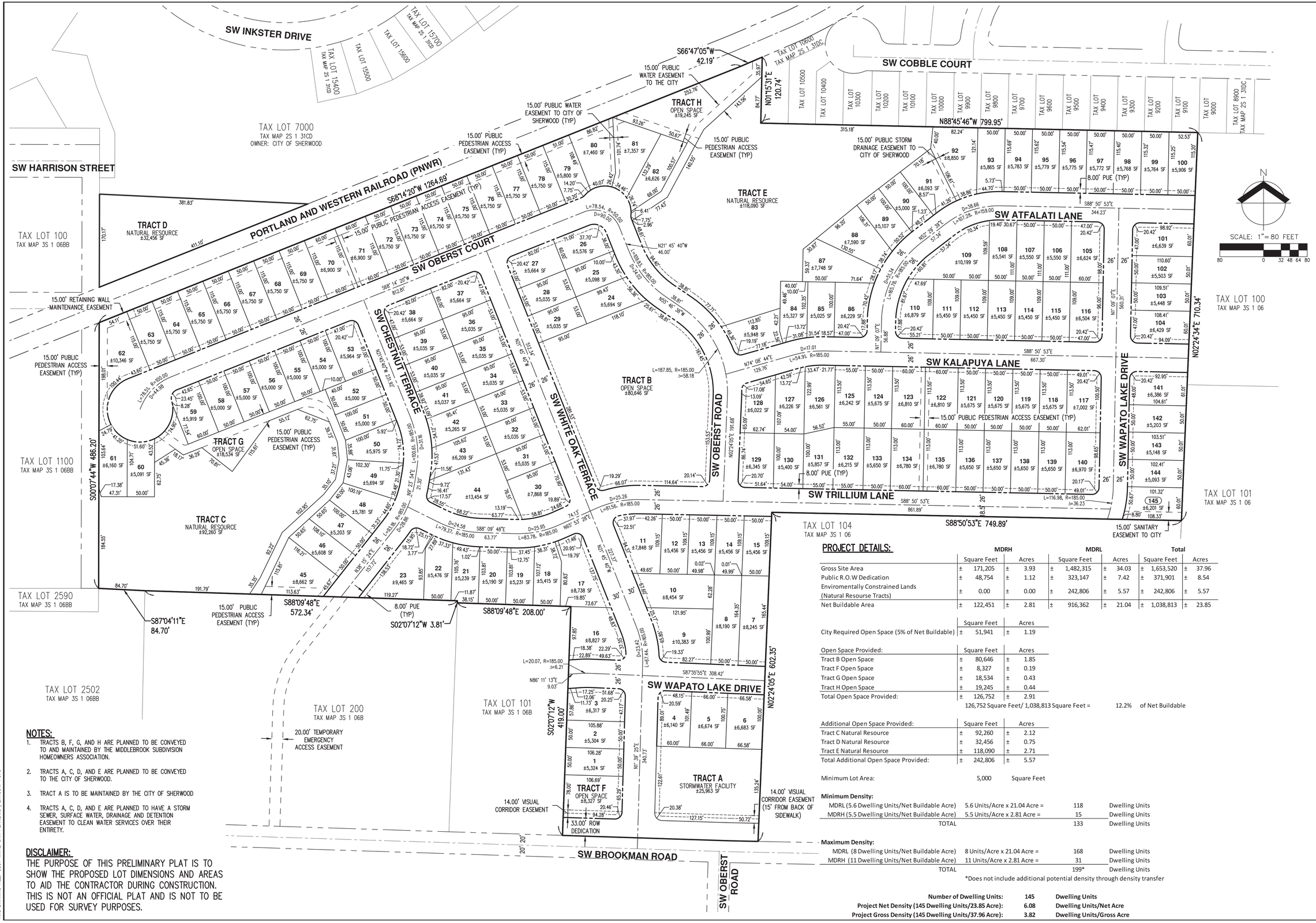

NOTES:

1. TRACTS B, F, G, AND H ARE PLANNED TO BE CONVEYED TO AND MAINTAINED BY THE MIDDLEBROOK SUBDIVISION HOMEOWNERS ASSOCIATION.
2. TRACTS A, C, D, AND E ARE PLANNED TO BE CONVEYED TO THE CITY OF SHERWOOD.
3. TRACT A IS TO BE MAINTAINED BY THE CITY OF SHERWOOD
4. TRACTS A, C, D, AND E ARE PLANNED TO HAVE A STORM SEWER, SURFACE WATER, DRAINAGE AND DETENTION EASEMENT TO CLEAN WATER SERVICES OVER THEIR ENTIRETY.

DISCLAIMER:

THE PURPOSE OF THIS PRELIMINARY PLAT IS TO SHOW THE PROPOSED LOT DIMENSIONS AND AREAS TO AID THE CONTRACTOR DURING CONSTRUCTION. THIS IS NOT AN OFFICIAL PLAT AND IS NOT TO BE USED FOR SURVEY PURPOSES.

PROJECT DETAILS:

	MDRH		MDRL		Total	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Gross Site Area	± 171,205	± 3.93	± 1,482,315	± 34.03	± 1,653,520	± 37.96
Public R.O.W Dedication	± 48,754	± 1.12	± 323,147	± 7.42	± 371,901	± 8.54
Enviromentally Constrained Lands (Natural Resourse Tracts)	± 0.00	± 0.00	± 242,806	± 5.57	± 242,806	± 5.57
Net Buildable Area	± 122,451	± 2.81	± 916,362	± 21.04	± 1,038,813	± 23.85

	Square Feet	Acres
City Required Open Space (5% of Net Buildable)	± 51,941	± 1.19

Open Space Provided:	Square Feet	Acres
Tract B Open Space	± 80,646	± 1.85
Tract F Open Space	± 8,327	± 0.19
Tract G Open Space	± 18,534	± 0.43
Tract H Open Space	± 19,245	± 0.44
Total Open Space Provided:	± 126,752	± 2.91

126,752 Square Feet/ 1,038,813 Square Feet = 12.2% of Net Buildable

Additional Open Space Provided:	Square Feet	Acres
Tract C Natural Resource	± 92,260	± 2.12
Tract D Natural Resource	± 32,456	± 0.75
Tract E Natural Resource	± 118,090	± 2.71
Total Additional Open Space Provided:	± 242,806	± 5.57

Minimum Lot Area: 5,000 Square Feet

Minimum Density:

MDRL (5.6 Dwelling Units/Net Buildable Acre)	5.6 Units/Acre x 21.04 Acre =	118	Dwelling Units
MDRH (5.5 Dwelling Units/Net Buildable Acre)	5.5 Units/Acre x 2.81 Acre =	15	Dwelling Units
TOTAL		133	Dwelling Units

Maximum Density:

MDRL (8 Dwelling Units/Net Buildable Acre)	8 Units/Acre x 21.04 Acre =	168	Dwelling Units
MDRH (11 Dwelling Units/Net Buildable Acre)	11 Units/Acre x 2.81 Acre =	31	Dwelling Units
TOTAL		199*	Dwelling Units

*Does not include additional potential density through density transfer

Number of Dwelling Units:	**145**	**Dwelling Units**
Project Net Density (145 Dwelling Units/23.85 Acre):	**6.08**	**Dwelling Units/Net Acre**
Project Gross Density (145 Dwelling Units/37.96 Acre):	**3.82**	**Dwelling Units/Gross Acre**

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AKS ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

MIDDLEBROOK SUBDIVISION

SHERWOOD OREGON

TAX LOTS 103 AND 101 (ADJUSTED) WASHINGTON COUNTY TAX MAP 3S 1 06/06B

PRELIMINARY SUBDIVISION PLAT WHITE OAK

DESIGNED BY: DRS/PAS
DRAWN BY: DRS
MANAGED BY: PAS
CHECKED BY: PAS/AHH
DATE: 06/25/2019

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS
RENEWS: 6/30/21

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER 3591

SHEET P07B

AKS DRAWING FILE: 3591 WHITE OAK PLATDWG | LAYOUT: P07C

SW INKSTER DRIVE

TAX LOT 15700
TAX MAP 2S 1 31DC

TAX LOT 15600

TAX LOT 15500

TAX LOT 15400
TAX MAP 2S 1 31D

SW COBBLE COURT

TAX LOT 10600
TAX MAP 2S 1 31DC

TAX LOT 10500

TAX LOT 10400

TAX LOT 10300

TAX LOT 10200

TAX LOT 10100

TAX LOT 10000

TAX LOT 9900

TAX LOT 9800

TAX LOT 9700

TAX LOT 9600

TAX LOT 9500

TAX LOT 9400

TAX LOT 9300

TAX LOT 9200

TAX LOT 9100

TAX LOT 9000

TAX LOT 8900
TAX MAP 2S 1 31DC

SW HARRISON STREET

TAX LOT 7000
TAX MAP 2S 1 31CD
OWNER: CITY OF SHERWOOD

15.00' PUBLIC PEDESTRIAN ACCESS EASEMENT

TRACT H
OPEN SPACE

15.00' PUBLIC STORM DRAINAGE EASEMENT TO CITY OF SHERWOOD

TAX LOT 100
TAX MAP 3S 1 06BB

TRACT D
NATURAL RESOURCE

PORTLAND AND WESTERN RAILROAD (PNWR)

15.00' PUBLIC PEDESTRIAN ACCESS EASEMENT (TYP)

15.00' PUBLIC PEDESTRIAN ACCESS EASEMENT

SW OBERST COURT

CL–CL INTERSECTION
STA 11+86.72 SW OBERST ROAD
= STA 11+78.92 SW CHESTNUT TERRACE

CL–CL INTERSECTION
STA 9+44.72 SW OBERST ROAD
= STA 12+47.88 SW WHITE OAK TERRACE

TRACT E
NATURAL RESOURCE

BEGIN PEDESTRIAN PATH
MATCH PROPOSED SIDEWALK
STA 1+00.00 PATH 1

CL–CL INTERSECTION
STA 24+32.10 SW WAPATO LAKE DRIVE
= STA 7+03.94 SW ATFALATI LANE

END STREET IMPROVEMENTS
STA 8+31.50 SW ATFALATI LANE

SW ATFALATI LANE

SW WAPATO LAKE DRIVE

TAX LOT 100
TAX MAP 3S 1 06

CL–CL INTERSECTION
STA 8+19.45 SW KALAPUYA LANE
= STA 21+60.10 SW WAPATO LAKE DRIVE

END STREET IMPROVEMENTS
STA 9+30.00 SW KALAPUYA LANE

TYPE III BARRICADE (TYP)

RETAINING WALL

END PEDESTRIAN PATH
MATCH PROPOSED SIDEWALK
STA 16+00.36 PATH 1

TRACT G
OPEN SPACE

15.00' PUBLIC PEDESTRIAN ACCESS EASEMENT

SW CHESTNUT TERRACE

TRACT B
OPEN SPACE

CL–CL INTERSECTION
STA 3+32.75 SW OBERST ROAD
= STA 1+00.00 SW KALAPUYA LANE

CL–CL INTERSECTION
STA 3+89.25 SW KALAPUYA LANE
= STA 1+00.00 SW ATFALATI LANE

SW KALAPUYA LANE

SW OBERST ROAD

15.00' PUBLIC PEDESTRIAN ACCESS EASEMENT

TAX LOT 1100
TAX MAP 3S 1 06BB

BEGIN PEDESTRIAN PATH
MATCH PROPOSED SIDEWALK
STA 1+00.00 PATH 2

CL–CL INTERSECTION
STA 6+97.85 SW TRILLIUM LANE
= STA 1+00.00 SW OBERST ROAD

SW TRILLIUM LANE

TAX LOT 101
TAX MAP 3S 1 06

CL–CL INTERSECTION
STA 1+00.00 SW TRILLIUM LANE
= STA 7+79.88 SW CHESTNUT TERRACE

TRACT C
NATURAL RESOURCE

CL–CL INTERSECTION
STA 4+51.47 SW TRILLIUM LANE
= STA 7+35.55 SW WHITE OAK TERRACE

TAX LOT 104
TAX MAP 3S 1 06

RETAINING WALL

CL–CL INTERSECTION
STA 14+06.93 SW TRILLIUM LANE
= STA 18+81.27 SW WAPATO LAKE DRIVE

SW WHITE OAK TERRACE

TAX LOT 2590
TAX MAP 3S 1 06BB

END PEDESTRIAN PATH
MATCH PROPOSED SIDEWALK
STA 9+29.91 PATH 2

GATE WITH KNOX LOCK

END TEMPORARY ACCESS ROAD
BEGIN STREET IMPROVEMENTS
STA 5+78.24 SW CHESTNUT TERRACE

TYPE III BARRICADE (TYP)

SW WAPATO LAKE DRIVE

CONCEPTUAL FUTURE ROAD ALIGNMENT

BEGIN STREET IMPROVEMENTS
STA 7+39.46 SW WAPATO LAKE DRIVE

END STREET IMPROVEMENTS
STA 10+80.00 SW WAPATO LAKE DRIVE

CONCEPTUAL FUTURE ROAD ALIGNMENT

TAX LOT 2502
TAX MAP 3S 1 06BB

TAX LOT 200
TAX MAP 3S 1 06B

TAX LOT 101
TAX MAP 3S 1 06B

CL–CL INTERSECTION
STA 4+17.04 SW WHITE OAK TERRACE
= STA 8+65.76 SW WAPATO LAKE DRIVE

20.00' TEMPORARY EMERGENCY ACCESS EASEMENT

60' ROW

TRACT F
OPEN SPACE

TRACT A
STORMWATER FACILITY

GATE WITH KNOX LOCK

BEGIN STREET IMPROVEMENTS
STA 6+20.30 SW BROOKMAN ROAD

END STREET IMPROVEMENTS
STA 10+56.39 SW BROOKMAN ROAD

CL–CL INTERSECTION
STA 1+85.01 SW BROOKMAN ROAD
= STA 1+00.00 TEMPORARY ACCESS ROAD

SW BROOKMAN ROAD

RETAINING WALL

100' OFFSET

SW OBERST ROAD

N

SCALE: 1" = 80 FEET
80 0 32 48 64 80

LEGEND

- CONCRETE SIDEWALK BY CONTRACTOR
- CONCRETE SIDEWALK BY HOMEBUILDER
- NEW AC PAVEMENT

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F: 503.563.6152
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ENGINEERING - SURVEYING - NATURAL RESOURCES
FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

MIDDLEBROOK SUBDIVISION

SHERWOOD OREGON
TAX LOT 103 AND 100 (ADJUSTED)
WASHINGTON COUNTY TAX MAP 3S 1 06/06B

PRELIMINARY STREET PLAN - WHITE OAK ACCESS

DESIGNED BY: DRS/PAS
DRAWN BY: DRS
CHECKED BY: AHH
SCALE: AS NOTED
DATE: 06/25/2019

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 09, 2001
PAUL A. SELLKE
PRELIMINARY NOT FOR CONSTRUCTION

RENEWAL DATE: 6/30/20

REVISIONS

JOB NUMBER
3591

SHEET
P14B

AKS DRAWING FILE: 3591 P14B STREET PLAN WHITE OAK.DWG | LAYOUT: P14B

Date: 6/26/2019
To: Joy Chang – Associate Planner, City of Sherwood (via email submittal)
From: Chris Goodell, AKS Engineering & Forestry
Project: Middlebrook Subdivision (City Case File No.: SUB 18-02)
Subject: **Alternate Access Location**

A copy of the Middlebrook Subdivision Preliminary Plat (with alternate access to SW Brookman Road) is attached to this memo. The primary difference between this layout (preliminary plat) and that which has have already provided is the location for access to SW Brookman Road. As you know, this access location is based on significant correspondence with Bob Galati, PE City Engineer.

The access relocation involves shifting the planned street to the west, which alters the configuration of Lots 1 through 17 of the preliminary plat. As shown on the attached plan, this alternative does not change planned land uses, increase the number of lots in the subdivision, or affect the project in a significant manner. This memorandum summarizes the continued compliance with the dimensional standards from Section 16.12 of the City's Zoning and Community Development Code.

16.12.030 - Residential Land Use Development Standards

A. Generally

No lot area, setback, yard, landscaped area, open space, off-street parking or loading area, or other site dimension or requirement, existing on, or after, the effective date of this Code shall be reduced below the minimum required by this Code. Nor shall the conveyance of any portion of a lot, for other than a public use or right-of-way, leave a lot or structure on the remainder of said lot with less than minimum Code dimensions, area, setbacks or other requirements, except as permitted by Chapter 16.84. (Variance and Adjustments)

B. Development Standards

Except as modified under Chapter 16.68 (Infill Development), Section 16.144.030 (Wetland, Habitat and Natural Areas) Chapter 16.44 (Townhomes), or as otherwise provided, required minimum lot areas, dimensions and setbacks shall be provided in the following table.

C. Development Standards per Residential Zone

DEVELOPMENT STANDARD BY RESIDENTIAL ZONE	MDRH	MDRL
Minimum Lot areas: (in square ft.)		
Single-Family Detached	5,000	5,000
Single-Family Attached	4,000	5,000
Two or Multi-Family: for the first 2 units	8,000	10,000
Multi-Family: each additional unit after first 2	3,200	X
Minimum Lot width at front property line: (in feet)	25	25
Minimum Lot width at building line[1] (in feet)		
Single-Family	50	50
Two-Family	60	60
Multi-Family	60	X
Lot Depth	80	80

Maximum Height [2] (in feet)	35 or 2.5 stories	30 or 2 stories
Setbacks (in feet)		
Front yard [4]	14	14
Face of garage	20	20
Interior side yard		
Single-family detached	5	5
Single-family attached	5	10
Two Family	5	5
Corner lot street side		
Single-family or Two family	15	15
Rear Yard	20	20

Response: The attached preliminary plat demonstrates that the minimum lot size requirement of 5,000 square feet is met. The smallest lot is +/- 5,304 square feet. The preliminary plat also shows that the minimum lot width and depth standards of 50 feet and 80 feet (respectively) are met. Since the minimum lot area and lot dimensional requirements are satisfied, there is sufficient area for a new home to be built on each lot in the future, while satisfying the above listed setback requirements. These criteria are met.

The attached preliminary plat demonstrates the requirements of the City's Zoning and Community Development Code continue to be met. This includes frontage improvements, right-of-way dedications for streets, visual corridors, street connectivity, block length standards, etc. Much of this is also illustrated on the table provided on the preliminary plat. As is typical, the applicant anticipates appropriate conditions of approval in the City's decision to ensure compliance with these standards for final design and the final plat.

In addition, as requested by Mr. Galati, an addendum is provided to the Preliminary Stormwater Report that illustrates that the alternate site layout and its corresponding stormwater management facility continues to meet stormwater quality and quality requirements for the project.

Memorandum

Date:	June 25, 2019
To:	Bob Galati – City of Sherwood
Cc:	Joy Chang – City of Sherwood
From:	Paul A. Sellke, PE, GE (PaulS@aks-eng.com)
Project:	**Middlebrooks Subdivision (SUB 18-02)**
Subject:	**White Oak Terrace Access Plan Alternative Preliminary Stormwater Evaluation**
Site Location:	**Sherwood, OR**

The following paragraphs are intended to provide a summary of the Middlebrook Subdivision stormwater facility, utilizing the alternate site layout with SW White Oak Terrace serving as the site's access.

The alternate Middlebrook Subdivision site layout reconfigures a portion of the subdivision and utilizes SW White Oak Terrace for site access (west of existing intersection), maintaining a street offset of 100 feet between the nearest right-of-way lines between SW White Oak Terrace and SW Oberst Road. The alternate access concept is attached for reference (Sheet P14B) and shows the revised Tract A (Stormwater Facility).

The original preliminary stormwater facility (as submitted within the Middlebrook Subdivision Land Use Application) was designed to accommodate stormwater runoff from 145 lots and associated impervious surfaces (streets, sidewalks, etc.). The alternate Middlebrook Subdivision site layout does not substantially increase (or change) the site's impervious surfaces. Utilizing the alternate site layout, and stormwater facility configuration, the preliminary stormwater facility can be sized meet the required water quality and quantity requirements.

Based on the preliminary stormwater facility analysis, the alternative site layout and stormwater facility can be designed to meet the City of Sherwood and Clean Water Services (R&O 17-05) requirements as well as the additional SLOPES V requirements.

Do not hesitate to call or email with any questions.

Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Paul A. Sellke, P.E., G.E.
Project Engineer

6/25/19
REGISTERED PROFESSIONAL ENGINEER
65688PE
OREGON
JULY 08, 2001
PAUL A SELLKE
RENEWAL DATE: 6/30/20

KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

MEMORANDUM

Date: May 28, 2019 Project #: 21399

To: Bob Galati & Joy Chang, City of Sherwood

From: Chris Brehmer & Kelly Laustsen

Project: Middlebrook Residential Subdivision

Subject: Supplemental Operations and Queueing Assessment

This memorandum supplements the Traffic Impact Analysis (TIA) for the Middlebrook Residential Subdivision. It provides an updated operations and queueing analysis at the study intersections with the intersection of Highway 99W and SW Brookman Road-SW Chapman Road restricted to right-in/right-out (RIRO).

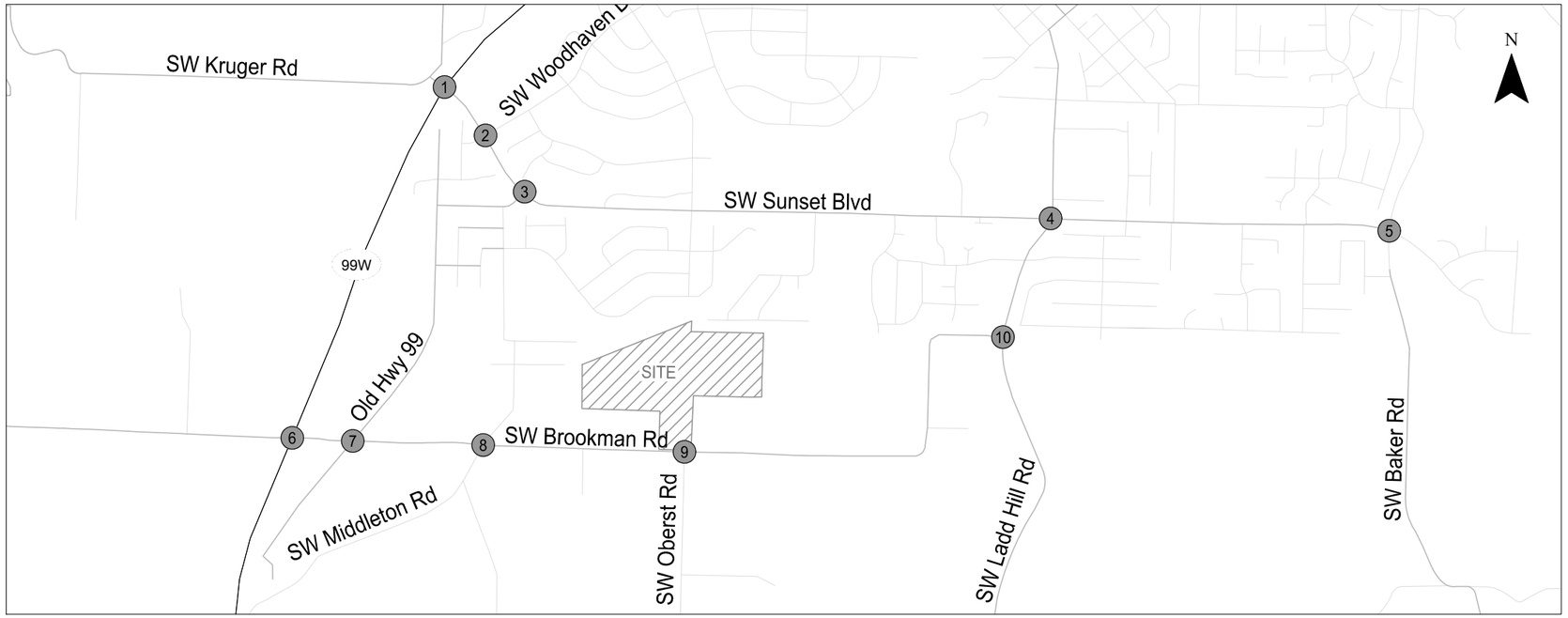
BACKGROUND CONTEXT

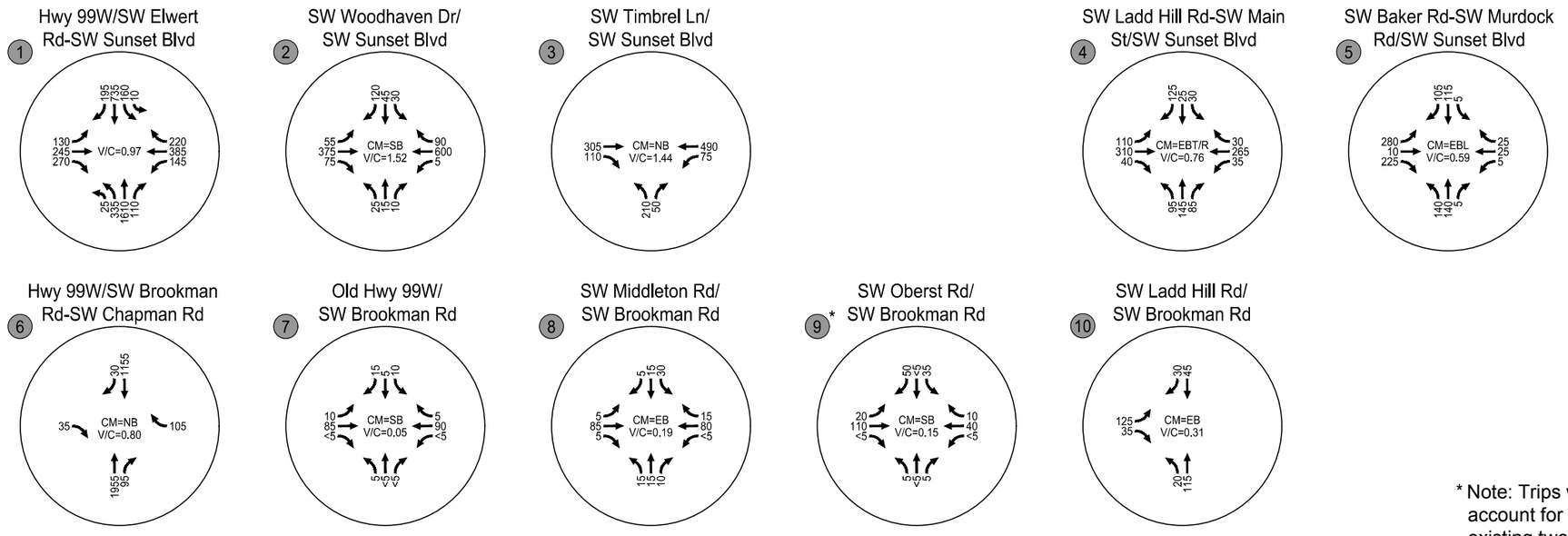
The TIA provided figures documenting year 2020 total traffic conditions (with development of the proposed Middlebrook Subdivision) at the study intersections and an appendix with an assessment of 95th percentile queues under all scenarios (*Appendix E*). The queueing and operations assessment have now been updated to reflect limiting the intersection of Highway 99W and SW Brookman Road-SW Chapman Road to RIRO turn movements. The memorandum "Supplemental Transportation Assessment of Potential Highway 99W & SW Brookman Road-SW Chapman Road Access Restrictions" (provided in Attachment A) documents the anticipated traffic volumes at the study intersections with the RIRO.

INTERSECTION OPERATIONS

Figures 1 and 2 illustrate projected traffic volumes and operations under 2020 total traffic conditions with the RIRO. All but two of the study intersections are projected to satisfy the applicable operating standards. The intersections of SW Woodhaven Drive/SW Sunset Boulevard and SW Timbrel Lane/SW Sunset Boulevard are projected to have side street operations exceeding the City's movement v/c standard during the weekday AM peak hour. These intersections were also reported to not satisfy standards during background or total traffic conditions in the TIA. Proposed mitigation at these locations is discussed in the memorandum "Proposed Mitigation with Development."

Synchro output sheets are provided in Attachment B.





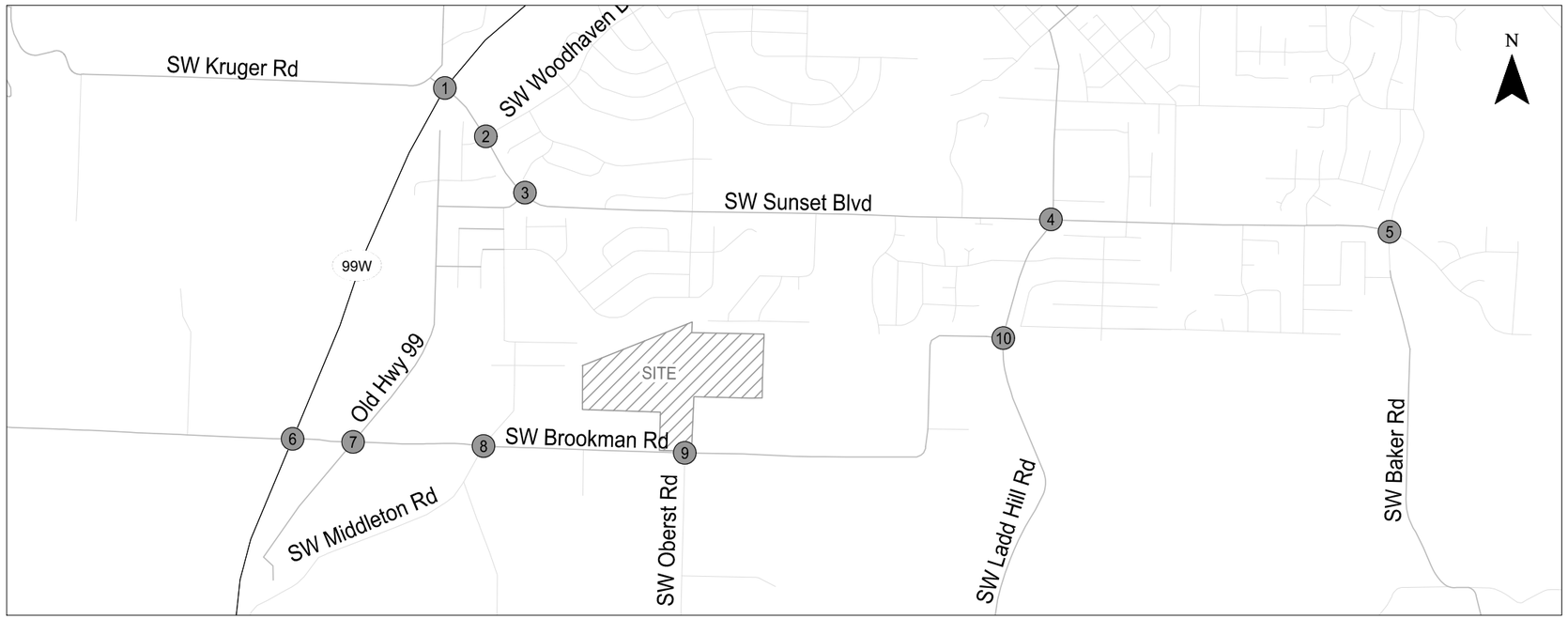
* Note: Trips were added to intersection 9 to account for rerouted trips associated with the existing two homes on site.

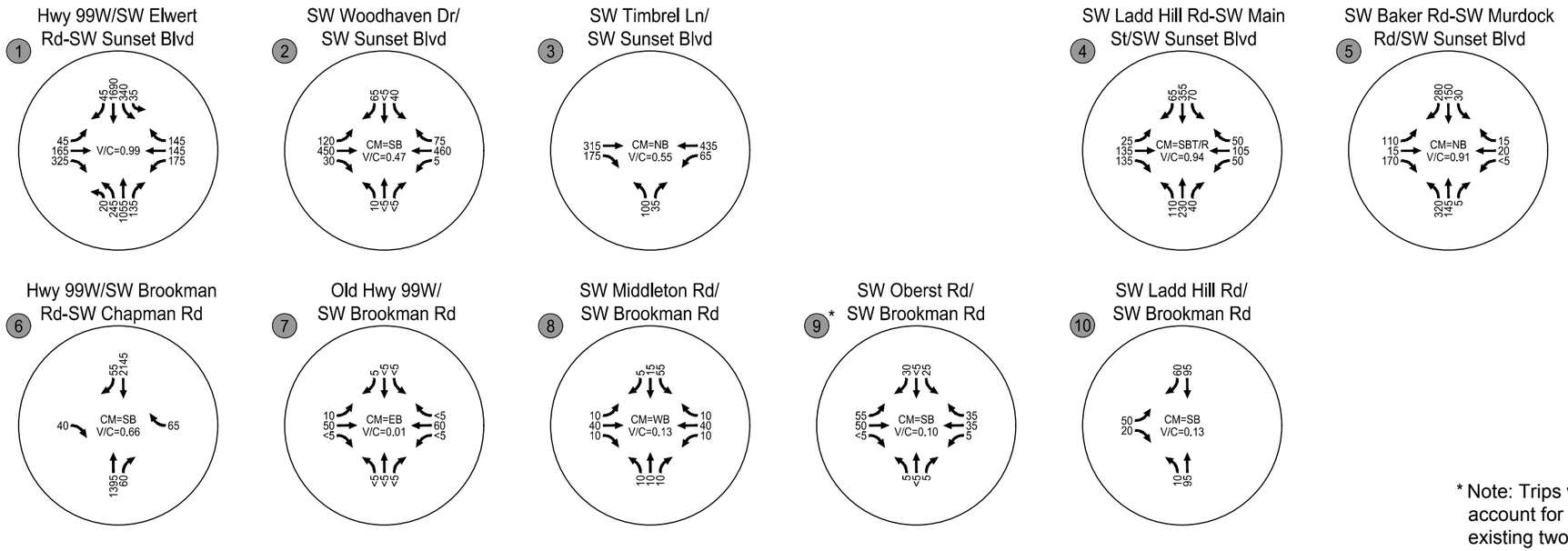
CM = CRITICAL MOVEMENT (TWSC & AWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL
AWSC = ALL-WAY STOP CONTROL

Year 2020 Total Traffic Intersection Operations - RIRO at Hwy 99W/SW Brookman Rd-SW Chapman Rd
Weekday AM Peak Hour
Sherwood, Oregon

Figure 1

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING





* Note: Trips were added to intersection 9 to account for rerouted trips associated with the existing two homes on site.

CM = CRITICAL MOVEMENT (TWSC & AWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL
AWSC = ALL-WAY STOP CONTROL

Year 2020 Total Traffic Intersection Operations - RIRO at Hwy 99W/SW Brookman Rd-SW Chapman Rd
Weekday PM Peak Hour
Sherwood, Oregon

Figure 2

QUEUEING ASSESSMENT

The analysis in the TIA found the proposed development would not by itself trigger any queue storage to be exceeded but would increase queues at locations where the available queue storage was exceeded under existing and/or background traffic conditions.

The queueing assessment was updated for total traffic conditions assuming the intersection of Highway 99W and SW Brookman Road-SW Chapman Road is restricted to RIRO turn movements. A table summarizing the queueing assessment is provided in Attachment C. Each location where the 95th percentile queue is projected to exceed storage under total traffic conditions is discussed below.

Highway 99W/SW Elwert Road-SW Sunset Boulevard

The 95th percentile queue for the eastbound left-turn and westbound left-turn at the signalized intersection of Highway 99W/SW Elwert Road-SW Sunset Boulevard are projected to exceed storage during the weekday AM and/or weekday PM peak hour.

Consistent with background conditions, the eastbound left-turn movement is projected to have a 95th percentile queue of 287 feet during the weekday AM peak hour, in excess of the 260 feet of storage planned for the intersection[1]. The Middlebrook subdivision is not projected to add any trips to the eastbound left-turn.

The 95th percentile queue for the westbound left-turn is expected to exceed the proposed 185 feet of queue storage during both the weekday AM and PM peak hour under total traffic conditions (the queue exceeds storage during the weekday PM peak hour under background conditions). The increase in queue during the weekday AM peak hour is in part due to the RIRO restriction at Highway 99W and SW Brookman Road-SW Chapman Road, which is expected to add vehicles to the westbound left-turn movement. The site is projected to add 4 westbound left-turns (of a total projected westbound left-turn volume of 147) during the weekday AM peak hour, or about one every 15 minutes on average. Once the interim RIRO restriction is removed, the proposed residential development would not contribute any westbound left-turns to the intersection.

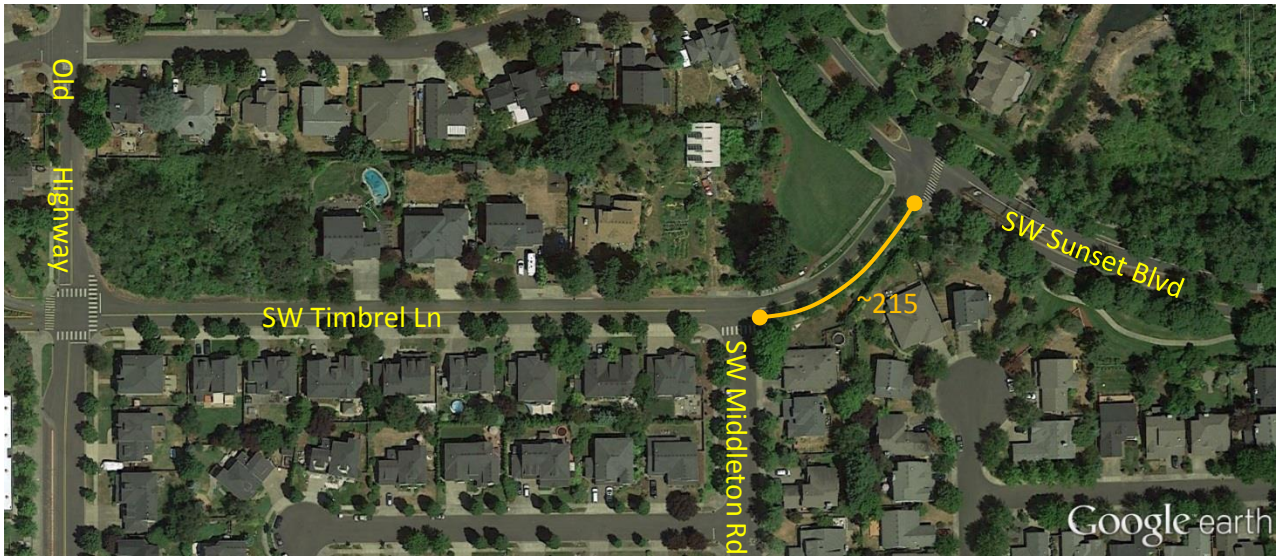
No mitigation is recommended at the Highway 99W/SW Elwert Road-SW Sunset Boulevard in conjunction with the proposed site development.

[1] The analysis assumes the planned improvements at the intersection of Highway 99W/SW Elwert Road-SW Sunset Boulevard with the Sherwood High School project, including a second northbound left-turn lane, extended storage for the northbound and southbound left-turns, and exclusive eastbound and westbound left-turn lanes. In addition, the project relocated the intersection of SW Kruger Road and SW Elwert Road to provide additional storage on the eastbound approach to 99W.

SW Timbrel Lane/SW Sunset Boulevard

The 95th percentile queue for the northbound through/left-turn movement at the two-way stop-controlled intersection of SW Timbrel Lane/SW Sunset Boulevard is projected to extend beyond the adjacent intersection of SW Middleton Road during the weekday AM peak hour under background and total traffic conditions. As illustrated in Exhibit 1, there is approximately 215 feet between the intersections.

Exhibit 1. SW Timbrel Lane/SW Sunset Boulevard



The site is projected to contribute 4 of the projected 208 northbound left-turns during the weekday AM peak hour. The projected site-generated trips are expected to travel north on SW Middleton Road and west of SW Sunset Boulevard to travel south on Highway 99W, given the RIRO restriction at Highway 99W and SW Brookman Road-SW Chapman Road. Once the interim RIRO restriction is removed, the proposed residential development would not contribute any northbound left-turns to the intersection.

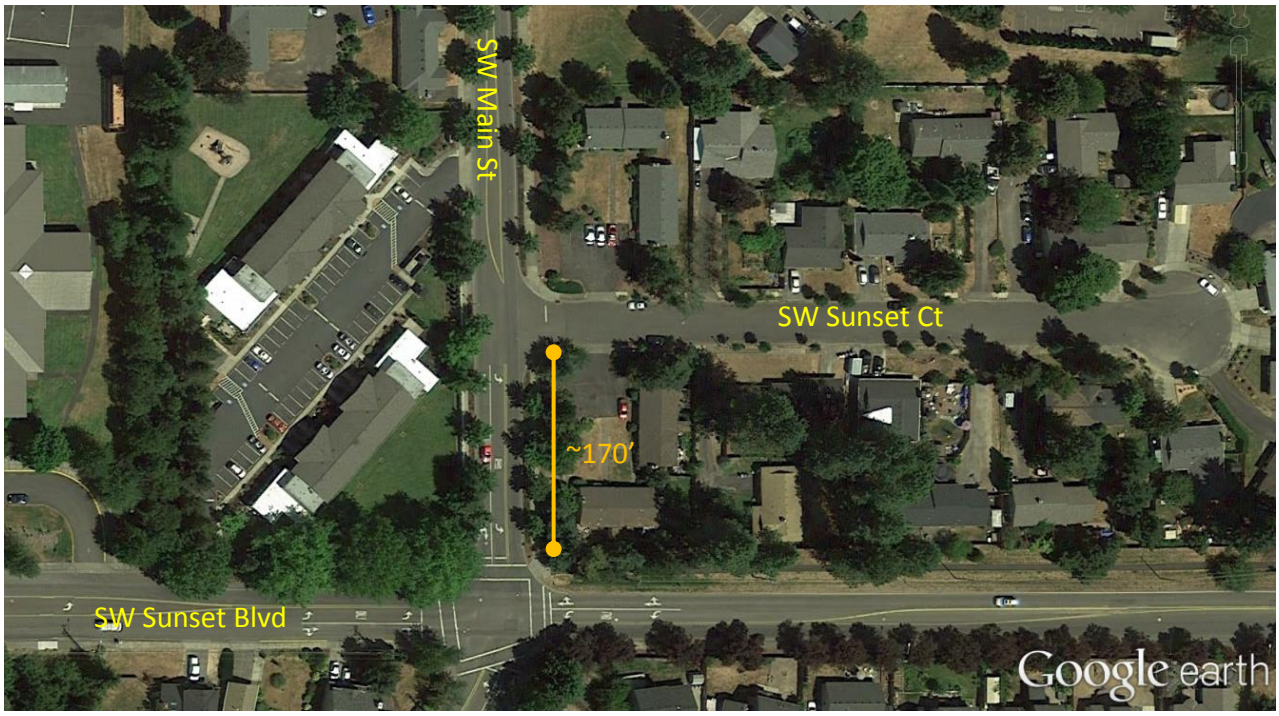
The proposed development is expected to pay a proportional share contribution towards capacity mitigation of the SW Timbrel Lane/SW Sunset Boulevard intersection. No additional mitigation beyond the proportional share payment is recommended.

SW Ladd Hill Road-SW Main Street/SW Sunset Boulevard

The 95th percentile queue for the southbound through/right-turn movement at the all-way stop-controlled intersection of SW Ladd Hill Road-SW Main Street/SW Sunset Boulevard is projected to extend beyond the adjacent intersection of SW Sunset Court (north of SW Sunset Boulevard) during the weekday PM peak hour under all scenarios studied. As illustrated in Exhibit 2, there is approximately 170 feet between the two intersections. The 95th percentile queue for the southbound through/right-turn during the weekday PM peak hour is projected to be 308 feet under background traffic conditions. The site is anticipated to add 9 southbound vehicles to the intersection (of a total

418 southbound through and right-turns on the approach) over the course of the PM peak hour. During the weekday PM peak hour, vehicles turning left from SW Sunset Court onto SW Main Street may experience incrementally longer delays waiting for a gap in traffic on SW Main Street as a result.

Exhibit 2. SW Ladd Hill Road-SW Main Street/SW Sunset Boulevard



No mitigation is recommended at the intersection in conjunction with the proposed site development.

FINDINGS

Based on the discussion in this memorandum, no additional mitigations are recommended as a result of the queueing assessment. Please contact us if you have questions or need additional information.

Attachment A Supplemental Transportation Assessment of Potential Highway 99W & SW Brookman Road-SW Chapman Road Access Restrictions

KITTELSON & ASSOCIATES
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P 503.228.5230 F 503.273.8169

MEMORANDUM

Date: April 23, 2019 Project #: 21399

To: Bob Galati & Joy Chang, City of Sherwood

Cc: Avi Tayar, Oregon Department of Transportation
Naomi Vogel, Washington County Department of Land Use & Transportation

From: Chris Brehmer & Kelly Laustsen

Project: Middlebrook Residential Subdivision

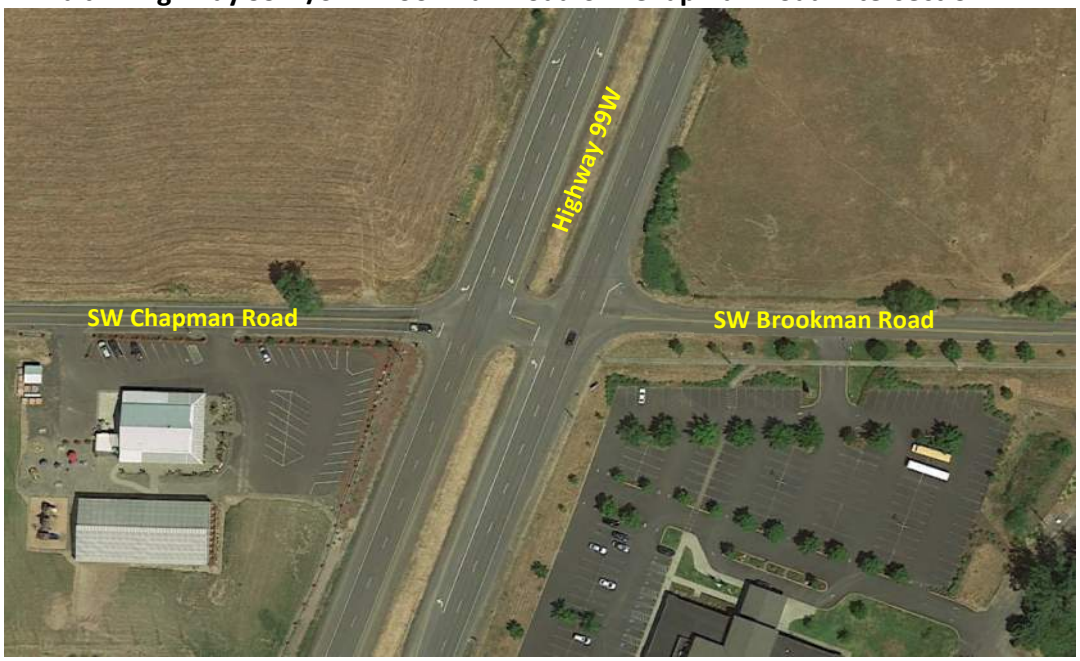
Subject: Supplemental Transportation Assessment of Potential Highway 99W & SW Brookman Road-SW Chapman Road Access Restrictions

This memorandum supplements the Traffic Impact Analysis (TIA) for the Middlebrook Residential Subdivision. It provides analysis of the implications of restricting turn movements at the intersection of Highway 99W and SW Brookman Road-SW Chapman Road to right-in/right-out (RIRO).

BACKGROUND CONTEXT

The intersection of Highway 99W and SW Brookman Road-SW Chapman Road is currently full-movement, with stop-control on the eastbound and westbound approaches. A center refuge area allows two-stage left-turns and through movements. The existing intersection is shown in Exhibit 1.

Exhibit 1. Highway 99W/SW Brookman Road-SW Chapman Road Intersection



Source: Google Earth

ODOT's mobility standards identify a maximum volume-to-capacity (V/C ratio) of 0.99 for the side street stop-controlled approaches. As described in the TIA, the SW Brookman Road westbound approach to the Highway 99W/SW Brookman Road-SW Chapman Road intersection is projected to operate with a V/C ratio of 1.45 under year 2020 total traffic conditions during the weekday AM peak hour, compared to a V/C ratio of 1.08 under background conditions.

The TIA recommended the impact of site-generated trips at the intersection be mitigated by either 1) provision of an exclusive right-turn lane on the SW Brookman Road approach in conjunction with site development or 2) payment of a proportionate share contribution to planned future intersection improvements (using the methodology established in the *Sherwood High School Transportation Impact Study*, which assumes future installation of a traffic signal).

ODOT provided the City of Sherwood comments and recommendations in a response letter dated February 21, 2019. ODOT staff noted several points including:

- "The City of Sherwood has a Metro grant to study the location of the OR 99W intersection as it relates to the Brookman Rd Concept Plan. This study will identify the preferred alternative for the location of the signalized intersection that is in the City's Transportation System Plan."
- "The applicant proposes to construct a right turn lane which may not be needed at this location if the intersection is moved further north. Therefore, it is recommended that the applicant contribute a fee in lieu of construction of the right turn lane."
- "This intersection is within a high speed corridor and ODOT is concerned about adding additional traffic to this intersection without making safety improvements."
- "We are recommending two options to mitigate the safety concerns at the OR 99W and Brookman Rd intersection:
    1. As an interim solution, restrict the movements onto Brookman Rd from OR 99W to right in/right out movements. This would eliminate the potential for crashes relating to vehicles turning left into and out of Brookman Rd onto OR 99W. -OR-
    2. As an interim solution, install a traffic signal which will control traffic movements at the intersection increasing the safe operation of the intersection. The signal equipment could be relocated in the future if the City's study recommends locating the signal further north to accommodate the Brookman Rd Concept Plan."

Subsequent conversations with ODOT staff determined that, while ODOT may be willing to consider signalization of the intersection on an interim basis, State approval of a signalization option is subject to Region 1 and State Traffic Engineer approval and is not guaranteed. Signalization would require geometric changes at the intersection to allow for signalization in compliance with State standards.

The required geometric and signalization costs are likely to exceed $1 million[1] and could ultimately be rendered entirely "throw-away" improvements pending where the now-initiated Brookman Road planning study identifies a preferred alignment and configuration.

After reviewing and discussing the ODOT feedback along with the nexus of potential mitigation requirements to the proposed Middlebrook Subdivision, the Applicant elected to further investigate implications of the potential turn movement restriction option identified by ODOT. The remainder of this memorandum discusses the operational impacts of restricting the intersection to RIRO, considering both existing traffic and the proposed development trips.

TRAFFIC VOLUMES & TURN MOVEMENT IMPLICATIONS

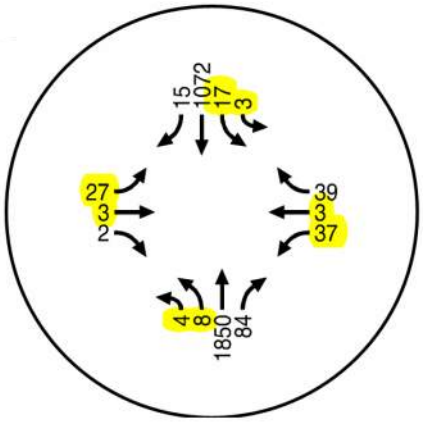
Operations of the Highway 99W and SW Brookman Road-SW Chapman Road intersection were re-assessed with the assumed turn movement restrictions in place to better understand operational implications of the potential changes. To do so, the anticipated turn movement volumes at the intersection were projected. The discussion below documents how existing and future traffic volumes would likely change with the intersection turn movements restricted per ODOT's suggestions.

Existing Traffic Volumes

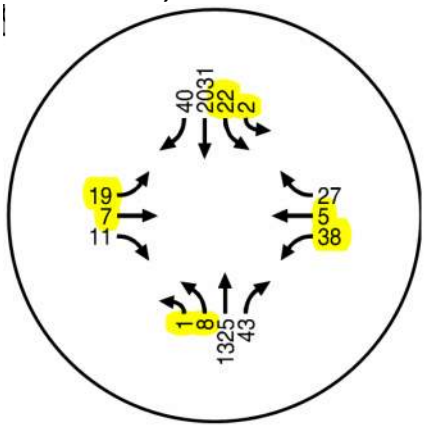
Traffic volumes were collected at the intersection in May 2017 as part of the TIA. The weekday AM and PM peak hour counts are shown in Exhibit 2 with the movements that would be impacted by the potential RIRO restriction highlighted in yellow.

Exhibit 2. Highway 99W/SW Brookman Road-SW Chapman Road Existing Traffic Volumes

Weekday AM Peak Hour:



Weekday PM Peak Hour:



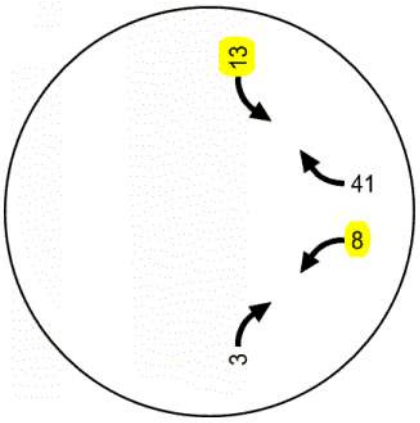
[1] The proportional share cost mitigation methodology established in the *Sherwood High School Transportation Impact Study* prepared by DKS Associates assumed the cost of installing a traffic signal at the intersection as $1.936 million.

Site-Generated Traffic Volumes

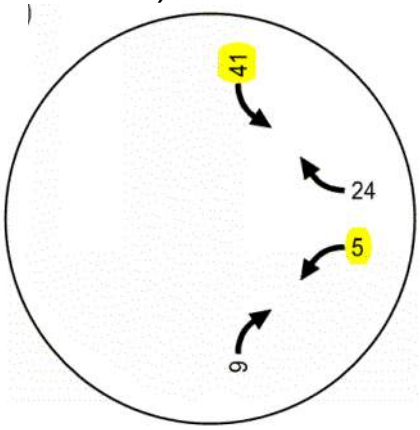
The proposed Middlebrook Subdivision includes 145 detached single-family homes located on the north side of SW Brookman Road, with access proposed at a new public street aligned with SW Oberst Road on SW Brookman Road. The TIA completed for the site assumed full access at Highway 99W/SW Brookman Road-SW Chapman Road, resulting in the intersection site-generated trips shown in Exhibit 3.

Exhibit 3. Highway 99W/SW Brookman Road-SW Chapman Road Site-Generated Trips

Weekday AM Peak Hour:



Weekday PM Peak Hour:



Impact of Turn Movement Restriction on Existing Traffic

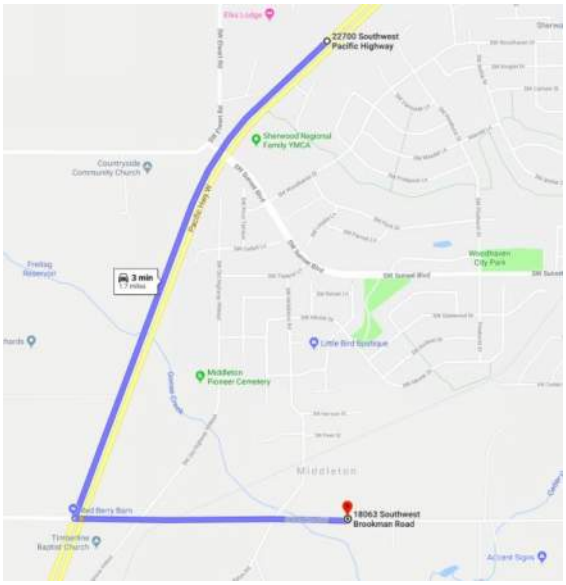
The impact of access restrictions at the intersection of Highway 99W and SW Brookman Road-SW Chapman Road was assessed in terms of each movement at the intersection as documented below.

Southbound Left-Turn (17 lefts AM, 22 lefts PM, 3 U-turns AM, 2 U-turns PM)

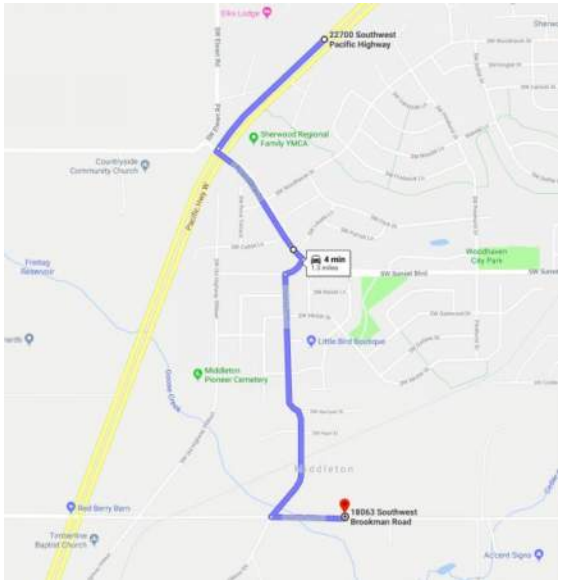
Vehicles from Highway 99W that currently complete a southbound left-turn on SW Brookman Road will likely elect to make a left-turn at SW Sunset Boulevard and utilize SW Middleton Lane to connect to SW Brookman Road. Alternatively, vehicles could continue south on Highway 99W to make a U-turn at Bell Road to access SW Brookman Road. Travel time data collected in April 2019 suggests that it will be significantly faster to travel via Sunset Boulevard and SW Middleton Lane as compared to U-turning at Bell Road so existing traffic volumes were reassigned to this route as shown in Exhibit 4. Note that existing southbound U-turns are less than 5 in each of the peak hours (3 AM, 2 PM) and were assumed to occur at SW Sunset Boulevard.

Exhibit 4. Assumed Re-routing of Existing Southbound Left-turn Movements

Current Route:



Route with RIRO:



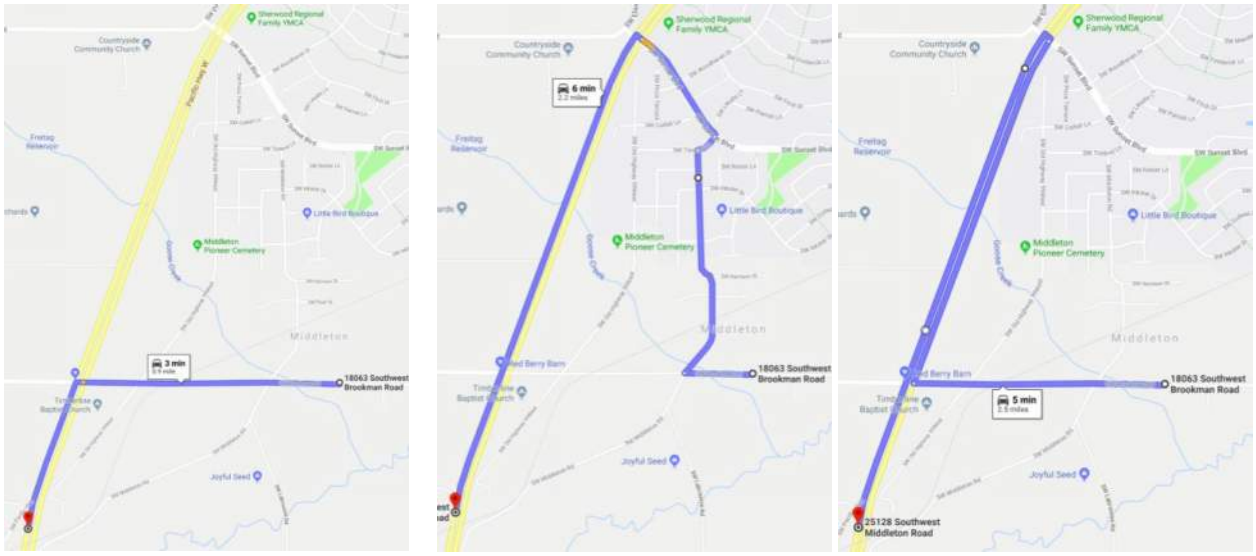
Source: Google Maps

Westbound Left-Turn/Through Movement (37 lefts AM, 38 lefts PM, 3 throughs AM, 5 throughs PM)

Vehicles from SW Brookman Road that currently take a left-turn or make a through movement at Highway 99 have the option to either 1) travel SW Middleton Lane to SW Sunset Boulevard and complete a left on Highway 99W or 2) to turn right on Highway 99W at SW Brookman Road and U-turn at SW Sunset Boulevard. Based on travel time data collected along both potential routes in April 2019, travel times are highly variable for both routes. The travel time study results generally indicate U-turning at SW Sunset Boulevard is faster during the evening peak hour and slower during the morning peak hour (compared to utilizing SW Middleton Lane). Therefore, for analysis purposes, vehicles were assumed to split evenly between the routes as shown in Exhibit 5.

Exhibit 5. Assumed Re-routing of Existing Westbound Left-turn & Through Movements

Current Route: ***Route Options with RIRO:***



Source: Google Maps

License plate data was also collected to assess the number of westbound left-turns/through movements at Highway 99W/SW Brookman Road-SW Chapman Road that originate along the SW Brookman Road corridor between Highway 99W and Ladd Hill Road versus from points beyond SW Brookman Road ("cut through trips"). The resulting data is shown in Table 1. As shown in Table 1, over half of the vehicles turning left onto Highway 99 from SW Brookman Road began their trip from a point east of SW Brookman Road. The apparent "cut through" trips that originate from Ladd Hill Road or further away were assumed to change their paths to use Sunset Boulevard and not impact SW Brookman Road as a function of the potential turn movement restrictions.

Table 1. Vehicle Origin-Destination Data

Movement at Highway 99W/Brookman Road-Chapman Road	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Total Volume	From Ladd Hill Rd	Total Volume	From Ladd Hill Rd
Westbound Right-Turn	29	3 (10%)	24	3 (13%)
Westbound Through	1	0 (0%)	2	2 (100%)
Westbound Left-Turn	41	23 (56%)	45	30 (67%)

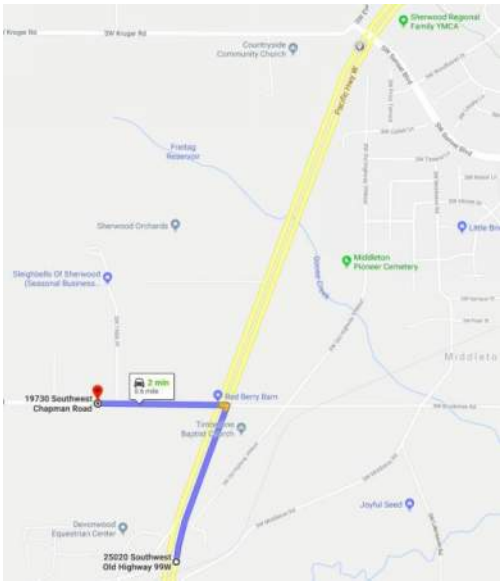
Northbound Left-Turn (8 lefts AM, 8 lefts PM, 4 U-turns AM, 1 U-turn PM)

Vehicles from Highway 99W that currently complete a northbound left-turn on SW Chapman Road will likely continue on Highway 99W to Sunset Boulevard and then make a U-turn to reach SW Chapman Road with the potential RIRO restriction in place. The U-turn movement will be facilitated by the planned construction of northbound dual left-turn lanes on Highway 99W at Sunset Boulevard and the legalization of the U-turn movement (these changes are being designed and constructed by Washington County in conjunction with the new Sherwood High School and are expected to be in place prior to occupancy of the proposed Brookman Subdivision).

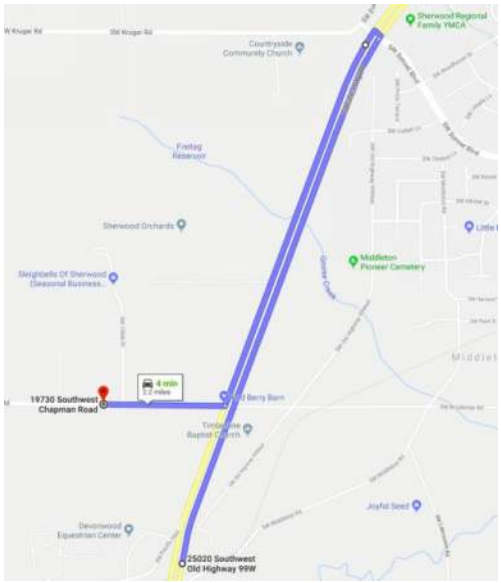
Existing traffic volumes at the study intersection were rerouted to reflect these changes as shown in Exhibit 6. In addition, vehicles that were recorded making a northbound U-turn at the SW Brookman Road-SW Chapman Road intersection currently were also rerouted to complete a U-turn at SW Sunset Boulevard.

Exhibit 6. Assumed Re-routing of Existing Northbound Left-turn Movements

Current Route:



Route with RIRO:



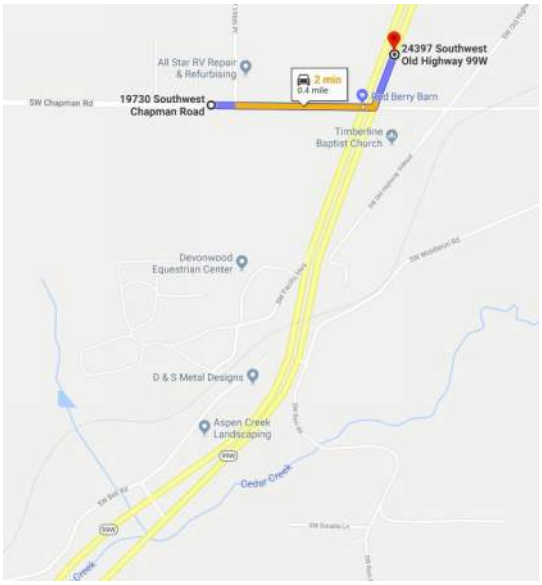
Source: Google Maps

Eastbound Left-Turn/Through Movement (27 lefts AM, 19 lefts PM, 3 throughs AM, 7 throughs PM)

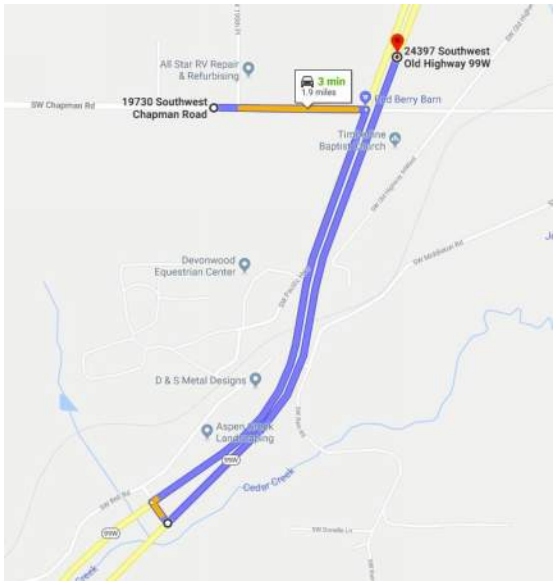
Vehicles from SW Chapman Road that currently complete a left-turn or make a through movement at Highway 99W will likely elect to make an eastbound right-turn and travel south approximately 0.7 miles to complete a U-turn at Bell Road as shown in Exhibit 7.

Exhibit 7. Assumed Re-routing of Existing Eastbound Left-turn & Through Movements

Current Route:



Route with RIRO:



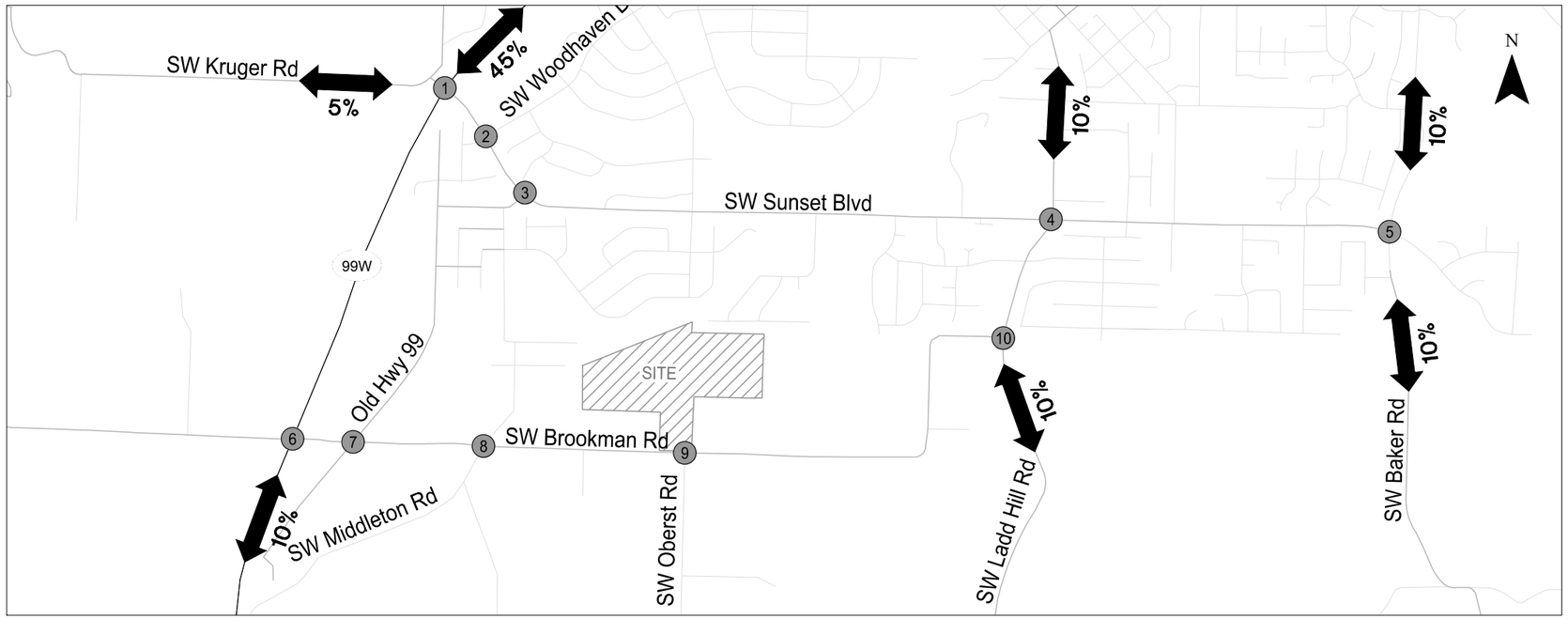
Source: Google Maps

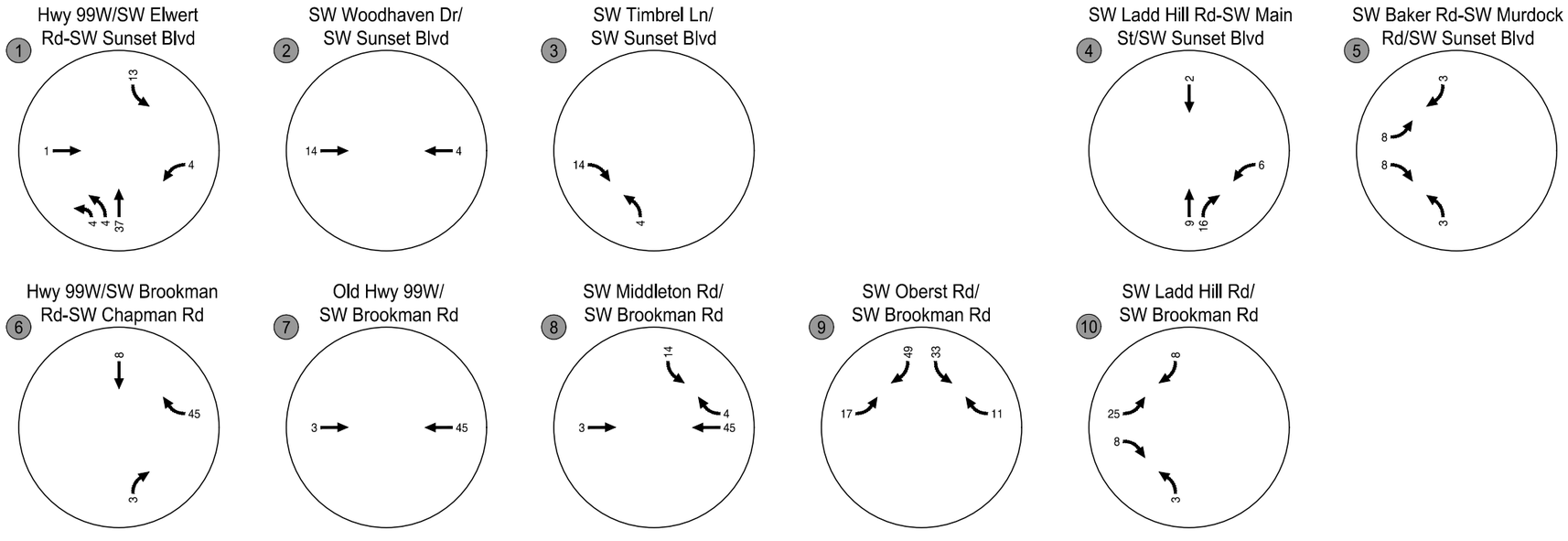
Impact of Restriction on Site-Generated Trips

The assignment of site trips to the network with the potential restriction to RIRO is shown in Figure 1 and 2 during the weekday AM and weekday PM peak hours, respectively. As shown, the restriction impacts trips from the north and to the south on Highway 99W. With the RIRO in place, trips from the north are anticipated to complete a left-turn at the Highway 99W/SW Sunset Boulevard and then utilize SW Middleton Road to travel south and access the site. Trips to the south are anticipated to either:

1. Exit the site onto SW Brookman Road, turn right onto SW Middleton Road, travel north to SW Sunset Boulevard, and turn left at the Highway 99W/SW Sunset Boulevard signal, - OR -
2. Exit the site onto SW Brookman Road, turn right onto Highway 99W and then U-turn at the SW Sunset Boulevard intersection.

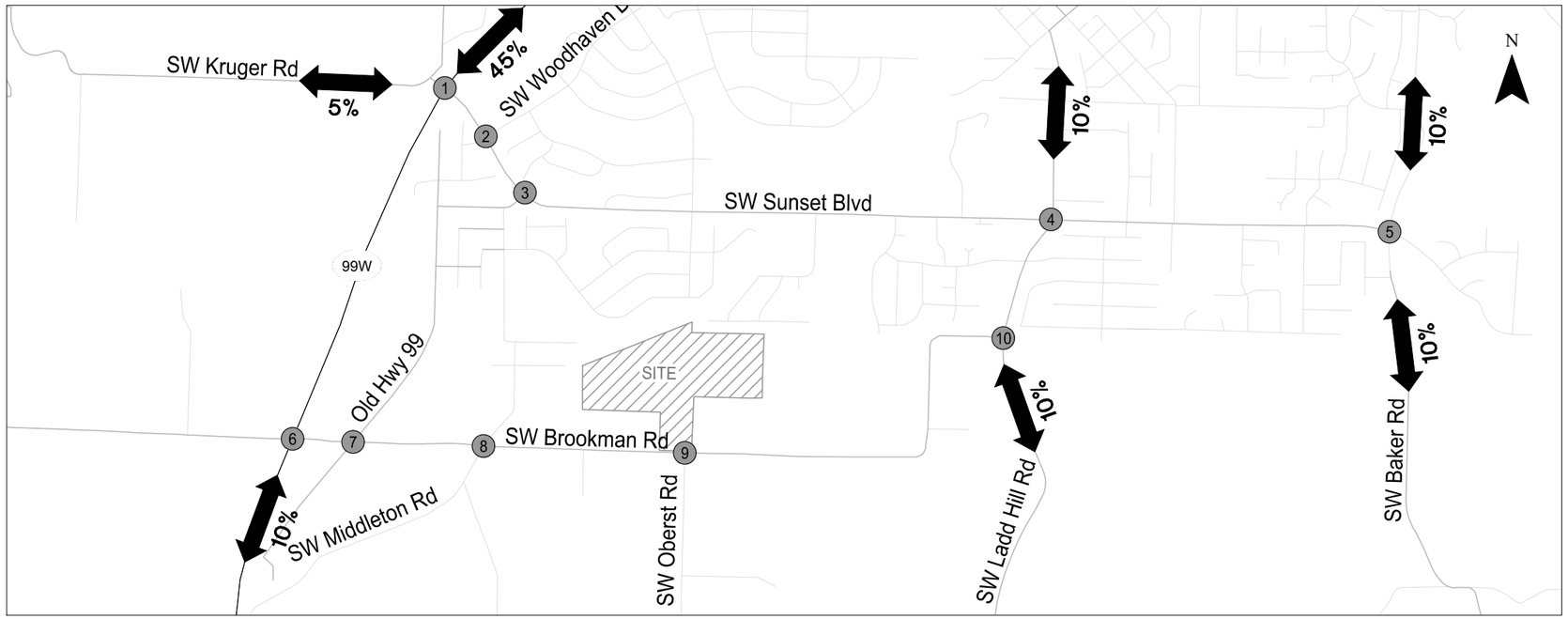
The two route options to travel south are relatively similar in length, with the faster route varying based on time of day and traffic volume fluctuations. Therefore, it was assumed that site trips destined southbound on Highway 99W would be evenly split over the two options (matching the assumption made for existing traffic volumes).

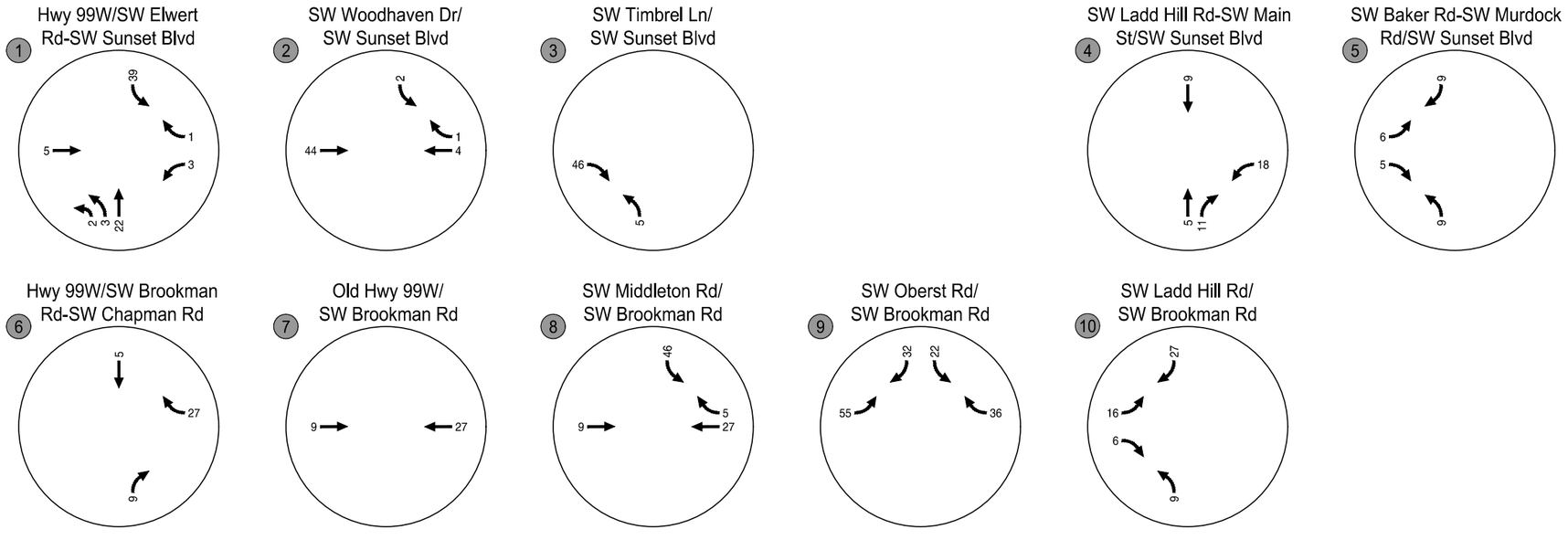




Assumed Trip □istri□ution and Assignment with RIRO at Highway 99W/SW Brookman Road-SW Chapman Road
Weekday AM Peak Hour
Sherwood, Oregon

Figure
1





Assumed Trip Distribution and Assignment with RIRO at Highway 99W/SW Brookman Road-SW Chapman Road
Weekday PM Peak Hour
Sherwood, Oregon

Figure 2

As shown in Figures 1 and 2, the proposed development is anticipated to add 18 weekday AM peak hour trips and 51 weekday PM peak hour trips to SW Middleton Road on an interim basis while the turn movements restrictions are in place on Highway 99W at SW Brookman Road. SW Middleton Road is classified as a neighborhood route, which "provide connectivity to collectors or arterials" (2014 Sherwood Transportation System Plan).

KEY INTERSECTION OPERATIONAL ANALYSIS FINDINGS

Operations at the Middlebrook Subdivision TIA study intersections were reassessed under 2020 total traffic conditions, assuming implementation of the potential RIRO. Key findings from the assessment are detailed below.

- The intersection of Highway 99W/SW Elwert Road-SW Sunset Boulevard continues to satisfy ODOT mobility standards, considering the improvements planned with the Sherwood High School project and the re-routed existing and site-generated trips.
- Conversion to RIRO addresses the operational deficiency at the intersection of Highway 99W/SW Brookman Road-SW Chapman Road, allowing the intersection to satisfy ODOT mobility standards.
- Consistent with background traffic conditions findings, the side street stop-controlled movements at the intersections of SW Woodhaven Drive and SW Timbrel Lane on SW Sunset Boulevard continue to not meet City standards during the weekday AM peak hour. The re-routed site-generated trips using these intersections due to implementation of the potential RIRO have an incremental impact as summarized in Table 2.

Table 2. Intersection Impacts – Weekday AM Peak Hour

Scenario	SW Woodhaven Drive/ SW Sunset Boulevard	SW Timbrel Lane/ SW Sunset Boulevard
Existing Total Entering Vehicle Volumes	1,012	894
Additional Traffic Volume with RIRO (Existing Volumes Rerouted)	50 (14 EBT, 3 EBR, 3 NBL, 30 WBT)	44 (1 EBT, 13 EBR, 6 NBL, 24 WBT)
Site-Generated Trips	18 (14 EBT, 4 WBT)	18 (14 EBR, 4 NBL)
Site-Generated Trips/Year 2020 Total Traffic Intersection Volume	1.2%	1.5%

Where EBT = Eastbound through, EBR = Eastbound right, NBL = Northbound left, WBT = Westbound through

The Sunset High School traffic study previously indentifed a possible proportionate share methodology for mitigating trip impacts at the SW Woodhaven Drive/SW Sunset Boulevard and SW Timbrel Lane/SW Sunset Boulevard intersections. Site trip impacts at these two intersections associated with the proposed Middlebrook Subdivision could potentially be mitigated through payment of a proportional share assessment; however, it should be noted that the site-generated trips are expected to shift back to the Highway 99W/SW Brookman Road-SW Chapman Road intersection once the ultimate migation is implemented on Highway 99W (the site-generated trip impacts along SW Sunset Boulevard in the

absence of the potential RIRO restriction are documented in the Middlebrook Subdivision TIA). The City of Sherwood will need to assess the temporal implications of site trip impacts along SW Sunset Boulevard resulting from the potential turn movement restriction so that the Middlebrook Subdivision mitigation requirements are equitable and avoid double-counting the cumulative site trip impacts.

The synchro output sheets for 2020 total traffic conditions are provided in *Attachment A.*

NEXT STEPS

We look forward to discussing the contents of this memorandum and potential next steps during the upcoming April 24th, 2019 meeting with City, ODOT and County staff.

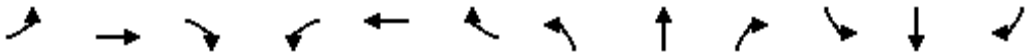
Attachment A Year 2020 Total Traffic Conditions (RIRO) Synchro Output Sheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	131	246	272	147	387	219	25	335	1610	112	12	159
Future Volume (vph)	131	246	272	147	387	219	25	335	1610	112	12	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%				-1%			
Total Lost time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Lane Util. Factor	1.00	0.95		1.00	0.95			0.97	0.95	1.00		0.97
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Frt	1.00	0.92		1.00	0.95			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	1805	3216		1770	3303			3424	3489	1561		3200
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (perm)	1805	3216		1770	3303			3424	3489	1561		3200
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)	138	259	286	155	407	231	26	353	1695	118	13	167
RTOR Reduction (vph)	0	128	0	0	50	0	0	0	0	43	0	0
Lane Group Flow (vph)	138	417	0	155	588	0	0	379	1695	75	0	180
Confl. Bikes (#/hr)												
Heavy Vehicles (%)	0%	5%	2%	2%	3%	4%	0%	3%	4%	4%	0%	9%
Turn Type	Prot	NA		Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		5	5	2		1	1
Permitted Phases										2		
Actuated Green, G (s)	13.5	33.0		13.5	33.0			20.1	77.1	77.1		12.5
Effective Green, g (s)	13.5	33.0		13.5	33.0			20.1	77.1	77.1		12.5
Actuated g/C Ratio	0.09	0.21		0.09	0.21			0.13	0.49	0.49		0.08
Clearance Time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	5.4	5.4		3.5
Lane Grp Cap (vph)	154	673		151	691			436	1706	763		253
v/s Ratio Prot	0.08	0.13		c0.09	c0.18			c0.11	c0.49			0.06
v/s Ratio Perm										0.05		
v/c Ratio	0.90	0.62		1.03	0.85			0.87	0.99	0.10		0.71
Uniform Delay, d1	71.4	56.6		72.0	59.9			67.5	40.0	21.6		70.8
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	43.2	1.7		80.4	9.9			16.6	20.2	0.1		9.4
Delay (s)	114.5	58.3		152.5	69.8			84.1	60.2	21.7		80.2
Level of Service	F	E		F	E			F	E	C		F
Approach Delay (s)		69.7			86.0				62.3			
Approach LOS		E			F				E			

Intersection Summary			
HCM 2000 Control Delay	61.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	157.6	Sum of lost time (s)	21.5
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	734	194
Future Volume (vph)	734	194
Ideal Flow (vphpl)	1900	1900
Grade (%)	2%	
Total Lost time (s)	6.0	6.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.98
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3279	1505
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3279	1505
Peak-hour factor, PHF	0.95	0.95
Adj. Flow (vph)	773	204
RTOR Reduction (vph)	0	114
Lane Group Flow (vph)	773	90
Confl. Bikes (#/hr)		1
Heavy Vehicles (%)	9%	4%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	69.5	69.5
Effective Green, g (s)	69.5	69.5
Actuated g/C Ratio	0.44	0.44
Clearance Time (s)	6.0	6.0
Vehicle Extension (s)	5.4	5.4
Lane Grp Cap (vph)	1446	663
v/s Ratio Prot	0.24	
v/s Ratio Perm		0.06
v/c Ratio	0.53	0.14
Uniform Delay, d1	32.2	26.2
Progression Factor	1.00	1.00
Incremental Delay, d2	0.8	0.2
Delay (s)	33.0	26.4
Level of Service	C	C
Approach Delay (s)	39.2	
Approach LOS	D	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	375	77	7	598	91	23	15	11	29	47	119
Future Volume (Veh/h)	55	375	77	7	598	91	23	15	11	29	47	119
Sign Control		Free			Free			Stop			Stop	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	69	469	96	9	748	114	29	19	14	36	59	149
Pedestrians					5						3	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					3.5						3.5	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		648										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	865			565			1552	1490	474	1462	1529	808
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	865			450			1558	1489	348	1457	1533	808
tC, single (s)	4.2			4.2			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	91			99			0	81	98	50	37	61
cM capacity (veh/h)	751			935			23	100	620	71	94	383

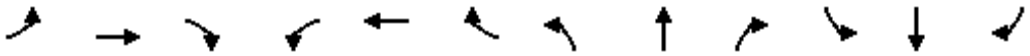
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	69	469	96	9	862	62	244
Volume Left	69	0	0	9	0	29	36
Volume Right	0	0	96	0	114	14	149
cSH	751	1700	1700	935	1700	43	161
Volume to Capacity	0.09	0.28	0.06	0.01	0.51	1.45	1.52
Queue Length 95th (ft)	8	0	0	1	0	154	403
Control Delay (s)	10.3	0.0	0.0	8.9	0.0	446.8	314.8
Lane LOS	B			A		F	F
Approach Delay (s)	1.1			0.1		446.8	314.8
Approach LOS						F	F

Intersection Summary				
Average Delay	58.1			
Intersection Capacity Utilization	62.1%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	304	109	75	488	208	48
Future Volume (Veh/h)	304	109	75	488	208	48
Sign Control	Free			Free	Stop	
Grade	-1%			1%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	362	130	89	581	248	57
Pedestrians				21	1	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				3.5	3.5	
Percent Blockage				2	0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1264					
pX, platoon unblocked			0.97		0.97	0.97
vC, conflicting volume			493		1187	449
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			457		1176	412
tC, single (s)			4.2		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.4
p0 queue free %			91		0	90
cM capacity (veh/h)			1045		184	595

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	492	89	581	305
Volume Left	0	89	0	248
Volume Right	130	0	0	57
cSH	1700	1045	1700	211
Volume to Capacity	0.29	0.09	0.34	1.44
Queue Length 95th (ft)	0	7	0	451
Control Delay (s)	0.0	8.8	0.0	266.7
Lane LOS		A		F
Approach Delay (s)	0.0	1.2		266.7
Approach LOS				F

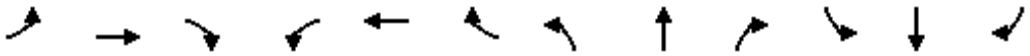
Intersection Summary			
Average Delay	56.0		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	112	311	40	37	265	32	96	145	85	30	23	126
Future Volume (vph)	112	311	40	37	265	32	96	145	85	30	23	126
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	124	346	44	41	294	36	107	161	94	33	26	140

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	124	390	41	330	107	255	33	166
Volume Left (vph)	124	0	41	0	107	0	33	0
Volume Right (vph)	0	44	0	36	0	94	0	140
Hadj (s)	0.58	-0.05	0.72	-0.05	0.55	-0.20	0.50	-0.55
Departure Headway (s)	7.6	7.0	8.0	7.2	8.1	7.3	8.4	7.3
Degree Utilization, x	0.26	0.76	0.09	0.66	0.24	0.52	0.08	0.34
Capacity (veh/h)	454	500	431	479	426	463	398	455
Control Delay (s)	12.1	27.4	10.6	21.9	12.4	16.7	10.9	12.8
Approach Delay (s)	23.7		20.6		15.4		12.5	
Approach LOS	C		C		C		B	

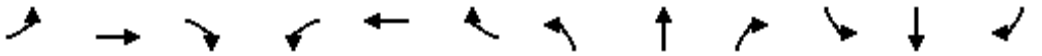
Intersection Summary				
Delay	19.3			
Level of Service	C			
Intersection Capacity Utilization	54.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	280	9	227	5	23	24	141	141	3	5	116	105
Future Volume (vph)	280	9	227	5	23	24	141	141	3	5	116	105
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	308	10	249	5	25	26	155	155	3	5	127	115

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	308	259	56	313	247
Volume Left (vph)	308	0	5	155	5
Volume Right (vph)	0	249	26	3	115
Hadj (s)	0.55	-0.60	-0.19	0.21	-0.16
Departure Headway (s)	6.9	5.7	6.6	6.2	6.0
Degree Utilization, x	0.59	0.41	0.10	0.54	0.41
Capacity (veh/h)	506	607	458	549	562
Control Delay (s)	18.0	11.4	10.3	16.2	13.1
Approach Delay (s)	15.0		10.3	16.2	13.1
Approach LOS	C		B	C	B

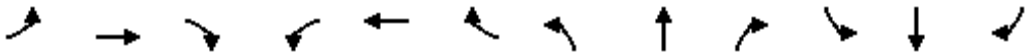
Intersection Summary				
Delay	14.7			
Level of Service	B			
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	35	0	0	105	0	1955	95	0	1157	28
Future Volume (Veh/h)	0	0	35	0	0	105	0	1955	95	0	1157	28
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	36	0	0	109	0	2036	99	0	1205	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2332	3340	602	2724	3320	1068	1234			2135		
vC1, stage 1 conf vol	1205	1205		2086	2086							
vC2, stage 2 conf vol	1127	2135		638	1234							
vCu, unblocked vol	2332	3340	602	2724	3320	1068	1234			2135		
tC, single (s)	7.7	6.5	6.9	7.6	6.5	7.2	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.6	5.5							
tF (s)	3.6	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	92	100	100	46	100			100		
cM capacity (veh/h)	79	82	447	51	86	200	572			258		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	36	109	1357	778	602	602	29
Volume Left	0	0	0	0	0	0	0
Volume Right	36	109	0	99	0	0	29
cSH	447	200	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.54	0.80	0.46	0.35	0.35	0.02
Queue Length 95th (ft)	7	72	0	0	0	0	0
Control Delay (s)	13.7	42.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	E					
Approach Delay (s)	13.7	42.6	0.0		0.0		
Approach LOS	B	E					

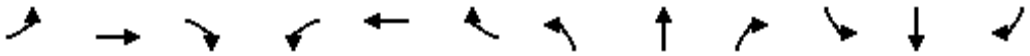
Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	70.2%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	85	0	1	90	3	3	2	2	8	4	14
Future Volume (Veh/h)	10	85	0	1	90	3	3	2	2	8	4	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			2%			2%			-2%	
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Hourly flow rate (vph)	14	123	0	1	130	4	4	3	3	12	6	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	134			123			308	287	123	290	285	132
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	134			123			308	287	123	290	285	132
tC, single (s)	4.1			4.1			7.6	7.0	6.2	7.1	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.2			2.2			4.0	4.5	3.3	3.5	4.0	3.5
p0 queue free %	99			100			99	99	100	98	99	98
cM capacity (veh/h)	1463			1477			539	544	933	657	621	869

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	137	135	10	38
Volume Left	14	1	4	12
Volume Right	0	4	3	20
cSH	1463	1477	619	746
Volume to Capacity	0.01	0.00	0.02	0.05
Queue Length 95th (ft)	1	0	1	4
Control Delay (s)	0.8	0.1	10.9	10.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.8	0.1	10.9	10.1
Approach LOS			B	B

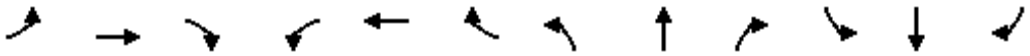
Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	21.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	87	4	2	78	14	16	13	10	29	14	4
Future Volume (Veh/h)	4	87	4	2	78	14	16	13	10	29	14	4
Sign Control		Stop			Stop			Free			Free	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	6	121	6	3	108	19	22	18	14	40	19	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	244	178	22	238	174	25	25			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	244	178	22	238	174	25	25			32		
tC, single (s)	7.1	6.5	6.2	7.6	6.6	6.4	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.5	2.2			2.2		
p0 queue free %	99	82	99	99	84	98	99			97		
cM capacity (veh/h)	598	690	1061	524	686	1009	1603			1593		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	133	130	54	65
Volume Left	6	3	22	40
Volume Right	6	19	14	6
cSH	696	715	1603	1593
Volume to Capacity	0.19	0.18	0.01	0.03
Queue Length 95th (ft)	18	17	1	2
Control Delay (s)	11.4	11.2	3.0	4.6
Lane LOS	B	B	A	A
Approach Delay (s)	11.4	11.2	3.0	4.6
Approach LOS	B	B		

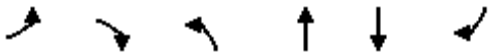
Intersection Summary				
Average Delay	9.0			
Intersection Capacity Utilization	17.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	110	2	1	38	12	4	0	3	35	0	50
Future Volume (Veh/h)	18	110	2	1	38	12	4	0	3	35	0	50
Sign Control		Free			Free			Stop			Stop	
Grade		-3%			2%			1%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Hourly flow rate (vph)	26	162	3	1	56	18	6	0	4	51	0	74
Pedestrians					1						2	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					3.5						3.5	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	76			165			356	294	164	290	286	67
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76			165			356	294	164	290	286	67
tC, single (s)	4.1			4.1			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.6	3.5	4.0	3.3
p0 queue free %	98			100			99	100	100	92	100	93
cM capacity (veh/h)	1533			1426			550	609	805	652	615	1000

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	191	75	10	125
Volume Left	26	1	6	51
Volume Right	3	18	4	74
cSH	1533	1426	629	821
Volume to Capacity	0.02	0.00	0.02	0.15
Queue Length 95th (ft)	1	0	1	13
Control Delay (s)	1.1	0.1	10.8	10.2
Lane LOS	A	A	B	B
Approach Delay (s)	1.1	0.1	10.8	10.2
Approach LOS			B	B

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	25.8%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	124	33	18	117	43	30
Future Volume (Veh/h)	124	33	18	117	43	30
Sign Control	Stop			Free	Free	
Grade	2%			-1%	0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	177	47	26	167	61	43
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	302	82	104			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	302	82	104			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.4			
p0 queue free %	74	95	98			
cM capacity (veh/h)	676	961	1399			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	224	193	104
Volume Left	177	26	0
Volume Right	47	0	43
cSH	720	1399	1700
Volume to Capacity	0.31	0.02	0.06
Queue Length 95th (ft)	33	1	0
Control Delay (s)	12.2	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	45	167	323	176	145	143	18	247	1054	133	34	340
Future Volume (vph)	45	167	323	176	145	143	18	247	1054	133	34	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%				-1%			
Total Lost time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Lane Util. Factor	1.00	0.95		1.00	0.95			0.97	0.95	1.00		0.97
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	1.00	0.99		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Frt	1.00	0.90		1.00	0.93			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	1671	3211		1703	3250			3487	3489	1587		3460
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (perm)	1671	3211		1703	3250			3487	3489	1587		3460
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	48	178	344	187	154	152	19	263	1121	141	36	362
RTOR Reduction (vph)	0	77	0	0	115	0	0	0	0	80	0	0
Lane Group Flow (vph)	48	445	0	187	191	0	0	282	1121	61	0	398
Confl. Peds. (#/hr)	3					3						
Confl. Bikes (#/hr)										1		
Heavy Vehicles (%)	8%	0%	2%	6%	2%	2%	0%	1%	4%	1%	2%	0%
Turn Type	Prot	NA		Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		5	5	2		1	1
Permitted Phases										2		
Actuated Green, G (s)	5.0	22.6		17.5	35.1			8.0	62.2	62.2		19.4
Effective Green, g (s)	5.0	22.6		17.5	35.1			8.0	62.2	62.2		19.4
Actuated g/C Ratio	0.03	0.16		0.12	0.25			0.06	0.43	0.43		0.14
Clearance Time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	5.4	5.4		3.5
Lane Grp Cap (vph)	58	506		208	796			194	1515	689		468
v/s Ratio Prot	0.03	c0.14		c0.11	0.06			c0.08	0.32			0.12
v/s Ratio Perm										0.04		
v/c Ratio	0.83	1.06dr		0.90	0.24			1.45	0.74	0.09		0.85
Uniform Delay, d1	68.7	59.0		62.0	43.4			67.6	33.8	23.8		60.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	59.9	16.2		35.6	0.2			230.5	2.5	0.1		14.1
Delay (s)	128.5	75.2		97.6	43.5			298.1	36.2	24.0		74.6
Level of Service	F	E		F	D			F	D	C		E
Approach Delay (s)		79.7			64.0				82.9			
Approach LOS		E			E				F			

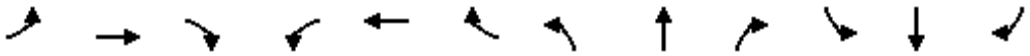
Intersection Summary			
HCM 2000 Control Delay	69.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	143.2	Sum of lost time (s)	21.5
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1689	45
Future Volume (vph)	1689	45
Ideal Flow (vphpl)	1900	1900
Grade (%)	2%	
Total Lost time (s)	6.0	6.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3504	1599
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3504	1599
Peak-hour factor, PHF	0.94	0.94
Adj. Flow (vph)	1797	48
RTOR Reduction (vph)	0	23
Lane Group Flow (vph)	1797	25
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	2%	0%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	73.6	73.6
Effective Green, g (s)	73.6	73.6
Actuated g/C Ratio	0.51	0.51
Clearance Time (s)	6.0	6.0
Vehicle Extension (s)	5.4	5.4
Lane Grp Cap (vph)	1800	821
v/s Ratio Prot	c0.51	
v/s Ratio Perm		0.02
v/c Ratio	1.00	0.03
Uniform Delay, d1	34.7	17.2
Progression Factor	1.00	1.00
Incremental Delay, d2	20.7	0.0
Delay (s)	55.5	17.2
Level of Service	E	B
Approach Delay (s)	58.0	
Approach LOS	E	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	451	30	5	457	73	12	0	1	38	1	64
Future Volume (Veh/h)	121	451	30	5	457	73	12	0	1	38	1	64
Sign Control		Free			Free			Stop			Stop	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	132	490	33	5	497	79	13	0	1	41	1	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		648										
pX, platoon unblocked												
vC, conflicting volume	576			523			1332	1340	490	1302	1334	536
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	576			523			1332	1340	490	1302	1334	536
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			87	100	100	67	99	87
cM capacity (veh/h)	1002			1054			103	133	583	124	134	544

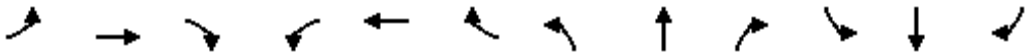
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	132	490	33	5	576	14	112
Volume Left	132	0	0	5	0	13	41
Volume Right	0	0	33	0	79	1	70
cSH	1002	1700	1700	1054	1700	110	241
Volume to Capacity	0.13	0.29	0.02	0.00	0.34	0.13	0.47
Queue Length 95th (ft)	11	0	0	0	0	11	57
Control Delay (s)	9.1	0.0	0.0	8.4	0.0	42.6	32.3
Lane LOS	A			A		E	D
Approach Delay (s)	1.8			0.1		42.6	32.3
Approach LOS						E	D

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	50.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	315	176	63	436	100	37
Future Volume (Veh/h)	315	176	63	436	100	37
Sign Control	Free			Free	Stop	
Grade	-1%			1%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	346	193	69	479	110	41
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				3.5		
Percent Blockage				0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1264					
pX, platoon unblocked						
vC, conflicting volume			539		1060	444
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			539		1060	444
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		53	93
cM capacity (veh/h)			1024		232	612

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	539	69	479	151
Volume Left	0	69	0	110
Volume Right	193	0	0	41
cSH	1700	1024	1700	279
Volume to Capacity	0.32	0.07	0.28	0.54
Queue Length 95th (ft)	0	5	0	75
Control Delay (s)	0.0	8.8	0.0	32.2
Lane LOS		A		D
Approach Delay (s)	0.0	1.1		32.2
Approach LOS				D

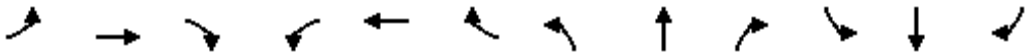
Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	27	133	136	52	103	52	110	232	39	69	354	64
Future Volume (vph)	27	133	136	52	103	52	110	232	39	69	354	64
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	30	149	153	58	116	58	124	261	44	78	398	72

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	30	302	58	174	124	305	78	470
Volume Left (vph)	30	0	58	0	124	0	78	0
Volume Right (vph)	0	153	0	58	0	44	0	72
Hadj (s)	0.50	-0.33	0.55	-0.22	0.50	-0.06	0.53	-0.09
Departure Headway (s)	8.4	7.6	8.7	8.0	8.1	7.5	7.8	7.2
Degree Utilization, x	0.07	0.64	0.14	0.38	0.28	0.64	0.17	0.94
Capacity (veh/h)	414	455	395	434	431	459	443	493
Control Delay (s)	10.8	21.7	12.0	14.7	12.9	21.5	11.2	53.2
Approach Delay (s)	20.7		14.0		19.0		47.2	
Approach LOS	C		B		C		E	

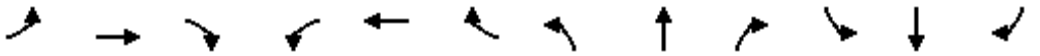
Intersection Summary				
Delay	28.6			
Level of Service	D			
Intersection Capacity Utilization	60.9%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	110	14	171	1	21	16	322	143	6	32	149	282
Future Volume (vph)	110	14	171	1	21	16	322	143	6	32	149	282
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	122	16	190	1	23	18	358	159	7	36	166	313

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	122	206	42	524	515
Volume Left (vph)	122	0	1	358	36
Volume Right (vph)	0	190	18	7	313
Hadj (s)	0.50	-0.57	-0.21	0.16	-0.32
Departure Headway (s)	8.1	7.0	8.0	6.2	5.8
Degree Utilization, x	0.27	0.40	0.09	0.91	0.83
Capacity (veh/h)	430	495	413	564	601
Control Delay (s)	12.9	13.3	11.8	43.0	31.4
Approach Delay (s)	13.2		11.8	43.0	31.4
Approach LOS	B		B	E	D

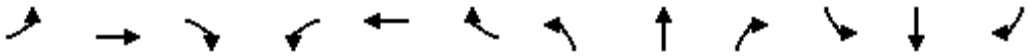
Intersection Summary				
Delay	30.9			
Level of Service	D			
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	39	0	0	63	0	1397	62	0	2144	56
Future Volume (Veh/h)	0	0	39	0	0	63	0	1397	62	0	2144	56
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	41	0	0	66	0	1455	65	0	2233	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3026	3753	1116	2645	3778	760	2291			1520		
vC1, stage 1 conf vol	2233	2233		1488	1488							
vC2, stage 2 conf vol	794	1520		1158	2291							
vCu, unblocked vol	3026	3753	1116	2645	3778	760	2291			1520		
tC, single (s)	7.6	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.6	5.5		6.6	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	80	100	100	81	100			100		
cM capacity (veh/h)	40	70	205	97	67	353	224			445		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	41	66	970	550	1116	1116	58
Volume Left	0	0	0	0	0	0	0
Volume Right	41	66	0	65	0	0	58
cSH	205	353	1700	1700	1700	1700	1700
Volume to Capacity	0.20	0.19	0.57	0.32	0.66	0.66	0.03
Queue Length 95th (ft)	18	17	0	0	0	0	0
Control Delay (s)	26.9	17.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	26.9	17.5	0.0		0.0		
Approach LOS	D	C					

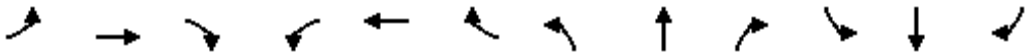
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	69.3%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	51	0	1	58	2	1	1	2	1	2	5
Future Volume (Veh/h)	8	51	0	1	58	2	1	1	2	1	2	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			2%			2%			-2%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	10	62	0	1	71	2	1	1	2	1	2	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	73			62			163	157	62	158	156	72
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	73			62			163	157	62	158	156	72
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	100	100	99
cM capacity (veh/h)	1540			1554			795	733	1009	805	734	996

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	72	74	4	9
Volume Left	10	1	1	1
Volume Right	0	2	2	6
cSH	1540	1554	869	901
Volume to Capacity	0.01	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	1.1	0.1	9.2	9.0
Lane LOS	A	A	A	A
Approach Delay (s)	1.1	0.1	9.2	9.0
Approach LOS			A	A

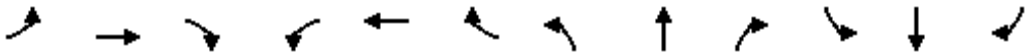
Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	17.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	42	9	12	41	11	11	10	8	56	16	5
Future Volume (Veh/h)	8	42	9	12	41	11	11	10	8	56	16	5
Sign Control		Stop			Stop			Free			Free	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	11	57	12	16	55	15	15	14	11	76	22	7
Pedestrians		1			1						1	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	272	234	26	268	232	22	30			26		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	272	234	26	268	232	22	30			26		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.3			2.2		
p0 queue free %	98	91	99	97	91	99	99			95		
cM capacity (veh/h)	601	630	1054	589	632	1060	1501			1600		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	80	86	40	105
Volume Left	11	16	15	76
Volume Right	12	15	11	7
cSH	666	670	1501	1600
Volume to Capacity	0.12	0.13	0.01	0.05
Queue Length 95th (ft)	10	11	1	4
Control Delay (s)	11.1	11.2	2.8	5.4
Lane LOS	B	B	A	A
Approach Delay (s)	11.1	11.2	2.8	5.4
Approach LOS	B	B		

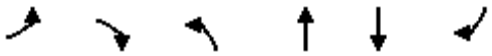
Intersection Summary				
Average Delay	8.2			
Intersection Capacity Utilization	20.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	50	0	4	34	36	4	0	4	23	0	32
Future Volume (Veh/h)	57	50	0	4	34	36	4	0	4	23	0	32
Sign Control		Free			Free			Stop			Stop	
Grade		-3%			2%			1%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Hourly flow rate (vph)	83	72	0	6	49	52	6	0	6	33	0	46
Pedestrians											2	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	103			72			371	353	72	333	327	77
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	103			72			371	353	72	333	327	77
tC, single (s)	4.1			4.1			7.4	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.7	4.0	3.5	3.5	4.0	3.3
p0 queue free %	94			100			99	100	99	94	100	95
cM capacity (veh/h)	1499			1541			496	540	930	590	559	988

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	155	107	12	79
Volume Left	83	6	6	33
Volume Right	0	52	6	46
cSH	1499	1541	647	771
Volume to Capacity	0.06	0.00	0.02	0.10
Queue Length 95th (ft)	4	0	1	9
Control Delay (s)	4.2	0.4	10.7	10.2
Lane LOS	A	A	B	B
Approach Delay (s)	4.2	0.4	10.7	10.2
Approach LOS			B	B

Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	22.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	52	20	10	95	97	60
Future Volume (Veh/h)	52	20	10	95	97	60
Sign Control	Stop			Free	Free	
Grade	2%			-1%	0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	67	26	13	122	124	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	310	162	201			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	162	201			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	90	97	99			
cM capacity (veh/h)	673	869	1383			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	93	135	201
Volume Left	67	13	0
Volume Right	26	0	77
cSH	719	1383	1700
Volume to Capacity	0.13	0.01	0.12
Queue Length 95th (ft)	11	1	0
Control Delay (s)	10.8	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.8	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

Attachment B Synchro Output Sheets

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	138	545	155	638	379	1695	118	180	773	204
v/c Ratio	0.90	0.68	1.03	0.86	0.87	0.99	0.15	0.71	0.53	0.26
Control Delay	119.2	44.3	148.2	66.7	87.8	60.1	8.4	87.5	34.7	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	119.2	44.3	148.2	66.7	87.8	60.1	8.4	87.5	34.7	4.2
Queue Length 50th (ft)	148	196	~178	308	206	~1000	19	97	321	0
Queue Length 95th (ft)	#287	263	#336	385	#288	#1136	57	142	388	51
Internal Link Dist (ft)		574		568		888			476	
Turn Bay Length (ft)	260		185		490		150	460		300
Base Capacity (vph)	154	879	151	825	456	1707	806	264	1445	777
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	0.90	0.62	1.03	0.77	0.83	0.99	0.15	0.68	0.53	0.26

Intersection Summary

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

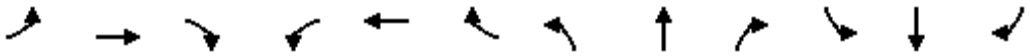
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	131	246	272	147	387	219	25	335	1610	112	12	159
Future Volume (vph)	131	246	272	147	387	219	25	335	1610	112	12	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%				-1%			
Total Lost time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Lane Util. Factor	1.00	0.95		1.00	0.95			0.97	0.95	1.00		0.97
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Frt	1.00	0.92		1.00	0.95			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	1805	3216		1770	3303			3424	3489	1561		3200
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (perm)	1805	3216		1770	3303			3424	3489	1561		3200
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)	138	259	286	155	407	231	26	353	1695	118	13	167
RTOR Reduction (vph)	0	128	0	0	50	0	0	0	0	43	0	0
Lane Group Flow (vph)	138	417	0	155	588	0	0	379	1695	75	0	180
Confl. Bikes (#/hr)												
Heavy Vehicles (%)	0%	5%	2%	2%	3%	4%	0%	3%	4%	4%	0%	9%
Turn Type	Prot	NA		Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		5	5	2		1	1
Permitted Phases										2		
Actuated Green, G (s)	13.5	33.0		13.5	33.0			20.1	77.1	77.1		12.5
Effective Green, g (s)	13.5	33.0		13.5	33.0			20.1	77.1	77.1		12.5
Actuated g/C Ratio	0.09	0.21		0.09	0.21			0.13	0.49	0.49		0.08
Clearance Time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	5.4	5.4		3.5
Lane Grp Cap (vph)	154	673		151	691			436	1706	763		253
v/s Ratio Prot	0.08	0.13		c0.09	c0.18			c0.11	c0.49			0.06
v/s Ratio Perm										0.05		
v/c Ratio	0.90	0.62		1.03	0.85			0.87	0.99	0.10		0.71
Uniform Delay, d1	71.4	56.6		72.0	59.9			67.5	40.0	21.6		70.8
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	43.2	1.7		80.4	9.9			16.6	20.2	0.1		9.4
Delay (s)	114.5	58.3		152.5	69.8			84.1	60.2	21.7		80.2
Level of Service	F	E		F	E			F	E	C		F
Approach Delay (s)		69.7			86.0				62.3			
Approach LOS		E			F				E			

Intersection Summary			
HCM 2000 Control Delay	61.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	157.6	Sum of lost time (s)	21.5
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	734	194
Future Volume (vph)	734	194
Ideal Flow (vphpl)	1900	1900
Grade (%)	2%	
Total Lost time (s)	6.0	6.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.98
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3279	1505
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3279	1505
Peak-hour factor, PHF	0.95	0.95
Adj. Flow (vph)	773	204
RTOR Reduction (vph)	0	114
Lane Group Flow (vph)	773	90
Confl. Bikes (#/hr)		1
Heavy Vehicles (%)	9%	4%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	69.5	69.5
Effective Green, g (s)	69.5	69.5
Actuated g/C Ratio	0.44	0.44
Clearance Time (s)	6.0	6.0
Vehicle Extension (s)	5.4	5.4
Lane Grp Cap (vph)	1446	663
v/s Ratio Prot	0.24	
v/s Ratio Perm		0.06
v/c Ratio	0.53	0.14
Uniform Delay, d1	32.2	26.2
Progression Factor	1.00	1.00
Incremental Delay, d2	0.8	0.2
Delay (s)	33.0	26.4
Level of Service	C	C
Approach Delay (s)	39.2	
Approach LOS	D	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	375	77	7	598	91	23	15	11	29	47	119
Future Volume (Veh/h)	55	375	77	7	598	91	23	15	11	29	47	119
Sign Control		Free			Free			Stop			Stop	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	69	469	96	9	748	114	29	19	14	36	59	149
Pedestrians					5						3	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					3.5						3.5	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		648										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	865			565			1552	1490	474	1462	1529	808
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	865			450			1558	1489	348	1457	1533	808
tC, single (s)	4.2			4.2			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	91			99			0	81	98	50	37	61
cM capacity (veh/h)	751			935			23	100	620	71	94	383

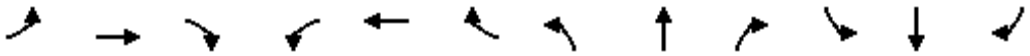
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	69	469	96	9	862	62	244
Volume Left	69	0	0	9	0	29	36
Volume Right	0	0	96	0	114	14	149
cSH	751	1700	1700	935	1700	43	161
Volume to Capacity	0.09	0.28	0.06	0.01	0.51	1.45	1.52
Queue Length 95th (ft)	8	0	0	1	0	154	403
Control Delay (s)	10.3	0.0	0.0	8.9	0.0	446.8	314.8
Lane LOS	B			A		F	F
Approach Delay (s)	1.1			0.1		446.8	314.8
Approach LOS						F	F

Intersection Summary				
Average Delay	58.1			
Intersection Capacity Utilization	62.1%	ICU Level of Service		B
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	304	109	75	488	208	48
Future Volume (Veh/h)	304	109	75	488	208	48
Sign Control	Free			Free	Stop	
Grade	-1%			1%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	362	130	89	581	248	57
Pedestrians				21	1	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				3.5	3.5	
Percent Blockage				2	0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1264					
pX, platoon unblocked			0.97		0.97	0.97
vC, conflicting volume			493		1187	449
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			457		1176	412
tC, single (s)			4.2		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.4
p0 queue free %			91		0	90
cM capacity (veh/h)			1045		184	595

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	492	89	581	305
Volume Left	0	89	0	248
Volume Right	130	0	0	57
cSH	1700	1045	1700	211
Volume to Capacity	0.29	0.09	0.34	1.44
Queue Length 95th (ft)	0	7	0	451
Control Delay (s)	0.0	8.8	0.0	266.7
Lane LOS		A		F
Approach Delay (s)	0.0	1.2		266.7
Approach LOS				F

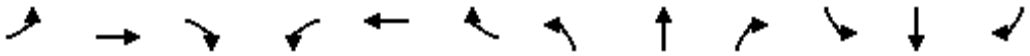
Intersection Summary			
Average Delay	56.0		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	112	311	40	37	265	32	96	145	85	30	23	126
Future Volume (vph)	112	311	40	37	265	32	96	145	85	30	23	126
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	124	346	44	41	294	36	107	161	94	33	26	140

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	124	390	41	330	107	255	33	166
Volume Left (vph)	124	0	41	0	107	0	33	0
Volume Right (vph)	0	44	0	36	0	94	0	140
Hadj (s)	0.58	-0.05	0.72	-0.05	0.55	-0.20	0.50	-0.55
Departure Headway (s)	7.6	7.0	8.0	7.2	8.1	7.3	8.4	7.3
Degree Utilization, x	0.26	0.76	0.09	0.66	0.24	0.52	0.08	0.34
Capacity (veh/h)	454	500	431	479	426	463	398	455
Control Delay (s)	12.1	27.4	10.6	21.9	12.4	16.7	10.9	12.8
Approach Delay (s)	23.7		20.6		15.4		12.5	
Approach LOS	C		C		C		B	

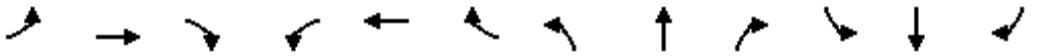
Intersection Summary				
Delay	19.3			
Level of Service	C			
Intersection Capacity Utilization	54.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	280	9	227	5	23	24	141	141	3	5	116	105
Future Volume (vph)	280	9	227	5	23	24	141	141	3	5	116	105
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	308	10	249	5	25	26	155	155	3	5	127	115

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	308	259	56	313	247
Volume Left (vph)	308	0	5	155	5
Volume Right (vph)	0	249	26	3	115
Hadj (s)	0.55	-0.60	-0.19	0.21	-0.16
Departure Headway (s)	6.9	5.7	6.6	6.2	6.0
Degree Utilization, x	0.59	0.41	0.10	0.54	0.41
Capacity (veh/h)	506	607	458	549	562
Control Delay (s)	18.0	11.4	10.3	16.2	13.1
Approach Delay (s)	15.0		10.3	16.2	13.1
Approach LOS	C		B	C	B

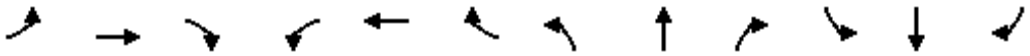
Intersection Summary				
Delay	14.7			
Level of Service	B			
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	35	0	0	105	0	1955	95	0	1157	28
Future Volume (Veh/h)	0	0	35	0	0	105	0	1955	95	0	1157	28
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	36	0	0	109	0	2036	99	0	1205	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2332	3340	602	2724	3320	1068	1234			2135		
vC1, stage 1 conf vol	1205	1205		2086	2086							
vC2, stage 2 conf vol	1127	2135		638	1234							
vCu, unblocked vol	2332	3340	602	2724	3320	1068	1234			2135		
tC, single (s)	7.7	6.5	6.9	7.6	6.5	7.2	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.6	5.5							
tF (s)	3.6	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	92	100	100	46	100			100		
cM capacity (veh/h)	79	82	447	51	86	200	572			258		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	36	109	1357	778	602	602	29
Volume Left	0	0	0	0	0	0	0
Volume Right	36	109	0	99	0	0	29
cSH	447	200	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.54	0.80	0.46	0.35	0.35	0.02
Queue Length 95th (ft)	7	72	0	0	0	0	0
Control Delay (s)	13.7	42.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	E					
Approach Delay (s)	13.7	42.6	0.0		0.0		
Approach LOS	B	E					

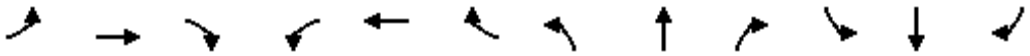
Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	70.2%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	85	0	1	90	3	3	2	2	8	4	14
Future Volume (Veh/h)	10	85	0	1	90	3	3	2	2	8	4	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			2%			2%			-2%	
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Hourly flow rate (vph)	14	123	0	1	130	4	4	3	3	12	6	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	134			123			308	287	123	290	285	132
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	134			123			308	287	123	290	285	132
tC, single (s)	4.1			4.1			7.6	7.0	6.2	7.1	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.2			2.2			4.0	4.5	3.3	3.5	4.0	3.5
p0 queue free %	99			100			99	99	100	98	99	98
cM capacity (veh/h)	1463			1477			539	544	933	657	621	869

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	137	135	10	38
Volume Left	14	1	4	12
Volume Right	0	4	3	20
cSH	1463	1477	619	746
Volume to Capacity	0.01	0.00	0.02	0.05
Queue Length 95th (ft)	1	0	1	4
Control Delay (s)	0.8	0.1	10.9	10.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.8	0.1	10.9	10.1
Approach LOS			B	B

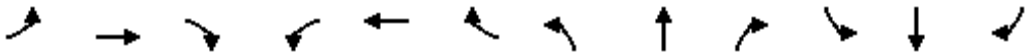
Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	21.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	87	4	2	78	14	16	13	10	29	14	4
Future Volume (Veh/h)	4	87	4	2	78	14	16	13	10	29	14	4
Sign Control		Stop			Stop			Free			Free	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	6	121	6	3	108	19	22	18	14	40	19	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	244	178	22	238	174	25	25			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	244	178	22	238	174	25	25			32		
tC, single (s)	7.1	6.5	6.2	7.6	6.6	6.4	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.0	4.0	3.5	2.2			2.2		
p0 queue free %	99	82	99	99	84	98	99			97		
cM capacity (veh/h)	598	690	1061	524	686	1009	1603			1593		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	133	130	54	65
Volume Left	6	3	22	40
Volume Right	6	19	14	6
cSH	696	715	1603	1593
Volume to Capacity	0.19	0.18	0.01	0.03
Queue Length 95th (ft)	18	17	1	2
Control Delay (s)	11.4	11.2	3.0	4.6
Lane LOS	B	B	A	A
Approach Delay (s)	11.4	11.2	3.0	4.6
Approach LOS	B	B		

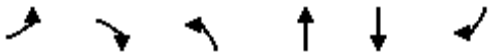
Intersection Summary				
Average Delay	9.0			
Intersection Capacity Utilization	17.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	110	2	1	38	12	4	0	3	35	0	50
Future Volume (Veh/h)	18	110	2	1	38	12	4	0	3	35	0	50
Sign Control		Free			Free			Stop			Stop	
Grade		-3%			2%			1%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Hourly flow rate (vph)	26	162	3	1	56	18	6	0	4	51	0	74
Pedestrians					1						2	
Lane Width (ft)					12.0						12.0	
Walking Speed (ft/s)					3.5						3.5	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	76			165			356	294	164	290	286	67
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76			165			356	294	164	290	286	67
tC, single (s)	4.1			4.1			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.6	3.5	4.0	3.3
p0 queue free %	98			100			99	100	100	92	100	93
cM capacity (veh/h)	1533			1426			550	609	805	652	615	1000

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	191	75	10	125
Volume Left	26	1	6	51
Volume Right	3	18	4	74
cSH	1533	1426	629	821
Volume to Capacity	0.02	0.00	0.02	0.15
Queue Length 95th (ft)	1	0	1	13
Control Delay (s)	1.1	0.1	10.8	10.2
Lane LOS	A	A	B	B
Approach Delay (s)	1.1	0.1	10.8	10.2
Approach LOS			B	B

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	25.8%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	124	33	18	117	43	30
Future Volume (Veh/h)	124	33	18	117	43	30
Sign Control	Stop			Free	Free	
Grade	2%			-1%	0%	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	177	47	26	167	61	43
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	302	82	104			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	302	82	104			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.4			
p0 queue free %	74	95	98			
cM capacity (veh/h)	676	961	1399			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	224	193	104
Volume Left	177	26	0
Volume Right	47	0	43
cSH	720	1399	1700
Volume to Capacity	0.31	0.02	0.06
Queue Length 95th (ft)	33	1	0
Control Delay (s)	12.2	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	48	522	188	306	282	1121	141	398	1797	48
v/c Ratio	0.83	1.06dr	0.90	0.34	1.45	0.74	0.18	0.85	1.00	0.05
Control Delay	144.8	67.5	103.1	22.6	274.0	38.0	2.5	78.2	55.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	144.8	67.5	103.1	22.6	274.0	38.0	2.5	78.2	55.8	0.1
Queue Length 50th (ft)	46	214	177	60	~187	467	0	191	~905	0
Queue Length 95th (ft)	#130	#306	#321	103	#284	556	27	#270	#1074	0
Internal Link Dist (ft)		1143		568		888			476	
Turn Bay Length (ft)	260		185		490		150	460		300
Base Capacity (vph)	58	612	215	952	194	1514	782	483	1799	883
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	0.83	0.85	0.87	0.32	1.45	0.74	0.18	0.82	1.00	0.05

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.

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	45	167	323	177	145	143	18	247	1054	133	34	340
Future Volume (vph)	45	167	323	177	145	143	18	247	1054	133	34	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%				-1%			
Total Lost time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Lane Util. Factor	1.00	0.95		1.00	0.95			0.97	0.95	1.00		0.97
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	1.00	0.99		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Frt	1.00	0.90		1.00	0.93			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	1671	3211		1703	3250			3487	3489	1587		3460
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (perm)	1671	3211		1703	3250			3487	3489	1587		3460
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	48	178	344	188	154	152	19	263	1121	141	36	362
RTOR Reduction (vph)	0	77	0	0	115	0	0	0	0	80	0	0
Lane Group Flow (vph)	48	445	0	188	191	0	0	282	1121	61	0	398
Confl. Peds. (#/hr)	3					3						
Confl. Bikes (#/hr)										1		
Heavy Vehicles (%)	8%	0%	2%	6%	2%	2%	0%	1%	4%	1%	2%	0%
Turn Type	Prot	NA		Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		5	5	2		1	1
Permitted Phases										2		
Actuated Green, G (s)	5.0	22.6		17.6	35.2			8.0	62.2	62.2		19.4
Effective Green, g (s)	5.0	22.6		17.6	35.2			8.0	62.2	62.2		19.4
Actuated g/C Ratio	0.03	0.16		0.12	0.25			0.06	0.43	0.43		0.14
Clearance Time (s)	4.5	6.0		4.5	6.0			5.0	6.0	6.0		5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	5.4	5.4		3.5
Lane Grp Cap (vph)	58	506		209	798			194	1514	688		468
v/s Ratio Prot	0.03	c0.14		c0.11	0.06			c0.08	0.32			0.12
v/s Ratio Perm										0.04		
v/c Ratio	0.83	1.06dr		0.90	0.24			1.45	0.74	0.09		0.85
Uniform Delay, d1	68.7	59.0		62.0	43.3			67.7	33.8	23.9		60.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2	59.9	16.2		35.6	0.2			230.5	2.5	0.1		14.1
Delay (s)	128.6	75.3		97.5	43.5			298.1	36.3	24.0		74.6
Level of Service	F	E		F	D			F	D	C		E
Approach Delay (s)		79.7			64.1				83.0			
Approach LOS		E			E				F			

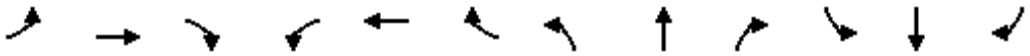
Intersection Summary			
HCM 2000 Control Delay	69.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	143.3	Sum of lost time (s)	21.5
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1689	45
Future Volume (vph)	1689	45
Ideal Flow (vphpl)	1900	1900
Grade (%)	2%	
Total Lost time (s)	6.0	6.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3504	1599
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3504	1599
Peak-hour factor, PHF	0.94	0.94
Adj. Flow (vph)	1797	48
RTOR Reduction (vph)	0	23
Lane Group Flow (vph)	1797	25
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	2%	0%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	73.6	73.6
Effective Green, g (s)	73.6	73.6
Actuated g/C Ratio	0.51	0.51
Clearance Time (s)	6.0	6.0
Vehicle Extension (s)	5.4	5.4
Lane Grp Cap (vph)	1799	821
v/s Ratio Prot	c0.51	
v/s Ratio Perm		0.02
v/c Ratio	1.00	0.03
Uniform Delay, d1	34.8	17.2
Progression Factor	1.00	1.00
Incremental Delay, d2	20.9	0.0
Delay (s)	55.7	17.3
Level of Service	E	B
Approach Delay (s)	58.2	
Approach LOS	E	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	451	30	5	458	73	12	0	1	38	1	64
Future Volume (Veh/h)	121	451	30	5	458	73	12	0	1	38	1	64
Sign Control		Free			Free			Stop			Stop	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	132	490	33	5	498	79	13	0	1	41	1	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		648										
pX, platoon unblocked												
vC, conflicting volume	577			523			1332	1341	490	1302	1334	538
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	577			523			1332	1341	490	1302	1334	538
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			87	100	100	67	99	87
cM capacity (veh/h)	1001			1054			103	133	583	124	134	544

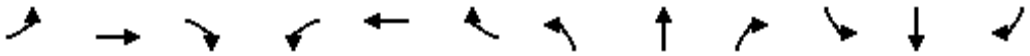
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	132	490	33	5	577	14	112
Volume Left	132	0	0	5	0	13	41
Volume Right	0	0	33	0	79	1	70
cSH	1001	1700	1700	1054	1700	109	240
Volume to Capacity	0.13	0.29	0.02	0.00	0.34	0.13	0.47
Queue Length 95th (ft)	11	0	0	0	0	11	57
Control Delay (s)	9.1	0.0	0.0	8.4	0.0	42.7	32.4
Lane LOS	A			A		E	D
Approach Delay (s)	1.8			0.1		42.7	32.4
Approach LOS						E	D

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	50.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	315	176	63	436	101	37
Future Volume (Veh/h)	315	176	63	436	101	37
Sign Control	Free			Free	Stop	
Grade	-1%			1%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	346	193	69	479	111	41
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				3.5		
Percent Blockage				0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1264					
pX, platoon unblocked						
vC, conflicting volume			539		1060	444
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			539		1060	444
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		52	93
cM capacity (veh/h)			1024		232	612

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	539	69	479	152
Volume Left	0	69	0	111
Volume Right	193	0	0	41
cSH	1700	1024	1700	278
Volume to Capacity	0.32	0.07	0.28	0.55
Queue Length 95th (ft)	0	5	0	76
Control Delay (s)	0.0	8.8	0.0	32.5
Lane LOS		A		D
Approach Delay (s)	0.0	1.1		32.5
Approach LOS				D

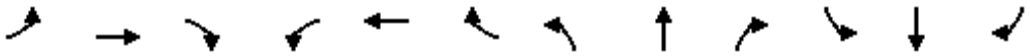
Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	27	133	136	52	103	52	110	232	39	69	354	64
Future Volume (vph)	27	133	136	52	103	52	110	232	39	69	354	64
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	30	149	153	58	116	58	124	261	44	78	398	72

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	30	302	58	174	124	305	78	470
Volume Left (vph)	30	0	58	0	124	0	78	0
Volume Right (vph)	0	153	0	58	0	44	0	72
Hadj (s)	0.50	-0.33	0.55	-0.22	0.50	-0.06	0.53	-0.09
Departure Headway (s)	8.4	7.6	8.7	8.0	8.1	7.5	7.8	7.2
Degree Utilization, x	0.07	0.64	0.14	0.38	0.28	0.64	0.17	0.94
Capacity (veh/h)	414	455	395	434	431	459	443	493
Control Delay (s)	10.8	21.7	12.0	14.7	12.9	21.5	11.2	53.2
Approach Delay (s)	20.7		14.0		19.0		47.2	
Approach LOS	C		B		C		E	

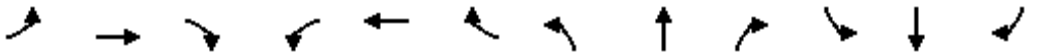
Intersection Summary				
Delay	28.6			
Level of Service	D			
Intersection Capacity Utilization	60.9%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	110	14	171	1	21	16	322	143	6	32	149	282
Future Volume (vph)	110	14	171	1	21	16	322	143	6	32	149	282
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	122	16	190	1	23	18	358	159	7	36	166	313

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	122	206	42	524	515
Volume Left (vph)	122	0	1	358	36
Volume Right (vph)	0	190	18	7	313
Hadj (s)	0.50	-0.57	-0.21	0.16	-0.32
Departure Headway (s)	8.1	7.0	8.0	6.2	5.8
Degree Utilization, x	0.27	0.40	0.09	0.91	0.83
Capacity (veh/h)	430	495	413	564	601
Control Delay (s)	12.9	13.3	11.8	43.0	31.4
Approach Delay (s)	13.2		11.8	43.0	31.4
Approach LOS	B		B	E	D

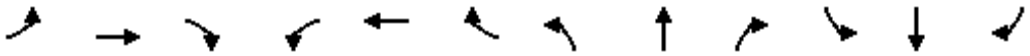
Intersection Summary				
Delay	30.9			
Level of Service	D			
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	39	0	0	63	0	1397	62	0	2144	56
Future Volume (Veh/h)	0	0	39	0	0	63	0	1397	62	0	2144	56
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	41	0	0	66	0	1455	65	0	2233	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3026	3753	1116	2645	3778	760	2291			1520		
vC1, stage 1 conf vol	2233	2233		1488	1488							
vC2, stage 2 conf vol	794	1520		1158	2291							
vCu, unblocked vol	3026	3753	1116	2645	3778	760	2291			1520		
tC, single (s)	7.6	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.6	5.5		6.6	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	80	100	100	81	100			100		
cM capacity (veh/h)	40	70	205	97	67	353	224			445		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	41	66	970	550	1116	1116	58
Volume Left	0	0	0	0	0	0	0
Volume Right	41	66	0	65	0	0	58
cSH	205	353	1700	1700	1700	1700	1700
Volume to Capacity	0.20	0.19	0.57	0.32	0.66	0.66	0.03
Queue Length 95th (ft)	18	17	0	0	0	0	0
Control Delay (s)	26.9	17.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	26.9	17.5	0.0		0.0		
Approach LOS	D	C					

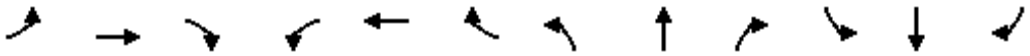
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	69.3%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	51	0	1	58	2	1	1	2	1	2	5
Future Volume (Veh/h)	8	51	0	1	58	2	1	1	2	1	2	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			2%			2%			-2%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	10	62	0	1	71	2	1	1	2	1	2	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	73			62			163	157	62	158	156	72
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	73			62			163	157	62	158	156	72
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	100	100	99
cM capacity (veh/h)	1540			1554			795	733	1009	805	734	996

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	72	74	4	9
Volume Left	10	1	1	1
Volume Right	0	2	2	6
cSH	1540	1554	869	901
Volume to Capacity	0.01	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	1.1	0.1	9.2	9.0
Lane LOS	A	A	A	A
Approach Delay (s)	1.1	0.1	9.2	9.0
Approach LOS			A	A

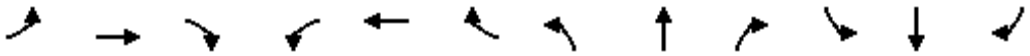
Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	17.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	42	9	12	41	11	11	10	8	56	16	5
Future Volume (Veh/h)	8	42	9	12	41	11	11	10	8	56	16	5
Sign Control		Stop			Stop			Free			Free	
Grade		-1%			1%			-2%			0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	11	57	12	16	55	15	15	14	11	76	22	7
Pedestrians		1			1						1	
Lane Width (ft)		12.0			12.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	272	234	26	268	232	22	30			26		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	272	234	26	268	232	22	30			26		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.3	2.3			2.2		
p0 queue free %	98	91	99	97	91	99	99			95		
cM capacity (veh/h)	601	630	1054	589	632	1060	1501			1600		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	80	86	40	105
Volume Left	11	16	15	76
Volume Right	12	15	11	7
cSH	666	670	1501	1600
Volume to Capacity	0.12	0.13	0.01	0.05
Queue Length 95th (ft)	10	11	1	4
Control Delay (s)	11.1	11.2	2.8	5.4
Lane LOS	B	B	A	A
Approach Delay (s)	11.1	11.2	2.8	5.4
Approach LOS	B	B		

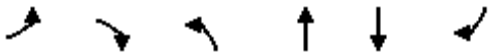
Intersection Summary				
Average Delay	8.2			
Intersection Capacity Utilization	20.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	50	0	4	34	36	4	0	4	23	0	32
Future Volume (Veh/h)	57	50	0	4	34	36	4	0	4	23	0	32
Sign Control		Free			Free			Stop			Stop	
Grade		-3%			2%			1%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Hourly flow rate (vph)	83	72	0	6	49	52	6	0	6	33	0	46
Pedestrians											2	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	103			72			371	353	72	333	327	77
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	103			72			371	353	72	333	327	77
tC, single (s)	4.1			4.1			7.4	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.7	4.0	3.5	3.5	4.0	3.3
p0 queue free %	94			100			99	100	99	94	100	95
cM capacity (veh/h)	1499			1541			496	540	930	590	559	988

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	155	107	12	79
Volume Left	83	6	6	33
Volume Right	0	52	6	46
cSH	1499	1541	647	771
Volume to Capacity	0.06	0.00	0.02	0.10
Queue Length 95th (ft)	4	0	1	9
Control Delay (s)	4.2	0.4	10.7	10.2
Lane LOS	A	A	B	B
Approach Delay (s)	4.2	0.4	10.7	10.2
Approach LOS			B	B

Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	22.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	52	20	10	95	97	60
Future Volume (Veh/h)	52	20	10	95	97	60
Sign Control	Stop			Free	Free	
Grade	2%			-1%	0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	67	26	13	122	124	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	310	162	201			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	162	201			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	90	97	99			
cM capacity (veh/h)	673	869	1383			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	93	135	201
Volume Left	67	13	0
Volume Right	26	0	77
cSH	719	1383	1700
Volume to Capacity	0.13	0.01	0.12
Queue Length 95th (ft)	11	1	0
Control Delay (s)	10.8	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.8	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

Attachment C Queueing Summary

Attachment C. 95th Percentile Queues

ID	Intersection	Existing				Year 2020 Background				Year 2020 Total Traffic (RIRO at 99W/Brookman-Chapman)			
		Movement	Storage (ft)	Weekday AM	Weekday PM	Movement	Storage (ft)	Weekday AM	Weekday PM	Movement	Storage (ft)	Weekday AM	Weekday PM
1	Highway 99W/SW Elwert Road-SW Sunset Boulevard	EBL/T	85 [1]	**148**	203	EBL	260 [1]	**287**	98	EBL	260 [1]	**287**	130
		EBR	85 [1]	63	**97**	EBT/R	500 [1]	256	260	EBT/R	500 [1]	263	306
		WBL/T	600 [1]	351	438	WBL	185 [4]	227	**315**	WBL	185 [4]	**336**	**321**
		WBR	140	138	95	WBT/R	600 [1]	385	123	WBT/R	600 [1]	385	103
		NBL	320	295	**341**	NBL	490	247	250	NBL	490	288	284
		NBR	150	59	69	NBR	150	57	78	NBR	150	57	27
		SBL	210	90	194	SBL	460	110	236	SBL	460	142	270
		SBR	300	0	0	SBR	300	51	4	SBR	300	51	4
2	SW Woodhaven Drive/SW Sunset Boulevard	EBL	90	6	8	EBL	90	7	11	EBL	90	8	11
		EBR	150	0	0	EBR	150	0	0	EBR	150	0	0
		WBL	125	1	0	WBL	125	1	0	WBL	125	1	0
		WBT/R	675 [1]	0	0	WBT/R	675 [1]	0	0	WBT/R	675 [1]	0	0
		NBL/T/R	190 [1]	26	5	NBL/T/R	190 [1]	108	9	NBL/T/R	190 [1]	154	11
		SBL/T/R	460 [1]	96	30	SBL/T/R	460 [1]	344	44	SBL/T/R	460 [1]	403	57
3	SW Timbrel Lane/SW Sunset Boulevard	EBT/R	675 [1]	0	0	EBT/R	675 [1]	0	0	EBT/R	675 [1]	0	0
		WBL	115	6	5	WBL	115	7	5	WBL	115	7	5
		NBL/R	215 [1]	161	40	NBL/R	215 [1]	**384**	55	NBL/R	215 [1]	**451**	76
4	SW Ladd Hill Road-SW Main Street/SW Sunset Boulevard[2]	EBL	95	23	5	EBL	95	28	5	EBL	95	28	5
		EBT/R	700 [1]	80	80	EBT/R	700 [1]	173	118	EBT/R	700 [1]	183	123
		WBL	100	5	8	WBL	100	8	8	WBL	100	8	13
		WBT/R	740 [1]	53	35	WBT/R	740 [1]	125	48	WBT/R	740 [1]	133	50
		NBL	100	15	20	NBL	100	23	25	NBL	100	25	30
		NBT/R	470 [1]	48	80	NBT/R	470 [1]	63	108	NBT/R	470 [1]	80	123
		SBL	150	5	13	SBL	150	8	15	SBL	150	8	18
		SBT/R	170 [1]	30	**215**	SBT/R	170 [1]	38	**308**	SBT/R	170 [1]	40	**340**
5	SW Baker Road-SW Murdock Road/SW Sunset Boulevard[2]	EBL	95	65	20	EBL	95	88	25	EBL	95	95	28
		EBT/R	880 [1]	40	38	EBT/R	880 [1]	50	43	EBT/R	880 [1]	53	48
		WBL/T/R	700 [1]	8	8	WBL/T/R	700 [1]	10	10	WBL/T/R	700 [1]	10	10
		NBL/T/R	390 [1]	63	188	NBL/T/R	390 [1]	78	258	NBL/T/R	390 [1]	80	280
		SBL/T/R	540 [1]	35	145	SBL/T/R	540 [1]	53	205	SBL/T/R	540 [1]	53	225
6	Highway 99W/SW Brookman Road-SW Chapman Road	EBL/T/R	1,000 [1]	26	64	EBL/T/R	1,000 [1]	37	76	EBR	1,000 [1]	7	18
		WBL/T/R	520 [1]	125	66	WBL/T/R	520 [1]	164	79	WBR	520 [1]	72	17
		NBL/U	260	1	2	NBL/U	260	1	3				
		NBT/R	>1,000 [1]	0	0	NBT/R	>1,000 [1]	0	0	NBT/R	>1,000 [1]	0	0
		SBL/U	260	5	4	SBL/U	260	8	4				
		SBR	255	0	0	SBR	255	0	0	SBR	255	0	0
7	Old Highway 99 W/SW Brookman Road	EBL/T/R	520 [1]	1	1	EBL/T/R	520 [1]	1	1	EBL/T/R	520 [1]	1	0
		WBL/T/R	220 [3]	0	0	WBL/T/R	220 [3]	0	0	WBL/T/R	220 [3]	0	0
		NBL/T/R	>1,000 [1]	1	0	NBL/T/R	>1,000 [1]	1	0	NBL/T/R	>1,000 [1]	1	0
		SBL/T/R	>1,000 [1]	4	0	SBL/T/R	>1,000 [1]	4	0	SBL/T/R	>1,000 [1]	4	1

ID	Intersection	Existing				Year 2020 Background				Year 2020 Total Traffic (RIRO at 99W/Brookman-Chapman)			
		Movement	Storage (ft)	Weekday AM	Weekday PM	Movement	Storage (ft)	Weekday AM	Weekday PM	Movement	Storage (ft)	Weekday AM	Weekday PM
8	SW Middleton Road/SW Brookman Road	EBL/T/R	>1,000 [3]	15	8	EBL/T/R	>1,000 [3]	18	9	EBL/T/R	>1,000 [3]	18	10
		WBL/T/R	>1,000 [1]	9	9	WBL/T/R	>1,000 [1]	10	9	WBL/T/R	>1,000 [1]	17	11
		NBL/T/R	400 [1]	1	1	NBL/T/R	400 [1]	1	1	NBL/T/R	400 [1]	1	1
		SBL/T/R	690 [3]	0	0	SBL/T/R	690 [3]	0	0	SBL/T/R	690 [3]	2	4
9	SW Oberst Road-Future Site Access/SW Brookman Road	EBT/R	890 [1]	0	0	EBT/R	890 [1]	0	0	EBL/T/R	890 [1]	1	4
		WBL/T	100 [1]	0	0	WBL/T	100 [1]	0	0	WBL/T/R	100 [1]	0	0
		NBL/R	>1,000 [1]	1	1	NBL/R	>1,000 [1]	1	1	NBL/T/R	>1,000 [1]	1	1
										SBL/T/R	250 [1]	13	9
10	SW Ladd Hill Road/SW Brookman Road	EBL/R	>1,000 [1]	22	7	EBL/R	>1,000 [1]	24	7	EBL/R	>1,000 [1]	33	11
		NBL/T	>1,000 [1]	1	1	NBL/T	>1,000 [1]	1	1	NBL/T	>1,000 [1]	1	1
		SBT/R	820 [1]	0	0	SBT/R	820 [1]	0	0	SBT/R	820 [1]	0	0

[1] Distance to adjacent intersection

[2] Queues were recorded from the HCM 2010 AWSC methodology, as implemented by Synchro

[3] Distance to railroad crossing

[4] Based on conceptual drawing provided by the City of Sherwood

Intersections 7, 8, 9 and 10 are not included as they do not have exclusive turn lanes

Bold and grey shading indicates 95th percentile queue exceeds available storage

Yellow shading indicates change in lane configuration