level of Service	D	B		D	C			C			E	
Approach Delay (s)		16.5			21.5			28.4			61.0	
Approach LOS		B			C			C			E	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	32	1141	420	251	1285	303	31	367	105
v/c Ratio	0.34	0.68	0.45	0.81	0.57	0.79	0.10	0.67	0.37
Control Delay	55.0	22.2	3.4	59.0	10.9	54.4	33.5	10.3	26.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.0	22.2	3.4	59.0	10.9	54.4	33.5	10.3	26.6
Queue Length 50th (ft)	20	285	0	152	234	95	17	0	37
Queue Length 95th (ft)	51	401	53	#239	322	139	41	82	84
Internal Link Dist (ft)		699			207		278		89
Turn Bay Length (ft)	150		300	150					
Base Capacity (vph)	99	1676	937	362	2243	452	367	583	328
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.68	0.45	0.69	0.57	0.67	0.08	0.63	0.32

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	1084	399	238	1214	7	288	29	349	40	14	46
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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	0.95	1.00	1.00	0.95		0.97	1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1662	3260	1427	1646	3289		3153	1750	1397		1585	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.65	1.00	1.00		0.88	
Satd. Flow (perm)	1662	3260	1427	1646	3289		2156	1750	1397		1422	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	1141	420	251	1278	7	303	31	367	42	15	48
RTOR Reduction (vph)	0	0	204	0	0	0	0	0	302	0	31	0
Lane Group Flow (vph)	32	1141	216	251	1285	0	303	31	65	0	74	0
Confl. Peds. (#/hr)							7		8	8		7
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	2%	2%	1%	1%	0%	1%	0%	4%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.6	51.4	51.4	18.8	66.6		17.8	17.8	17.8		17.8	
Effective Green, g (s)	3.6	51.4	51.4	18.8	66.6		17.8	17.8	17.8		17.8	
Actuated g/C Ratio	0.04	0.51	0.51	0.19	0.67		0.18	0.18	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)	2.5	5.5	5.5	2.5	5.5		2.5	2.5	2.5		2.5	
Lane Grp Cap (vph)	59	1675	733	309	2190		383	311	248		253	
v/s Ratio Prot	0.02	c0.35		c0.15	0.39			0.02				
v/s Ratio Perm			0.15				c0.14		0.05		0.05	
v/c Ratio	0.54	0.68	0.29	0.81	0.59		0.79	0.10	0.26		0.29	
Uniform Delay, d1	47.4	18.2	13.9	38.9	9.2		39.3	34.4	35.4		35.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	7.8	2.3	1.0	14.6	1.2		10.3	0.1	0.4		0.5	
Delay (s)	55.2	20.4	14.9	53.5	10.3		49.6	34.5	35.9		36.1	
Level of Service	E	C	B	D	B		D	C	D		D	
Approach Delay (s)		19.7			17.4			41.8			36.1	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBR
Lane Group Flow (vph)	16	1101	434	1884	235	180	18	40
v/c Ratio	0.19	0.46	0.37	0.82	0.74	0.54	0.18	0.20
Control Delay	50.6	6.6	1.4	17.2	58.9	17.1	47.7	2.3
Queue Delay	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0
Total Delay	50.6	6.6	1.4	23.6	58.9	17.1	47.7	2.3
Queue Length 50th (ft)	10	147	0	392	76	25	11	0
Queue Length 95th (ft)	32	196	27	#777	#127	87	32	0
Internal Link Dist (ft)		203		104		647		
Turn Bay Length (ft)	125						100	
Base Capacity (vph)	86	2370	1188	2295	322	399	120	212
Starvation Cap Reductn	0	0	0	372	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.46	0.37	0.98	0.73	0.45	0.15	0.19

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1046	412	0	1767	23	223	0	171	15	0	34
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00		1.00		1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	0.98		1.00		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00		0.99		1.00
Frt	1.00	1.00	0.85		1.00		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1662	3197	1452		3253		3225	1371		1648		1488
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00		0.93		1.00
Satd. Flow (perm)	1662	3197	1452		3253		3225	1371		1613		1488
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	16	1101	434	0	1860	24	235	0	180	18	0	40
RTOR Reduction (vph)	0	0	120	0	1	0	0	109	0	0	0	38
Lane Group Flow (vph)	16	1101	314	0	1883	0	235	71	0	18	0	2
Confl. Peds. (#/hr)	4		1	1		4	4		8	8		4
Confl. Bikes (#/hr)			2			2						
Heavy Vehicles (%)	0%	4%	0%	0%	2%	0%	0%	0%	6%	0%	0%	0%
Turn Type	Prot	NA	Perm		NA		Prot	NA		Perm		Prot
Protected Phases	5	2			6		3	8				4
Permitted Phases			2							4		
Actuated Green, G (s)	2.0	72.4	72.4		66.4		9.8	18.1		4.3		4.3
Effective Green, g (s)	2.0	72.4	72.4		66.4		9.8	18.1		4.3		4.3
Actuated g/C Ratio	0.02	0.72	0.72		0.66		0.10	0.18		0.04		0.04
Clearance Time (s)	4.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Vehicle Extension (s)	2.5	5.9	5.9		5.9		3.0	2.5		2.5		2.5
Lane Grp Cap (vph)	33	2314	1051		2159		316	248		69		63
v/s Ratio Prot	0.01	c0.34			c0.58		c0.07	c0.05				0.00
v/s Ratio Perm			0.22							0.01		
v/c Ratio	0.48	0.48	0.30		0.87		0.74	0.29		0.26		0.03
Uniform Delay, d1	48.5	5.8	4.9		13.4		43.9	35.4		46.3		45.8
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	7.9	0.7	0.7		5.2		9.1	0.5		1.5		0.1
Delay (s)	56.4	6.5	5.6		18.6		53.0	35.8		47.8		46.0
Level of Service	E	A	A		B		D	D		D		D
Approach Delay (s)		6.8			18.6			45.6			46.5	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	SBL	SBR
Lane Group Flow (vph)	43	1302	13	1773	8	174
v/c Ratio	0.32	0.55	0.07	0.75	0.06	0.62
Control Delay	44.5	1.3	0.7	12.8	35.3	15.9
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	44.5	1.5	0.7	12.8	35.3	15.9
Queue Length 50th (ft)	24	0	0	280	4	0
Queue Length 95th (ft)	55	23	0	#668	15	46
Internal Link Dist (ft)				770	226	
Turn Bay Length (ft)						
Base Capacity (vph)	286	2348	249	2367	286	388
Starvation Cap Reductn	0	322	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.64	0.05	0.75	0.03	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	41	0	1237	12	1635	49	7	148	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88	1.00	0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00	1.00	1.00		1.00	0.96		
Flpb, ped/bikes	1.00		1.00	0.90	1.00		1.00	1.00		
Frt	1.00		0.85	1.00	1.00		1.00	0.85		
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1662		2618	1492	3241		1662	1418		
Flt Permitted	0.95		1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1662		2618	1492	3241		1662	1418		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	43	0	1302	13	1721	52	8	174	0	0
RTOR Reduction (vph)	0	0	312	13	1	0	0	159	0	0
Lane Group Flow (vph)	43	0	990	0	1772	0	8	15	0	0
Confl. Peds. (#/hr)	8		4	4		8	10	20		
Confl. Bikes (#/hr)						1				
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	1%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Effective Green, g (s)	5.1		68.4	0.8	64.1		7.8	7.8		
Actuated g/C Ratio	0.06		0.76	0.01	0.71		0.09	0.09		
Clearance Time (s)	4.0		4.5	4.0	4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0	1.5	5.0		2.5	2.5		
Lane Grp Cap (vph)	94		1989	13	2308		144	122		
v/s Ratio Prot	c0.03		0.38	0.00	c0.55		0.00			
v/s Ratio Perm								c0.01		
v/c Ratio	0.46		0.50	0.01	0.77		0.06	0.12		
Uniform Delay, d1	41.1		4.2	44.2	8.2		37.7	37.9		
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	2.6		0.9	0.1	2.5		0.1	0.3		
Delay (s)	43.7		5.1	44.3	10.7		37.8	38.3		
Level of Service	D		A	D	B		D	D		
Approach Delay (s)		6.3			11.0		38.3		0.0	
Approach LOS		A			B		D		A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	31	1243	20	1222	5	75
v/c Ratio	0.26	0.51	0.19	0.52	0.03	0.44
Control Delay	45.1	8.0	37.0	12.2	26.2	29.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	8.0	37.0	12.2	26.2	29.9
Queue Length 50th (ft)	17	81	8	254	2	24
Queue Length 95th (ft)	45	342	m20	378	10	52
Internal Link Dist (ft)		553		699	147	253
Turn Bay Length (ft)	150		175			
Base Capacity (vph)	126	2420	113	2362	352	336
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.51	0.18	0.52	0.01	0.22

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	1175	6	19	1086	75	2	1	2	36	1	27
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.95			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1662	3135		1662	3170			1608			1543	
Flt Permitted	0.95	1.00		0.95	1.00			0.90			0.82	
Satd. Flow (perm)	1662	3135		1662	3170			1472			1307	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	31	1237	6	20	1143	79	2	1	2	42	1	32
RTOR Reduction (vph)	0	0	0	0	4	0	0	2	0	0	29	0
Lane Group Flow (vph)	31	1243	0	20	1218	0	0	3	0	0	46	0
Confl. Peds. (#/hr)			1	1			3		6	6		3
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	6%	0%	0%	4%	0%	0%	0%	0%	5%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.2	65.0		2.6	63.4			8.9			8.9	
Effective Green, g (s)	4.2	65.0		2.6	63.4			8.9			8.9	
Actuated g/C Ratio	0.05	0.72		0.03	0.70			0.10			0.10	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	2.5	5.0		2.5	5.0			2.5			2.5	
Lane Grp Cap (vph)	77	2264		48	2233			145			129	
v/s Ratio Prot	c0.02	c0.40		0.01	0.38							
v/s Ratio Perm								0.00			c0.04	
v/c Ratio	0.40	0.55		0.42	0.55			0.02			0.36	
Uniform Delay, d1	41.7	5.8		43.0	6.4			36.6			37.9	
Progression Factor	1.00	1.00		0.84	1.42			1.00			1.00	
Incremental Delay, d2	2.5	1.0		3.8	0.9			0.0			1.2	
Delay (s)	44.2	6.7		40.0	9.9			36.7			39.1	
Level of Service	D	A		D	A			D			D	
Approach Delay (s)		7.6			10.4			36.7			39.1	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	86	921	271	156	936	282	149	438	45	65
v/c Ratio	0.54	0.54	0.34	0.67	0.49	0.65	0.46	0.73	0.25	0.23
Control Delay	58.0	24.1	10.8	49.8	13.5	40.6	36.1	12.3	32.7	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.0	24.1	10.8	49.8	13.5	40.6	36.1	12.3	32.7	15.4
Queue Length 50th (ft)	45	166	0	85	161	77	76	13	22	10
Queue Length 95th (ft)	102	366	155	141	258	107	121	99	49	41
Internal Link Dist (ft)		699			207		278			201
Turn Bay Length (ft)	150		300	150					150	
Base Capacity (vph)	178	1715	791	297	1907	648	486	689	269	397
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.54	0.34	0.53	0.49	0.44	0.31	0.64	0.17	0.16

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	875	257	148	867	22	268	142	416	43	21	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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	1.00	0.95	1.00	1.00	0.95		0.97	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	0.98	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.98	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.90	
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)	1458	3228	1250	1554	3217		3100	1750	1412	1649	1313	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.71	1.00	1.00	0.56	1.00	
Satd. Flow (perm)	1458	3228	1250	1554	3217		2332	1750	1412	970	1313	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	86	921	271	156	913	23	282	149	438	45	22	43
RTOR Reduction (vph)	0	0	127	0	2	0	0	0	335	0	35	0
Lane Group Flow (vph)	86	921	144	156	934	0	282	149	103	45	30	0
Confl. Peds. (#/hr)	1					1	10		8	8		10
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	14%	3%	19%	7%	3%	0%	2%	0%	3%	0%	0%	27%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	8.8	47.8	47.8	13.5	52.5		16.7	16.7	16.7	16.7	16.7	
Effective Green, g (s)	8.8	47.8	47.8	13.5	52.5		16.7	16.7	16.7	16.7	16.7	
Actuated g/C Ratio	0.10	0.53	0.53	0.15	0.58		0.19	0.19	0.19	0.19	0.19	
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)	2.5	5.5	5.5	2.5	5.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	142	1714	663	233	1876		432	324	262	179	243	
v/s Ratio Prot	0.06	c0.29		c0.10	0.29			0.09			0.02	
v/s Ratio Perm			0.12				c0.12		0.07	0.05		
v/c Ratio	0.61	0.54	0.22	0.67	0.50		0.65	0.46	0.39	0.25	0.12	
Uniform Delay, d1	38.9	13.8	11.2	36.1	11.0		34.0	32.6	32.2	31.3	30.5	
Progression Factor	1.25	1.44	4.14	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.3	1.1	0.7	6.4	0.9		3.1	0.8	0.7	0.5	0.2	
Delay (s)	53.9	21.1	47.0	42.6	12.0		37.1	33.4	32.9	31.8	30.7	
Level of Service	D	C	D	D	B		D	C	C	C	C	
Approach Delay (s)		28.8			16.3			34.4			31.2	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBR
Lane Group Flow (vph)	129	897	379	1017	373	298	60	195
v/c Ratio	0.67	0.47	0.36	0.74	0.77	0.55	0.59	0.61
Control Delay	55.6	11.6	2.1	33.5	48.6	17.6	60.5	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.6	11.6	2.1	33.5	48.6	17.6	60.5	14.3
Queue Length 50th (ft)	70	144	0	231	105	72	33	0
Queue Length 95th (ft)	#144	198	37	393	#163	148	69	51
Internal Link Dist (ft)		203		104		647		
Turn Bay Length (ft)	125						100	
Base Capacity (vph)	208	1929	1041	1373	501	586	128	352
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.47	0.36	0.74	0.74	0.51	0.47	0.55

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	852	360	0	877	89	354	56	227	51	0	166
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00		1.00		1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	0.98		1.00		1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00		0.99		1.00
Frt	1.00	1.00	0.85		0.99		1.00	0.88		1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1662	3228	1488		3128		3225	1512		1651		1430
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00		0.58		1.00
Satd. Flow (perm)	1662	3228	1488		3128		3225	1512		1005		1430
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85
Adj. Flow (vph)	129	897	379	0	923	94	373	59	239	60	0	195
RTOR Reduction (vph)	0	0	152	0	8	0	0	95	0	0	0	175
Lane Group Flow (vph)	129	897	227	0	1009	0	373	203	0	60	0	20
Confl. Peds. (#/hr)	3					3	1		8	8		1
Confl. Bikes (#/hr)						4						
Heavy Vehicles (%)	0%	3%	0%	0%	5%	0%	0%	0%	0%	0%	0%	4%
Turn Type	Prot	NA	Perm		NA		Prot	NA		Perm		Prot
Protected Phases	5	2			6		3	8				4
Permitted Phases			2							4		
Actuated Green, G (s)	10.5	53.8	53.8		39.3		13.5	26.7		9.2		9.2
Effective Green, g (s)	10.5	53.8	53.8		39.3		13.5	26.7		9.2		9.2
Actuated g/C Ratio	0.12	0.60	0.60		0.44		0.15	0.30		0.10		0.10
Clearance Time (s)	4.0	5.0	5.0		5.0		4.0	4.5		4.5		4.5
Vehicle Extension (s)	3.0	5.9	5.9		5.9		3.0	2.5		2.5		2.5
Lane Grp Cap (vph)	193	1929	889		1365		483	448		102		146
v/s Ratio Prot	c0.08	0.28			c0.32		c0.12	0.13				0.01
v/s Ratio Perm			0.15							c0.06		
v/c Ratio	0.67	0.47	0.25		0.74		0.77	0.45		0.59		0.14
Uniform Delay, d1	38.1	10.1	8.6		21.1		36.8	25.7		38.6		36.8
Progression Factor	1.00	1.00	1.00		1.36		1.00	1.00		1.00		1.00
Incremental Delay, d2	8.5	0.8	0.7		3.2		7.5	0.5		7.0		0.3
Delay (s)	46.5	10.9	9.3		31.9		44.3	26.3		45.6		37.1
Level of Service	D	B	A		C		D	C		D		D
Approach Delay (s)		13.7			31.9			36.3			39.1	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBT	SBL	SBR
Lane Group Flow (vph)	140	1028	1044	4	86
v/c Ratio	0.64	0.46	0.52	0.03	0.39
Control Delay	41.4	2.2	10.6	35.3	8.8
Queue Delay	0.0	0.2	0.0	0.0	0.0
Total Delay	41.4	2.3	10.6	35.3	8.8
Queue Length 50th (ft)	53	0	140	2	0
Queue Length 95th (ft)	123	173	286	10	20
Internal Link Dist (ft)			869	226	
Turn Bay Length (ft)					
Base Capacity (vph)	283	2254	2027	286	339
Starvation Cap Reductn	0	416	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.56	0.52	0.01	0.25

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Volume (vph)	133	0	977	0	909	83	3	73	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.5		4.5		4.5	4.5		
Lane Util. Factor	1.00		0.88		0.95		1.00	1.00		
Frpb, ped/bikes	1.00		1.00		1.00		1.00	0.98		
Flpb, ped/bikes	1.00		1.00		1.00		1.00	1.00		
Frt	1.00		0.85		0.99		1.00	0.85		
Flt Protected	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (prot)	1646		2470		3052		1662	1420		
Flt Permitted	0.95		1.00		1.00		0.95	1.00		
Satd. Flow (perm)	1646		2470		3052		1662	1420		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.92	0.92
Adj. Flow (vph)	140	0	1028	0	957	87	4	86	0	0
RTOR Reduction (vph)	0	0	174	0	5	0	0	80	0	0
Lane Group Flow (vph)	140	0	854	0	1039	0	4	6	0	0
Confl. Peds. (#/hr)	4		3	3		4	5	4		
Heavy Vehicles (%)	1%	0%	6%	0%	8%	0%	0%	3%	2%	2%
Turn Type	Prot		Prot	Prot	NA		Prot	Perm		
Protected Phases	5		2	1	6		4			
Permitted Phases								4		
Actuated Green, G (s)	12.0		74.8		58.8		6.2	6.2		
Effective Green, g (s)	12.0		74.8		58.8		6.2	6.2		
Actuated g/C Ratio	0.13		0.83		0.65		0.07	0.07		
Clearance Time (s)	4.0		4.5		4.5		4.5	4.5		
Vehicle Extension (s)	2.5		5.0		5.0		2.5	2.5		
Lane Grp Cap (vph)	219		2052		1993		114	97		
v/s Ratio Prot	c0.09		0.35		c0.34		0.00			
v/s Ratio Perm								c0.00		
v/c Ratio	0.64		0.42		0.52		0.04	0.06		
Uniform Delay, d1	36.9		2.0		8.2		39.1	39.2		
Progression Factor	0.79		6.74		1.00		1.00	1.00		
Incremental Delay, d2	4.9		0.6		1.0		0.1	0.2		
Delay (s)	34.3		13.8		9.2		39.2	39.4		
Level of Service	C		B		A		D	D		
Approach Delay (s)		16.2			9.2		39.4		0.0	
Approach LOS		B			A		D		A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	1976	1653	383	154	201
v/c Ratio	0.82	0.68	0.33	0.57	0.74
Control Delay	11.5	10.1	1.5	44.6	47.4
Queue Delay	0.0	0.2	0.0	0.0	1.1
Total Delay	11.5	10.3	1.5	44.6	48.4
Queue Length 50th (ft)	480	239	0	92	103
Queue Length 95th (ft)	m#291	462	31	137	161
Internal Link Dist (ft)	296	43		682	
Turn Bay Length (ft)					625
Base Capacity (vph)	2424	2424	1166	423	407
Starvation Cap Reductn	9	0	0	0	0
Spillback Cap Reductn	0	210	0	0	70
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.82	0.75	0.33	0.36	0.60

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1877	1570	364	146	191
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	0.97	1.00	0.97
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3292	3292	1448	1568	1420
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3292	3292	1448	1568	1420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1976	1653	383	154	201
RTOR Reduction (vph)	0	0	0	101	0	27
Lane Group Flow (vph)	0	1976	1653	282	154	174
Confl. Peds. (#/hr)	3			3	4	13
Confl. Bikes (#/hr)				1		
Heavy Vehicles (%)	0%	1%	1%	0%	6%	2%
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		2	6		4	
Permitted Phases				6		4
Actuated Green, G (s)		73.7	73.7	73.7	17.3	17.3
Effective Green, g (s)		73.7	73.7	73.7	17.3	17.3
Actuated g/C Ratio		0.74	0.74	0.74	0.17	0.17
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		4.6	4.6	4.6	2.5	2.5
Lane Grp Cap (vph)		2426	2426	1067	271	245
v/s Ratio Prot		c0.60	0.50		0.10	
v/s Ratio Perm				0.20		c0.12
v/c Ratio		0.81	0.68	0.26	0.57	0.71
Uniform Delay, d1		8.7	6.9	4.3	37.9	39.0
Progression Factor		0.83	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.1	1.6	0.6	2.2	8.4
Delay (s)		9.3	8.5	4.9	40.1	47.4
Level of Service		A	A	A	D	D
Approach Delay (s)		9.3	7.8		44.2	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBR
Lane Group Flow (vph)	70	1006	265	1465	591	246	333	48	290
v/c Ratio	0.91	0.56	0.23	0.97	1.02	0.79	0.73	0.20	0.95
Control Delay	131.3	17.1	0.9	44.5	84.9	60.2	22.6	41.2	71.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	131.3	17.1	0.9	44.5	84.9	60.2	22.6	41.2	71.3
Queue Length 50th (ft)	48	221	0	487	~218	160	55	29	132
Queue Length 95th (ft)	#136	281	16	#660	#328	#283	#168	64	#301
Internal Link Dist (ft)		44		1575		1019			
Turn Bay Length (ft)	75				775			150	
Base Capacity (vph)	77	1785	1144	1516	581	312	455	248	306
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.56	0.23	0.97	1.02	0.79	0.73	0.19	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	956	252	0	1353	38	561	226	316	44	0	267
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5	4.0		4.5		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	0.95	1.00		0.95		0.97	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00		1.00	1.00	0.98	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
Frt	1.00	1.00	0.85		1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1630	3260	1462		3277		3193	1716	1416	1630		1458
Flt Permitted	0.95	1.00	1.00		1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1630	3260	1462		3277		3193	1716	1416	1630		1458
Peak-hour factor, PHF	0.92	0.95	0.95	0.95	0.95	0.92	0.95	0.92	0.95	0.92	0.92	0.92
Adj. Flow (vph)	70	1006	265	0	1424	41	591	246	333	48	0	290
RTOR Reduction (vph)	0	0	72	0	2	0	0	0	197	0	0	84
Lane Group Flow (vph)	70	1006	193	0	1463	0	591	246	136	48	0	206
Confl. Peds. (#/hr)			1	1			9		4			
Heavy Vehicles (%)	2%	2%	0%	0%	1%	2%	1%	2%	3%	2%	2%	2%
Turn Type	Prot	NA	pm+ov		NA		Split	NA	Perm	Prot		Perm
Protected Phases	5	2	8		6		8	8		4		
Permitted Phases			2						8			4
Actuated Green, G (s)	5.0	57.5	76.6		48.5		19.1	19.1	19.1	15.9		15.9
Effective Green, g (s)	5.0	57.5	76.6		48.5		19.1	19.1	19.1	15.9		15.9
Actuated g/C Ratio	0.05	0.55	0.73		0.46		0.18	0.18	0.18	0.15		0.15
Clearance Time (s)	4.0	4.5	4.0		4.5		4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	6.1	3.0		6.1		3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	77	1785	1122		1513		580	312	257	246		220
v/s Ratio Prot	c0.04	0.31	0.03		c0.45		c0.19	0.14		0.03		
v/s Ratio Perm			0.10						0.10			c0.14
v/c Ratio	0.91	0.56	0.17		0.97		1.02	0.79	0.53	0.20		0.94
Uniform Delay, d1	49.8	15.5	4.4		27.5		43.0	41.0	38.9	39.0		44.0
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	71.5	1.3	0.1		16.5		42.2	12.4	2.0	0.4		42.8
Delay (s)	121.3	16.8	4.5		44.0		85.2	53.4	40.8	39.3		86.9
Level of Service	F	B	A		D		F	D	D	D		F
Approach Delay (s)		19.8			44.0			65.9			80.1	
Approach LOS		B			D			E			F	

Intersection Summary			
HCM 2000 Control Delay	45.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	142	1168	53	1184	143	106	65	80	96
v/c Ratio	0.60	0.62	0.74	0.77	0.99	0.37	0.62	0.37	0.29
Control Delay	50.0	16.8	94.8	26.6	117.4	20.1	66.7	38.0	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.0	16.8	94.8	26.6	117.4	20.1	66.7	38.0	2.4
Queue Length 50th (ft)	74	212	30	292	83	27	37	44	0
Queue Length 95th (ft)	#199	#454	#95	#511	#200	59	#95	70	3
Internal Link Dist (ft)		1575		319		529		945	
Turn Bay Length (ft)	140		85		125		150		150
Base Capacity (vph)	235	1899	72	1532	144	513	108	476	527
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.62	0.74	0.77	0.99	0.21	0.60	0.17	0.18

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	970	105	49	1057	32	132	47	51	60	74	88
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1630	3212		1630	3245		1630	1582		1630	1716	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1630	3212		1630	3245		1630	1582		1630	1716	1458
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)	142	1054	114	53	1149	35	143	51	55	65	80	96
RTOR Reduction (vph)	0	6	0	0	2	0	0	47	0	0	0	85
Lane Group Flow (vph)	142	1162	0	53	1182	0	143	59	0	65	80	11
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	13.0	51.4		3.2	41.6		8.0	13.6		4.8	10.4	10.4
Effective Green, g (s)	13.0	51.4		3.2	41.6		8.0	13.6		4.8	10.4	10.4
Actuated g/C Ratio	0.14	0.57		0.04	0.46		0.09	0.15		0.05	0.12	0.12
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	4.5		4.0	4.5	4.5
Vehicle Extension (s)	2.5	4.6		2.5	4.6		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	235	1834		57	1499		144	239		86	198	168
v/s Ratio Prot	0.09	c0.36		0.03	c0.36		c0.09	c0.04		0.04	c0.05	
v/s Ratio Perm												0.01
v/c Ratio	0.60	0.63		0.93	0.79		0.99	0.25		0.76	0.40	0.07
Uniform Delay, d1	36.1	13.0		43.3	20.5		41.0	33.7		42.0	36.9	35.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.7	1.7		92.7	4.3		72.6	0.4		29.6	1.0	0.1
Delay (s)	39.8	14.6		136.0	24.8		113.6	34.1		71.6	37.9	35.6
Level of Service	D	B		F	C		F	C		E	D	D
Approach Delay (s)		17.4			29.5			79.7			46.1	
Approach LOS		B			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	1687	75	1614	169	256	39	71
v/c Ratio	0.35	0.80	0.73	0.75	0.75	0.69	0.44	0.22
Control Delay	57.8	19.5	85.9	16.8	60.5	28.0	52.1	10.2
Queue Delay	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Total Delay	57.8	19.5	85.9	17.5	60.5	28.0	52.1	10.2
Queue Length 50th (ft)	22	423	50	392	109	77	24	2
Queue Length 95th (ft)	#62	#719	#126	577	169	152	55	36
Internal Link Dist (ft)		591		526		246		206
Turn Bay Length (ft)	75		100					
Base Capacity (vph)	98	2113	104	2148	317	474	124	428
Starvation Cap Reductn	0	0	0	230	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.80	0.72	0.84	0.53	0.54	0.31	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	1505	98	71	1280	254	161	9	235	37	3	65
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3255		1662	3194		1648	1468		1655	1468	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.28	1.00	
Satd. Flow (perm)	1662	3255		1662	3194		1233	1468		485	1468	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	1584	103	75	1347	267	169	9	247	39	3	68
RTOR Reduction (vph)	0	4	0	0	13	0	0	107	0	0	56	0
Lane Group Flow (vph)	34	1683	0	75	1601	0	169	149	0	39	15	0
Confl. Peds. (#/hr)	9		8	8		9	8		7	7		8
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Effective Green, g (s)	4.0	66.2		6.2	68.4		19.1	19.1		19.1	19.1	
Actuated g/C Ratio	0.04	0.63		0.06	0.65		0.18	0.18		0.18	0.18	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.5		2.5	4.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	63	2052		98	2080		224	267		88	267	
v/s Ratio Prot	0.02	c0.52		0.05	c0.50			0.10			0.01	
v/s Ratio Perm							c0.14			0.08		
v/c Ratio	0.54	0.82		0.77	0.77		0.75	0.56		0.44	0.06	
Uniform Delay, d1	49.6	14.8		48.7	12.8		40.7	39.1		38.2	35.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	3.8		28.2	2.8		12.8	2.0		2.6	0.1	
Delay (s)	56.3	18.7		76.9	15.6		53.6	41.1		40.8	35.6	
Level of Service	E	B		E	B		D	D		D	D	
Approach Delay (s)		19.4			18.3			46.1			37.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	245	1625	6	1342	505	26	31	331	321
v/c Ratio	0.98	0.67	0.07	0.76	0.50	0.27	0.22	1.03	0.65
Control Delay	97.2	10.7	19.2	19.4	3.3	52.0	22.7	102.9	10.0
Queue Delay	0.0	0.5	0.0	1.2	0.4	0.0	0.0	0.0	0.0
Total Delay	97.2	11.2	19.2	20.5	3.7	52.0	22.7	102.9	10.0
Queue Length 50th (ft)	158	252	1	191	0	16	4	~116	0
Queue Length 95th (ft)	#313	514	m3	#607	79	43	29	#205	60
Internal Link Dist (ft)		526		296			109		204
Turn Bay Length (ft)	100		100		300	50		100	
Base Capacity (vph)	249	2409	82	1770	1014	99	290	322	585
Starvation Cap Reductn	0	355	0	215	155	0	0	0	0
Spillback Cap Reductn	0	223	0	0	0	0	1	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.79	0.07	0.86	0.59	0.26	0.11	1.03	0.55

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	233	1538	6	6	1275	480	25	5	25	314	0	305
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	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	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3290		1660	3292	1452	1662	1506		3225	1465	
Flt Permitted	0.95	1.00		0.09	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	3290		153	3292	1452	1662	1506		3225	1465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	245	1619	6	6	1342	505	26	5	26	331	0	321
RTOR Reduction (vph)	0	0	0	0	0	245	0	22	0	0	275	0
Lane Group Flow (vph)	245	1625	0	6	1342	260	26	9	0	331	46	0
Confl. Peds. (#/hr)	2		12	12		2	2		4	4		2
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases				6		6						
Actuated Green, G (s)	15.0	70.9		51.4	51.4	51.4	2.4	6.6		10.0	14.2	
Effective Green, g (s)	15.0	70.9		51.4	51.4	51.4	2.4	6.6		10.0	14.2	
Actuated g/C Ratio	0.15	0.71		0.51	0.51	0.51	0.02	0.07		0.10	0.14	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	4.2		4.2	4.2	4.2	3.0	2.0		3.0	2.5	
Lane Grp Cap (vph)	249	2332		78	1692	746	39	99		322	208	
v/s Ratio Prot	c0.15	0.49			c0.41		0.02	0.01		c0.10	c0.03	
v/s Ratio Perm				0.04		0.18						
v/c Ratio	0.98	0.70		0.08	0.79	0.35	0.67	0.09		1.03	0.22	
Uniform Delay, d1	42.4	8.4		12.3	19.9	14.4	48.4	43.9		45.0	38.0	
Progression Factor	1.00	1.00		1.02	0.80	1.08	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.2	1.8		1.4	2.9	1.0	35.5	0.1		57.5	0.4	
Delay (s)	94.5	10.1		14.0	18.9	16.4	83.9	44.0		102.5	38.4	
Level of Service	F	B		B	B	B	F	D		F	D	
Approach Delay (s)		21.2			18.2			62.2			70.9	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			