

## MEMORANDUM

Date: May 30, 2019  
To: Bob Galati & Joy Chang, City of Sherwood  
From: Chris Brehmer  
Project: Middlebrook Residential Subdivision  
Subject: Proposed Mitigation with Development

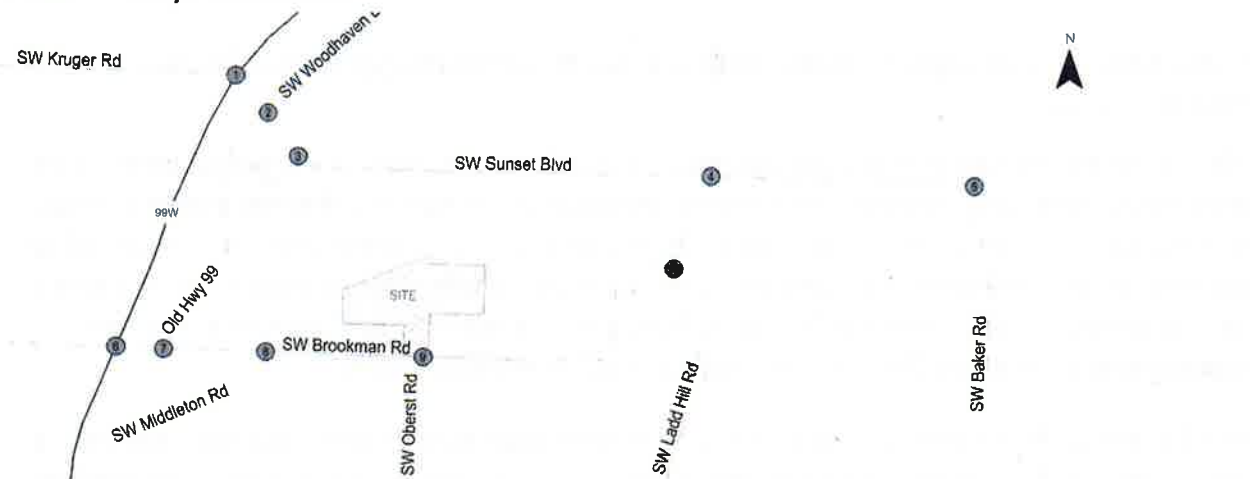
Project #: 21399

This memorandum supplements the Traffic Impact Analysis (TIA) for the Middlebrook Residential Subdivision and the April 23, 2019 memo "Supplemental Transportation Assessment of Potential Highway 99W & SW Brookman Road-SW Chapman Road Access Restrictions," provided in *Appendix A*. It describes proposed mitigation associated with the Middlebrook Residential Subdivision development, based on the TIA, memo, and April 24, 2019 meeting with City, Washington County, and Oregon Department of Transportation (ODOT) staff. The vehicle trips associated with the subdivision will not cause any intersection to fail that is not failing because of background trip growth. In order to work cooperatively with the City and ODOT, the applicant has proposed potential proportional share mitigation fees to assist the City and ODOT in improving certain intersections.

### BACKGROUND CONTEXT

The TIA assessed operations at the ten intersections shown in Exhibit 1 under existing conditions and in the year 2020 with and without the proposed residential subdivision.

#### Exhibit 1. Study Intersections



As documented in the TIA, three intersections are projected to not satisfy operational standards during the weekday AM peak hour in the future with or without the site (assuming full turning movements are allowed at the Highway 99W/SW Brookman Road-SW Chapman Road intersection):

- The southbound approach to the stop-controlled SW Woodhaven Drive/SW Sunset Boulevard intersection is projected to operate with a V/C ratio of 1.30 and at a LOS F (no change from background conditions and the proposed development adds no trips to the southbound approach).
- The northbound approach to the stop-controlled SW Timbrel Lane/SW Sunset Boulevard intersection is projected to operate with a V/C ratio of 1.26 and at a LOS F (no change from background conditions and the proposed development adds no trips to the northbound approach).
- The westbound SW Brookman Road approach to the unsignalized Highway 99W/SW Brookman Road-SW Chapman Road intersection is projected to operate with a V/C ratio of 1.45.

Given the site's negligible impact at the intersections on SW Sunset Boulevard, mitigation were not recommended in the TIA. At Highway 99W/SW Brookman Road-SW Chapman Road, 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 proportional share contribution to planned future intersection improvements (using the methodology established in the *Sherwood High School Transportation Impact Study*, Reference 1, which assumes future installation of a traffic signal). The City has established practice to accept proportional share payments in lieu of physical mitigation when there are no approved improvement projects and the payments allow the City to collect fees to apply to future-identified improvement projects.

### Traffic Impacts with Highway 99W/SW Brookman Road-SW Chapman Road Intersection Turn Restrictions

ODOT provided the City of Sherwood comments and recommendations in a response letter dated February 21, 2019. ODOT recommended interim restriction of the Highway 99W/SW Brookman Road-SW Chapman Road intersection to right in/right (RIRO) out movements as one option to mitigate safety concerns at the intersection. The traffic impacts at the study intersections associated with this option were evaluated and documented in the memo "Supplemental Transportation Assessment of Potential Highway 99W & SW Brookman Road-SW Chapman Road Access Restrictions."

Based on the additional analyses prepared and subsequent conversations with City, ODOT, and County staff, implementation of the RIRO only restrictions recommended by ODOT is now proposed for implementation with site development. In addition, ODOT recommended the applicant pay a fee in lieu of construction of the westbound right-turn lane on SW Brookman Road at the intersection of Highway 99W. As documented in the preliminary cost estimate prepared by AKS Engineering & Forestry (refer to *Appendix B*), the cost of the westbound right-turn lane is estimated at \$109,430.

## SW WOODHAVEN DRIVE/SW SUNSET BOULEVARD AND SW TIMBREL LANE/SW SUNSET BOULEVARD

Limiting the intersection of Highway 99W/SW Brookman Road-SW Chapman Road to RIRO changes the routing of trips to the site from the north and from the site headed south, resulting in some site trips traveling Sunset Boulevard and Middleton Road to access the site. The proposed development is projected to add 18 weekday AM peak hour trips and 51 weekday PM peak hour trips to both the intersection of SW Woodhaven Drive/SW Sunset Boulevard and SW Timbrel Lane/SW Sunset Boulevard on an interim basis while the turn movements restrictions are in place on Highway 99W at SW Brookman Road.

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 1.

**Table 1. Sunset Boulevard Study 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%

### Potential Proportional Share Mitigation Assessment

The *Sherwood High School Transportation Impact Study* (Reference 1) identified a proportional share assessment methodology for mitigating trip impacts at the SW Woodhaven Drive/SW Sunset Boulevard and SW Timbrel Lane/SW Sunset Boulevard intersections. Table 2 presents the assumed mitigation measures and costs as well as the trip components and assessment methodology presented in the study for both Sunset Boulevard study intersections.

**Table 2. Proportional Share Methodology**

	Sunset Blvd/Woodhaven Dr	Sunset Blvd/Timbrel Ln
Mitigation Project Summary	Construct Traffic Signal	Construct Mini Roundabout
Peak Hour	Weekday AM	Weekday AM
Scenario when mitigation is triggered	No Build	No Build
Existing Total Entering Volume, TEV (X)	1,012	894
2020 No Build (Background with RIRO, Y)	1,428	1,215
2020 Project Trips (PT)	18	18
Growth (Z = Y - X)	416	321
Proportional Share (%)*	4.15%	5.31%
Mitigation Cost Estimate (\$)	\$1,050,000	\$630,000
Proportional Share Cost (\$) **	\$43,548	\$33,451

\*if 2020 mitigation is triggered in: Existing Proportional Share % =  $PT / X$   
 No Build/Build Proportional Share % =  $PT / (PT + Z)$

\*\* If intersection fails in AM and PM, use average of AM and PM proportional share (%) to estimate share cost (\$)

Source: *Sherwood High School Transportation Impact Study* (Reference 1)

In reviewing the proportional share estimates in Table 2, it is requested that the City consider:

- The extent to which the proportional share contributions will be Transportation Development Tax creditable.
- While Middlebrook Subdivision trip impacts at the two Sunset Boulevard study intersections could be mitigated through payment of a proportional share, the site-generated trips are expected to shift back to the Highway 99W/SW Brookman Road-SW Chapman Road intersection once the ultimate mitigation is implemented on Highway 99W. Site mitigation would then no longer be required on Sunset Boulevard.
  - As such, the City should assess how the combination of proportional share payments at the Highway 99W/SW Brookman Road-SW Chapman Road, SW Woodhaven Drive/SW Sunset Boulevard and SW Timbrel Lane/SW Sunset Boulevard intersections in conjunction with Transportation Development Tax credits can be assessed in an equitable manner that avoids double-counting the site trip impacts.

Proposed conditions of approval that could be used to implement the proportional share payment are included in Appendix C.

## NEXT STEPS

We look forward to discussing the contents of this memorandum and next steps.

## REFERENCES

1. DKS. *Sherwood High School Transportation Impact Study*. April 25, 2018.

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

## MEMORANDUM

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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

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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<sup>1</sup> 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.

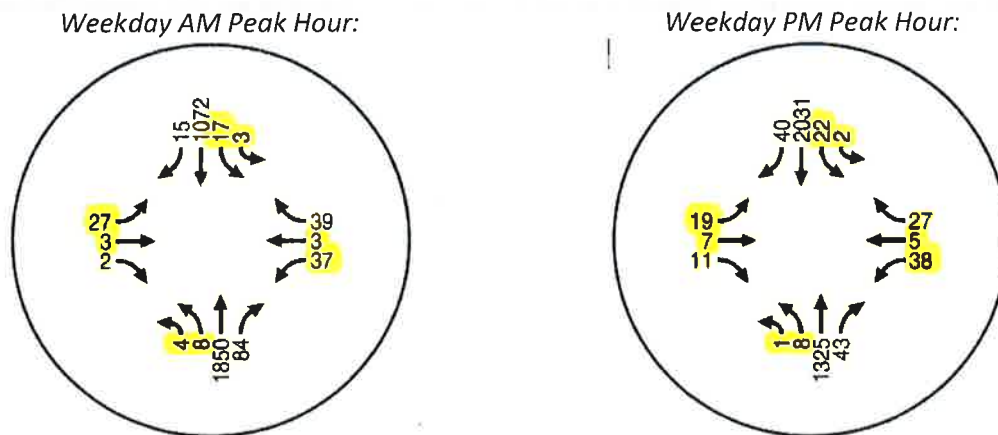
## TRAFFIC VOLUMES & TURN MOVEMENT IMPLICATIONS

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**

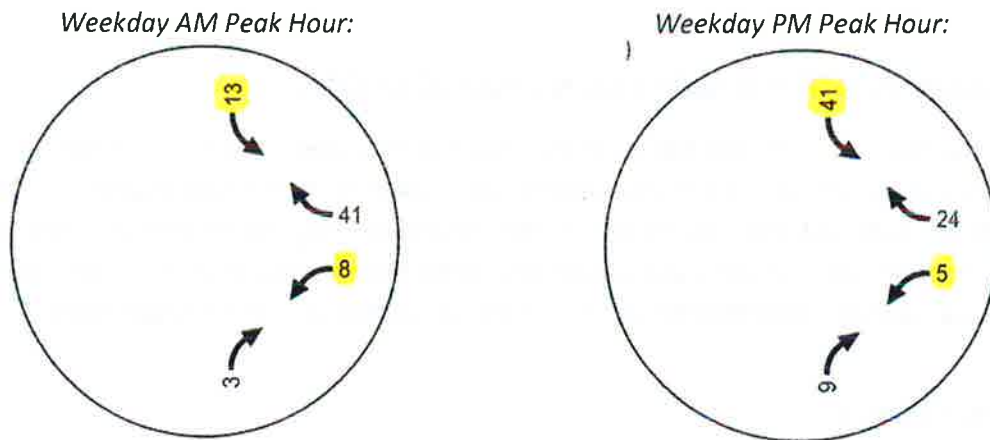


<sup>1</sup> The proportional share cost mitigation methodology established in the *Sherwood High School Transportation Impact Study* prepared by DKS Associates assumed the cost of installing a traffic signal at the intersection as \$1.936 million.

### 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



### 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%)

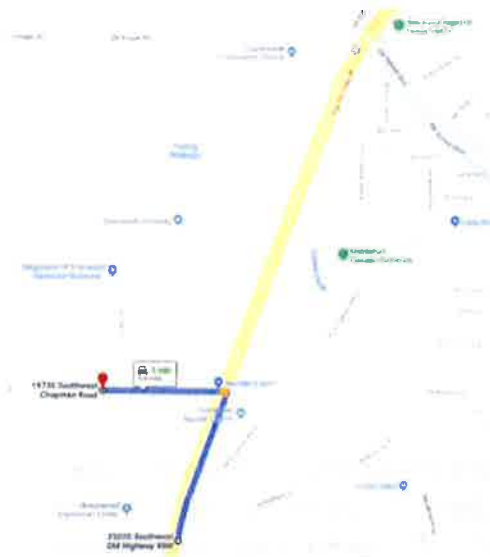
**Northbound Left-Turn (8 lefts AM, 8 lefts PM, 4 U-turns AM, 1 U-turn PM)**

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).

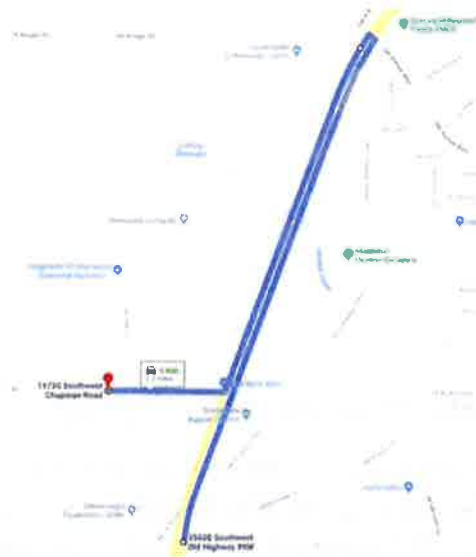
Existing traffic volumes at the study intersection were rerouted to reflect these changes as shown in Exhibit 6. In addition, vehicles that were recorded making a northbound U-turn at the SW Brookman Road-SW Chapman Road intersection currently were also rerouted to complete a U-turn at SW Sunset Boulevard.

**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).

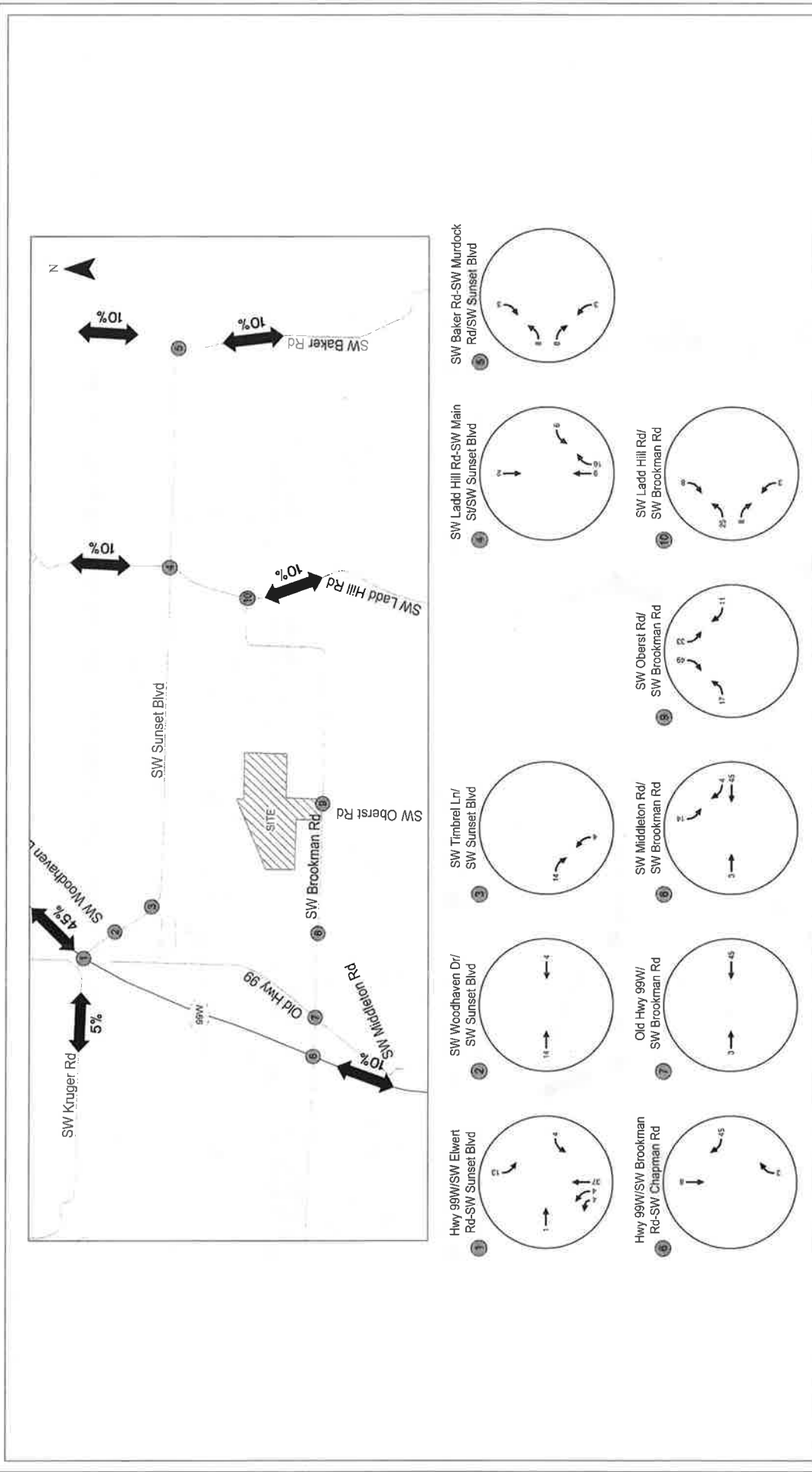
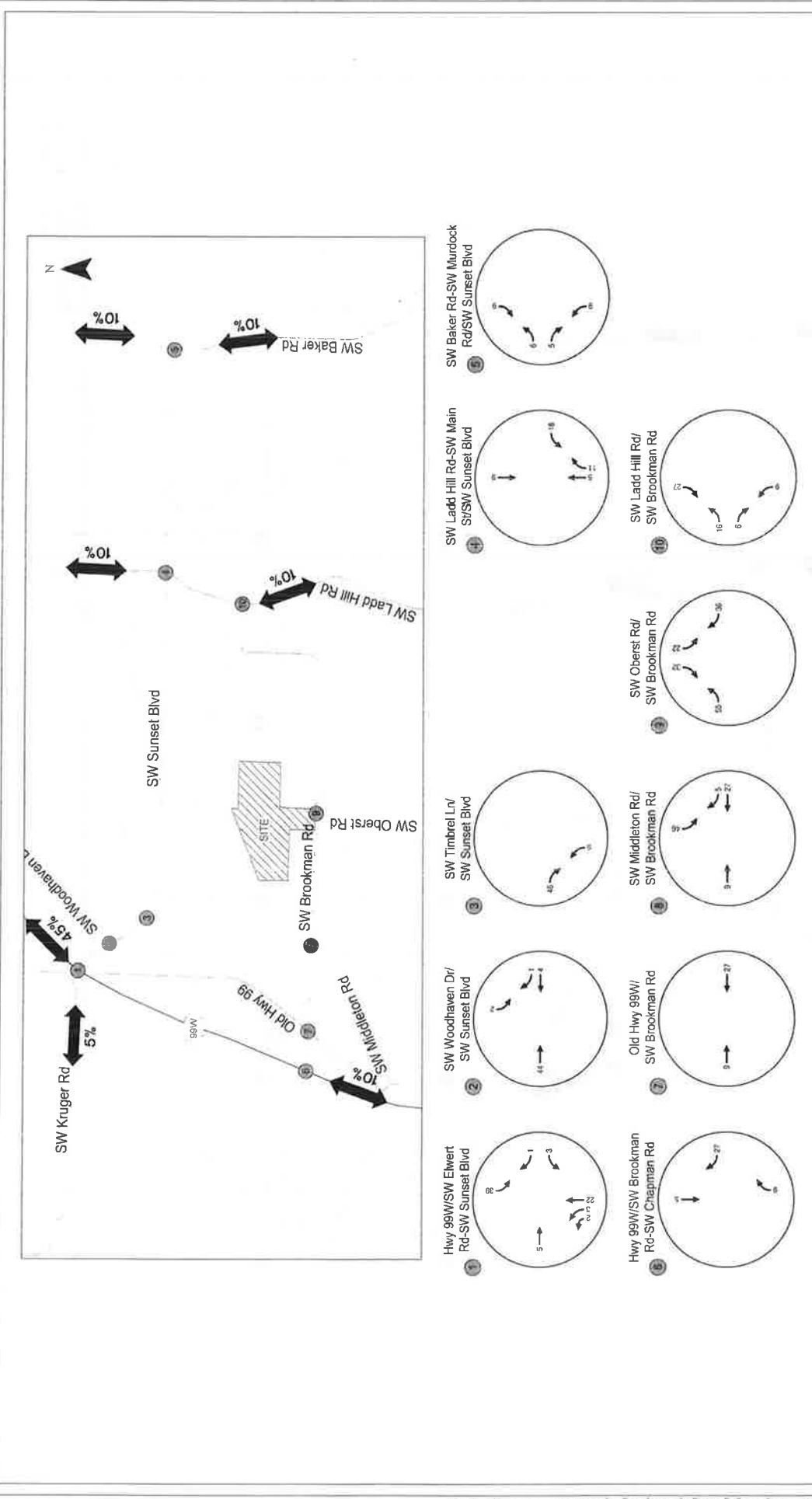


Figure 1

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



Assumed Trip Distribution and Assignment with RIR0 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 identified 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 mitigation 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 24<sup>th</sup>, 2019 meeting with City, ODOT and County staff.

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

HCM Signalized Intersection Capacity Analysis  
 101: SW Pacific Hwy & SW Elwert Rd/SW Sunset Blvd

04/18/2019



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
Frbp, 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			

HCM Signalized Intersection Capacity Analysis  
 101: SW Pacific Hwy & SW Elwert Rd/SW Sunset Blvd

04/18/2019



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

HCM Unsignalized Intersection Capacity Analysis  
 102: SW Woodhaven Dr & SW Sunset Blvd

04/18/2019



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
Analysis Period (min)		15	B

HCM Unsignalized Intersection Capacity Analysis  
 103: SW Timbrel Ln & SW Sunset Blvd

04/18/2019



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	

HCM Unsignalized Intersection Capacity Analysis  
 104: SW Main St/SW Ladd Hill Rd & SW Sunset Blvd

04/18/2019



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									



HCM Unsignalized Intersection Capacity Analysis  
 105: SW Baker Rd/SW Murdock Rd & SW Sunset Blvd

04/18/2019




















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

HCM Unsignalized Intersection Capacity Analysis  
 106: SW Pacific Hwy & SW Chapman Rd

04/18/2019

													
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						
Median storage (veh)							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	
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>						
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											
<b>Intersection Summary</b>													
Average Delay			1.5										
Intersection Capacity Utilization			70.2%	ICU Level of Service	C								
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis  
 107: SW Old Hwy 99W & SW Brookman Rd

04/18/2019















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	

















HCM Unsignalized Intersection Capacity Analysis  
 108: SW Middleton Rd & SW Brookman Rd

04/18/2019

												
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		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
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										
<b>Intersection Summary</b>												
Average Delay			9.0									
Intersection Capacity Utilization			17.5%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 109: SW Oberst Rd/Site Access & SW Brookman Rd

04/18/2019

												
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
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
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								
<b>Intersection Summary</b>												
Average Delay			4.0									
Intersection Capacity Utilization			25.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 110: SW Ladd Hill Rd & SW Brookman Rd

04/18/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			T	T	
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			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
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					
<b>Intersection Summary</b>						
Average Delay			5.7			
Intersection Capacity Utilization			29.4%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis  
 101: SW Pacific Hwy & SW Elwert Rd/SW Sunset Blvd

04/18/2019



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
Frbp, 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
Frnt	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

HCM Signalized Intersection Capacity Analysis  
 101: SW Pacific Hwy & SW Elwert Rd/SW Sunset Blvd

04/18/2019























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
Frbp, 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



HCM Unsignalized Intersection Capacity Analysis  
 102: SW Woodhaven Dr & SW Sunset Blvd

04/18/2019

													
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
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>EB 3</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>SB 1</b>						
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					
<b>Intersection Summary</b>													
Average Delay			4.0										
Intersection Capacity Utilization			50.8%		ICU Level of Service		A						
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis  
 103: SW Timbrel Ln & SW Sunset Blvd

04/18/2019
























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	

HCM Unsignalized Intersection Capacity Analysis  
 104: SW Main St/SW Ladd Hill Rd & SW Sunset Blvd

04/18/2019

												
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									

HCM Unsignalized Intersection Capacity Analysis  
 105: SW Baker Rd/SW Murdock Rd & SW Sunset Blvd

04/18/2019



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		

HCM Unsignalized Intersection Capacity Analysis  
 106: SW Pacific Hwy & SW Chapman Rd

04/18/2019



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						
Median storage (veh)							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		

HCM Unsignalized Intersection Capacity Analysis  
 107: SW Old Hwy 99W & SW Brookman Rd

04/18/2019



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		

HCM Unsignalized Intersection Capacity Analysis  
 108: SW Middleton Rd & SW Brookman Rd

04/18/2019



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	

HCM Unsignalized Intersection Capacity Analysis  
 109: SW Oberst Rd/Site Access & SW Brookman Rd

04/18/2019



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
Analysis Period (min)	15		A



HCM Unsignalized Intersection Capacity Analysis  
 110: SW Ladd Hill Rd & SW Brookman Rd

04/18/2019



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		

**Appendix B Preliminary Cost Estimate for  
Right-Turn Lane on Brookman  
Road at Highway 99W**



**BEND, OR**  
 3052 NW Merchant Way, Suite 100  
 Bend, OR 97703  
 (503) 317-8429  
 www.aks-eng.com

**KEIZER, OR**  
 4300 Cherry Avenue NE  
 Keizer, OR 97303  
 (503) 400-6028

**TUALATIN, OR**  
 12965 SW Herman Road, Suite 100  
 Tualatin, OR 97062  
 (503) 563-6151

**VANCOUVER, WA**  
 9600 NE 126th Avenue, Suite 2520  
 Vancouver, WA 98682  
 (360) 882-0419

## PRELIMINARY COST ESTIMATE BROOKMAN RD. RIGHT HAND TURN-LANE

ITEM	SCHEDULE 1	UNIT	UNIT PRICE	QTY	TOTAL COST
	<u>BROOKMAN RIGHT ROAD TURN LANE</u>				
1 - 1	8" AC Pavement	SY	\$ 38.00	630	\$ 23,940
1 - 2	2" Crushed Rock - 3/4"-0 Leveling Course	SY	\$ 6.00	630	\$ 3,780
1 - 3	16" Crushed Rock - 1 1/2"-0 Base Course	SY	\$ 21.00	670	\$ 14,070
1 - 4	Standard Curb and Gutter	LF	\$ 15.00	420	\$ 6,300
1 - 5	Geotextile Fabric	SY	\$ 2.00	670	\$ 1,340
1 - 6	Signage and Striping	LS	\$ 2,500.00	1	\$ 2,500
1 - 7	Traffic Control	LS	\$ 10,000.00	1	\$ 10,000
1 - 8	SD Main - 12" PVC w/ Rock Backfill	LF	\$ 70.00	50	\$ 3,500
1 - 9	SD CG-48 Catch Basin	EA	\$ 2,500.00	1	\$ 2,500
1 - 10	SD 60" Water Quality Manhole	EA	\$ 6,500.00	1	\$ 6,500
1 - 11	Vegetated Swale, 2' W x 100' L	LS	\$ 35,000.00	1	\$ 35,000

**SCHEDULE 1 SUBTOTAL**

**\$ 109,430**

**Assumes:**

- All unit prices are based on today's costs, utilize construction pricing experience, and do not represent actual contractor bids, Actual contractor bid will vary significantly.
- Quantities are based on concept improvement plan sheet P18, dated December 18, 2018 and are subject to change upon surveying and preparation of detailed plans.

Appendix C Proposed Conditions of  
Approval for Staff  
Consideration

Proposed Condition of Approval  
for  
Proportional Share Payments in Lieu of Construction of Intersection Improvements.

The applicant, in lieu of constructing improvements at the three intersections listed below, shall make a fee-in-lieu payment to the City for each intersection that is proportional to the application's impact on the operational capacity of each intersection. The proportional payments shall be based on an engineer's estimate approved by the City. The payments are eligible for Transportation Development Tax ("TDT") credits pursuant to the April 10, 2018 memorandum by the TDT Ordinance Administrator. The payments are also eligible for City Transportation System Development Charge ("TSDC") credits. The applicant and the City shall memorialize this condition through a development agreement. The payments shall be made prior to the recording of the final plat.

1. Highway 99W and SW Brookman Road. The payment shall be \$109,000.00, the estimated cost of an eastbound right-turn lane from SW Brookman Road to Highway 99W. The payment is eligible for 100% TDT and 100% TSDC credits.

2. SW Timbrel Lane and SW Sunset Boulevard. The payment shall be \$33,451.00, based on the Sherwood High School Transportation Impact Study (the "TIS") methodology prepared by DKS. The payment is eligible for 54% TSDC credits, based on the City's SDC methodology, and 100% TDT credits.

3. SW Sunset Boulevard and SW Woodhaven Drive. The payment shall be \$43,548.00, based on the TIS methodology. The payment is eligible for 100% TDT and 100% TSDC credits.

