Coffee Creek Master Plan Appendix

Section G. Traffic Analysis

DKS Associates
TRANSPORTATION SOLUTIONS

MEMORANDUM

DATE: February 12, 2007

TO: Todd Chase, OTAK
Sandy Young, City of Wilsonville

FROM: Scott Mansur, PE

SUBJECT: **Coffee Creek Transportation Technical Memorandum #2** P06097x201x000

This memorandum provides a summary of the transportation analysis performed for the Coffee Creek industrial area located west of the I-5/Stafford Road interchange in the City of Wilsonville. This study focuses on the existing and future traffic conditions related to the Coffee Creek land use planning efforts.

Project Description

In 2002, the Coffee Creek area (Urban Reserve Area 42) was annexed into the City of Wilsonville urban growth boundary (UGB) and was designated as a Regionally Significant Industrial Area (RSIA). A prior Urban Reserve study by OTAK[1] identified the need for industrial, complementary commercial, and office uses within Coffee Creek boundaries. At this time, the City of Wilsonville is seeking Master Plan approval for the portion of land south of Day Road, which is consistent with the land that was annexed into the City. The land north of Day Road is being considered for conceptual purposes with the likelihood that it could be master planned in the future.

Existing Conditions

The following sections summarize the current traffic and transportation conditions in the study area. The following nine intersections (seven exist today and two are future intersections) were chosen for analysis:

- I-5 Northbound Ramp Terminal @ Boones Ferry Road-Elligsen Road
- I-5 Southbound Ramp Terminal @ Boones Ferry Road-Elligsen Road
- Boones Ferry Road @ Day Road
- Boones Ferry Road @ Commerce Circle/95th Avenue
- Grahams Ferry Road @ Clutter/Ridder
- Graham's Ferry Road @ Day Road
- Grahams Ferry Road @ Tonquin Rd
- Day Road @ Kinsman Road **(future)**
- Ridder Road @ Kinsman Road **(future)**

The study area is shown in Figure 1.

[1] Preliminary Urban Reserve Plan, Area 42, OTAK, Inc. December 1998.

Figure 1: Study Area

Traffic Counts

Traffic counts were conducted at the seven existing intersections within in the Coffee Creek study area. Peak period (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) weekday turning movement counts were conducted to provide information regarding traffic volume, capacity, pedestrian movements, bicycle movements, truck activity and transit flow. Figure 2 summarizes the existing turn movement counts in the study area. These counts were used to establish existing operating conditions, which will serve as a baseline for analyzing future development options for the Coffee Creek area.

Functional Classification

Table 1 summarizes the various functional classifications for streets in the study area based on the City of Wilsonville Transportation System Plan (TSP)[2] adopted in June 2003 and the Washington County TSP[3] adopted in October 2002. Roadway classifications form the basis for street design considerations, particularly relating to access management and mobility.

Table 1: Study Area Roadway Network

Roadway	Classification (Wilsonville TSP)	Classification (Washington Co.)	Cross Section	Posted Speed	Existing Sidewalks
I-5	Principal Arterial	Principal Arterial	6 lanes	65	None
Boones Ferry	Major Arterial	Arterial	5 lanes	35	Partial
Elligsen Road	Major Arterial	Arterial	6 lanes	35	Partial
Day Road	Major Collector	Arterial	3 lanes	35	South side
Commerce Circle	Local Street	Local	2 lanes	25	Partial
95th Avenue	Minor Arterial	Local	3 lanes	35	Yes
Grahams Ferry Road	Minor Arterial	Arterial N of Day/Collector S of Day	2 lanes	45	Partial
Clutter Road	Major Collector	Collector	2 lanes	35	None
Ridder Road	Minor Arterial	Collector	3 lanes w/CTL	35	Partial
Tonquin Road	Minor Arterial	Arterial	2 lanes	45	None

Access Management

Table 2 summarizes the access spacing standards for the roadways in the study area adjacent to the proposed development site as adopted in the City's TSP[4]. In general, the speed, level of mobility and the relative safety of a roadway is related to the number of accesses and the traffic volume it carries. It is in the City's best interest to control the number and spacing of access along its major roadways. The minimum and desirable access spacing standards vary depending on roadway type. In the City of Wilsonville, minor arterial roadways require a minimum access spacing of 600 feet, whereas major collectors only require 100 feet of spacing between accesses. An access is any point along a roadway where vehicles may enter the traffic stream, including other roads or driveways.

[2] City of Wilsonville Transportation System Plan, Adopted June 2, 2003.
[3] Washington County 2020 Transportation System Plan, Adopted October 29, 2002
[4] City of Wilsonville Transportation System Plan, Adopted June 2, 2003.

Figure 2: Turn Movement Counts

Table 2: Access Spacing for Roadways Adjacent to Proposed Development Site

Roadway	Classification (Wilsonville TSP)	Posted Speed	Minimum Access Spacing (ft)	Desirable Access Spacing
Grahams Ferry Road	Minor Arterial	35-50	600	1 mile
Day Road	Major Collector	25-40	100	½ mile
Ridder Road	Minor Arterial	35-50	600	1 mile
Clutter Road	Major Collector	25-40	100	½ mile
Tonquin Road	Minor Arterial	35-50	600	1 mile

Source: City of Wilsonville Transportation System Plan, Adopted June 2, 2003. Table 4.o.

Vehicle Traffic Operation

The concept of level of service has been developed to correlate traffic volume data to subjective descriptions of traffic performance at intersections. Level of service (LOS) is used as a measure of effectiveness for intersection operation. It is similar to a "report card" rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where vehicles can move freely. Level of service D and E are progressively worse. Level of service F represents conditions where traffic volumes exceed the capacity of a specific movement, in the case of unsignalized intersections, or an entire intersection, in the case of a signal control, resulting in long queues and delays. Level of service D or better is generally desirable for signalized intersections.

Unsignalized intersections provide levels of service for major and minor street turning movements. For this reason, LOS E and even LOS F can be acceptable under conditions where signalization is not warranted or would adversely affect intersection operation as a whole. A summary of descriptions of level of service for signalized and unsignalized intersections has been attached in the Appendix.

Traffic operation standards for this project are based on the City of Wilsonville, Metro Regional Transportation Plan (RTP) and the Oregon Highway Plan (OHP) for the study area roadways. All of the applicable standards are based on HCM methodology[5]. The City of Wilsonville has a minimum performance standard of LOS D for its arterial and collector street network[6]. The RTP standards for level of service are shown in Table 3, the OHP standards for volume to capacity ratio are listed in Table 4 and the Washington County standards are summarized in Table 5.

Table 3: Regional AM/PM Peak Hour Performance Standards - RTP

Roadway	Classification	Preferred Operating Standard		Acceptable Operating Standard	
		1st Hour	2nd Hour	1st Hour	2nd Hour
I-5	Principal Arterial	E	D	E	E
Boones Ferry	Minor Arterial (ODOT)	E	D	E	E

2004 Regional Transportation Plan, July 8, 2004 (Table 1.2). LOS D defined as demand to capacity ratio of 0.8 to 0.9, LOS E 0.9 to 1.0, and LOS F 1.0 to 1.1.

[5] Highway Capacity Manual 2000, Transportation Research Board, Chapters 16 and 17.
[6] City of Wilsonville 2003 Transportation Systems Plan, Adopted June 2, 2003, section 2.7.

Table 4: Oregon Department of Transportation Volume-to-Capacity Standards - OHP

Highway	Classification	V/C Standard*	
		1st Hour	2nd Hour
I-5	Interstate Highway	0.99	0.99
Boones Ferry	District Highway	0.99	0.99

*Based on the December 13, 2000 Amendment to the 1999 Oregon Highway Plan. V/C is volume-to-capacity ratio.

Table 5: Washington County Peak Hour Performance Standards - TSP

Roadway	Classification	Preferred Operating Standard		Acceptable Operating Standard	
		1st Hour	2nd Hour	1st Hour	2nd Hour
Boones Ferry Road	Arterial	D	D	E	D
Grahams Ferry Road	Arterial – N. of Day Rd. Collector – S. of Day Rd.	D	D	E	D
Day Road	Arterial	D	D	E	D

Washington County 2020 TSP, October 29, 2002 (Table 5) LOS D defined as demand to capacity ratio of 0.81 to 0.9, LOS E 0.91 to 0.99.

Existing transportation conditions have been evaluated to provide a baseline scenario to compare with future scenarios and to determine existing deficiencies. Analysis of the existing traffic conditions was conducted in the morning and evening peak hours when traffic volumes are greatest. The existing study intersection operations are shown in Table 6.

All of the study intersections currently operate at a level of service and volume to capacity ratio that comply with City, County, State and Regional guidelines. The lowest level of operating service occurred at the Boones Ferry/95th Avenue intersection, which had a LOS D during both the AM and PM peak hours.

Table 6: AM and PM Peak Hour Existing Intersection Performance

	AM Peak Hour			PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**	**Delay**	**LOS**	**V/C**
Signalized						
I-5 Northbound Ramp/Boones Ferry-Elligsen	9.0	A	0.55	8.8	A	0.70
I-5 Southbound Ramp/Boones Ferry-Elligsen	17.4	B	0.75	15.5	B	0.48
Boones Ferry Road/Commerce Cir - 95th Ave	38.3	D	0.82	45.9	D	0.80
Grahams Ferry Road/Day Road	11.4	B	0.62	12.8	B	0.41
Boones Ferry Road/Day Road	16.3	B	0.55	24.8	C	0.62
Unsignalized						
Grahams Ferry Road/Clutter Road	14.0	A/B	0.22	12.9	A/B	0.39
Grahams Ferry Road/Tonquin	15.1	A/C	0.52	19.1	A/C	0.56

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major Street left turn level of service/minor street level of service
V/C = Volume-to-capacity ratio provided for the worst approach.

Field Observations/Queuing

Field observations were conducted at the study area intersections during the peak periods[7]. The AM peak hour observation showed a high volume of left turns on Boones Ferry Road at 95th Avenue. More than 600 left turns make this movement in the AM peak hour with only one 400' left turn pocket. The queues were observed to spill back to the I-5 southbound ramp terminal thus impacting the I-5 southbound off ramp.

During the PM peak period, there were several notable queues that were observed. At the intersection of 95th Avenue and Boones Ferry Road, queues extended to Ridder Road from approximately 4:10 to 4:30. The excessive queues on 95th Avenue only occurred for about a 20 minute period. After this short peak, queues and this approach ranged from 400' to 500'.

At the intersection of Boones Ferry Road/Day Road, the northbound left turn queues routinely exceeded the 200 feet of available storage. There is sufficient width on Boones Ferry Road south of Day Road to extend the existing left turn pocket. Striping modifications would be necessary to extend the left turn pocket.

[7] Field observations by DKS Associates were conducted at the study intersections during the AM and PM peak hours on Wednesday January 31, 2007 and Wednesday February 6, 2007.

Collision Data

Collision data was obtained within the study area from ODOT for a three year period (2003-2005). Table 8 displays the number of collisions and associated collision rate for the study intersections. The data was analyzed and revealed that none of the study intersections currently have collision rates higher than 1.0. Typically, a collision rate equal to or greater than 1.0 collisions per Million Entering Vehicles (MEV) would indicate that there could possibly be a safety problem. The highest crash rate observed (0.51 crashes per MEV) was at the I-5 Southbound Ramp Terminal/Boones Ferry Road intersection. Of the 29 crashes reported in the study area, none of the collisions had fatalities or involved pedestrians or bicycles.

Table 7: Study Area Collision Summary (2003-2005)

Intersection	Collisions	Collision Rate/MEV
I-5 Northbound Ramp Terminal @ Boones Ferry Road – Elligsen Road	9	0.28
I-5 Southbound Ramp Terminal/Boones Ferry Road – Elligsen Road	15	0.51
Boones Ferry Road/Day Road	0	0.00
Boones Ferry Road/Commerce Circle – 95th Avenue	5	0.18
Grahams Ferry Road/Clutter Road	0	0.00
Grahams Ferry Road/Day Road	0	0.00
Grahams Ferry Road/Tonquin Road	0	0.00

Note: MEV-Million Entering Vehicles

Future Conditions

The following sections describe the future impacts of the proposed Coffee Creek industrial area on the study area transportation system. The future conditions evaluation includes trip generation, trip distribution and assignment, motor vehicle intersection capacity analysis, queuing and internal circulation.

Coffee Creek Alternatives

Two land use alternatives have been developed by the project team for the Coffee Creek project area, including comments from the Coffee Creek Technical Advisory Committee (TAC). The Coffee Creek area is generally bounded by properties just north of Day Road, the existing railroad tracks to the west, the BPA power lines to the east, and Ridder Road/Clutter Road to the south. Both alternatives have similar roadway networks with two exceptions. Alternative 2 shows an extension of Commerce Circle South to the future extension of Kinsman Road. This connection would provide an east/west connection to Kinsman Road between Day Road and Ridder Road. The second network change is a realignment of Clutter Road and Grahams Ferry Road intersection. This realignment would provide safe intersection sight distance caused by the existing Grahams Ferry Road grade separated crossing. The Coffee Creek alternatives that depict the proposed roadways, pedestrian connections and zoning are shown in Figures 3 and 4.

Insert Figure 3

Insert figure 4

Coffee Creek Master Plan Area - South of Day Road

The area south of Day Road that is within the Wilsonville UGB is considered a Regionally Significant Industrial Area (RSIA). A RSIA is considered an area which is near the region's most significant transportation facilities for the movement of freight and other areas most suitable for movement and storage of goods. The area south of Day Road includes approximately 193 total acres with 164 gross build able acres. This area is projected to generate approximately 1,480 new jobs. The land use for the project area south of Day Road is summarized in Table 8. It should be noted that there are no differences in proposed land uses between Alternatives 1 and 2 for the master plan area south of Day Road.

Table 8: Coffee Creek Area South of Day Road Land Use Summary

Coffee Creek Area	Public Facilities*	Industrial	Service Commercial	Total
		Acres/Employment		
South of Day Road (Alternative 1 & 2)	29/-	154/1390	10/90	193/1,480

** includes public right-of-way for arterial and collector roads, utilities, and parks.*

Coffee Creek Conceptual Area - North of Day Road

The Coffee Creek project area North of Day contains portion of RSLA and therefore contains Industrial, as well as service commercial zoning. The project area north of Day Road encompasses approximately 74 total acres with approximately 55 build able acres under Alternative 1 and 65 build able acres under Alternative 2. Alternative 2 assumes approximately 10 additional acres could be developed over alternative because of a residential component of the project just west of Boones Ferry Road that has topography that would be conducive to residential development as compared to industrial. The area north of Day Road will produce between 260 and 420 jobs depending on the alternative. Table 9 compares the number of jobs and build able acres between each alternative.

Table 9: Coffee Creek Area North of Day Road Land Use Summary

Coffee Creek Area	Public Facilities*	Industrial	Service Commercial	Residential	Total
			Acres/Employment		
Alternative 1	8/-	44/395	3/25	-	55/420
Alternative 2	13/-	20/180	9/80	23/-	65/260

* includes public right-of-way for arterial and collector roads, utilities, and parks.

Trip Generation

Trip generation was estimated using standard transportation planning trip generation rates based on research conducted by the Institute of Transportation Engineers[8] (ITE) for land use types similar to the proposed land uses within the Coffee Creek project area. The land use alternatives identified for the project area include industrial, service commercial, and residential. The estimated PM peak hour and weekday daily vehicle trip generation is summarized in Table 10. Supporting information is provided in the appendix. Trip generation information is provided for both the area south of Day Road (that is within the UGB) and the area north of Day Road (the conceptual area north of Day Road that is outside the UGB) to differentiate the level of trip generation potential for the project area. The Coffee Creek industrial area is estimated to generate between 17,200 and 19,300 daily vehicles trips depending on the alternative (approximately 13,000 for the area south of Day Road and between 4,300 and 6,300 for the area north of Day Road). The Coffee Creek project area south of Day Road generates approximately 67% to 75% of the total project trips based on land use potential in Alternatives 1 and 2 respectively.

Table 10: Coffee Creek Industrial Area Trip Generation

Coffee Creek Master Plan Area - South of Day Road	PM Peak Hour			Weekday
	Total Trips	In	Out	Daily
Alternative 1 and 2*	1,681	345	1,336	12,935
Coffee Creek Conceptual Area - North of Day Road	**PM Peak Hour**			**Weekday**
	Total Trips	**In**	**Out**	**Daily**
Alternative 1	590	119	471	4,264
Alternative 2	631	216	415	6,332
Coffee Creek Total Area- North and South of Day Road	**PM Peak Hour**			**Weekday**
	Total Trips	**In**	**Out**	**Daily**
Total (North Alt. 1+South)	2,271	464	1,807	17,199
Total (North Alt. 2+South)	2,312	561	1,751	19,267

*Trip Generation for the project area south of Day Road is the same for both alternatives.

[8] *Trip Generation Manual, 7th Edition*, Institute of Transportation Engineers, 2003, Land Use Codes 130, 230, 710 and 814.

Coffee Creek Future Travel Demand Forecasts

Future travel demand forecasting for the Coffee Creek study area utilized the latest 2030 model developed by Metro, Washington County, and DKS Associates for the I-5 to 99W Connector Study. As part of the model development for the I-5 to 99W Connector Study, the Wilsonville TSP travel demand model zone structure and network detail was used as a guideline to refine the regional model. The resulting travel demand model provides a forecast of background traffic growth based on the *2030 MetroScope* land use, estimation of trip distribution for the Coffee Creek land areas, and assignment of trips to the roadway network based on congestion levels. Future 2030 PM peak hour volumes at study intersections were developed for the No Build and three Coffee Creek land uses scenarios by adjusting the travel demand model trip tables to reflect the trip rates listed in Table 10. These volumes were then used to analyze and determine future impacts from the proposed Coffee Creek industrial area on the planned roadway network. The future 2030 PM peak hour scenarios include:

- 2030 No Build (no development in the Coffee Creek area)
- 2030 with Coffee Creek Master Plan Area South of Day (Alternative 1)
- 2030 with Coffee Creek Area North and South of Day (Alternative 1)
- 2030 with Coffee Creek Area North and South of Day (Alternative 2)

The 2030 future PM peak hour forecasts for each of the study area scenarios are shown in Figure 5.

Planned Study Area Roadway Improvements

The City of Wilsonville TSP and the Washington County TSP provide specific information regarding future transportation projects that were identified to meet needs created by future growth within the study area. Table 11 identifies the projects that were recommended specific to the project area. The only projects that have been assumed in the 2030 No Build scenario are those that have already been constructed as well as the Kinsman Road extension. The Kinsman Road project has been assumed for the No Build scenario since this project would be necessary to evaluate the future Kinsman Road study intersections at Day Road and Clutter Road. The remaining projects were not included in any of the future analysis scenarios in order to determine which scenario triggers the specific improvement need.

Figure 5: 2030 PM peak hour traffic volumes

Table 11: Study Area Planned Projects

TSP Project Number	Location	Description (Project Status)
Wilsonville #W-2	Boones Ferry Rd.	Widen Boones Ferry Road from 95th Avenue to Day Road to five lanes (this project has been constructed).
Wilsonville #W-16	Day Rd.	Widen Day Road to three lanes from Grahams Ferry Road to Boones Ferry Road (this project has been constructed).
Wilsonville #C-7 and #S-36	Kinsman Rd. Extension	Construct two-lane extension of Kinsman Road from RxR tracks to Ridder Road. Construct traffic signal at Kinsman Road/Day Road intersection. (these projects have not been constructed)
Wilsonville #C-24 and #S-18	Kinsman Rd. Extension	Construct two-lane extension of Kinsman Road from Ridder Road to Day Road. Construct left turn pockets on all approaches and a traffic signal (these projects have not been constructed).
Wilsonville #S-1	Grahams Ferry Rd/Day Rd Intersection	Install traffic signal (this traffic signal has been constructed).
Wilsonville #S-6	Boones Ferry Rd/Day Rd Intersection	Install traffic signal and northbound through lane (this project has been constructed).
Wilsonville #S-11	Boones Ferry Rd./95th Ave. Intersection	Construct eastbound right turn lane to create dual eastbound right turn lanes, restripe westbound approach for an additional left turn pocket (this project has not been constructed) and widen the Boones Ferry Road for a third eastbound through lane that drops at the I-5 southbound on ramp. (this project has not been constructed).
Washington County #131	Grahams Ferry Rd	Widen Grahams Ferry Road to three lanes from Tonquin to Cutter Rd and provide sidewalks
Washington County #132	Day St	Widen Day St. to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks (this project has been completed)
Washington County #133	Clutter/Ridder Rd	Widen Clutter/Ridder to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks (this project has not been completed)
Washington County #138	Tonquin Rd	Widen and Realign Tonquin Rd from Grahams Ferry to Oregon St and provide sidewalks

Sources: Washington County Transportation System Plan, October 29, 2002
City of Wilsonville Transportation System Plan, Adopted June 2, 2003.

Future Year Operations Analysis

2030 No Build

In order to provide a baseline comparison to the future Coffee Creek alternatives, the 2030 No Build scenario evaluates future traffic volumes assuming the existing geometry and no development of the Coffey Creek project area beyond what currently exists today.

With the addition of 2030 No Build traffic volumes, four of the study area intersections would fail to meet operating standards. These intersections include Boones Ferry Road/95th Avenue, Boones Ferry Road/Day Road, Grahams Ferry Road/Tonquin Road and Grahams Ferry Road/Clutter Road. The 2030 No Build intersection operations are summarized in Table 12. Mitigations have been identified in Table 13 to improve the 2030 No Build intersection operations to meet the applicable standards.

Table 12: 2030 No Build Intersection Performance (PM Peak Hour)

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.6	B	0.80
I-5 Southbound Ramp/Boones Ferry-Elligsen	26.7	C	0.82
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	14.6	B	0.68
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	26.6	C	0.81
Kinsman Road/Ridder Road	17.3	B	0.42
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major Street left turn level of service/minor street level of service
V/C = Volume-to-capacity ratio provided for the worst approach.

Table 13: 2030 No Build Mitigations (PM Peak Hour)

Intersection	Recommended Mitigation
Tonquin/SW Grahams Ferry Road	• Install westbound left turn lane • Install northbound left turn lane • Install traffic signal
Day Road/Boones Ferry Road	• Construct a four lane roadway on Boones Ferry Road north of Day Road.
Boones Ferry Road/95th Avenue	• Construct an eastbound right turn lane on 95th Avenue. The eastbound approach would consist of a shared through-left turn lane and dual right turn lanes. • Stripe a westbound separate left turn pocket on the private industrial park approach • Install median on 95th Avenue to modify the Commerce Circle north approach to 95th Avenue to right in and right out movements only. The median would provide for improved operation of the intersection and increased storage with the existing center turn lane being available for left and through movements. • Construct a second northbound left turn pocket on Boones Ferry Road at 95th Avenue. Additional widening for two southbound through lanes (a minimum of 500' plus taper) would be required on 95th Avenue to facilitate the dual left turns.
Grahams Ferry Road/Clutter Road	• Construct a westbound left turn pocket on Clutter Road • Construct a southbound left turn pocket on Grahams Ferry Road • Construct a traffic signal

With the mitigations identified in Table 13, the intersections were reanalyzed to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "C" or better. The 2030 No Build mitigated intersection performance is summarized in Table 14.

Table 14: 2030 No Build Mitigated Intersection Performance (PM Peak Hour)

Signalized Intersection	PM Peak Hour		
	Delay	LOS	V/C
Boones Ferry Road/95th Avenue	24.3	C	0.75
Boones Ferry Road/Day Road	30.4	C	0.84
Grahams Ferry Road/Clutter Road	15.3	B	0.79
Grahams Ferry Road/Tonquin Road	32.3	C	0.86

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The operational analysis as previously shown in Tables 12 and 14 is based on an isolated intersection evaluation which means that each study intersection is evaluated independently. In order to evaluate the entire Stafford Road interchange area, the SimTraffic™ simulation model was utilized to provide a system wide assessment of traffic operating conditions on the Elligsen Road corridor. This simulation is especially important within the Elligsen Road interchange area because of the pre-existing non-conforming intersection spacing on Boones Ferry Road between the I-5 southbound interchange ramp and 95th Avenue where queuing from one intersection could affect an adjacent intersection (as occurs today on Boones Ferry Road between the I-5 southbound ramp and 95th Avenue during the AM peak period).

Queuing analysis was performed for the future mitigated No Build alternative using SimTraffic™, which estimates the 95th percentile queue for each approach movement at signalized intersections. This 95th percentile queue estimates that for any given cycle at a signalized intersection, the queue length calculated is representative of 95 percent of the peak fifteen minute vehicular queues during the peak hour at that intersection.

Under the mitigated No Build alternative, one of the estimated vehicle queues would exceed the available storage that would be provided under this alternative. The northbound left turn lane on Boones Ferry Road would need to be lengthened to provide at least 400 feet of storage under this scenario. Table 15 summarizes the available storage for key movements within the Stafford Road interchange area and summarizes the results of the vehicle queuing analysis.

Table 15: 2030 Mitigated No Build 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200’	400’	**Yes**
	NB Through	825’	250’	No
	SB Through	>2,000’	1,200’	No
	EB Left	>750’	500’	No
	EB Right	1,500’	500’	No
Boones Ferry Road/95th Avenue	EB Left	TBD	275’	No
	EB Right	TBD	525’	No
	NB Left	400’	350’	No
	NB Through	400’	250’	No
	SB Through	825’	800’	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500’	325’	No
	SB Right	500’	300’	No
	EB Through	400’	350’	No
	WB Through	>1,500’	425’	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500’	425’	No
	WB Through	425’	275’	No
	NB Right	325’	250’	No
	NB Left	325’	200’	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Master Plan Area South of Day Road (Alternative 1)

The following scenario evaluated project traffic from the Coffee Creek Master Plan area south of Day Road. Based on the forecasted traffic volumes for this scenario, five of the study area intersections would fail to meet operating standards. The 2030 with Coffee Creek Master Plan area intersection operations are summarized in Table 16. Mitigations have been identified for the five failing intersections in Table 17 to meet the applicable operating standards.

Table 16: 2030 with Coffee Creek Master Plan Area South of Day Alternative 1 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.7	B	0.79
I-5 Southbound Ramp/Boones Ferry-Elligsen	26.9	C	0.88
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	23.9	C	0.81
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	64.9	**E**	**>1.0**
Kinsman Road/Ridder Road	22.0	C	0.58
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major Street left turn level of service/minor street level of service
V/C = Volume-to-capacity ratio provided for the worst approach.

Table 17: 2030 with Coffee Creek Master Plan Area South of Day Road- Alternative 1 Mitigations

Intersection/Roadway	**Recommended Mitigation**
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 17, the intersections were reevaluated to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "C" or better. The 2030 with Coffee Creek Master Plan area south of Day Road mitigated intersection performance is summarized in Table 18.

Table 18: 2030 with Coffee Creek Master Plan Area South of Day Road Alternative 1 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	24.9	C	0.74
Boones Ferry Road/Day Road	31.4	C	0.87
Kinsman Road/Day Road	34.4	C	0.89
Grahams Ferry Road/Clutter Road	16.0	B	0.82
Grahams Ferry Road/Tonquin Road	38.4	C	0.91

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek Master Plan Area south of Day Road was evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. This evaluation determined that a third southbound through lane would be needed on Boones Ferry Road from Day Road to the I-5 southbound ramp (as discussed in Table 17). The third southbound through lane is consistent with prior findings in the City's TSP. With the mitigations shown in Table 17, all of the vehicular movements would operate within estimated storage with the exception of the northbound left turn movement on Boones Ferry Road at Day Road. This turn pocket would need to be extended to provide adequate storage. There is adequate width on Boones Ferry Road to lengthen the existing turn pocket with striping medications. Table 19 summarizes the available storage for key movements within the Stafford interchange area.

Table 19: 2030 with Coffee Creek Master Plan Area South of Day Road Alternative 1 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	425'	**Yes**
	NB Through	825'	250'	No
	SB Through	>2,000'	600'	No
	EB Left	>750'	350'	No
	EB Right	1,500'	400'	No
Boones Ferry Road/95th Avenue	EB Left	TBD	275'	No
	EB Right	TBD	525'	No
	NB Left	400'	275'	No
	NB Through	400'	200'	No
	SB Through	825'	375'	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	325'	No
	SB Right	500'	300'	No
	EB Through	400'	400'	No
	WB Through	>1,500'	350'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	400'	No
	WB Through	425'	250'	No
	NB Right	325'	250'	No
	NB Left	325'	225'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Areas North & South of Day Road (Alternative 1)

The following scenario evaluates project traffic from the Coffee Creek areas north and south of Day Road utilizing the Alternative 1 roadway network. Based on the forecasted traffic volumes for this scenario, the same study area intersections would fail to meet operating standards as was identified in Coffee Creek area south of Day Road. The intersection operations for this scenario are summarized in Table 20. Mitigations have been identified for the failing intersections in Table 21 to meet the applicable operating standards.

Table 20: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.8	B	0.79
I-5 Southbound Ramp/Boones Ferry-Elligsen	27.1	C	0.91
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	26.3	C	0.84
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	63.9	**E**	**>1.0**
Kinsman Road/Ridder Road	23.0	C	0.61
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major Street left turn level of service/minor street level of service
V/C = Volume-to-capacity ratio provided for the worst approach.

Table 21: 2030 with Coffee Creek North and South of Day Road Alternative 1 Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Boones Ferry Road/Day Road	• Construct dual eastbound right turn lanes
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 21, the intersections were reevaluated to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "C" or better. The 2030 with Coffee Creek areas north and south of Day Road mitigated intersection performance is summarized in Table 22.

Table 22: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	24.3	C	0.77
Boones Ferry Road/Day Road	33.9	C	0.90
Kinsman Road/Day Road	34.4	C	0.89
Grahams Ferry Road/Clutter Road	16.2	B	0.82
Grahams Ferry Road/Tonquin Road	41.8	D	0.93

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek areas north and south of Day Road (Alternative 1) was evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. With the mitigations shown in Table 17, all of the vehicular movements would operate within estimated storage with the exception of the northbound left turn movement on Boones Ferry Road at Day Road. This turn pocket would need to be extended to provide adequate storage. There is adequate width on Boones Ferry Road to lengthen the existing turn pocket with striping medications. Table 23 summarizes the available storage for key movements within the Stafford interchange area.

Table 23: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	425'	**Yes**
	NB Through	825'	425'	No
	SB Through	>2,000'	500'	No
	EB Left	>750'	275'	No
	EB Right	1,500'	200'	No
Boones Ferry Road/95th Avenue	EB Left	TBD	275'	No
	EB Right	TBD	450'	No
	NB Left	400'	275'	No
	NB Through	400'	200'	No
	SB Through	825'	475'	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	325'	No
	SB Right	500'	300'	No
	EB Through	400'	400'	No
	WB Through	>1,500'	450'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	250'	No
	WB Through	425'	275'	No
	NB Right	325'	275'	No
	NB Left	325'	225'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Areas North & South of Day Road (Alternative 2)

The following scenario evaluates project traffic from the Coffee Creek areas north and south of Day Road with the Alternative 2 roadway network. Based on the forecasted traffic volumes for this scenario, five study area intersections would fail to meet operating standards. The intersection operations for this scenario are summarized in Table 24. Mitigations have been identified for the failing intersections in Table 25 to meet the applicable operating standards.

This alternative includes an extension of Commerce Circle to the future Kinsman Road extension. Based on the traffic forecasts as shown in Figure 5, this roadway project would increase the westbound left turns from Boones Ferry Road to 95th Avenue as well as the northbound right turns from 95th Avenue to Boones Ferry Road. Since this project would be expensive to construct and would not significantly benefit traffic operations, this network connection would not be recommended.

Table 24: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.9	B	0.79
I-5 Southbound Ramp/Boones Ferry-Elligsen	27.6	C	0.95
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	23.2	C	0.80
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	48.0	D	**>1.0**
Kinsman Road/Ridder Road	27.2	C	0.77
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major Street left turn level of service/minor street level of service
V/C = Volume-to-capacity ratio provided for the worst approach.

Table 25: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Commerce Circle Extension	• Extend Commerce Circle to the future Kinsman Road Extension (This improvement is included as part of the Alternative 2 roadway network).
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 25, the intersections were reevaluated to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "D" or better. The 2030 with Coffee Creek areas north and south of Day Road mitigated intersection performance is summarized in Table 26.

Table 26: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	25.2	C	0.79
Boones Ferry Road/Day Road	30.2	C	0.81
Kinsman Road/Day Road	31.1	C	0.92
Grahams Ferry Road/Clutter Road	28.0	C	0.94
Grahams Ferry Road/Tonquin Road	43.8	D	0.94

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek areas north and south of Day Road (Alternative 2) was evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. With the mitigations shown in Table 25, all of the vehicular movements would operate within estimated storage with the exception of the northbound left turn movement on Boones Ferry Road at Day Road. This turn pocket would need to be extended to provide adequate storage. There is adequate width on Boones Ferry Road to lengthen the existing turn pocket with striping medications. Table 27 summarizes the available storage for key movements within the Stafford interchange area.

Table 27: 2030 with Coffee Creek North and South of Day Road Alternative 2 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	350'	**Yes**
	NB Through	825'	200'	No
	SB Through	>2,000'	775'	No
	EB Left	>750'	425'	No
	EB Right	1,500'	350'	No
Boones Ferry Road/95th Avenue	EB Left	TBD	275'	No
	EB Right	TBD	525'	No
	NB Left	400'	325'	No
	NB Through	400'	175'	No
	SB Through	825'	300'	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	300'	No
	SB Right	500'	300'	No
	EB Through	400'	400'	No
	WB Through	>1,500'	400'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	250'	No
	WB Through	425'	275'	No
	NB Right	325'	275'	No
	NB Left	325'	225'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

Coffee Creek Safety Improvements

There are several safety related improvements that are needed within the Coffee Creek project area that will be needed to meet current standards. The first improvement is the Grahams Ferry Road grade separated railroad crossing that is located approximately 350 feet south of Clutter Road. This crossing is narrow (approximately 22 feet) and restricts sight distance at the Clutter Road intersection in the southbound direction. Either the railroad crossing needs to be improved to provide safe sight distance and a wider cross section or Clutter Road will need to be realigned further to the north (see alignment shown for Alternative 2. If the railroad crossing is improved, it should be widened consistent with City Minor Arterial standards.

The second safety improvement is the horizontal curve on Boones Ferry Road approximately 400 feet north of Day Road. This segment was identified for widening to a 4-lane section north of Day Road as part of the 2030 No Build scenario. The horizontal curve should be improved as part of the capacity related improvements to Boones Ferry Road north of Day Road that were identified for the 2030 No Build scenario. The safety related improvements are summarized in Table 28.

Table 28: Coffee Creek Safety Improvements

Safety Improvement	Recommendation
Grahams Ferry Road Grade Separated Railroad Crossing	• Reconstruct Grade Separated Railroad Crossing to City of Wilsonville Minor Arterial standards.
Clutter Road/Grahams Ferry Road Intersection Sight Distance	• Realign Clutter Road to the North as shown in Alternative 2.
Boones Ferry Road Horizontal Curve	• As part of the Boones Ferry Road widening, bring horizontal curve up to current standards.

Summary

The transportation impacts of future traffic associated with the Coffee Creek Industrial Area has been investigated in the preceding report. The primary findings and recommendations are summarized in the following sections.

Recommended Mitigation Measures

To maintain adequate traffic performance standards within the study area during the PM peak period, mitigation measures are necessary to reduce the negative transportation impacts of future traffic growth.

Non-Project Oriented Transportation Mitigation (No Build and Safety)

The following measures are related to estimated traffic growth on study area roadways. These mitigations would be necessary whether the Coffee Creek industrial area was developed. Additional safety related mitigations have been identified as well. Non-project oriented mitigations are summarized in Table 28.

Table 28: 2030 No Build and Safety Related Mitigations (PM Peak Hour)

Intersection	Recommended Mitigation
Tonquin/SW Grahams Ferry Road	• Install eastbound left turn lane • Install northbound left turn lane • Install traffic signal
Day Road/Boones Ferry Road	• Construct a four-lane roadway on Boones Ferry Road north of Day Road.
Kinsman Rd. Extension	• Construct two-lane extension of Kinsman Road from RxR tracks to Day Road. • Construct traffic signals at Kinsman Road/Day Road and Kinsman Road/Ridder Road intersections. • Construct left turn pockets on all approaches at the Kinsman Road/Ridder Road intersection.
Boones Ferry Road/95th Avenue	• Construct an eastbound right turn lane on 95th Avenue. The eastbound approach would consist of a shared through-left turn lane and dual right turn lanes. • Stripe a westbound separate left turn pocket on the private industrial park approach • Install median on 95th Avenue to modify the Commerce Circle north approach to 95th Avenue to right in and right out movements only. The median would provide for improved operation of the intersection and increased storage with the existing center turn lane being available for left and through movements. • Construct a second northbound left turn pocket on Boones Ferry Road at 95th Avenue. Additional widening for two southbound through lanes (a minimum of 500' plus taper) would be required on 95th Avenue to facilitate the dual left turns.
Grahams Ferry Road/Clutter Road	• Construct a westbound left turn pocket on Clutter Road • Construct a southbound left turn pocket on Grahams Ferry Road • Construct a traffic signal
Safety Improvement	**Recommendation**
Grahams Ferry Road Grade Separated Railroad Crossing	• Reconstruct Grade Separated Railroad Crossing to City of Wilsonville Minor Arterial standards.
Clutter Road/Grahams Ferry Road Intersection Sight Distance	• Realign Clutter Road to the North as shown in Alternative 2.
Boones Ferry Road Horizontal Curve	• As part of the Boones Ferry Road widening, bring horizontal curve up to current standards.

Coffee Creek Master Plan Area Oriented Transportation Mitigation

The following measures as shown in Table 29 are related to the impacts of the proposed Coffee Creek Master Plan area south of Day Road. The mitigations as shown are in addition to the improvements identified for the 2030 No build scenario.

Table 29: Coffee Creek Master Plan Area South of Day Road Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

Coffee Creek Concept Area Oriented Transportation Mitigation

The following measures as shown in Tables 30 and 31 are related to the impacts of the proposed Coffee Creek conceptual area north of Day Road dependant upon. Table 30 summarizes the mitigation measures for Alternative 1 and Table 31 summarized the mitigation measures for Alternative 2. The main difference between the two alternatives is that Alternative 1 would require dual eastbound right turn lanes on Day Road at Boones Ferry Road and Alternative 2 would require the extension of Commerce Circle to the future Kinsman Road extension. The mitigations as shown are in addition to the improvements identified for the 2030 No build scenario.

Table 30: 2030 with Coffee Creek Master Plan and Concept Areas (Alternative 1) Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound and southbound left turn pockets
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Boones Ferry Road/Day Road	• Construct dual eastbound right turn lanes
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

Table 31: 2030 with Coffee Creek Master Plan and Concept Areas (Alternative 2) Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound and southbound left turn pockets
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes
Commerce Circle Extension	• Extend Commerce Circle to the future Kinsman Road Extension (This improvement is included as part of the Alternative 2 roadway network).
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

DKS Associates
TRANSPORTATION SOLUTIONS

MEMORANDUM

TO: Todd Chase, AICP, OTAK

FROM: Scott Mansur, P.E., DKS Associates

DATE: June 30, 2006

SUBJECT: Wilsonville Coffee Creek I TGM
Transportation Plans and Policies, Goals and Objectives Technical Memo #1

This is the first in a series of memorandums that presents technical findings and recommendations for the Wilsonville Coffee Creek TGM project. The purpose of this memorandum is to provide the Technical Advisory Committee (TAC) with a summary of key transportation issues specific to the Coffee Creek project area that were addressed in the following past plans:

- 2004 Regional Transportation System Plan
- 1999 Oregon Highway Plan
- City of Wilsonville Transportation System Plan
- City of Wilsonville Bicycle and Pedestrian Master Plan
- City of Wilsonville Transit Master Plan (Draft)
- Washington County Transportation System Plan

2004 Regional Transportation Plan, Metro, July 8, 2004.

The Regional Transportation Plan (RTP) is a 20-year blueprint to ensure our ability to get from here to there as the Portland region grows. The RTP establishes transportation policies for all forms of travel - motor vehicle, transit, pedestrian, bicycle and freight - and lays out the priority projects for roads and freight movement as well as bicycling, walking and transit. The plan is based on forecasts of growth in population, households, and jobs as well as future travel patterns and analysis of travel conditions. It considers estimates of federal, state and local funding which will be available for transportation improvements. The plan also comes with cost estimates and funding strategies to meet these costs. Local transportation plans are required by state law to be consistent with the RTP.

The following roadway classifications as shown in the table below as defined in the 2004 Regional Transportation Plan. It should be noted that there are no regional trails or greenways shown with the Coffee Creek project area.

Study Area Roadway Classifications as defined in the 2004 RTP:

Roadway	*Motor Vehicle Function Class*	*Transit*	*Bike*	*Pedestrian*	*Freight*
I-5	*Principal Arterial (Freeway)*	*ND*	*ND*	*ND*	*Main Roadway Route*
Boones Ferry Road	*Minor Arterial*	*Regional Bus*	*Regional Corridor*	*Transit Mixed Use*	*Road Connector*

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ND-No Designation
The following table provides the regional performance measures for the study area roadways.

Regional Motor Vehicle Performance Measures as defined in the RTP:

Roadway	*Classification*	*Preferred Operating Standard*		*Acceptable Operating Standard*	
		1st Hour	*2nd Hour*	*1st Hour*	*2nd Hour*
I-5	Principal Arterial	E	D	E	E
Boones Ferry Road	Minor Arterial	E	D	E	E

2004 Regional Transportation Plan, July 8, 2004 (Table 1.2). LOS D defined as demand to capacity ratio of 0.8 to 0.9, LOS E 0.9 to 1.0, and LOS F 1.0 to 1.1.

1999 Oregon Highway Plan, Oregon Department of Transportation, May 1999.

The Oregon Highway Plan (OHP) is a specific element of the Oregon Transportation Plan. The plan has three main elements: the Vision, the Policy Element and the System Element. The Vision portion of the plan considers what Oregon's highway system should look like, considering an anticipated 1.2 million new residents over the next 20 years, as well as projections for economic, demographic and technology forecasts. The Policy Element contains policies and actions under goals for System Definition, System Management, Access Management, Travel Alternatives, and Environmental and Scenic Resources. The System Element begins with an analysis of 20-year state highway needs and lays out investment strategies to meet these needs. This element also lays out an implementation plan for the goals, policies and actions identified in the Policy Element.

Currently, I-5 is classified as an Interstate Highway and Boones Ferry Road is classified as a District Highway within the Coffee Creek study area.

These policies apply to the following study area roadways:

Highway	*Classification*	*V/C Standard**	
		1st Hour	*2nd Hour*
I-5	Interstate Highway	0.99	0.99
Boones Ferry Road	District Highway	0.99	0.99

*Based on the December 13, 2000 Amendment to the 1999 Oregon Highway Plan.

Transportation System Plan (TSP), City of Wilsonville, June 2003.

The City of Wilsonville TSP provides specific information regarding transportation needs to guide future transportation investment in the City and determine how land use and transportation decisions can be brought together beneficially for the City. The TSP also addressed current problem areas and looked into the future (20 years) to identify needs created by growth. The table below identifies the projects that were recommended specific to the project area.

Several projects have been listed in the TSP within the project area.

Number	Location	Description (Project Status)
W-2	Boones Ferry Road	Widen Boones Ferry Road from 95th Avenue to Day Road to five lanes(this project has been constructed).
W-16	Day Road	Widen Day Road to three lanes from Grahams Ferry Road to Boones Ferry Road (this project has been constructed).
C-7	Kinsman Road Extension	Construct two-lane extension of Kinsman Road from RxR tracks to Ridder Road (this project has not been constructed).
C-24	Kinsman Road Extension	Construct two-lane extension of Kinsman Road from Ridder Road to Day Road (this project has not been constructed).
S-1	Grahams Ferry Road/Day Road Intersection	Install traffic signal (this traffic signal has been constructed).
S-6	Boones Ferry Road/Day Road Intersection	Install traffic signal and northbound through lane (this project has been constructed).

All of the public street intersections within the City of Wilsonville are required to meet a level of service "D" standard.

Bicycle and Pedestrian Master Plan, City of Wilsonville, March 2006 (Draft).

The City of Wilsonville Bicycle and Pedestrian Master Plan was recently updated and provides information regarding bicycle and pedestrian needs and identified improvements within the Coffee Creek study area and are summarized in the following table.

The following bicycle and pedestrian projects were identified within the project area.

Number	Location	Description (Priority)
C14	Commerce Circle (west of 95th)	Commerce Circle serves north Wilsonville as a transit route, and major portions of the roadway lacks sidewalks on one or both sides. (11+ years)
C35	Area 42 Trail (Kinsman to Day Road)	This trail was outlined in the Preliminary Urban Reserve Plan Area 42 and North Wilsonville Industrial Area Proposed Concept Plan providing a connection to the BPA powerline easement. Provides an off-street connection through the industrial lands. (6-10 years)
C36	BPA Powerline Trail (Day Road to Tonquin Trail	This trail connects bicyclists and pedestrians along Day Rd with the Tonquin Trail. Provides Tonquin trail users access to the northern industrial area of Wilsonville. (6-10 years)
C37	Cahalin Road (Kinsman Road to Tonquin Trail)	Provides a safe connection through the northern industrial area of Wilsonville. May provide additional connection to the Tonquin Trail. (6-10 years)
C38	Clutter Road (Garden Acres Road to Grahams Ferry Road)	Provides a safe connection through the northern industrial area of Wilsonville. (6-10 years)
C39	Grahams Ferry Road (Day Road to Tooze Road)	A major north south access road into Wilsonville that currently has no provisions for bicyclists or pedestrians. Providing dedicated facilities provides additional choices for bicycle commuters. (1-5 years)

Transit Master Plan, City of Wilsonville, Draft May 2006.

The draft Transit Master Plan provides strategies for reducing the demand on roads and parking as well as improved transit service. The draft plan proposes a future transit route (Route #203) that would provide service to the Coffee Creek project area via Day Road including a stop at the Coffee Creek Correctional Facility. This revised route was intended to serve the future annexation of industrial lands.

Transportation System Plan (TSP), Washington County, October 2002

The Washington County 2020 Transportation System Plan is one of the several elements that comprise the Washington County Comprehensive Plan. The TSP contains the accumulation of recommended system and service improvements and programs that will be needed to serve long-term growth to 2020 and addresses transportation and safety issues related to motor vehicles, transit, pedestrian, bicycle, freight and other modes of transportation. The major work elements of the TSP are policies and strategies, data collection, existing travel conditions and future needs, travel mode alternatives, cost estimates and preparation of draft transportation plan.

The following table provides the Washington County motor vehicle performance measures for the study area roadways.

Roadway	*Classification*	*Target Performance Measures*		*Acceptable performance Measures*	
		First Hour	*Second Hour*	*First Hour*	*Second Hour*
SW Boones Ferry Road	Arterial	D	D	E	D
SW Grahams Ferry Road	Arterial – North of Day St. Collector – South of Day St.	D	D	E	D
SW Day St	Arterial	D	D	E	D

Washington County 2020 TSP, October 29, 2002 (Table 5) LOS D defined as demand to capacity ratio of 0.81 to 0.9, LOS E 0.91 to 0.99.

The table below shows the capacity enhancement projects that were listed in the Washington County 2020 TSP technical appendix within the project area.

Number	*Location*	*Description*
131	Grahams Ferry Rd	Widen Grahams Ferry Road to three lanes from Tonquin to Cutter Rd and provide sidewalks
132	Day St	Widen Day St. to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks
133	Clutter/Ridder Rd	Widen Clutter/Ridder to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks
138	Tonquin Rd	Widen and Realign Tonquin Rd from Grahams Ferry to Oregon St and provide sidewalks

Washington County 2020 TSP, Technical Appendix B-2, C-4 May 3, 2002

DKS Associates
TRANSPORTATION SOLUTIONS

MEMORANDUM

DATE: May 2, 2007

TO: Todd Chase, OTAK
Sandy Young, City of Wilsonville

FROM: Scott Mansur, PE

SUBJECT: **Coffee Creek Transportation Technical Memorandum #2** P06097x201x000

This memorandum provides a summary of the transportation analysis performed for the Coffee Creek industrial area located west of the I-5/Stafford Road interchange in the City of Wilsonville, Oregon. This study focuses on the existing and future traffic conditions related to the Coffee Creek land use planning efforts.

Project Description

In 2002, the Coffee Creek area (Urban Reserve Area 42) was annexed into the City of Wilsonville's urban growth boundary (UGB) and was designated as a Regionally Significant Industrial Area (RSIA) by Metro. A prior Urban Reserve study by OTAK[1] identified the need for industrial, complementary commercial, and office uses within Coffee Creek boundaries. At this time, the City of Wilsonville is seeking Master Plan approval for the portion of land south of Day Road, which is consistent with the land that was annexed into the City. The land north of Day Road is being considered for conceptual purposes with the likelihood that it could be master planned in the future.

Existing Conditions

The following sections summarize the current traffic and transportation conditions in the study area. The following nine intersections (seven existing and two future) were chosen for analysis:

- I-5 Northbound Ramp Terminal @ Boones Ferry Road-Elligsen Road
- I-5 Southbound Ramp Terminal @ Boones Ferry Road-Elligsen Road
- Boones Ferry Road @ Day Road
- Boones Ferry Road @ Commerce Circle/95th Avenue
- Grahams Ferry Road @ Clutter/Ridder
- Graham's Ferry Road @ Day Road
- Grahams Ferry Road @ Tonquin Rd
- Day Road @ Kinsman Road **(future)**
- Ridder Road @ Kinsman Road **(future)**

The study area is shown in Figure 1.

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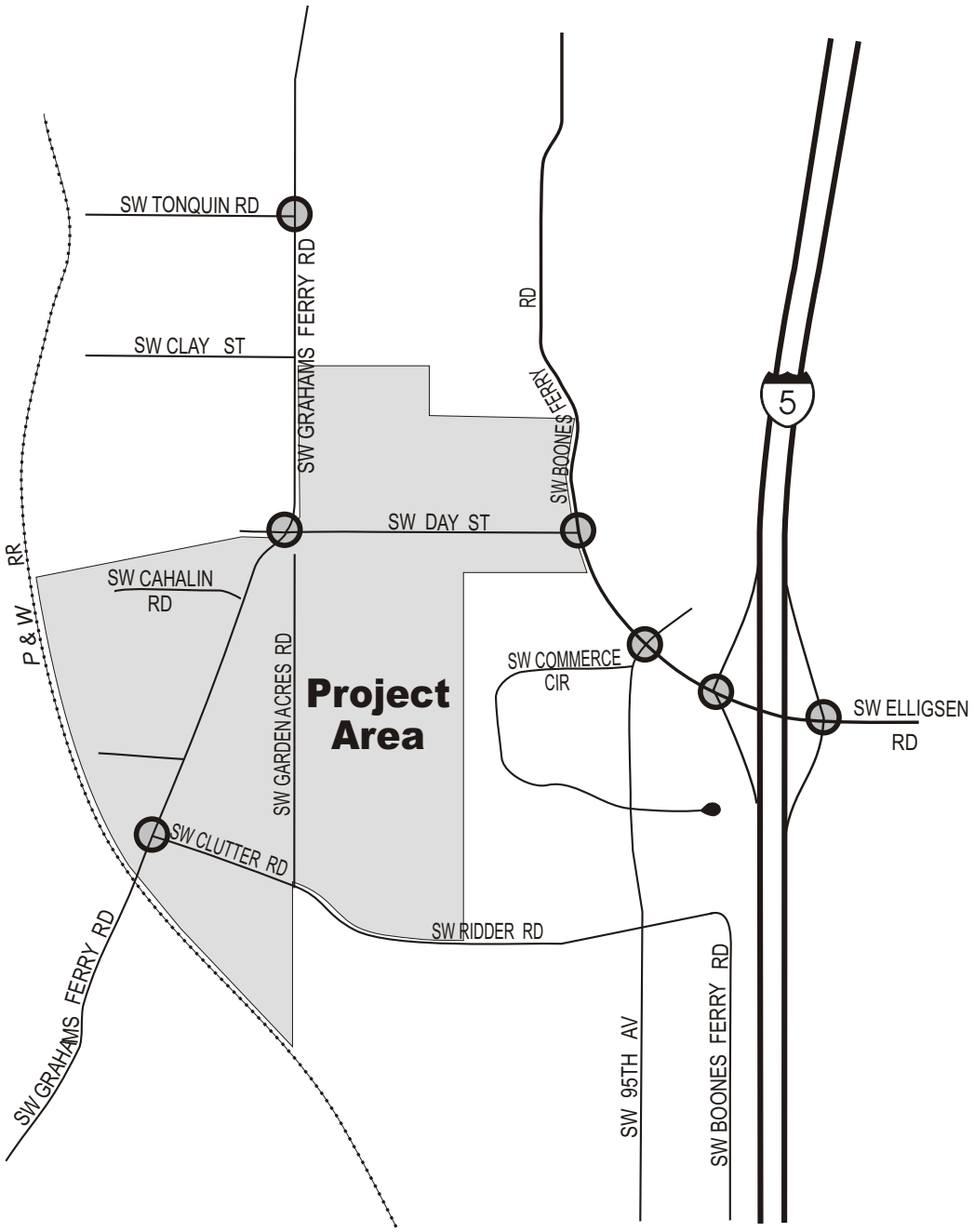
[1] Preliminary Urban Reserve Plan, Area 42, OTAK, Inc. December 1998.



LEGEND

- Study Intersection

DKS *Associates*
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 1

STUDY AREA

Traffic Counts

Traffic counts were conducted at the seven existing intersections within the Coffee Creek study area. Peak period (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) weekday turning movement counts were conducted to provide information regarding traffic volume, capacity, pedestrian movements, bicycle movements, truck activity and transit flow. Figure 2 summarizes the existing turn movement counts in the study area. These counts were used to establish existing operating conditions, which will serve as a baseline for analyzing future development options for the Coffee Creek area.

Functional Classification

Table 1 summarizes the various functional classifications for streets in the study area based on the City of Wilsonville Transportation System Plan (TSP)[2] adopted in June 2003 and the Washington County TSP[3] adopted in October 2002. Roadway classifications form the basis for street design considerations, particularly relating to access management and mobility.

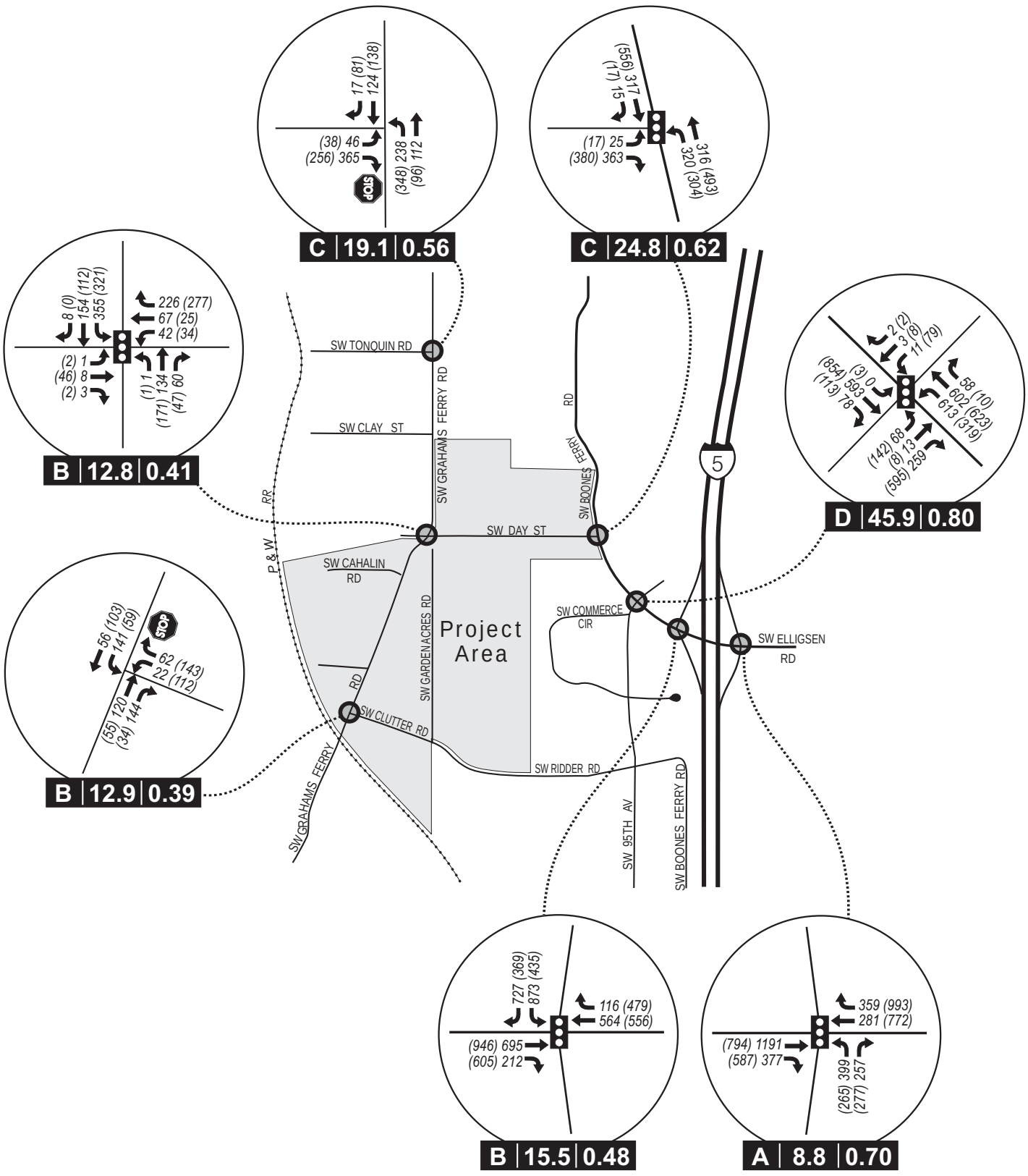
Table 1: Study Area Roadway Network

Roadway	Classification (Wilsonville TSP)	Classification (Washington Co.)	Cross Section	Posted Speed	Existing Sidewalks
I-5	Principal Arterial	Principal Arterial	6 lanes	65	None
Boones Ferry	Major Arterial	Arterial	5 lanes	35	Partial
Elligsen Road	Major Arterial	Arterial	6 lanes	35	Partial
Day Road	Major Collector	Arterial	3 lanes	35	South Side
Commerce Circle	Local Street	Local	2 lanes	25	Partial
95th Avenue	Minor Arterial	Local	3 lanes	35	Yes
Grahams Ferry Road	Minor Arterial	Arterial N of Day/Collector S of Day	2 lanes	45	Partial
Clutter Road	Major Collector	Collector	2 lanes	35	None
Ridder Road	Minor Arterial	Collector	3 lanes w/CTL	35	Partial
Tonquin Road	Minor Arterial	Arterial	2 lanes	45	None

Access Management

Table 2 summarizes the access spacing standards for the roadways in the study area adjacent to the proposed development site as adopted in the City's TSP[4]. In general, the speed, level of mobility and the relative safety of a roadway is related to the number of accesses and the traffic volume it carries. It is in the City's best interest to control the number and spacing of accesses along its major roadways. The minimum and desirable access spacing standards vary depending on roadway type. In the City of Wilsonville, minor arterial roadways require a minimum access spacing of 600 feet, whereas major collectors only require 100 feet of spacing between accesses. An access is any point along a roadway where vehicles may enter the traffic stream, including other roads or driveways.

[2] City of Wilsonville Transportation System Plan, Figure 4.8, Adopted June 2, 2003.
[3] Washington County 2020 Transportation System Plan, Adopted October 29, 2002
[4] City of Wilsonville Transportation System Plan, Table 4.o, Adopted June 2, 2003.



LEGEND

- Study Intersection
- *AM (PM)* - Peak Hour Traffic Volumes
- Traffic Signal
- STOP - Stop Sign
- **X | 00.0 | 0.00** - PM Peak Operations (LOS Delay V/C)

DKS *Associates*
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 2

2006 EXISTING AM/PM PEAK HOUR TRAFFIC VOLUMES

Table 2: Access Spacing for Roadways Adjacent to Proposed Development Site

Roadway	Classification (Wilsonville TSP)	Posted Speed	Minimum Access Spacing (ft)	Desirable Access Spacing
Grahams Ferry Road	Minor Arterial	35-50	600	1 mile
Day Road	Major Collector	25-40	100	½ mile
Ridder Road	Minor Arterial	35-50	600	1 mile
Clutter Road	Major Collector	25-40	100	½ mile
Tonquin Road	Minor Arterial	35-50	600	1 mile

Source: City of Wilsonville Transportation System Plan, Adopted June 2, 2003. Table 4.o.

Vehicle Traffic Operation

The concept of level of service has been developed to correlate traffic volume data to subjective descriptions of traffic performance at intersections. Level of service (LOS) is used as a measure of effectiveness for intersection operation. It is similar to a "report card" rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where vehicles can move freely. Level of service D and E are progressively worse. Level of service F represents conditions where traffic volumes exceed the capacity of a specific movement, in the case of unsignalized intersections, or an entire intersection, in the case of a signal control, resulting in long queues and delays. Level of service D or better is generally desirable for signalized intersections.

Unsignalized intersections provide levels of service for major and minor street turning movements. For this reason, LOS E and even LOS F can be acceptable under conditions where signalization is not warranted or would adversely affect intersection operation as a whole. A summary of descriptions of level of service for signalized and unsignalized intersections has been attached in the Appendix.

Traffic operation standards for this project are based on the City of Wilsonville, Metro Regional Transportation Plan (RTP) and the Oregon Highway Plan (OHP) for the study area roadways. All of the applicable standards are based on HCM methodology[5]. The City of Wilsonville has a minimum performance standard of LOS D for its arterial and collector street network[6]. The RTP standards for level of service are shown in Table 3, the OHP standards for volume to capacity ratio are listed in Table 4 and the Washington County standards are summarized in Table 5.

Table 3: Regional AM/PM Peak Hour Performance Standards - RTP

Roadway	Classification	Preferred Operating Standard		Acceptable Operating Standard	
		1st Hour	2nd Hour	1st Hour	2nd Hour
I-5	Principal Arterial	E	D	E	E
Boones Ferry	Minor Arterial (ODOT)	E	D	E	E

2004 Regional Transportation Plan, July 8, 2004 (Table 1.2). LOS D defined as demand to capacity ratio of 0.8 to 0.9, LOS E 0.9 to 1.0, and LOS F 1.0 to 1.1.

[5] Highway Capacity Manual 2000, Transportation Research Board, Chapters 16 and 17.
[6] City of Wilsonville 2003 Transportation Systems Plan, Adopted June 2, 2003, section 2.7.

Table 4: Oregon Department of Transportation Volume-to-Capacity Standards - OHP

Highway	Classification	V/C Standard*	
		1st Hour	2nd Hour
I-5	Interstate Highway	0.99	0.99
Boones Ferry	District Highway	0.99	0.99

*Based on the December 13, 2000 Amendment to the 1999 Oregon Highway Plan. V/C is volume-to-capacity ratio.

Table 5: Washington County Peak Hour Performance Standards - TSP

Roadway	Classification	Preferred Operating Standard		Acceptable Operating Standard	
		1st Hour	2nd Hour	1st Hour	2nd Hour
Boones Ferry Road	Arterial	D	D	E	D
Grahams Ferry Road	Arterial – N. of Day Rd. Collector – S. of Day Rd.	D	D	E	D
Day Road	Arterial	D	D	E	D

Washington County 2020 TSP, October 29, 2002 (Table 5) LOS D defined as demand to capacity ratio of 0.81 to 0.9, LOS E 0.91 to 0.99.

Existing transportation conditions have been evaluated to provide a baseline scenario to compare with future scenarios and to determine existing deficiencies. Analysis of the existing traffic conditions was conducted in the morning and evening peak hours when traffic volumes are greatest. The existing study intersection operations are shown in Table 6.

All of the study intersections currently operate at a level of service and volume to capacity ratio that comply with City, County, State and Regional guidelines. The intersection of Boones Ferry Road/95th Avenue currently operates at LOS D during both the AM and PM peak hours, while all remaining study intersections currently operate at LOS C or better during both the AM and PM peak hours.

Table 6: AM and PM Peak Hour Existing Intersection Performance

	AM Peak Hour			PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**	**Delay**	**LOS**	**V/C**
Signalized						
I-5 Northbound Ramp/Boones Ferry-Elligsen	9.0	A	0.55	8.8	A	0.70
I-5 Southbound Ramp/Boones Ferry-Elligsen	17.4	B	0.75	15.5	B	0.48
Boones Ferry Road/Commerce Cir - 95th Ave	38.3	D	0.82	45.9	D	0.80
Grahams Ferry Road/Day Road	11.4	B	0.62	12.8	B	0.41
Boones Ferry Road/Day Road	16.3	B	0.55	24.8	C	0.62
Unsignalized						
Grahams Ferry Road/Clutter Road	14.0	A/B	0.22	12.9	A/B	0.39
Grahams Ferry Road/Tonquin	15.1	A/C	0.52	19.1	A/C	0.56

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major street left turn level of service/minor street left turn level of service
V/C = Volume-to-capacity ratio for the worst approach.
Delay = Average vehicle delay in peak hour for worst approach

Field Observations/Queuing

Field observations were conducted at study area intersections during the weekday AM and PM peak periods[7]. The AM peak hour observations showed a high volume of northbound left turns on Boones Ferry Road at 95th Avenue. Traffic counts indicated that more than 600 vehicles make this movement in the AM peak hour with only one 400' left turn pocket. The vehicle queues were observed to spill back to the I-5 southbound ramp terminal thus impacting normal operations at the I-5 southbound off ramp.

During the PM peak period, there were several notable queues that were observed. At the intersection of 95th Avenue and Boones Ferry Road, queues extended back along 95th Avenue from Boones Ferry Road to Ridder Road from approximately 4:10 to 4:30 pm. The excessive queues on 95th Avenue only occurred for about a 20 minute duration. After this short peak, queues and this approach ranged from approximately 400' to 500'.

At the intersection of Boones Ferry Road/Day Road, the northbound left turn queues routinely exceeded the 200 feet of available storage. It is recommended that this turn lane be extended to provide adequate storage of vehicles and reduce queuing into the northbound through travel lanes. This extension could be done by re-striping the back to back northbound and southbound left turn lanes at the intersections of Day Road and SW Pioneer Court. With this, the northbound left turn pocket at Day Road could be extended to 500-feet with 100 feet of this storage area being a two-way left turn pocket to be shared with the Pioneer Court access. The southbound left turns on Boones Ferry Road at Pioneer Court is relatively low in the PM peak hour (less than 10 left turns). Striping modifications would be necessary to modify the left turn pockets on Boones Ferry Road between Day Road and Pioneer Court.

[7] Field observations by DKS Associates were conducted at the study intersections during the AM and PM peak hours on Wednesday January 31, 2007 and Wednesday February 6, 2007.

Collision Data

Collision data was obtained within the study area from ODOT for a three year period (2003-2005). Table 8 displays the number of collisions and associated collision rate for the study intersections. The data was analyzed and revealed that none of the study intersections currently have collision rates higher than 1.0. Typically, a collision rate equal to or greater than 1.0 collisions per Million Entering Vehicles (MEV) would indicate that there could possibly be a safety problem. The highest crash rate observed (0.51 crashes per MEV) was at the I-5 Southbound Ramp Terminal/Boones Ferry Road intersection. Of the 29 crashes reported in the study area, none of the collisions had fatalities or involved pedestrians or bicycles.

Table 7: Study Area Collision Summary (2003-2005)

Intersection	Collisions	Collision Rate/MEV
I-5 Northbound Ramp Terminal @ Boones Ferry Road – Elligsen Road	9	0.28
I-5 Southbound Ramp Terminal/Boones Ferry Road – Elligsen Road	15	0.51
Boones Ferry Road/Day Road	0	0.00
Boones Ferry Road/Commerce Circle – 95th Avenue	5	0.18
Grahams Ferry Road/Clutter Road	0	0.00
Grahams Ferry Road/Day Road	0	0.00
Grahams Ferry Road/Tonquin Road	0	0.00

Note: MEV-Million Entering Vehicles

Future Conditions

The following sections describe the future impacts of the proposed Coffee Creek industrial area on the study area transportation system. The future conditions evaluation includes trip generation, trip distribution and assignment, motor vehicle intersection capacity analysis, queuing and internal circulation.

Coffee Creek Alternatives

Two land use alternatives have been developed by the project team for the Coffee Creek project area, including comments from the Coffee Creek Technical Advisory Committee (TAC). The Coffee Creek area is generally bounded by properties just north of Day Road, the existing railroad tracks to the west, the BPA power lines to the east, and Ridder Road/Clutter Road to the south. Both alternatives have similar roadway networks with two exceptions. Alternative 2 shows an extension of Commerce Circle South to the future extension of Kinsman Road. This connection would provide an east/west connection to Kinsman Road between Day Road and Ridder Road. The second network change is a realignment of Clutter Road and Grahams Ferry Road intersection. This realignment would provide safe intersection sight distance caused by the existing Grahams Ferry Road grade separated crossing. The Coffee Creek alternatives that depict the proposed roadways, pedestrian connections and zoning are shown in Figures 3 and 4.

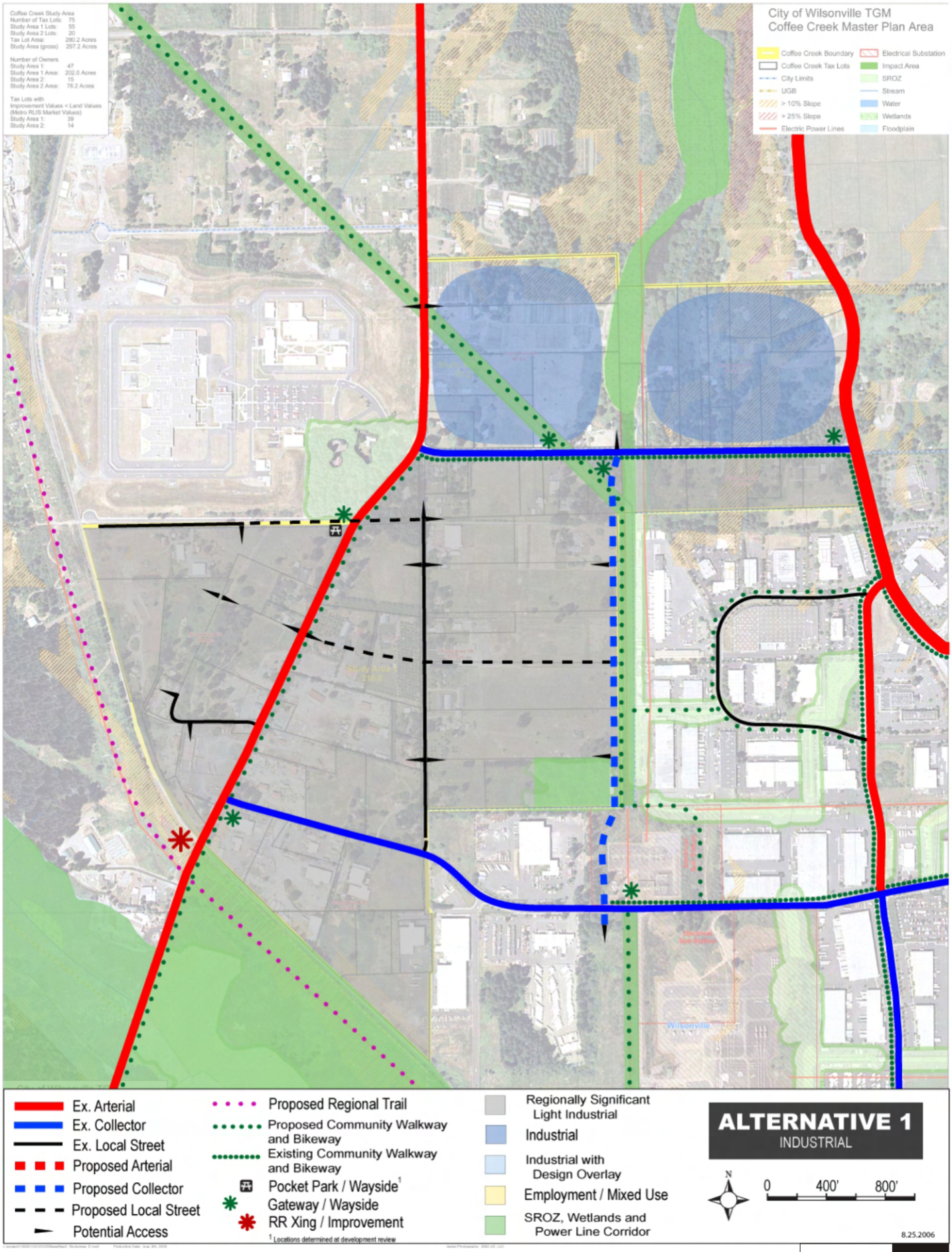
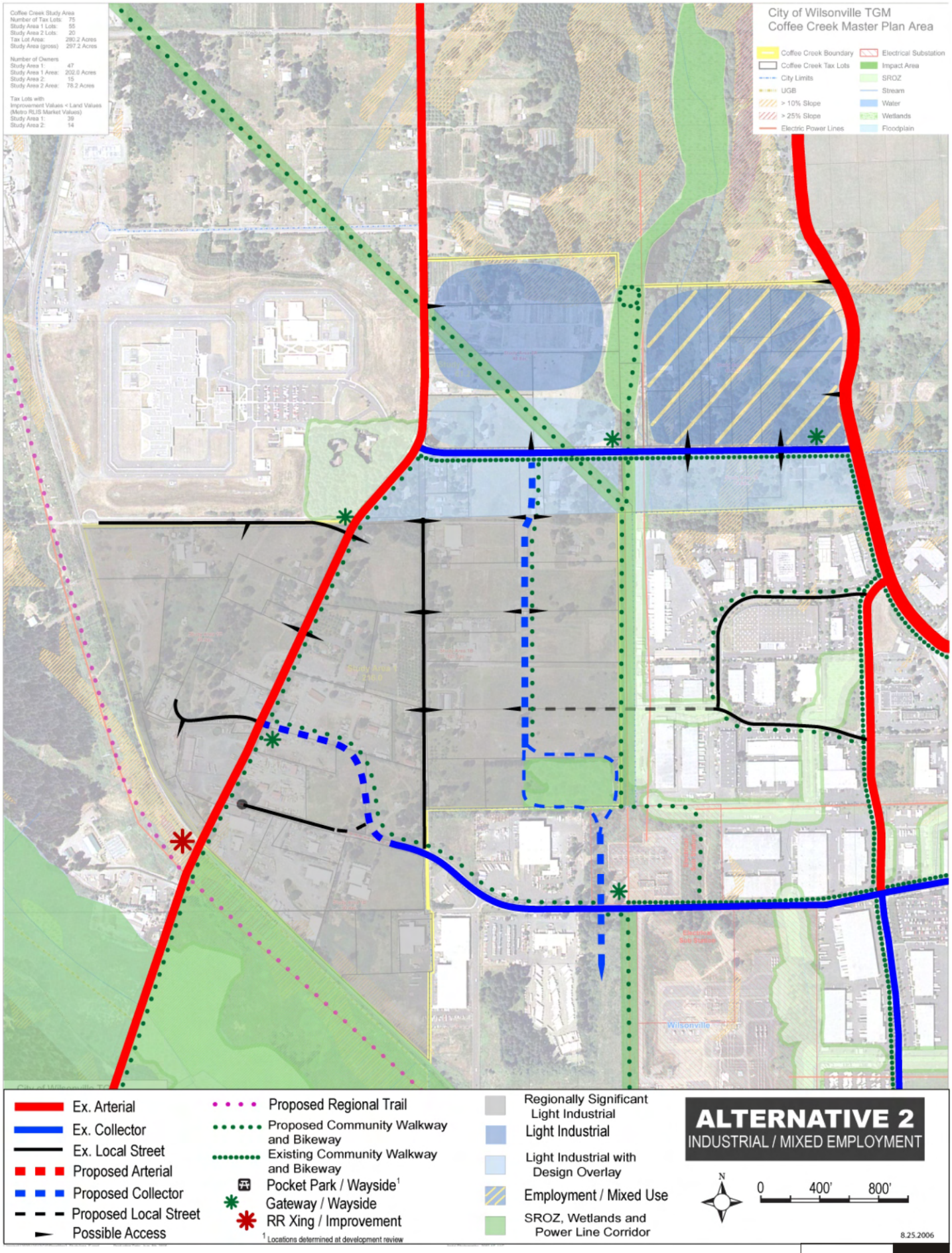

City of Wilsonville TGM
Coffee Creek Master Plan Area
Coffee Creek Boundary
Coffee Creek Tax Lots
City Limits
UGB
> 10% Slope
> 25% Slope
Electric Power Lines
Electrical Substation
Impact Area
SROZ
Stream
Water
Wetlands
Floodplain
Ex. Arterial
Ex. Collector
Ex. Local Street
Proposed Arterial
Proposed Collector
Proposed Local Street
Potential Access
Proposed Regional Trail
Proposed Community Walkway and Bikeway
Existing Community Walkway and Bikeway
Pocket Park / Wayside[1]
Gateway / Wayside
RR Xing / Improvement
[1] Locations determined at development review
Regionally Significant Light Industrial
Industrial
Industrial with Design Overlay
Employment / Mixed Use
SROZ, Wetlands and Power Line Corridor
ALTERNATIVE 1
INDUSTRIAL
N
0
400'
800'
8.25.2006

Figure 3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Ex. Arterial
Ex. Collector
Ex. Local Street
Proposed Arterial
Proposed Collector
Proposed Local Street
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RR Xing / Improvement
[1] Locations determined at development review
Regionally Significant Light Industrial
Light Industrial
Light Industrial with Design Overlay
Employment / Mixed Use
SROZ, Wetlands and Power Line Corridor
ALTERNATIVE 2
INDUSTRIAL / MIXED EMPLOYMENT
N
0
400'
800'
8.25.2006

Figure 4

Coffee Creek Master Plan Area - South of Day Road

The area south of Day Road that is within the Wilsonville UGB is considered a Regionally Significant Industrial Area (RSIA). A RSIA is defined by Metro as an area that is near the region's most significant transportation facilities for the movement of freight and other areas most suitable for movement and storage of goods. The area south of Day Road includes approximately 193 total acres with 164 gross build able acres. This area is projected to generate approximately 1,480 new jobs. The land use for the project area south of Day Road is summarized in Table 8. It should be noted that there are no differences in proposed land uses between Alternatives 1 and 2 for the master plan area south of Day Road.

Table 8: Coffee Creek Area South of Day Road Land Use Summary

Coffee Creek Area	Public Facilities*	Industrial	Service Commercial	Total
		Acres/Employment		
South of Day Road (Alternative 1 & 2)	29/-	154/1,390	10/90	193/1,480

** includes public right-of-way for arterial and collector roads, utilities, and parks.*

Coffee Creek Conceptual Area - North of Day Road

The Coffee Creek project area North of Day contains a portion of RSIA and therefore contains Industrial, as well as service commercial zoning. The project area north of Day Road encompasses approximately 74 total acres with approximately 55 build able acres under Alternative 1 and 65 build able acres under Alternative 2. Alternative 2 assumes approximately 10 additional acres could be developed compared to Alternative 1 because of a residential component of the project just west of Boones Ferry Road that has topography that would be conducive to residential development as compared to industrial. The area north of Day Road would produce between 260 and 420 jobs depending on the alternative. Table 9 compares the number of jobs and build able acres between each alternative.

Table 9: Coffee Creek Area North of Day Road Land Use Summary

Coffee Creek Area	Public Facilities*	Industrial	Service Commercial	Residential	Total
			Acres/Employment		
Alternative 1	8/-	44/395	3/25	-	55/420
Alternative 2	13/-	20/180	9/80	23/-	65/260

* includes public right-of-way for arterial and collector roads, utilities, and parks.

Trip Generation/Distribution

Trip generation was estimated using standard transportation planning trip generation rates based on research conducted by the Institute of Transportation Engineers[8] (ITE) for land use types similar to the proposed land uses within the Coffee Creek project area. The land use alternatives identified for the project area include industrial, service commercial, and residential. The estimated PM peak hour and weekday daily vehicle trip generation is summarized in Table 10. Trip generation information is provided for both the area south of Day Road (that is within the UGB) and the area north of Day Road (the conceptual area north of Day Road that is outside the UGB) to differentiate the level of trip generation potential for the project area. The Coffee Creek industrial area is estimated to generate between 17,200 and 19,300 daily vehicle trips depending on the alternative (approximately 13,000 for the area south of Day Road and between 4,300 and 6,300 for the area north of Day Road). The Coffee Creek project area south of Day Road generates approximately 67% to 75% of the total project trips based on land use potential in Alternatives 1 and 2 respectively.

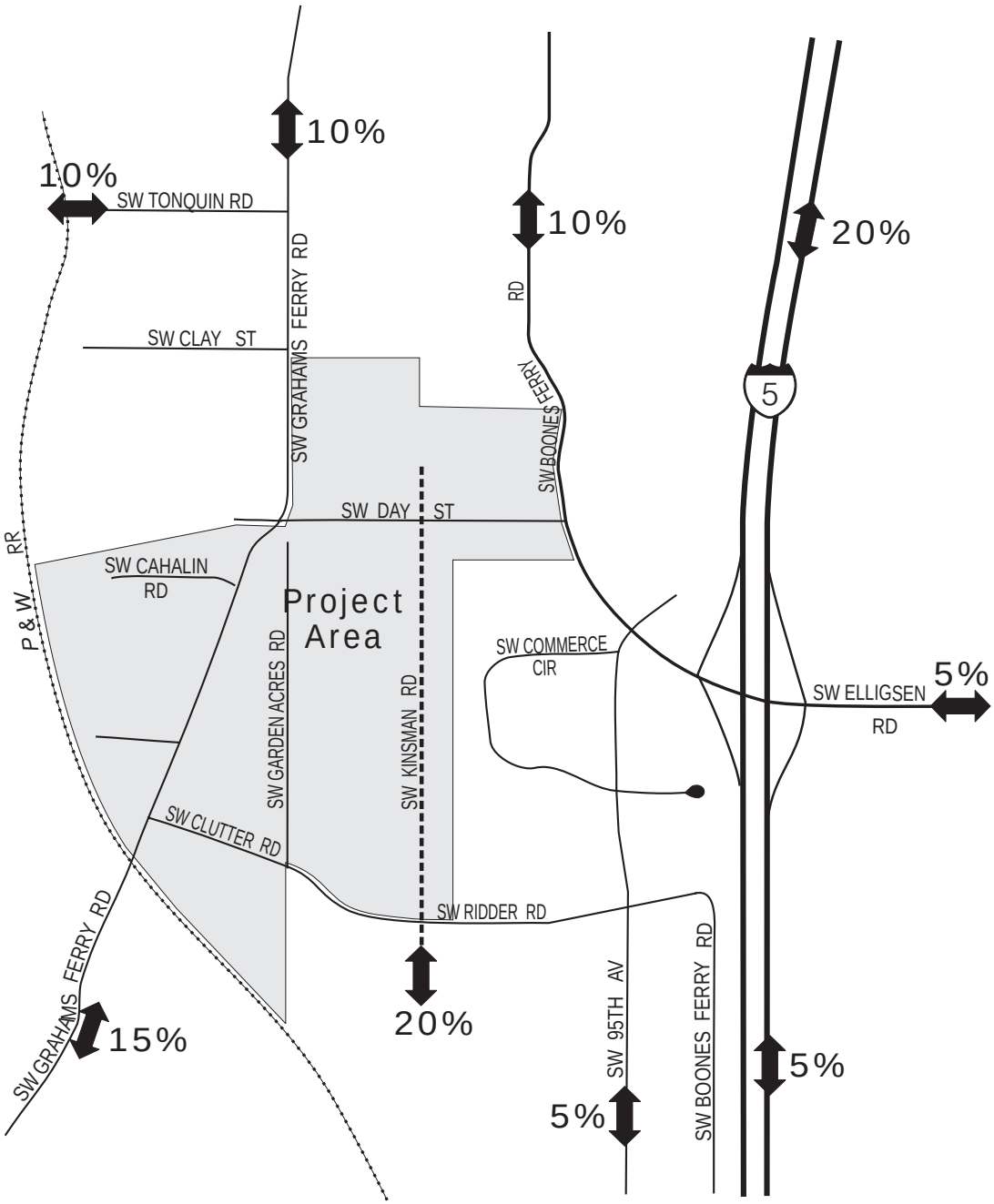
Table 10: Coffee Creek Industrial Area Trip Generation

Coffee Creek Master Plan Area - South of Day Road	PM Peak Hour			Weekday
	Total Trips	In	Out	Daily
Alternative 1 and 2*	1,681	345	1,336	12,935
Coffee Creek Conceptual Area - North of Day Road	**PM Peak Hour**			**Weekday**
	Total Trips	**In**	**Out**	**Daily**
Alternative 1	590	119	471	4,264
Alternative 2	631	216	415	6,332
Coffee Creek Total Area- North and South of Day Road	**PM Peak Hour**			**Weekday**
	Total Trips	**In**	**Out**	**Daily**
Total (North Alt. 1+South)	2,271	464	1,807	17,199
Total (North Alt. 2+South)	2,312	561	1,751	19,267

*Trip Generation for the project area south of Day Road is the same for both alternatives.

Vehicle trip distribution for the trips generated, as indicated in Table 10, to and from the potential Coffee Creek project area along the surrounding roadway network is summarized in Figure 5. The trip distribution was estimated using the 2030 PM peak hour travel demand model developed for the I-5 to 99W Connector Study. This particular model will be discussed more in detail in the following section (see Coffee Creek Future Travel Demand Forecasts). As illustrated, the majority of potential vehicle trips to the project area would originate and be destined north on I-5 as well as Kinsman Road (proposed Kinsman Road extension).

[8] *Trip Generation Manual, 7th Edition*, Institute of Transportation Engineers, 2003, Land Use Codes 130, 230, 710 and 814.



LEGEND

------ - Proposed Roadway

0% - Trip Distribution Percentage

DKS *Associates*
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 5

TRIP DISTRIBUTION

Coffee Creek Future Travel Demand Forecasts

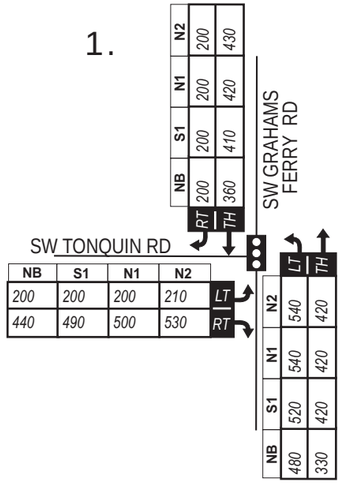
Future travel demand forecasting for the Coffee Creek study area utilized the latest 2030 model developed by Metro, Washington County, and DKS Associates for the I-5 to 99W Connector Study. As part of the model development for the I-5 to 99W Connector Study, the Wilsonville TSP travel demand model zone structure and network detail was used as a guideline to refine the regional model. The resulting travel demand model provides a forecast of background traffic growth based on the *2030 MetroScope* land use, estimation of trip distribution as previously mentioned for the Coffee Creek land areas, and assignment of trips to the roadway network based on congestion levels. Future 2030 PM peak hour volumes at study intersections were developed for the No Build and three Coffee Creek land uses scenarios by adjusting the travel demand model trip tables to reflect the trip rates listed in Table 10. These volumes were then used to analyze and determine future impacts from the proposed Coffee Creek industrial area on the planned roadway network. The future 2030 PM peak hour scenarios include:

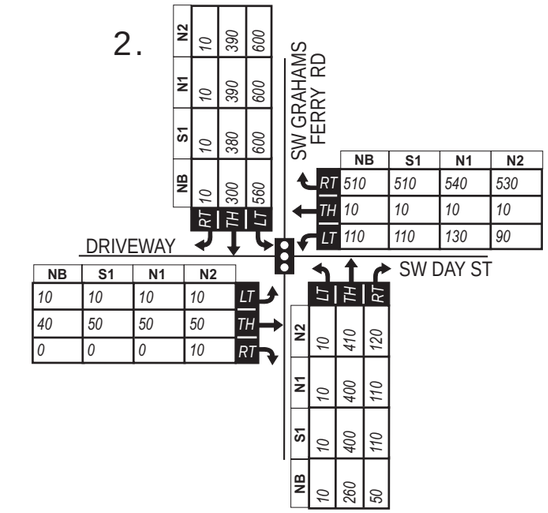
- 2030 No Build (no development in the Coffee Creek area)
- 2030 with Coffee Creek Master Plan Area South of Day (Alternative 1)
- 2030 with Coffee Creek Area North and South of Day (Alternative 1)
- 2030 with Coffee Creek Area North and South of Day (Alternative 2)

The 2030 future PM peak hour forecasts for each of the study area scenarios are shown in Figure 6.

Planned Study Area Roadway Improvements

The City of Wilsonville TSP and the Washington County TSP provide specific information regarding future transportation projects that were identified to meet needs created by future growth within the study area. Table 11 identifies the projects that were recommended specific to the project area. The only projects that have been assumed in the 2030 No Build scenario are those that have already been constructed as well as the Kinsman Road extension. The Kinsman Road project has been assumed for the No Build scenario since this project would be necessary to evaluate the future Kinsman Road study intersections at Day Road and Clutter Road. The remaining projects were not included in any of the future analysis scenarios in order to determine which scenario triggers the specific improvement need.





1\. SW Tonquin Rd / SW Grahams Ferry Rd

	NB	S1	N1	N2
SW Grahams Ferry Rd RT	200	200	200	200
SW Grahams Ferry Rd TH	360	410	420	430
SW Tonquin Rd LT	200	200	200	210
SW Tonquin Rd RT	440	490	500	530
SW Grahams Ferry Rd LT	480	520	540	540
SW Grahams Ferry Rd TH	330	420	420	420

2\. SW Grahams Ferry Rd / Driveway / SW Day St

	NB	S1	N1	N2
SW Grahams Ferry Rd RT	10	10	10	10
SW Grahams Ferry Rd TH	300	380	390	390
SW Grahams Ferry Rd LT	560	600	600	600
Driveway LT	10	10	10	10
Driveway TH	40	50	50	50
Driveway RT	0	0	0	10
SW Day St RT	510	510	540	530
SW Day St TH	10	10	10	10
SW Day St LT	110	110	130	90
SW Grahams Ferry Rd LT	10	10	10	10
SW Grahams Ferry Rd TH	260	400	400	410
SW Grahams Ferry Rd RT	50	110	110	120

3\. SW Kinsman Rd / SW Day St

	NB	S1	N1	N2
SW Kinsman Rd RT	0	0	10	10
SW Kinsman Rd TH	0	0	20	50
SW Kinsman Rd LT	10	10	40	60
SW Day St LT	0	0	20	20
SW Day St TH	630	660	630	690
SW Day St RT	90	100	110	80
SW Day St RT	10	10	50	60
SW Day St TH	460	420	420	420
SW Day St LT	180	220	220	210
SW Kinsman Rd LT	160	200	200	180
SW Kinsman Rd TH	0	20	20	40
SW Kinsman Rd RT	200	400	400	300

4\. SW Boones Ferry Rd / SW Day St

	NB	S1	N1	N2
SW Boones Ferry Rd RT	210	210	250	280
SW Boones Ferry Rd TH	830	780	730	730
SW Day St LT	280	310	240	360
SW Day St RT	460	710	830	690
SW Boones Ferry Rd LT	430	430	440	360
SW Boones Ferry Rd TH	720	740	740	750

5\. SW Boones Ferry Rd / Driveway / SW 95th Av

	NB	S1	N1	N2
Driveway RT	10	10	10	10
Driveway TH	10	10	10	10
Driveway LT	50	50	50	50
SW Boones Ferry Rd LT	10	10	10	10
SW Boones Ferry Rd TH	1130	1330	1410	1290
SW Boones Ferry Rd RT	150	150	140	110
SW Boones Ferry Rd RT	10	10	10	10
SW Boones Ferry Rd TH	940	960	970	910
SW Boones Ferry Rd LT	480	480	490	590
SW 95th Av LT	200	200	210	200
SW 95th Av TH	10	10	10	10
SW 95th Av RT	980	1020	1020	1160

6\. SW Boones Ferry Rd / I-5 SB On/Off-Ramps

	NB	S1	N1	N2
I-5 SB On/Off-Ramps RT	520	520	530	560
I-5 SB On/Off-Ramps LT	1040	1020	1010	1000
SW Boones Ferry Rd TH	1420	1610	1670	1690
SW Boones Ferry Rd RT	730	760	780	810
SW Boones Ferry Rd RT	470	470	470	470
SW Boones Ferry Rd TH	900	920	910	940

7\. SW Boones Ferry Rd / I-5 NB On/Off-Ramps

	NB	S1	N1	N2
SW Boones Ferry Rd TH	1620	1620	1630	1640
SW Boones Ferry Rd RT	830	1000	1040	1050
SW Boones Ferry Rd RT	1200	1170	1160	1160
SW Boones Ferry Rd TH	980	990	1000	1000
I-5 NB On/Off-Ramps LT	390	390	400	410
I-5 NB On/Off-Ramps RT	410	420	420	420

8\. SW Grahams Ferry Rd / Driveway / SW Clutter Rd

	NB	S1	N1	N2
SW Grahams Ferry Rd RT	10	10	10	10
SW Grahams Ferry Rd TH	450	430	440	350
SW Grahams Ferry Rd LT	190	130	130	270
Driveway LT	10	10	10	10
Driveway TH	10	10	10	40
Driveway RT	10	10	10	30
SW Clutter Rd RT	190	250	270	330
SW Clutter Rd TH	10	10	10	10
SW Clutter Rd LT	300	400	400	400
SW Grahams Ferry Rd LT	0	0	0	10
SW Grahams Ferry Rd TH	80	120	120	150
SW Grahams Ferry Rd RT	80	170	160	100

9\. SW Kinsman Rd / SW Ridder Rd

	NB	S1	N1	N2
SW Kinsman Rd RT	60	10	10	160
SW Kinsman Rd TH	170	350	390	400
SW Kinsman Rd LT	40	140	160	30
SW Ridder Rd LT	0	10	10	130
SW Ridder Rd TH	100	240	260	290
SW Ridder Rd RT	120	130	140	150
SW Ridder Rd RT	120	130	120	110
SW Ridder Rd TH	280	270	280	180
SW Ridder Rd LT	10	10	10	10
SW Kinsman Rd LT	100	100	100	120
SW Kinsman Rd TH	230	290	290	270
SW Kinsman Rd RT	30	10	10	10

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 6

2030 FUTURE PM PEAK HOUR TRAFFIC VOLUMES

Table 11: Study Area Planned Projects

TSP Project Number	Location	Description (Project Status)
Wilsonville #W-2	Boones Ferry Rd.	Widen Boones Ferry Road from 95th Avenue to Day Road to five lanes (this project has been constructed).
Wilsonville #W-16	Day Rd.	Widen Day Road to three lanes from Grahams Ferry Road to Boones Ferry Road (this project has been constructed).
Wilsonville #C-7 and #S-36	Kinsman Rd. Extension	Construct two-lane extension of Kinsman Road from RxR tracks to Ridder Road. Construct traffic signal at Kinsman Road/Day Road intersection. (these projects have not been constructed).
Wilsonville #C-24 and #S-18	Kinsman Rd. Extension	Construct two-lane extension of Kinsman Road from Ridder Road to Day Road. Construct left turn pockets on all approaches and a traffic signal (these projects have not been constructed).
Wilsonville #S-1	Grahams Ferry Rd/Day Rd Intersection	Install traffic signal (this traffic signal has been constructed).
Wilsonville #S-6	Boones Ferry Rd/Day Rd Intersection	Install traffic signal and northbound through lane (this project has been constructed).
Wilsonville #S-11	Boones Ferry Rd./95th Ave. Intersection	Construct eastbound right turn lane to create dual eastbound right turn lanes, restripe westbound approach for an additional left turn pocket (this project has not been constructed) and widen the Boones Ferry Road for a third eastbound through lane that drops at the I-5 southbound on ramp. (this project has not been constructed).
Washington County #131	Grahams Ferry Rd	Widen Grahams Ferry Road to three lanes from Tonquin to Cutter Rd and provide sidewalks (this project has not been constructed).
Washington County #132	Day St	Widen Day St. to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks (this project has been completed).
Washington County #133	Clutter/Ridder Rd	Widen Clutter/Ridder to three lanes from Grahams Ferry Road to Boones Ferry Road and provide sidewalks (this project has not been completed).
Washington County #138	Tonquin Rd	Widen and Realign Tonquin Rd from Grahams Ferry to Oregon St and provide sidewalks (this project has not been constructed).

Sources: Washington County Transportation System Plan, October 29, 2002
City of Wilsonville Transportation System Plan, Adopted June 2, 2003.

Future Year Operations Analysis

2030 No Build

In order to provide a baseline comparison to the future Coffee Creek alternatives, the 2030 No Build scenario evaluates future traffic volumes assuming the existing geometry and no development of the Coffee Creek project area beyond what currently exists today.

With the addition of 2030 No Build traffic volumes, four of the study area intersections would fail to meet operating standards. These intersections include Boones Ferry Road/95th Avenue, Boones Ferry Road/Day Road, Grahams Ferry Road/Tonquin Road and Grahams Ferry Road/Clutter Road. The 2030 No Build intersection operations are summarized in Table 12. Mitigations have been identified in Table 13 to improve the 2030 No Build intersection operations to meet the applicable standards.

Table 12: 2030 No Build Intersection Performance (PM Peak Hour)

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.6	B	0.80
I-5 Southbound Ramp/Boones Ferry-Elligsen	26.7	C	0.82
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	14.6	B	0.68
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	26.6	C	0.81
Kinsman Road/Ridder Road	17.3	B	0.42
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major street left turn level of service/minor street left turn level of service
V/C = Volume-to-capacity ratio for the worst approach.
Delay = Average vehicle delay in peak hour for worst approach

Table 13: 2030 No Build Mitigations (PM Peak Hour)

Intersection	Recommended Mitigation
Tonquin/SW Grahams Ferry Road	• Install eastbound left turn lane • Install northbound left turn lane • Install traffic signal
Day Road/Boones Ferry Road	• Construct a four lane roadway on Boones Ferry Road north of Day Road. • Restripe the northbound left turn pocket on Boones Ferry Road to provide additional storage.
Boones Ferry Road/95th Avenue	• Construct an eastbound right turn lane on 95th Avenue. The eastbound approach would consist of a shared through-left turn lane and dual right turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140. • Stripe a westbound separate left turn pocket on the private industrial park approach • Install median on 95th Avenue to modify the Commerce Circle north approach to 95th Avenue to right in and right out movements only. The median would provide for improved operation of the intersection and increased storage with the existing center turn lane being available for left and through movements. • Construct a second northbound left turn pocket on Boones Ferry Road at 95th Avenue. Additional widening for two southbound receiving lanes would be required on 95th Avenue to facilitate the dual left turns. The inside southbound through lane on 95th Avenue would utilize the existing shared center turn lane approximately 300 feet south of 95th Avenue. The roadway geometry within the vicinity of the Holiday Inn driveway would consist of one southbound though lane in addition to a through/left turn lane and one northbound through lane. Just south of this access (approximately 830' south of Boones Ferry Road), the two southbound lanes would merge into a single southbound through lane prior to the intersection at SW Commerce Circle. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Grahams Ferry Road/Clutter Road	• Construct a westbound left turn pocket on Clutter Road • Construct a southbound left turn pocket on Grahams Ferry Road • Construct a traffic signal

With the mitigations identified in Table 13, the intersections were reanalyzed to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "C" or better during the weekday PM peak hour. The 2030 No Build mitigated intersection performance is summarized in Table 14.

Table 14: 2030 No Build Mitigated Intersection Performance (PM Peak Hour)

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	24.3	C	0.75
Boones Ferry Road/Day Road	30.4	C	0.84
Grahams Ferry Road/Clutter Road	15.2	B	0.79
Grahams Ferry Road/Tonquin Road	32.3	C	0.86

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The operational analysis as previously shown in Tables 12 and 14 is based on an isolated intersection evaluation which means that each study intersection was evaluated independently. In order to evaluate the entire Stafford Road interchange area, the SimTraffic™ simulation model was utilized to provide a system wide assessment of traffic operating conditions on the Elligsen Road corridor. This simulation is especially important within the Elligsen Road interchange area because of the pre-existing non-conforming intersection spacing on Boones Ferry Road between the I-5 southbound interchange ramp and 95th Avenue where queuing from one intersection could affect an adjacent intersection (as occurs today on Boones Ferry Road between the I-5 southbound ramp and 95th Avenue during the AM peak period).

Queuing analysis was performed for the future mitigated No Build alternative using SimTraffic™, which estimates the 95th percentile queue for each approach movement at signalized intersections. This 95th percentile queue estimates that for any given cycle at a signalized intersection, the queue length calculated is representative of 95 percent of the peak fifteen minute vehicular queues during the peak hour at that intersection.

Under the mitigated No Build alternative, one of the estimated vehicle queues would exceed the available storage that would be provided under this alternative. The northbound left turn lane on Boones Ferry Road at Day Road would need to be lengthened to provide at least 400 feet of storage under this scenario in order to prevent queues from spilling back into downstream intersections. Table 15 summarizes the available storage for key intersection movements within the Stafford Road interchange area compared to the results of the vehicle queuing analysis.

Table 15: 2030 Mitigated No Build 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200’	400’	**Yes**
	NB Through	825’	250’	No
	SB Through	>2,000’	1,200’	No
	EB Left	>750’	500’	No
	EB Right	1,500’	500’	No
Boones Ferry Road/95th Avenue	EB Left	TBD	275’	No
	EB Right	TBD	525’	No
	NB Left	400’	350’	No
	NB Through	400’	250’	No
	SB Through	825’	800’	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500’	325’	No
	SB Right	500’	300’	No
	EB Through	400’	350’	No
	WB Through	>1,500’	425’	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500’	425’	No
	WB Through	425’	275’	No
	NB Right	325’	250’	No
	NB Left	325’	200’	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Master Plan Area South of Day Road (Alternative 1)

The following scenario evaluated project traffic from the Coffee Creek Master Plan area south of Day Road. Based on the forecasted traffic volumes for this scenario, five of the study area intersections would fail to meet operating standards. The future 2030 with Coffee Creek Master Plan area intersection operations are summarized in Table 16. Mitigations have been identified for the five failing intersections in Table 17 which would be needed in order to meet the applicable operating standards.

Table 16: 2030 with Coffee Creek Master Plan Area South of Day Road Alternative 1 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.6	B	0.79
I-5 Southbound Ramp/Boones Ferry-Elligsen	26.8	C	0.88
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	23.9	C	0.81
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	64.4	**E**	**>1.0**
Kinsman Road/Ridder Road	22.0	C	0.58
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major street left turn level of service/minor street left turn level of service
V/C = Volume-to-capacity ratio for the worst approach.
Delay = Average vehicle delay in peak hour for worst approach

Table 17: 2030 with Coffee Creek Master Plan Area South of Day Road- Alternative 1 Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 17, the intersections were reevaluated to determine the intersection operations with the identified improvements in place. With the indicated mitigations, all of the study area intersections would operate at an acceptable level of service "C" or better and have capacity for future growth. The 2030 with Coffee Creek Master Plan area south of Day Road mitigated intersection performance is summarized in Table 18.

Table 18: 2030 with Coffee Creek Master Plan Area South of Day Road Alternative 1 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	22.2	C	0.75
Boones Ferry Road/Day Road	31.4	C	0.87
Kinsman Road/Day Road	34.7	C	0.89
Grahams Ferry Road/Clutter Road	16.0	B	0.82
Grahams Ferry Road/Tonquin Road	38.4	C	0.91

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek Master Plan Area south of Day Road Alternative 1 was evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. This evaluation determined that a third southbound through lane would be needed on Boones Ferry Road from Day Road to the I-5 southbound ramp (as discussed in Table 17). The third southbound through lane is consistent with prior findings in the City's TSP. With the mitigations shown in Table 17, all of the vehicular movements would operate within estimated storage with the exception of the northbound left turn movement on Boones Ferry Road at Day Road. This turn pocket would need to be extended to provide adequate storage for this movement during the PM peak hour (see Field Observation/Queuing section on page 7 for mitigation recommendations). Table 19 summarizes the available storage as compared to 95th percentile queue lengths for key intersection movements within the Stafford Road interchange area.

Table 19: 2030 with Coffee Creek Master Plan Area South of Day Road Alternative 1 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	450'	**Yes**
	NB Through	825'	300'	No
	SB Through	>2,000'	600'	No
	EB Left	>750'	400'	No
	EB Right	1,500'	400'	No
Boones Ferry Road/95th Avenue	EB Left	TBD	225'	No
	EB Right	TBD	450'	No
	NB Left	400'	275'	No
	NB Through	400'	200'	No
	SB Through	825'	625'	No
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	375'	No
	SB Right	500'	350'	No
	EB Through	400'	400'	No
	WB Through	>1,500'	250'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	600'	No
	WB Through	425'	400'	No
	NB Right	325'	300'	No
	NB Left	325'	200'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Areas North & South of Day Road (Alternative 1)

The following scenario evaluates project traffic with respect to the Coffee Creek areas north and south of Day Road utilizing the Alternative 1 roadway network. Based on the forecasted traffic volumes for this scenario, the same study area intersections would fail to meet operating standards as were identified for the analysis of the Coffee Creek area south of Day Road. The intersection operations for this scenario are summarized in Table 20. Mitigations have been identified for the failing intersections in Table 21 that would be needed in order for them to meet the applicable operating standards.

Table 20: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.7	B	0.79
I-5 Southbound Ramp/Boones Ferry-Elligsen	27.1	C	0.91
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	26.3	C	0.84
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	63.9	**E**	**>1.0**
Kinsman Road/Ridder Road	23.0	C	0.61
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major street left turn level of service/minor street left turn level of service
V/C = Volume-to-capacity ratio for the worst approach.
Delay = Average vehicle delay in peak hour for worst approach

Table 21: 2030 with Coffee Creek North and South of Day Road Alternative 1 Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road/Day Road	• Construct dual eastbound right turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 21, the intersections were reevaluated to determine the intersection operations with the identified improvements. With the mitigations in place, all of the study area intersections would operate at an acceptable level of service "C" or better during the PM peak hour. The 2030 with Coffee Creek areas north and south of Day Road mitigated intersection performance is summarized in Table 22.

Table 22: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	25.7	C	0.77
Boones Ferry Road/Day Road	26.6	C	0.80
Kinsman Road/Day Road	31.0	C	0.91
Grahams Ferry Road/Clutter Road	16.2	B	0.82
Grahams Ferry Road/Tonquin Road	41.8	D	0.93

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek areas north and south of Day Road (Alternative 1) was evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. With the mitigations outlined in Table 17, the majority of vehicular movements would operate within estimated storage with the exception of three critical movements at three study intersections. At the intersection of Boones Ferry Road/Day Road the northbound left turn queue would continue to exceed the available storage for this movement. As noted previously, the northbound left turn pocket could be extended by removing the reverse curve along Boones Ferry Road between the left turn lanes at the intersections of Day Road and 95th Avenue and connecting the left turn lanes with shared left turn lane striping.

Additionally, queuing would spill back along Boones Ferry Road from the intersection of Boones Ferry Road/I-5 southbound ramp to 95th Avenue and Day Road, thus impacting normal operations at these intersections. Table 23 summarizes the available storage as compared to 95th percentile queue lengths for key movements within the Stafford interchange area. No additional mitigations would be feasible on Boones Ferry Road between the I-5 southbound ramp and Day Road to improve the queuing since three southbound through lanes were already considered in this analysis. Additional city-wide or regional improvements would be needed to provide sufficient capacity to support the concept area north of Day Road.

Table 23: 2030 with Coffee Creek Areas North and South of Day Road Alternative 1 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	>200	**Yes**
	NB Through	825'	400'	No
	SB Through	>2,000'	1,700'	No
	EB Left	>750'	575'	No
	EB Right	1,500'	600'	No
Boones Ferry Road/95th Avenue	EB Left	TBD	250'	No
	EB Right	TBD	425'	No
	NB Left	400'	350'	No
	NB Through	400'	250'	No
	SB Through	825'	>825'	**Yes**
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	425'	No
	SB Right	500'	350'	No
	EB Through	400'	>400'	**Yes**
	WB Through	>1,500'	275'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	550'	No
	WB Through	425'	275'	No
	NB Right	325'	275'	No
	NB Left	325'	225'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

2030 with Coffee Creek Areas North & South of Day Road (Alternative 2)

The following scenario evaluates project traffic from the Coffee Creek areas north and south of Day Road with the Alternative 2 roadway network. Based on the forecasted traffic volumes for this scenario, five study area intersections would fail to meet operating standards. The intersection operations for this scenario are summarized in Table 24. Mitigations have been identified for the failing intersections in Table 25 to meet the applicable operating standards.

This alternative includes an extension of Commerce Circle to the future Kinsman Road extension. Based on the traffic forecasts as shown in Figure 5, this roadway project would increase the westbound left turns from Boones Ferry Road to 95th Avenue as well as the northbound right turns from 95th Avenue to Boones Ferry Road. Since this project would be expensive to construct and would not significantly benefit traffic operations, this network connection would not be recommended.

Table 24: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Intersection Performance

	PM Peak Hour		
Intersection	**Delay**	**LOS**	**V/C**
Signalized			
I-5 Northbound Ramp/Boones Ferry-Elligsen	12.6	B	0.78
I-5 Southbound Ramp/Boones Ferry-Elligsen	27.6	C	0.94
Boones Ferry Road/95th Avenue	**>80**	**F**	**>1.0**
Grahams Ferry Road/Day Road	29.7	C	0.85
Boones Ferry Road/Day Road	**>80**	**F**	**>1.0**
Kinsman Road/Day Road	46.0	D	**>1.0**
Kinsman Road/Ridder Road	29.0	C	0.77
Unsignalized			
Grahams Ferry Road/Clutter Road	**>50**	**A/F**	**>1.0**
Grahams Ferry Road/Tonquin Road	**>50**	**A/F**	**>1.0**

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.
Unsignalized Intersection LOS:
A/A = Major street left turn level of service/minor street left turn level of service
V/C = Volume-to-capacity ratio for the worst approach.
Delay = Average vehicle delay in peak hour for worst approach

Table 25: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct northbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Commerce Circle Extension	• Extend Commerce Circle to the future Kinsman Road Extension (This improvement is included as part of the Alternative 2 roadway network and is not recommended).
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

It should be noted that the following mitigations are in addition to the improvements identified for the 2030 No Build scenario as shown in Table 13.

With the mitigations identified in Table 25, the intersections were reevaluated to determine the intersection operations with the identified improvements. With the mitigations, all of the study area intersections would operate at an acceptable level of service "D" or better. The 2030 with Coffee Creek areas north and south of Day Road mitigated intersection performance is summarized in Table 26.

Table 26: 2030 with Coffee Creek Areas North and South of Day Road Alternative 2 Mitigated Intersection Performance

	PM Peak Hour		
Signalized Intersection	**Delay**	**LOS**	**V/C**
Boones Ferry Road/95th Avenue	25.2	C	0.79
Boones Ferry Road/Day Road	30.2	C	0.81
Kinsman Road/Day Road	31.1	C	0.92
Grahams Ferry Road/Clutter Road	28.0	C	0.94
Grahams Ferry Road/Tonquin Road	43.8	D	0.94

Signalized Intersection LOS:
LOS = Level of service
Delay = Average vehicle delay in peak hour for entire intersection
V/C = Demand or Volume-to-capacity ratio.

The future 2030 with the Coffee Creek areas north and south of Day Road (Alternative 2) were evaluated with SimTraffic™ to determine if queuing impacts would affect the operations of adjacent intersections based on a system wide evaluation. With the mitigations shown in Table 25, extensive queuing would continue to spill back along Boones Ferry Road from the intersection of Boones Ferry Road/I-5 southbound ramp through 95th Avenue, and back to Day Road. This queuing along southbound Boones Ferry Road would also create large queues along the eastbound and southbound approaches at the intersection of Boones Ferry Road/Day Road. No additional mitigations would be feasible on Boones Ferry Road between the I-5 southbound ramp and Day Road to improve the queuing since three southbound through lanes were already considered in this analysis. Additional city-wide or regional improvements would be needed to provide sufficient capacity to support the concept area north of Day Road.

Furthermore, the northbound left turn movement at the intersection of Boones Ferry Road/Day Road would continue to extend beyond the available storage. The I-5 southbound ramp would have queuing that exceeds the available storage pockets but would not impact the I-5 mainline freeway. Table 27 summarizes the available storage for key movements within the Stafford interchange area.

Table 27: 2030 with Coffee Creek North and South of Day Road Alternative 2 Mitigated 95th Percentile Queuing Summary (PM Peak Hour)

Intersection	Movement	Available Storage	95th Percentile Estimated Queue	Exceeds Storage
Boones Ferry Road/Day Road	NB Left	200'	>200'	**Yes**
	NB Through	825'	225'	No
	SB Through	>2,000'	1,450'	No
	EB Left	>750'	>750'	**Yes**
	EB Right	1,500'	>1500	**Yes**
Boones Ferry Road/95th Avenue	EB Left	TBD	300'	No
	EB Right	TBD	650'	No
	NB Left	400'	>400'	**Yes**
	NB Through	400'	400'	No
	SB Through	825'	>825'	**Yes**
Boones Ferry Road/I-5 Southbound Ramp	SB Left	500'	>500'	**Yes**
	SB Right	500'	450'	No
	EB Through	400'	>400'	**Yes**
	WB Through	>1,500'	275'	No
Elligsen Road/I-5 Northbound Ramp	EB Through	>1,500'	600'	No
	WB Through	425'	425'	No
	NB Right	325'	275'	No
	NB Left	325'	225'	No

TBD- These future turn lanes would be constructed as part of the mitigated scenario and therefore the pocket lengths could be sized as needed.

Coffee Creek Safety Improvements

There are several safety related improvements that are needed within the Coffee Creek project area that will be needed to meet current standards. The first improvement is the Grahams Ferry Road grade separated railroad crossing that is located approximately 350 feet south of Clutter Road. This crossing is narrow (approximately 22 feet) and restricts sight distance at the Clutter Road intersection in the southbound direction. Either the railroad crossing needs to be improved to provide safe sight distance and a wider cross section or Clutter Road will need to be realigned further to the north (see alignment shown for Alternative 2. If the railroad crossing is improved, it should be widened consistent with City Minor Arterial standards.

The second safety improvement is the horizontal curve on Boones Ferry Road approximately 400 feet north of Day Road. This segment was identified for widening to a 4-lane section north of Day Road as part of the 2030 No Build scenario. The horizontal curve should be improved as part of the capacity related improvements to Boones Ferry Road north of Day Road that were identified for the 2030 No Build scenario. The safety related improvements are summarized in Table 28.

Table 28: Coffee Creek Safety Improvements

Safety Improvement	Recommendation
Grahams Ferry Road Grade Separated Railroad Crossing	• Reconstruct Grade Separated Railroad Crossing to City of Wilsonville Minor Arterial standards.
Clutter Road/Grahams Ferry Road Intersection Sight Distance	• Realign Clutter Road to the North as shown in Alternative 2.
Boones Ferry Road Horizontal Curve	• As part of the Boones Ferry Road widening, bring horizontal curve up to current standards.

Summary

The transportation impacts of future traffic associated with the Coffee Creek Industrial Area has been investigated in the preceding report. The primary findings and recommendations are summarized in the following sections.

Recommended Mitigation Measures

To maintain adequate traffic performance standards within the study area during the PM peak period, mitigation measures are necessary to reduce the negative transportation impacts of future traffic growth.

Non-Project Oriented Transportation Mitigation (No Build and Safety)

The following measures are related to estimated traffic growth on study area roadways. These mitigations would be necessary even without development of the Coffee Creek industrial area. Additional traffic safety related mitigations have been identified as well within the study area. Non-project oriented mitigations are summarized in Table 29.

Table 29: 2030 No Build and Safety Related Mitigations (PM Peak Hour)

Intersection	Recommended Mitigation
Tonquin/SW Grahams Ferry Road	• Install eastbound left turn lane • Install northbound left turn lane • Install traffic signal
Day Road/Boones Ferry Road	• Construct a four-lane roadway on Boones Ferry Road north of Day Road. • Restripe the northbound left turn pocket on Boones Ferry Road to provide additional storage.
Kinsman Rd. Extension	• Construct two-lane extension of Kinsman Road from RxR tracks to Day Road. • Construct traffic signals at Kinsman Road/Day Road and Kinsman Road/Ridder Road intersections. • Construct left turn pockets on all approaches at the Kinsman Road/Ridder Road intersection.
Boones Ferry Road/95th Avenue	• Construct an eastbound right turn lane on 95th Avenue. The eastbound approach would consist of a shared through-left turn lane and dual right turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140. • Stripe a westbound separate left turn pocket on the private industrial park approach • Install median on 95th Avenue to modify the Commerce Circle north approach to 95th Avenue to right in and right out movements only. The median would provide for improved operation of the intersection and increased storage with the existing center turn lane being available for left and through movements. • Construct a second northbound left turn pocket on Boones Ferry Road at 95th Avenue. Additional widening for two southbound receiving lanes would be required on 95th Avenue to facilitate the dual left turns. The inside southbound through lane on 95th Avenue would utilize the existing shared center turn lane approximately 300 feet south of 95th Avenue. The roadway geometry within the vicinity of the Holiday Inn driveway would consist of one southbound though lane in addition to a through/left turn lane and one northbound through lane. Just south of this access (approximately 830' south of Boones Ferry Road), the two southbound lanes would merge into a single southbound through lane prior to the intersection at SW Commerce Circle. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.

Grahams Ferry Road/Clutter Road	• Construct a westbound left turn pocket on Clutter Road • Construct a southbound left turn pocket on Grahams Ferry Road • Construct a traffic signal

Safety Improvement	Recommendation
Grahams Ferry Road Grade Separated Railroad Crossing	• Reconstruct Grade Separated Railroad Crossing to City of Wilsonville Minor Arterial standards.
Clutter Road/Grahams Ferry Road Intersection Sight Distance	• Realign Clutter Road to the North as shown in Alternative 2.
Boones Ferry Road Horizontal Curve	• As part of the Boones Ferry Road widening, bring horizontal curve up to current standards.

Coffee Creek Master Plan Area Oriented Transportation Mitigation

The following measures as shown in Table 30 are related to the impacts of the proposed Coffee Creek Master Plan area south of Day Road. The mitigations as shown are in addition to the improvements identified for the 2030 No build scenario.

Table 30: Coffee Creek Master Plan Area South of Day Road Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct southbound left turn pocket
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

Coffee Creek Concept Area Oriented Transportation Mitigation

The following measures as shown in Tables 31 and 32 are related to the impacts of the proposed Coffee Creek conceptual area north of Day Road dependant upon. Table 31 summarizes the mitigation measures for Alternative 1 and Table 32 summarized the mitigation measures for Alternative 2. The main difference between the two alternatives is that Alternative 1 would require dual eastbound right turn lanes on Day Road at Boones Ferry Road and Alternative 2 would require the extension of Commerce Circle to the future Kinsman Road extension. The mitigations as shown are in addition to the improvements identified for the 2030 No build scenario.

Although the mitigation measures outlined in Tables 31 and 32 would improve intersection operations to meet operational requirements based on isolated intersection capacity analysis, the additional project

traffic from the Coffee Creek concept area north of Day Road would cause significant queuing along Boones Ferry Road between the I-5 southbound ramp and Day Road. No additional mitigations would be feasible on Boones Ferry Road between the I-5 southbound ramp and Day Road to improve the queuing since three southbound through lanes were already considered in this analysis. Additional city-wide or regional improvements would be needed to provide sufficient capacity for the concept area north of Day Road to be developed.

Table 31: 2030 with Coffee Creek Master Plan and Concept Areas (Alternative 1) Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct southbound and southbound left turn pockets
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road/Day Road	• Construct dual eastbound right turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

Table 32: 2030 with Coffee Creek Master Plan and Concept Areas (Alternative 2) Mitigations

Intersection/Roadway	Recommended Mitigation
Day Road/Kinsman Road	• Construct southbound and southbound left turn pockets
Grahams Ferry Road/Day Road	• Construct dual southbound left turn lanes. The multiple turn lanes shall conform to the requirements for multiple turn lanes on state facilities as specified in OAR 734-020-0140.
Commerce Circle Extension	• Extend Commerce Circle to the future Kinsman Road Extension (This improvement is included as part of the Alternative 2 roadway network).
Boones Ferry Road	• Construct a third southbound through lane on Boones Ferry Road from Day Road that would drop at the I-5 southbound on-ramp. The existing southbound right turn lane on Boones Ferry Road at 95th Avenue could be removed at the time the third through lane is constructed.

Continued Analysis

It should be noted that this Coffee Creek industrial area analysis considered only Future 2030 PM peak hour operating conditions within the study area. As discussed in the field observation/queuing section, queuing from the Boones Ferry Road/95th Avenue intersection routinely spills back to the I-5 southbound ramp and can occasionally back up to the I-5 mainline freeway during the AM peak period. In order to ensure adequate system wide operations within the study area with the mitigation measures outlined for PM peak hour, analysis of AM peak hour operating conditions should be considered This AM analysis could be done as part of a future TSP amendment or could be completed as part of the design of future improvements that are currently being evaluated at the intersection of 95th Avenue and Boones Ferry Road by the City and ODOT.

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Appendix

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LOS Description

TRAFFIC LEVELS OF SERVICE

Analysis of traffic volumes is useful in understanding the general nature of traffic in an area, but by itself indicates neither the ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of *level of service* (LOS) has been developed to subjectively describe traffic performance. Level of service can be measured at intersections and along key roadway segments.

Level of service categories are similar to report card ratings for traffic performance. Intersections are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is generally diminished in their vicinities. Levels of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection. Most urban communities set level of service D as the minimum acceptable level of service for peak hour operation and plan for level of service C or better for all other times of the day. The *Highway Capacity Manual* provides level of service calculation methodology for both intersections and arterials[1]. The following sections provide interpretations of the analysis approaches.

[1] *Highway Capacity Manual 2000*, Transportation Research Board, Washington D.C., 2000, Chapters 16 and 17.

UNSIGNALIZED INTERSECTIONS (ALL-WAY STOP CONTROLLED)

Unsignalized intersections and all-way stop controlled intersections are each subject to a separate capacity analysis methodology. All-way stop controlled intersection operations are reported by leg of the intersection.

This method calculates a delay value for each approach to the intersection. The *2000 Highway Capacity Manual 2000* describes the detailed methodology. The following table describes the amount of delay associated with each level of service.

Level of Service	Delay (seconds)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Source: *Highway Capacity Manual 2000*, Exhibit 17-22

UNSIGNALIZED INTERSECTIONS (TWO-WAY STOP CONTROLLED)

Unsignalized intersection level of service is reported for the major street and minor street (generally, left turn movements). The method assesses available and critical gaps in the traffic stream which make it possible for side street traffic to enter the main street flow. The *Highway Capacity Manual 2000* describes the detailed methodology. It is not unusual for an intersection to experience level of service E or F conditions for the minor street left turn movement. It should be understood that, often, a poor level of service is experienced by only a few vehicles and the intersection as a whole operates acceptably.

Unsignalized intersection levels of service are described in the following table.

Level of Service	Delay (sec/veh)	Expected Delay
A	0 – 10	Little or no delay
B	> 10 – 15	Short traffic delays
C	> 15 – 25	Average traffic delays
D	> 25 – 35	Long traffic delays
E	> 35 – 50	Very long traffic delays
F	> 50	Extreme delays potentially affecting other traffic movements in the intersection

Source: *Highway Capacity Manual 2000*, Exhibit 17-2

SIGNALIZED INTERSECTIONS

For signalized intersections, level of service is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay (or signal delay) includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In previous versions of this chapter of the *HCM* (1994 and earlier), delay included only stopped delay. As delay increases, the level of service decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control. The *Highway Capacity Manual 2000* provides the basis for these calculations.

Level of Service	Delay (sec/veh)	Description
A	0 – 10	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication. Most vehicles do not stop at all. Progression is extremely favorable and most vehicles arrive during the green phase.
B	> 10 – 20	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles. This level generally occurs with good progression, short cycle lengths, or both.
C	> 20 – 35	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized. Most drivers feel somewhat restricted. Higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, and the number of vehicles stopping is significant.
D	> 35 – 55	**Approaching Unstable/Tolerable Delays:** The influence of congestion becomes more noticeable. Drivers may have to wait through more than one red signal indication. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. The proportion of vehicles not stopping declines, and individual cycle failures are noticeable.
E	> 55 – 80	**Unstable Operation/Significant Delays:** Volumes at or near capacity. Vehicles may wait though several signal cycles. Long queues form upstream from intersection. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are a frequent occurrence.
F	> 80	**Forced Flow/Excessive Delays:** Represents jammed conditions. Queues may block upstream intersections. This level occurs when arrival flow rates exceed intersection capacity, and is considered to be unacceptable to most drivers. Poor progression, long cycle lengths, and v/c ratios approaching 1.0 may contribute to these high delay levels.

Source: *Highway Capacity Manual 2000*, Exhibit 16-2

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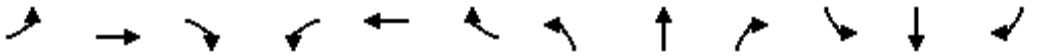
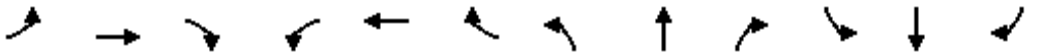
LOS Calculations



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	0.97
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.86			0.99		1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00			0.97		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1595	1314			1538		1697	3314			3167	1457
Flt Permitted	0.75	1.00			0.33		0.95	1.00			1.00	1.00
Satd. Flow (perm)	1251	1314			525		1697	3314			3167	1457
Volume (vph)	68	13	259	11	3	2	613	602	58	0	593	78
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	81	15	308	13	4	2	730	717	69	0	706	93
RTOR Reduction (vph)	0	275	0	0	2	0	0	4	0	0	0	46
Lane Group Flow (vph)	81	48	0	0	17	0	730	782	0	0	706	47
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			3
Heavy Vehicles (%)	13%	23%	24%	18%	0%	50%	10%	8%	0%	0%	14%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	10.2	10.2			10.2		53.0	76.8			19.8	19.8
Effective Green, g (s)	10.2	10.2			10.2		53.0	76.8			19.8	19.8
Actuated g/C Ratio	0.11	0.11			0.11		0.56	0.81			0.21	0.21
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	134	141			56		947	2679			660	304
v/s Ratio Prot		0.04					c0.43	0.24			c0.22	
v/s Ratio Perm	c0.06				0.03							0.03
v/c Ratio	0.60	0.34			0.31		0.77	0.29			1.07	0.15
Uniform Delay, d1	40.5	39.3			39.1		16.3	2.3			37.6	30.8
Progression Factor	1.00	1.00			1.00		1.46	2.27			0.83	0.77
Incremental Delay, d2	7.5	1.4			3.1		5.2	0.2			52.6	0.2
Delay (s)	48.0	40.7			42.2		29.0	5.4			84.0	24.0
Level of Service	D	D			D		C	A			F	C
Approach Delay (s)		42.2			42.2			16.8			77.0	
Approach LOS		D			D			B			E	

Intersection Summary			
HCM Average Control Delay	38.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

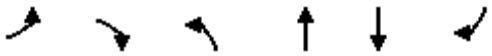


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95					0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00					1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00					1.00	1.00	1.00
Frt		1.00	0.85		1.00					1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00					0.95	0.95	1.00
Satd. Flow (prot)		3139	1352		3343					1649	1649	1455
Flt Permitted		1.00	1.00		1.00					0.95	0.95	1.00
Satd. Flow (perm)		3139	1352		3343					1649	1649	1455
Volume (vph)	0	695	212	0	564	0	0	0	0	727	0	873
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	790	241	0	641	0	0	0	0	826	0	992
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	790	241	0	641	0	0	0	0	413	413	992
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	15%	17%	0%	8%	0%	0%	0%	0%	4%	0%	11%
Turn Type			Free			Free				Split		Free
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						Free
Actuated Green, G (s)		60.0	95.0		60.0					26.0	26.0	95.0
Effective Green, g (s)		61.0	95.0		61.0					26.0	26.0	95.0
Actuated g/C Ratio		0.64	1.00		0.64					0.27	0.27	1.00
Clearance Time (s)		5.0			5.0					4.0	4.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		2016	1352		2147					451	451	1455
v/s Ratio Prot		0.25			0.19					c0.25	0.25	
v/s Ratio Perm			0.18									c0.68
v/c Ratio		0.39	0.18		0.30					0.92	0.92	0.68
Uniform Delay, d1		8.1	0.0		7.5					33.4	33.4	0.0
Progression Factor		0.42	1.00		1.77					1.00	1.00	1.00
Incremental Delay, d2		0.2	0.1		0.3					23.1	23.1	2.6
Delay (s)		3.6	0.1		13.6					56.5	56.5	2.6
Level of Service		A	A		B					E	E	A
Approach Delay (s)		2.8			13.6			0.0			27.1	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95			0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00			1.00	1.00	1.00		1.00			
Flpb, ped/bikes		1.00			1.00	1.00	1.00		1.00			
Frt		1.00			1.00	0.85	1.00		0.85			
Flt Protected		1.00			1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3406			3282	1482	3273		1553			
Flt Permitted		1.00			1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3406			3282	1482	3273		1553			
Volume (vph)	0	1191	0	0	281	359	399	0	257	0	0	0
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)	0	1267	0	0	299	382	424	0	273	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1267	0	0	299	382	424	0	273	0	0	0
Confl. Peds. (#/hr)							3					
Heavy Vehicles (%)	0%	6%	0%	0%	10%	9%	7%	0%	4%	0%	0%	0%
Turn Type			Free			Free	Prot		Free			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		68.9			68.9	95.0	17.1		95.0			
Effective Green, g (s)		69.9			69.9	95.0	17.1		95.0			
Actuated g/C Ratio		0.74			0.74	1.00	0.18		1.00			
Clearance Time (s)		5.0			5.0		4.0					
Vehicle Extension (s)		3.0			3.0		3.0					
Lane Grp Cap (vph)		2506			2415	1482	589		1553			
v/s Ratio Prot		c0.37			0.09		c0.13					
v/s Ratio Perm						0.26			0.18			
v/c Ratio		0.51			0.12	0.26	0.72		0.18			
Uniform Delay, d1		5.3			3.6	0.0	36.7		0.0			
Progression Factor		0.66			1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.5			0.0	0.4	4.2		0.2			
Delay (s)		4.0			3.7	0.4	40.9		0.2			
Level of Service		A			A	A	D		A			
Approach Delay (s)		4.0			1.8			25.0			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	46	365	238	112	124	17
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	55	440	287	135	149	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	868	160	170			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	868	160	170			
tC, single (s)	6.5	6.4	4.4			
tC, 2 stage (s)						
tF (s)	3.6	3.5	2.5			
p0 queue free %	77	48	77			
cM capacity (veh/h)	239	841	1231			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	55	440	422	170
Volume Left	55	0	287	0
Volume Right	0	440	0	20
cSH	239	841	1231	1700
Volume to Capacity	0.23	0.52	0.23	0.10
Queue Length 95th (ft)	22	78	23	0
Control Delay (s)	24.6	13.9	6.7	0.0
Lane LOS	C	B	A	
Approach Delay (s)	15.1		6.7	0.0
Approach LOS	C			

Intersection Summary			
Average Delay	9.5		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.98		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	0.85		1.00	0.85	1.00	0.95		1.00	0.99	
Flt Protected		1.00	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1891	1580		1729	1404	1805	1346		1517	1597	
Flt Permitted		0.98	1.00		0.88	1.00	0.63	1.00		0.61	1.00	
Satd. Flow (perm)		1856	1580		1550	1404	1203	1346		977	1597	
Volume (vph)	1	8	3	42	67	226	1	134	60	355	154	8
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	1	10	4	51	82	276	1	163	73	433	188	10
RTOR Reduction (vph)	0	0	3	0	0	227	0	22	0	0	3	0
Lane Group Flow (vph)	0	11	1	0	133	49	1	214	0	433	195	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	0%	0%	0%	17%	2%	15%	0%	42%	18%	19%	19%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		10.0	10.0		10.0	10.0	37.8	37.8		37.8	37.8	
Effective Green, g (s)		10.0	10.0		10.0	10.0	37.8	37.8		37.8	37.8	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.68	0.68		0.68	0.68	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		333	283		278	252	815	912		662	1082	
v/s Ratio Prot								0.16			0.12	
v/s Ratio Perm		0.01	0.00		c0.09	0.04	0.00			c0.44		
v/c Ratio		0.03	0.00		0.48	0.20	0.00	0.24		0.65	0.18	
Uniform Delay, d1		18.9	18.8		20.6	19.5	2.9	3.5		5.2	3.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	0.0		1.3	0.4	0.0	0.6		5.0	0.4	
Delay (s)		18.9	18.8		21.9	19.9	2.9	4.1		10.2	3.7	
Level of Service		B	B		C	B	A	A		B	A	
Approach Delay (s)		18.9			20.5			4.1			8.1	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1	1	22	2	62	0	120	144	141	56	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	1	1	28	3	79	0	154	185	181	72	0
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	760	772	72	681	679	246	72			338		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	760	772	72	681	679	246	72			338		
tC, single (s)	7.1	6.5	6.2	7.2	7.0	6.7	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.4	3.7	2.2			2.3		
p0 queue free %	100	100	100	91	99	89	100			84		
cM capacity (veh/h)	251	280	996	305	269	694	1541			1147		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	110	338	253
Volume Left	0	28	0	181
Volume Right	1	79	185	0
cSH	437	509	1541	1147
Volume to Capacity	0.01	0.22	0.00	0.16
Queue Length 95th (ft)	0	20	0	14
Control Delay (s)	13.3	14.0	0.0	6.7
Lane LOS	B	B		A
Approach Delay (s)	13.3	14.0	0.0	6.7
Approach LOS	B	B		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

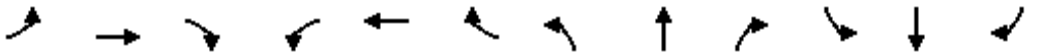
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		1.00		1.00	1.00			0.99	
Flt Protected		0.95	1.00		0.95		0.95	1.00			1.00	
Satd. Flow (prot)		1569	1346		1805		1612	3406			1784	
Flt Permitted		0.73	1.00		0.74		0.95	1.00			1.00	
Satd. Flow (perm)		1206	1346		1400		1612	3406			1784	
Volume (vph)	25	1	363	1	0	0	320	316	0	0	317	15
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	30	1	432	1	0	0	381	376	0	0	377	18
RTOR Reduction (vph)	0	0	118	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	31	314	0	1	0	381	376	0	0	393	0
Confl. Bikes (#/hr)									1			4
Heavy Vehicles (%)	16%	0%	20%	0%	0%	0%	12%	6%	0%	0%	5%	20%
Turn Type	Perm		pt+ov	Perm			Prot			Prot		
Protected Phases		8	8 1		4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		7.8	48.8		7.8		37.0	79.2			38.2	
Effective Green, g (s)		7.8	48.8		7.8		37.0	79.2			38.2	
Actuated g/C Ratio		0.08	0.51		0.08		0.39	0.83			0.40	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		99	691		115		628	2840			717	
v/s Ratio Prot			c0.23				c0.24	0.11			c0.22	
v/s Ratio Perm		0.03			0.00							
v/c Ratio		0.31	0.45		0.01		0.61	0.13			0.55	
Uniform Delay, d1		41.1	14.7		40.0		23.2	1.5			21.8	
Progression Factor		1.00	1.00		1.00		0.77	0.51			1.00	
Incremental Delay, d2		1.8	0.5		0.0		4.2	0.1			3.0	
Delay (s)		42.9	15.1		40.1		22.0	0.8			24.8	
Level of Service		D	B		D		C	A			C	
Approach Delay (s)		17.0			40.1			11.5			24.8	
Approach LOS		B			D			B			C	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	1.00	
Frt		1.00	0.85		0.86		1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1612	1538		1644		1597	3505		1805	1832	
Flt Permitted		0.76	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1285	1538		1644		1597	3505		1805	1832	
Volume (vph)	17	0	380	0	0	1	304	493	0	1	556	17
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	0	400	0	0	1	320	519	0	1	585	18
RTOR Reduction (vph)	0	0	367	0	1	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	18	33	0	0	0	320	519	0	1	602	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		8.6	8.6		8.6		35.0	82.2		1.2	48.4	
Effective Green, g (s)		8.6	8.6		8.6		35.0	83.2		1.2	49.4	
Actuated g/C Ratio		0.08	0.08		0.08		0.33	0.79		0.01	0.47	
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		105	126		135		532	2777		21	862	
v/s Ratio Prot					0.00		c0.20	0.15		0.00	c0.33	
v/s Ratio Perm		0.01	c0.02									
v/c Ratio		0.17	0.26		0.00		0.60	0.19		0.05	0.70	
Uniform Delay, d1		44.9	45.2		44.3		29.2	2.7		51.3	21.9	
Progression Factor		1.00	1.00		1.00		0.91	0.51		1.00	1.00	
Incremental Delay, d2		0.8	1.1		0.0		4.6	0.1		0.9	4.7	
Delay (s)		45.7	46.3		44.3		31.1	1.5		52.3	26.6	
Level of Service		D	D		D		C	A		D	C	
Approach Delay (s)		46.3			44.3			12.8			26.6	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

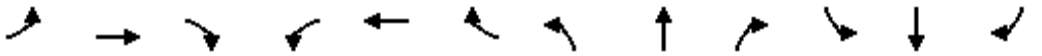
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85			0.99		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.96		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1650			1811		1400	3000		1805	3200	1464
Flt Permitted	0.74	1.00			0.20		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1333	1650			383		1400	3000		1805	3200	1464
Volume (vph)	160	7	637	63	9	4	295	653	10	2	789	104
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	8	692	68	10	4	321	710	11	2	858	113
RTOR Reduction (vph)	0	414	0	0	2	0	0	1	0	0	0	43
Lane Group Flow (vph)	174	286	0	0	80	0	321	720	0	2	858	70
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	18.0	18.0			18.0		37.5	73.8		1.2	37.5	37.5
Effective Green, g (s)	18.0	18.0			18.0		37.5	73.8		1.2	37.5	37.5
Actuated g/C Ratio	0.17	0.17			0.17		0.36	0.70		0.01	0.36	0.36
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	229	283			66		500	2109		21	1143	523
v/s Ratio Prot		0.17					c0.23	0.24		0.00	c0.27	
v/s Ratio Perm	0.13				c0.21							0.05
v/c Ratio	0.76	1.01			1.22		0.64	0.34		0.10	0.75	0.13
Uniform Delay, d1	41.4	43.5			43.5		28.2	6.1		51.4	29.6	22.8
Progression Factor	1.00	1.00			1.00		0.91	0.55		1.28	0.85	1.06
Incremental Delay, d2	13.5	56.0			180.5		5.7	0.4		1.3	1.8	0.1
Delay (s)	54.9	99.5			224.0		31.3	3.7		66.8	27.1	24.1
Level of Service	D	F			F		C	A		E	C	C
Approach Delay (s)		90.6			224.0			12.2			26.8	
Approach LOS		F			F			B			C	

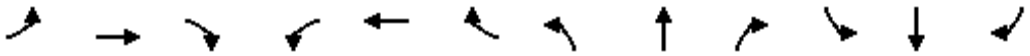
Intersection Summary			
HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	946	605	0	556	479	0	0	0	435	0	369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	985	630	0	579	499	0	0	0	453	0	384
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	204
Lane Group Flow (vph)	0	985	630	0	579	499	0	0	0	227	226	180
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		76.8	105.0		76.8	105.0				19.2	19.2	19.2
Effective Green, g (s)		77.8	105.0		77.8	105.0				19.2	19.2	19.2
Actuated g/C Ratio		0.74	1.00		0.74	1.00				0.18	0.18	0.18
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		2572	1521		2454	1582				302	302	250
v/s Ratio Prot		0.28			0.17					c0.14	0.14	
v/s Ratio Perm			c0.41			0.32						0.13
v/c Ratio		0.38	0.41		0.24	0.32				0.75	0.75	0.72
Uniform Delay, d1		4.9	0.0		4.3	0.0				40.6	40.6	40.4
Progression Factor		1.68	1.00		1.47	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.2	0.4		0.2	0.5				10.1	9.7	9.5
Delay (s)		8.5	0.4		6.5	0.5				50.7	50.3	49.8
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		5.3			3.7			0.0			50.2	
Approach LOS		A			A			A			D	

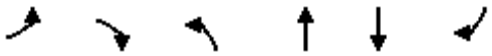
Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1565			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1565			
Volume (vph)	0	794	587	0	772	993	265	0	277	0	0	0
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	892	660	0	867	1116	298	0	311	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	125	0	0	0
Lane Group Flow (vph)	0	892	660	0	867	1116	298	0	186	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		78.7	105.0		78.7	105.0	17.3		17.3			
Effective Green, g (s)		79.7	105.0		79.7	105.0	17.3		17.3			
Actuated g/C Ratio		0.76	1.00		0.76	1.00	0.16		0.16			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2660	1615		2713	1599	506		258			
v/s Ratio Prot		0.25			0.24		0.10					
v/s Ratio Perm			0.41			c0.70			0.12			
v/c Ratio		0.34	0.41		0.32	0.70	0.59		0.72			
Uniform Delay, d1		4.1	0.0		4.0	0.0	40.6		41.6			
Progression Factor		0.22	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.3	0.7		0.3	2.6	1.8		9.3			
Delay (s)		1.2	0.7		4.3	2.6	42.3		50.8			
Level of Service		A	A		A	A	D		D			
Approach Delay (s)		1.0			3.3			46.7			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		

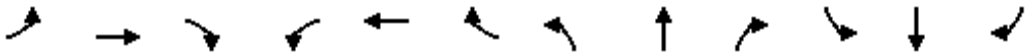
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	38	256	348	96	138	81
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	41	275	374	103	148	87
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1044	192	235			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1044	192	235			
tC, single (s)	6.4	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	77	67	71			
cM capacity (veh/h)	179	832	1286			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	316	477	235
Volume Left	41	374	0
Volume Right	275	0	87
cSH	566	1286	1700
Volume to Capacity	0.56	0.29	0.14
Queue Length 95th (ft)	86	30	0
Control Delay (s)	19.1	7.6	0.0
Lane LOS	C	A	
Approach Delay (s)	19.1	7.6	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		1.00	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1896	1615		1536	1468	1805	1783		1703	1759	
Flt Permitted		0.99	1.00		0.80	1.00	0.68	1.00		0.53	1.00	
Satd. Flow (perm)		1882	1615		1269	1468	1289	1783		958	1759	
Volume (vph)	2	48	2	34	25	277	1	171	47	321	112	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	52	2	37	27	301	1	186	51	349	122	0
RTOR Reduction (vph)	0	0	2	0	0	260	0	7	0	0	0	0
Lane Group Flow (vph)	0	54	0	0	64	41	1	230	0	349	122	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		8.7	8.7		8.7	8.7	34.2	33.3		47.4	42.5	
Effective Green, g (s)		8.7	8.7		8.7	8.7	34.2	33.3		47.4	42.5	
Actuated g/C Ratio		0.14	0.14		0.14	0.14	0.53	0.52		0.74	0.66	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		255	219		172	199	695	926		826	1166	
v/s Ratio Prot							0.00	0.13		c0.07	0.07	
v/s Ratio Perm		0.03	0.00		c0.05	0.03	0.00			c0.25		
v/c Ratio		0.21	0.00		0.37	0.21	0.00	0.25		0.42	0.10	
Uniform Delay, d1		24.6	23.9		25.2	24.6	7.0	8.5		3.0	3.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4	0.0		1.4	0.5	0.0	0.6		0.4	0.2	
Delay (s)		25.1	23.9		26.6	25.1	7.0	9.1		3.3	4.1	
Level of Service		C	C		C	C	A	A		A	A	
Approach Delay (s)		25.0			25.4			9.1			3.5	
Approach LOS		C			C			A			A	

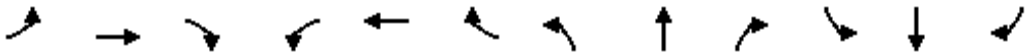
Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1	1	112	1	143	0	55	34	59	103	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	0	1	1	129	1	164	0	63	39	68	118	1
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	502	357	119	339	338	83	120			102		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	502	357	119	339	338	83	120			102		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	78	100	83	100			95		
cM capacity (veh/h)	384	545	938	591	559	950	1481			1429		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	294	102	187
Volume Left	0	129	0	68
Volume Right	1	164	39	1
cSH	690	749	1481	1429
Volume to Capacity	0.00	0.39	0.00	0.05
Queue Length 95th (ft)	0	47	0	4
Control Delay (s)	10.2	12.9	0.0	3.0
Lane LOS	B	B		A
Approach Delay (s)	10.2	12.9	0.0	3.0
Approach LOS	B	B		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			1.00	
Frt		1.00	0.85				1.00	1.00			0.97	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1612	1538				1597	3505			1758	
Flt Permitted		0.76	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1285	1538				1597	3505			1758	
Volume (vph)	280	0	460	0	0	0	430	720	0	0	830	210
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	286	0	469	0	0	0	439	735	0	0	847	214
RTOR Reduction (vph)	0	0	393	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	286	76	0	0	0	439	735	0	0	1052	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		14.0	14.0				35.0	82.0			43.0	
Effective Green, g (s)		14.0	14.0				35.0	83.0			44.0	
Actuated g/C Ratio		0.13	0.13				0.33	0.79			0.42	
Clearance Time (s)		4.0	4.0				4.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		171	205				532	2771			737	
v/s Ratio Prot							c0.27	0.21			c0.60	
v/s Ratio Perm		c0.22	0.05									
v/c Ratio		1.67	0.37				0.83	0.27			1.43	
Uniform Delay, d1		45.5	41.5				32.2	2.9			30.5	
Progression Factor		1.00	1.00				0.94	1.15			1.00	
Incremental Delay, d2		326.9	1.1				12.0	0.2			200.3	
Delay (s)		372.4	42.6				42.3	3.6			230.8	
Level of Service		F	D				D	A			F	
Approach Delay (s)		167.5			0.0			18.0			230.8	
Approach LOS		F			A			B			F	

Intersection Summary			
HCM Average Control Delay	131.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

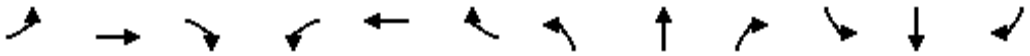
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85			0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1511			1796		1697	3340		1805	3505	1464
Flt Permitted	0.74	1.00			0.25		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1331	1511			457		1697	3340		1805	3505	1464
Volume (vph)	200	10	980	50	10	10	480	950	10	10	1130	150
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1000	51	10	10	490	969	10	10	1153	153
RTOR Reduction (vph)	0	433	0	0	5	0	0	1	0	0	0	43
Lane Group Flow (vph)	204	577	0	0	66	0	490	978	0	10	1153	110
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Effective Green, g (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Actuated g/C Ratio	0.13	0.13			0.13		0.39	0.74		0.01	0.36	0.36
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	177	201			61		663	2465		26	1268	530
v/s Ratio Prot		c0.38					c0.29	0.29		0.01	c0.33	
v/s Ratio Perm	0.15				0.14							0.07
v/c Ratio	1.15	2.87			1.08		0.74	0.40		0.38	0.91	0.21
Uniform Delay, d1	45.5	45.5			45.5		27.4	5.1		51.3	31.9	23.1
Progression Factor	1.00	1.00			1.00		0.56	0.46		1.22	1.22	1.59
Incremental Delay, d2	114.6	854.6			138.7		5.4	0.4		0.9	1.0	0.0
Delay (s)	160.1	900.1			184.2		20.9	2.7		63.2	39.8	36.7
Level of Service	F	F			F		C	A		E	D	D
Approach Delay (s)		775.7			184.2			8.8			39.6	
Approach LOS		F			F			A			D	

Intersection Summary			
HCM Average Control Delay	250.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	129.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1420	730	0	930	480	0	0	0	1040	0	520
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1449	745	0	949	490	0	0	0	1061	0	531
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	60
Lane Group Flow (vph)	0	1449	745	0	949	490	0	0	0	531	530	471
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		57.6	105.0		57.6	105.0				38.4	38.4	38.4
Effective Green, g (s)		58.6	105.0		58.6	105.0				38.4	38.4	38.4
Actuated g/C Ratio		0.56	1.00		0.56	1.00				0.37	0.37	0.37
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1937	1521		1848	1582				603	603	501
v/s Ratio Prot		c0.42			0.29					0.32	0.32	
v/s Ratio Perm			0.49			0.31						c0.34
v/c Ratio		0.75	0.49		0.51	0.31				0.88	0.88	0.94
Uniform Delay, d1		17.6	0.0		14.4	0.0				31.2	31.1	32.2
Progression Factor		1.64	1.00		1.29	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.2	0.1		0.9	0.5				14.1	13.7	26.1
Delay (s)		29.1	0.1		19.4	0.5				45.2	44.8	58.3
Level of Service		C	A		B	A				D	D	E
Approach Delay (s)		19.2			13.0			0.0			49.5	
Approach LOS		B			B			A			D	

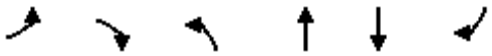
Intersection Summary			
HCM Average Control Delay	26.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1620	830	0	990	1200	420	0	410	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1653	847	0	1010	1224	429	0	418	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1653	847	0	1010	1224	429	0	401	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.8	105.0		65.8	105.0	30.2		30.2			
Effective Green, g (s)		66.8	105.0		66.8	105.0	30.2		30.2			
Actuated g/C Ratio		0.64	1.00		0.64	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2230	1615		2274	1599	884		452			
v/s Ratio Prot		0.47			0.28		0.14					
v/s Ratio Perm			0.52			c0.77			c0.26			
v/c Ratio		0.74	0.52		0.44	0.77	0.49		0.89			
Uniform Delay, d1		13.2	0.0		9.7	0.0	31.0		35.8			
Progression Factor		0.76	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.2	0.8		0.6	3.6	0.4		18.5			
Delay (s)		11.2	0.8		10.3	3.6	31.4		54.3			
Level of Service		B	A		B	A	C		D			
Approach Delay (s)		7.7			6.6			42.7			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

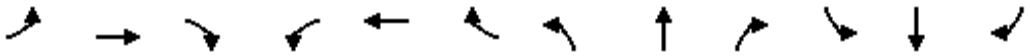
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	200	440	480	330	360	200
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	204	449	490	337	367	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1786	469	571			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1786	469	571			
tC, single (s)	6.4	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	0	23	49			
cM capacity (veh/h)	44	580	963			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	653	827	571
Volume Left	204	490	0
Volume Right	449	0	204
cSH	120	963	1700
Volume to Capacity	5.44	0.51	0.34
Queue Length 95th (ft)	Err	74	0
Control Delay (s)	Err	10.7	0.0
Lane LOS	F	B	
Approach Delay (s)	Err	10.7	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	3188.1		
Intersection Capacity Utilization	123.2%	ICU Level of Service	H
Analysis Period (min)	15		



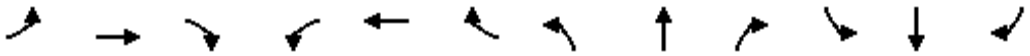
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	10	10	300	10	190	0	80	80	190	450	10
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	10	10	306	10	194	0	82	82	194	459	10
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	1173	1015	464	990	980	122	469			163		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1173	1015	464	990	980	122	469			163		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	91	95	98	0	95	79	100			86		
cM capacity (veh/h)	115	206	602	190	216	902	1103			1357		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	31	510	163	663
Volume Left	10	306	0	194
Volume Right	10	194	82	10
cSH	197	272	1103	1357
Volume to Capacity	0.16	1.87	0.00	0.14
Queue Length 95th (ft)	13	879	0	12
Control Delay (s)	26.6	437.6	0.0	3.5
Lane LOS	D	F		A
Approach Delay (s)	26.6	437.6	0.0	3.5
Approach LOS	D	F		

Intersection Summary				
Average Delay	165.6			
Intersection Capacity Utilization	89.3%	ICU Level of Service	E	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.92		1.00	0.96		1.00	0.98		1.00	0.96	
Flt Protected		1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1711		1770	1779		1770	1830		1770	1790	
Flt Permitted		1.00		0.40	1.00		0.50	1.00		0.60	1.00	
Satd. Flow (perm)		1711		741	1779		922	1830		1109	1790	
Volume (vph)	0	100	120	10	280	120	100	230	30	40	170	60
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	102	122	10	286	122	102	235	31	41	173	61
RTOR Reduction (vph)	0	55	0	0	18	0	0	4	0	0	11	0
Lane Group Flow (vph)	0	169	0	10	390	0	102	262	0	41	223	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.2		21.3	21.3		37.6	31.2		29.4	27.0	
Effective Green, g (s)		16.2		21.3	21.3		37.6	31.2		29.4	27.0	
Actuated g/C Ratio		0.24		0.32	0.32		0.56	0.47		0.44	0.40	
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		414		253	566		602	853		511	722	
v/s Ratio Prot		0.10		0.00	c0.22		c0.02	c0.14		0.00	0.12	
v/s Ratio Perm				0.01			0.08			0.03		
v/c Ratio		0.41		0.04	0.69		0.17	0.31		0.08	0.31	
Uniform Delay, d1		21.3		16.0	19.9		7.1	11.1		10.8	13.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7		0.1	3.5		0.1	0.2		0.1	1.1	
Delay (s)		22.0		16.1	23.4		7.2	11.3		10.8	14.7	
Level of Service		C		B	C		A	B		B	B	
Approach Delay (s)		22.0			23.2			10.2			14.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	66.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0			4.0	
Lane Util. Factor	1.00		1.00				1.00	0.95			0.95	
Frt	1.00		0.85				1.00	1.00			0.97	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	1800		1538				1597	3505			3340	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	1800		1538				1597	3505			3340	
Volume (vph)	280	0	460	0	0	0	430	720	0	0	830	210
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	286	0	469	0	0	0	439	735	0	0	847	214
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	0	0	20	0
Lane Group Flow (vph)	286	0	457	0	0	0	439	735	0	0	1041	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Prot		custom				Prot					
Protected Phases	8		1 8				1	6			2	
Permitted Phases												
Actuated Green, G (s)	23.0		58.8				31.8	73.0			37.2	
Effective Green, g (s)	23.0		58.8				31.8	74.0			38.2	
Actuated g/C Ratio	0.22		0.56				0.30	0.70			0.36	
Clearance Time (s)	4.0						4.0	5.0			5.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	394		861				484	2470			1215	
v/s Ratio Prot	c0.16		0.30				c0.27	0.21			c0.31	
v/s Ratio Perm												
v/c Ratio	0.73		0.53				0.91	0.30			0.86	
Uniform Delay, d1	38.1		14.5				35.2	5.8			30.9	
Progression Factor	1.00		1.00				1.19	0.74			1.00	
Incremental Delay, d2	6.5		0.6				18.7	0.3			7.9	
Delay (s)	44.6		15.1				60.6	4.6			38.8	
Level of Service	D		B				E	A			D	
Approach Delay (s)		26.3			0.0			25.5			38.8	
Approach LOS		C			A			C			D	

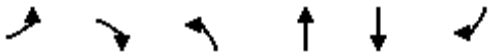
Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	0.88	1.00	1.00		0.97	0.95		1.00	0.95	1.00
Frpb, ped/bikes		1.00	1.00	1.00	0.99		1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected		0.95	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1721	2656	1805	1746		2918	3340		1805	3505	1477
Flt Permitted		0.72	1.00	0.39	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1301	2656	740	1746		2918	3340		1805	3505	1477
Volume (vph)	200	10	980	50	10	10	480	940	10	10	1130	150
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1000	51	10	10	490	959	10	10	1153	153
RTOR Reduction (vph)	0	0	45	0	8	0	0	0	0	0	0	11
Lane Group Flow (vph)	0	214	955	51	12	0	490	969	0	10	1153	142
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm		pm+ov	Perm			Prot			Prot		custom
Protected Phases		8	1		4		1	6		5	2	
Permitted Phases	8		8	4								2 8
Actuated Green, G (s)		19.9	40.9	19.9	19.9		21.0	71.6		1.5	52.1	76.0
Effective Green, g (s)		19.9	40.9	19.9	19.9		21.0	71.6		1.5	52.1	76.0
Actuated g/C Ratio		0.19	0.39	0.19	0.19		0.20	0.68		0.01	0.50	0.72
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		247	1136	140	331		584	2278		26	1739	1069
v/s Ratio Prot			c0.17		0.01		0.17	0.29		0.01	c0.33	
v/s Ratio Perm		0.16	0.19	0.07								0.10
v/c Ratio		0.87	0.84	0.36	0.04		0.84	0.43		0.38	0.66	0.13
Uniform Delay, d1		41.3	29.1	37.0	34.7		40.4	7.5		51.3	19.9	4.4
Progression Factor		1.00	1.00	1.00	1.00		1.11	0.64		0.94	0.60	0.23
Incremental Delay, d2		25.7	5.8	1.6	0.0		7.9	0.4		6.0	1.3	0.0
Delay (s)		67.0	34.8	38.7	34.8		52.8	5.3		54.0	13.1	1.1
Level of Service		E	C	D	C		D	A		D	B	A
Approach Delay (s)		40.5			37.6			21.2			12.1	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



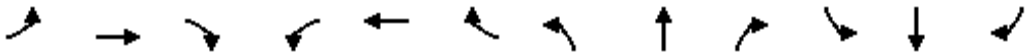
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1752	1482	1641	1863	1750	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1752	1482	1641	1863	1750	
Volume (vph)	200	440	480	330	360	200
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	449	490	337	367	204
RTOR Reduction (vph)	0	373	0	0	23	0
Lane Group Flow (vph)	204	76	490	337	548	0
Heavy Vehicles (%)	3%	9%	10%	2%	3%	4%
Turn Type		Perm	Prot			
Protected Phases	4		5	2	6	
Permitted Phases		4				
Actuated Green, G (s)	13.2	13.2	25.9	57.3	27.4	
Effective Green, g (s)	13.2	13.2	25.9	57.3	27.4	
Actuated g/C Ratio	0.17	0.17	0.33	0.73	0.35	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	295	249	541	1360	611	
v/s Ratio Prot	c0.12		c0.30	0.18	c0.31	
v/s Ratio Perm		0.05				
v/c Ratio	0.69	0.30	0.91	0.25	0.90	
Uniform Delay, d1	30.7	28.6	25.1	3.5	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.8	0.7	18.7	0.1	15.8	
Delay (s)	37.6	29.3	43.8	3.6	40.0	
Level of Service	D	C	D	A	D	
Approach Delay (s)	31.9			27.4	40.0	
Approach LOS	C			C	D	

Intersection Summary			
HCM Average Control Delay	32.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99			1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.95		1.00	0.86			0.93			1.00	
Flt Protected		0.98		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1785		1770	1462			1677			1770	
Flt Permitted		0.90		0.74	1.00			1.00			0.85	
Satd. Flow (perm)		1639		1374	1462			1677			1530	
Volume (vph)	10	10	10	300	10	190	0	80	80	190	450	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	10	10	306	10	194	0	82	82	194	459	10
RTOR Reduction (vph)	0	7	0	0	139	0	0	37	0	0	1	0
Lane Group Flow (vph)	0	23	0	306	65	0	0	127	0	0	662	0
Confl. Bikes (#/hr)									3			
Heavy Vehicles (%)	0%	0%	0%	2%	0%	12%	0%	6%	3%	12%	3%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.6		13.6	13.6			26.3			26.3	
Effective Green, g (s)		13.6		13.6	13.6			26.3			26.3	
Actuated g/C Ratio		0.28		0.28	0.28			0.55			0.55	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		465		390	415			921			840	
v/s Ratio Prot					0.04			0.08				
v/s Ratio Perm		0.01		c0.22							c0.43	
v/c Ratio		0.05		0.78	0.16			0.14			0.79	
Uniform Delay, d1		12.5		15.8	12.9			5.3			8.6	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.0		9.9	0.2			0.1			4.9	
Delay (s)		12.5		25.7	13.0			5.3			13.5	
Level of Service		B		C	B			A			B	
Approach Delay (s)		12.5			20.7			5.3			13.5	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	47.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			1.00	
Frt		1.00	0.85				1.00	1.00			0.97	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1612	1538				1597	3505			1754	
Flt Permitted		0.76	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1285	1538				1597	3505			1754	
Volume (vph)	310	0	710	0	0	0	430	740	0	0	780	210
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	316	0	724	0	0	0	439	755	0	0	796	214
RTOR Reduction (vph)	0	0	481	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	316	243	0	0	0	439	755	0	0	1001	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		14.0	14.0				35.0	82.0			43.0	
Effective Green, g (s)		14.0	14.0				35.0	83.0			44.0	
Actuated g/C Ratio		0.13	0.13				0.33	0.79			0.42	
Clearance Time (s)		4.0	4.0				4.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		171	205				532	2771			735	
v/s Ratio Prot							c0.27	0.22			c0.57	
v/s Ratio Perm		c0.25	0.16									
v/c Ratio		1.85	1.19				0.83	0.27			1.36	
Uniform Delay, d1		45.5	45.5				32.2	2.9			30.5	
Progression Factor		1.00	1.00				0.93	1.13			1.00	
Incremental Delay, d2		403.3	121.9				12.0	0.2			171.4	
Delay (s)		448.8	167.4				42.1	3.5			201.9	
Level of Service		F	F				D	A			F	
Approach Delay (s)		252.9			0.0			17.7			201.9	
Approach LOS		F			A			B			F	

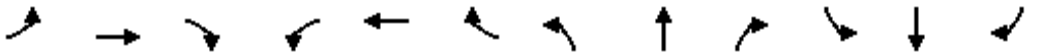
Intersection Summary			
HCM Average Control Delay	150.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85			0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1511			1796		1697	3340		1805	3505	1464
Flt Permitted	0.74	1.00			0.25		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1331	1511			457		1697	3340		1805	3505	1464
Volume (vph)	200	10	1020	50	10	10	480	960	10	10	1330	150
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1041	51	10	10	490	980	10	10	1357	153
RTOR Reduction (vph)	0	433	0	0	5	0	0	1	0	0	0	37
Lane Group Flow (vph)	204	618	0	0	66	0	490	989	0	10	1357	116
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Effective Green, g (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Actuated g/C Ratio	0.13	0.13			0.13		0.39	0.74		0.01	0.36	0.36
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	177	201			61		663	2465		26	1268	530
v/s Ratio Prot		c0.41					c0.29	0.30		0.01	c0.39	
v/s Ratio Perm	0.15				0.14							0.08
v/c Ratio	1.15	3.07			1.08		0.74	0.40		0.38	1.07	0.22
Uniform Delay, d1	45.5	45.5			45.5		27.4	5.1		51.3	33.5	23.2
Progression Factor	1.00	1.00			1.00		0.57	0.45		1.22	1.13	1.37
Incremental Delay, d2	114.6	945.9			138.7		5.5	0.4		0.9	33.4	0.0
Delay (s)	160.1	991.4			184.2		21.1	2.7		63.5	71.2	31.9
Level of Service	F	F			F		C	A		E	E	C
Approach Delay (s)		856.3			184.2			8.8			67.2	
Approach LOS		F			F			A			E	

Intersection Summary			
HCM Average Control Delay	278.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	137.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



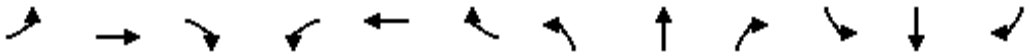
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1610	760	0	920	470	0	0	0	1020	0	520
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1643	776	0	939	480	0	0	0	1041	0	531
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	61
Lane Group Flow (vph)	0	1643	776	0	939	480	0	0	0	521	520	470
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		57.6	105.0		57.6	105.0				38.4	38.4	38.4
Effective Green, g (s)		58.6	105.0		58.6	105.0				38.4	38.4	38.4
Actuated g/C Ratio		0.56	1.00		0.56	1.00				0.37	0.37	0.37
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1937	1521		1848	1582				603	603	501
v/s Ratio Prot		c0.47			0.28					0.32	0.32	
v/s Ratio Perm			0.51			0.30						c0.34
v/c Ratio		0.85	0.51		0.51	0.30				0.86	0.86	0.94
Uniform Delay, d1		19.5	0.0		14.3	0.0				30.9	30.9	32.2
Progression Factor		1.60	1.00		1.22	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	0.1		0.9	0.5				12.3	12.1	25.4
Delay (s)		31.7	0.1		18.4	0.5				43.1	43.0	57.5
Level of Service		C	A		B	A				D	D	E
Approach Delay (s)		21.5			12.3			0.0			47.9	
Approach LOS		C			B			A			D	

Intersection Summary			
HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1620	1000	0	990	1170	390	0	420	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1653	1020	0	1010	1194	398	0	429	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1653	1020	0	1010	1194	398	0	412	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.3	105.0		65.3	105.0	30.7		30.7			
Effective Green, g (s)		66.3	105.0		66.3	105.0	30.7		30.7			
Actuated g/C Ratio		0.63	1.00		0.63	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2213	1615		2257	1599	898		459			
v/s Ratio Prot		0.47			0.28		0.13					
v/s Ratio Perm			0.63			c0.75			c0.26			
v/c Ratio		0.75	0.63		0.45	0.75	0.44		0.90			
Uniform Delay, d1		13.5	0.0		9.9	0.0	30.2		35.6			
Progression Factor		0.82	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.1	1.0		0.6	3.2	0.4		19.8			
Delay (s)		12.3	1.0		10.6	3.2	30.6		55.5			
Level of Service		B	A		B	A	C		E			
Approach Delay (s)		8.0			6.6			43.5			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

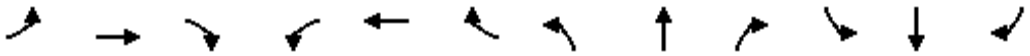
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885			1375	1468	1805	1783		1703	1756	
Flt Permitted		0.95			0.70	1.00	0.53	1.00		0.18	1.00	
Satd. Flow (perm)		1802			1006	1468	1002	1783		314	1756	
Volume (vph)	10	50	0	110	10	510	10	400	110	600	380	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	0	112	10	520	10	408	112	612	388	10
RTOR Reduction (vph)	0	0	0	0	0	81	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	0	0	122	439	10	510	0	612	397	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		12.3			12.3	38.7	29.9	28.8		59.2	54.1	
Effective Green, g (s)		12.3			12.3	38.7	29.9	28.8		59.2	54.1	
Actuated g/C Ratio		0.15			0.15	0.49	0.38	0.36		0.74	0.68	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		279			156	788	388	646		695	1195	
v/s Ratio Prot						c0.18	0.00	0.29		c0.29	0.23	
v/s Ratio Perm		0.03			c0.12	0.11	0.01			c0.36		
v/c Ratio		0.22			0.78	0.56	0.03	0.79		0.88	0.33	
Uniform Delay, d1		29.4			32.3	14.4	15.6	22.6		16.8	5.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			22.0	0.9	0.0	9.5		12.5	0.7	
Delay (s)		29.8			54.4	15.2	15.7	32.2		29.3	6.0	
Level of Service		C			D	B	B	C		C	A	
Approach Delay (s)		29.8			22.7			31.9			20.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	4.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

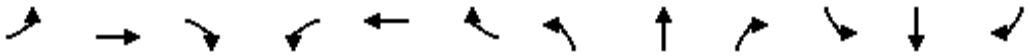


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1764		1770	1772		1770	1854		1770	1855	
Flt Permitted	0.23	1.00		0.28	1.00		0.39	1.00		0.49	1.00	
Satd. Flow (perm)	427	1764		514	1772		731	1854		910	1855	
Volume (vph)	10	240	130	10	270	130	100	290	10	140	350	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	245	133	10	276	133	102	296	10	143	357	10
RTOR Reduction (vph)	0	24	0	0	21	0	0	1	0	0	1	0
Lane Group Flow (vph)	10	354	0	10	388	0	102	305	0	143	366	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.4	18.5		19.4	18.5		32.6	26.3		31.4	25.7	
Effective Green, g (s)	19.4	18.5		19.4	18.5		32.6	26.3		31.4	25.7	
Actuated g/C Ratio	0.29	0.27		0.29	0.27		0.48	0.39		0.47	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	484		165	486		451	723		497	707	
v/s Ratio Prot	c0.00	0.20		0.00	c0.22		0.02	0.16		c0.02	c0.20	
v/s Ratio Perm	0.02			0.02			0.09			0.11		
v/c Ratio	0.07	0.73		0.06	0.80		0.23	0.42		0.29	0.52	
Uniform Delay, d1	18.0	22.2		17.8	22.7		10.0	15.0		10.6	16.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	5.6		0.2	8.9		0.3	0.4		0.3	2.7	
Delay (s)	18.2	27.8		18.0	31.6		10.2	15.4		10.9	18.8	
Level of Service	B	C		B	C		B	B		B	B	
Approach Delay (s)		27.6			31.3			14.1			16.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		0.98		1.00	1.00			0.91			1.00	
Flt Protected		1.00		0.95	1.00			0.98			0.95	
Satd. Flow (prot)		1826		1770	1856			1673			1770	
Flt Permitted		1.00		0.10	1.00			0.89			0.35	
Satd. Flow (perm)		1826		187	1856			1510			648	
Volume (vph)	0	660	100	220	420	10	200	20	400	10	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	673	102	224	429	10	204	20	408	10	0	0
RTOR Reduction (vph)	0	7	0	0	1	0	0	69	0	0	0	0
Lane Group Flow (vph)	0	768	0	224	438	0	0	563	0	0	10	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		35.9		44.0	44.0			24.4			24.4	
Effective Green, g (s)		35.9		44.0	44.0			24.4			24.4	
Actuated g/C Ratio		0.47		0.58	0.58			0.32			0.32	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		858		193	1069			482			207	
v/s Ratio Prot		0.42		c0.06	0.24							
v/s Ratio Perm				c0.61				c0.37			0.02	
v/c Ratio		0.89		1.16	0.41			1.17			0.05	
Uniform Delay, d1		18.5		16.4	9.0			26.0			18.0	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		11.8		114.7	0.3			95.7			0.1	
Delay (s)		30.3		131.1	9.2			121.7			18.1	
Level of Service		C		F	A			F			B	
Approach Delay (s)		30.3			50.4			121.7			18.1	
Approach LOS		C			D			F			B	

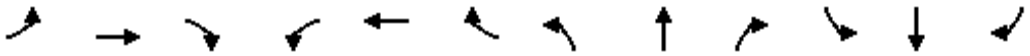
Intersection Summary			
HCM Average Control Delay	64.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0			4.0	
Lane Util. Factor	1.00		1.00				1.00	0.95			0.95	
Frt	1.00		0.85				1.00	1.00			0.97	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	1800		1538				1597	3505			3332	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	1800		1538				1597	3505			3332	
Volume (vph)	310	0	710	0	0	0	430	740	0	0	780	210
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	316	0	724	0	0	0	439	755	0	0	796	214
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	0	0	22	0
Lane Group Flow (vph)	316	0	709	0	0	0	439	755	0	0	988	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Prot		custom				Prot					
Protected Phases	8		1 8				1	6			2	
Permitted Phases												
Actuated Green, G (s)	25.0		61.0				32.0	71.0			35.0	
Effective Green, g (s)	25.0		61.0				32.0	72.0			36.0	
Actuated g/C Ratio	0.24		0.58				0.30	0.69			0.34	
Clearance Time (s)	4.0						4.0	5.0			5.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	429		894				487	2403			1142	
v/s Ratio Prot	0.18		c0.46				c0.27	0.22			c0.30	
v/s Ratio Perm												
v/c Ratio	0.74		0.79				0.90	0.31			0.86	
Uniform Delay, d1	37.0		17.1				35.0	6.6			32.2	
Progression Factor	1.00		1.00				1.21	0.83			1.00	
Incremental Delay, d2	6.5		4.9				17.9	0.3			8.8	
Delay (s)	43.4		22.0				60.3	5.8			41.0	
Level of Service	D		C				E	A			D	
Approach Delay (s)		28.5			0.0			25.8			41.0	
Approach LOS		C			A			C			D	

Intersection Summary			
HCM Average Control Delay	31.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	0.88	1.00	1.00		0.97	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	1.00	1.00	0.99		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	0.85	1.00	0.92		1.00	1.00		1.00	0.98	
Flt Protected		0.95	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1721	2656	1805	1746		2918	3340		1805	4929	
Flt Permitted		0.72	1.00	0.41	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1301	2656	777	1746		2918	3340		1805	4929	
Volume (vph)	200	10	1020	50	10	10	480	960	10	10	1330	150
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1041	51	10	10	490	980	10	10	1357	153
RTOR Reduction (vph)	0	0	8	0	8	0	0	0	0	0	12	0
Lane Group Flow (vph)	0	214	1033	51	12	0	490	990	0	10	1498	0
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm		pm+ov	Perm			Prot			Prot		
Protected Phases		8	1		4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		21.2	46.5	21.2	21.2		25.3	70.3		1.5	46.5	
Effective Green, g (s)		21.2	46.5	21.2	21.2		25.3	70.3		1.5	46.5	
Actuated g/C Ratio		0.20	0.44	0.20	0.20		0.24	0.67		0.01	0.44	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		263	1277	157	353		703	2236		26	2183	
v/s Ratio Prot			c0.19		0.01		0.17	0.30		0.01	c0.30	
v/s Ratio Perm		0.16	0.19	0.07								
v/c Ratio		0.81	0.81	0.32	0.03		0.70	0.44		0.38	0.69	
Uniform Delay, d1		40.0	25.4	35.8	33.7		36.4	8.1		51.3	23.4	
Progression Factor		1.00	1.00	1.00	1.00		1.13	0.64		0.97	0.76	
Incremental Delay, d2		17.3	3.9	1.2	0.0		2.2	0.5		4.9	0.9	
Delay (s)		57.3	29.3	37.0	33.7		43.3	5.7		54.7	18.7	
Level of Service		E	C	D	C		D	A		D	B	
Approach Delay (s)		34.1			36.1			18.1			18.9	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	23.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

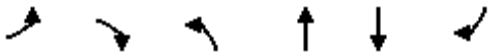
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1610	760	0	920	470	0	0	0	1020	0	520
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1643	776	0	939	480	0	0	0	1041	0	531
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	1643	776	0	939	480	0	0	0	521	520	479
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		56.7	105.0		56.7	105.0				39.3	39.3	39.3
Effective Green, g (s)		57.7	105.0		57.7	105.0				39.3	39.3	39.3
Actuated g/C Ratio		0.55	1.00		0.55	1.00				0.37	0.37	0.37
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1907	1521		1820	1582				617	617	512
v/s Ratio Prot		c0.47			0.28					0.32	0.32	
v/s Ratio Perm			0.51			0.30						c0.35
v/c Ratio		0.86	0.51		0.52	0.30				0.84	0.84	0.94
Uniform Delay, d1		20.2	0.0		14.9	0.0				30.1	30.0	31.6
Progression Factor		0.84	1.00		0.79	1.00				1.00	1.00	1.00
Incremental Delay, d2		3.7	0.8		1.0	0.5				10.3	10.2	24.6
Delay (s)		20.6	0.8		12.7	0.5				40.3	40.2	56.2
Level of Service		C	A		B	A				D	D	E
Approach Delay (s)		14.3			8.6			0.0			45.6	
Approach LOS		B			A			A			D	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1620	1000	0	990	1170	390	0	420	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1653	1020	0	1010	1194	398	0	429	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1653	1020	0	1010	1194	398	0	412	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.3	105.0		65.3	105.0	30.7		30.7			
Effective Green, g (s)		66.3	105.0		66.3	105.0	30.7		30.7			
Actuated g/C Ratio		0.63	1.00		0.63	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2213	1615		2257	1599	898		459			
v/s Ratio Prot		0.47			0.28		0.13					
v/s Ratio Perm			0.63			c0.75			c0.26			
v/c Ratio		0.75	0.63		0.45	0.75	0.44		0.90			
Uniform Delay, d1		13.5	0.0		9.9	0.0	30.2		35.6			
Progression Factor		0.58	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.2	0.9		0.6	3.2	0.4		19.8			
Delay (s)		8.9	0.9		10.6	3.2	30.6		55.5			
Level of Service		A	A		B	A	C		E			
Approach Delay (s)		5.9			6.6			43.5			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1752	1482	1641	1863	1757	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1752	1482	1641	1863	1757	
Volume (vph)	200	490	520	420	410	200
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	500	531	429	418	204
RTOR Reduction (vph)	0	419	0	0	20	0
Lane Group Flow (vph)	204	81	531	429	602	0
Heavy Vehicles (%)	3%	9%	10%	2%	3%	4%
Turn Type		Perm	Prot			
Protected Phases	4		5	2	6	
Permitted Phases		4				
Actuated Green, G (s)	13.8	13.8	29.0	63.6	30.6	
Effective Green, g (s)	13.8	13.8	29.0	63.6	30.6	
Actuated g/C Ratio	0.16	0.16	0.34	0.74	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	283	239	557	1387	630	
v/s Ratio Prot	c0.12		c0.32	0.23	c0.34	
v/s Ratio Perm		0.05				
v/c Ratio	0.72	0.34	0.95	0.31	0.96	
Uniform Delay, d1	34.0	31.7	27.5	3.6	26.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.7	0.8	26.7	0.1	25.1	
Delay (s)	42.7	32.6	54.3	3.7	51.8	
Level of Service	D	C	D	A	D	
Approach Delay (s)	35.5			31.7	51.8	
Approach LOS	D			C	D	

Intersection Summary			
HCM Average Control Delay	38.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	85.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885			1375	1468	1805	1783		1703	1756	
Flt Permitted		0.95			0.70	1.00	0.53	1.00		0.18	1.00	
Satd. Flow (perm)		1802			1006	1468	1002	1783		314	1756	
Volume (vph)	10	50	0	110	10	510	10	400	110	600	380	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	0	112	10	520	10	408	112	612	388	10
RTOR Reduction (vph)	0	0	0	0	0	81	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	0	0	122	439	10	510	0	612	397	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		12.3			12.3	38.7	29.9	28.8		59.2	54.1	
Effective Green, g (s)		12.3			12.3	38.7	29.9	28.8		59.2	54.1	
Actuated g/C Ratio		0.15			0.15	0.49	0.38	0.36		0.74	0.68	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		279			156	788	388	646		695	1195	
v/s Ratio Prot						c0.18	0.00	0.29		c0.29	0.23	
v/s Ratio Perm		0.03			c0.12	0.11	0.01			c0.36		
v/c Ratio		0.22			0.78	0.56	0.03	0.79		0.88	0.33	
Uniform Delay, d1		29.4			32.3	14.4	15.6	22.6		16.8	5.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			22.0	0.9	0.0	9.5		12.5	0.7	
Delay (s)		29.8			54.4	15.2	15.7	32.2		29.3	6.0	
Level of Service		C			D	B	B	C		C	A	
Approach Delay (s)		29.8			22.7			31.9			20.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	4.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

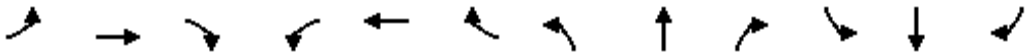
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99			1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.96		1.00	0.86			0.92			1.00	
Flt Protected		0.98		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1785		1770	1457			1656			1785	
Flt Permitted		0.90		0.74	1.00			1.00			0.85	
Satd. Flow (perm)		1638		1374	1457			1656			1540	
Volume (vph)	10	10	10	400	10	250	0	120	170	130	430	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	10	10	408	10	255	0	122	173	133	439	10
RTOR Reduction (vph)	0	6	0	0	164	0	0	92	0	0	2	0
Lane Group Flow (vph)	0	24	0	408	101	0	0	203	0	0	580	0
Confl. Bikes (#/hr)									3			
Heavy Vehicles (%)	0%	0%	0%	2%	0%	12%	0%	6%	3%	12%	3%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.3		16.3	16.3			21.5			21.5	
Effective Green, g (s)		16.3		16.3	16.3			21.5			21.5	
Actuated g/C Ratio		0.36		0.36	0.36			0.47			0.47	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		583		489	519			777			723	
v/s Ratio Prot					0.07			0.12				
v/s Ratio Perm		0.01		c0.30							c0.38	
v/c Ratio		0.04		0.83	0.19			0.26			0.80	
Uniform Delay, d1		9.6		13.5	10.2			7.3			10.3	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.0		11.7	0.2			0.2			6.4	
Delay (s)		9.7		25.2	10.4			7.5			16.8	
Level of Service		A		C	B			A			B	
Approach Delay (s)		9.7			19.4			7.5			16.8	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	45.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

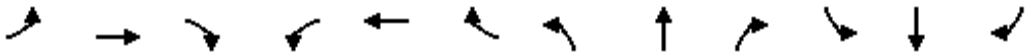
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1764		1770	1772		1770	1854		1770	1855	
Flt Permitted	0.23	1.00		0.28	1.00		0.39	1.00		0.49	1.00	
Satd. Flow (perm)	427	1764		514	1772		731	1854		910	1855	
Volume (vph)	10	240	130	10	270	130	100	290	10	140	350	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	245	133	10	276	133	102	296	10	143	357	10
RTOR Reduction (vph)	0	24	0	0	21	0	0	1	0	0	1	0
Lane Group Flow (vph)	10	354	0	10	388	0	102	305	0	143	366	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.4	18.5		19.4	18.5		32.6	26.3		31.4	25.7	
Effective Green, g (s)	19.4	18.5		19.4	18.5		32.6	26.3		31.4	25.7	
Actuated g/C Ratio	0.29	0.27		0.29	0.27		0.48	0.39		0.47	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	484		165	486		451	723		497	707	
v/s Ratio Prot	c0.00	0.20		0.00	c0.22		0.02	0.16		c0.02	c0.20	
v/s Ratio Perm	0.02			0.02			0.09			0.11		
v/c Ratio	0.07	0.73		0.06	0.80		0.23	0.42		0.29	0.52	
Uniform Delay, d1	18.0	22.2		17.8	22.7		10.0	15.0		10.6	16.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	5.6		0.2	8.9		0.3	0.4		0.3	2.7	
Delay (s)	18.2	27.8		18.0	31.6		10.2	15.4		10.9	18.8	
Level of Service	B	C		B	C		B	B		B	B	
Approach Delay (s)		27.6			31.3			14.1			16.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0		4.0		
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00		
Frt		0.98		1.00	1.00		1.00	0.86		1.00		
Flt Protected		1.00		0.95	1.00		0.95	1.00		0.95		
Satd. Flow (prot)		1826		1770	1856		1770	1596		1770		
Flt Permitted		1.00		0.10	1.00		0.76	1.00		0.26		
Satd. Flow (perm)		1826		187	1856		1410	1596		477		
Volume (vph)	0	660	100	220	420	10	200	20	400	10	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	673	102	224	429	10	204	20	408	10	0	0
RTOR Reduction (vph)	0	7	0	0	1	0	0	194	0	0	0	0
Lane Group Flow (vph)	0	768	0	224	438	0	204	234	0	10	0	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		35.9		44.0	44.0		24.4	24.4		24.4		
Effective Green, g (s)		35.9		44.0	44.0		24.4	24.4		24.4		
Actuated g/C Ratio		0.47		0.58	0.58		0.32	0.32		0.32		
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0		4.0		
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0		
Lane Grp Cap (vph)		858		193	1069		450	510		152		
v/s Ratio Prot		0.42		c0.06	0.24			c0.15				
v/s Ratio Perm				c0.61			0.14			0.02		
v/c Ratio		0.89		1.16	0.41		0.45	0.46		0.07		
Uniform Delay, d1		18.5		16.4	9.0		20.7	20.7		18.1		
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00		
Incremental Delay, d2		11.8		114.7	0.3		3.3	3.0		0.2		
Delay (s)		30.3		131.1	9.2		24.0	23.7		18.3		
Level of Service		C		F	A		C	C		B		
Approach Delay (s)		30.3			50.4			23.8			18.3	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			1.00	
Frt		1.00	0.85				1.00	1.00			0.96	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1612	1538				1597	3505			1735	
Flt Permitted		0.76	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1285	1538				1597	3505			1735	
Volume (vph)	240	0	830	0	0	0	440	740	0	0	730	250
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	245	0	847	0	0	0	449	755	0	0	745	255
RTOR Reduction (vph)	0	0	488	0	0	0	0	0	0	0	12	0
Lane Group Flow (vph)	0	245	359	0	0	0	449	755	0	0	988	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		14.0	14.0				35.0	82.0			43.0	
Effective Green, g (s)		14.0	14.0				35.0	83.0			44.0	
Actuated g/C Ratio		0.13	0.13				0.33	0.79			0.42	
Clearance Time (s)		4.0	4.0				4.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		171	205				532	2771			727	
v/s Ratio Prot							c0.28	0.22			c0.57	
v/s Ratio Perm		0.19	c0.23									
v/c Ratio		1.43	1.75				0.84	0.27			1.36	
Uniform Delay, d1		45.5	45.5				32.5	2.9			30.5	
Progression Factor		1.00	1.00				0.94	1.12			1.00	
Incremental Delay, d2		224.9	357.6				13.1	0.2			170.7	
Delay (s)		270.4	403.1				43.6	3.5			201.2	
Level of Service		F	F				D	A			F	
Approach Delay (s)		373.3			0.0			18.4			201.2	
Approach LOS		F			A			B			F	

Intersection Summary			
HCM Average Control Delay	191.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85			0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1511			1796		1697	3340		1805	3505	1464
Flt Permitted	0.74	1.00			0.25		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1331	1511			457		1697	3340		1805	3505	1464
Volume (vph)	210	10	1020	50	10	10	490	970	10	10	1410	140
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	214	10	1041	51	10	10	500	990	10	10	1439	143
RTOR Reduction (vph)	0	433	0	0	5	0	0	1	0	0	0	33
Lane Group Flow (vph)	214	618	0	0	66	0	500	999	0	10	1439	110
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Effective Green, g (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Actuated g/C Ratio	0.13	0.13			0.13		0.39	0.74		0.01	0.36	0.36
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	177	201			61		663	2465		26	1268	530
v/s Ratio Prot		c0.41					c0.29	0.30		0.01	c0.41	
v/s Ratio Perm	0.16				0.14							0.08
v/c Ratio	1.21	3.07			1.08		0.75	0.41		0.38	1.13	0.21
Uniform Delay, d1	45.5	45.5			45.5		27.6	5.1		51.3	33.5	23.1
Progression Factor	1.00	1.00			1.00		0.57	0.45		1.21	1.09	1.28
Incremental Delay, d2	135.0	945.9			138.7		5.9	0.4		0.9	61.7	0.0
Delay (s)	180.5	991.4			184.2		21.7	2.7		63.1	98.1	29.6
Level of Service	F	F			F		C	A		E	F	C
Approach Delay (s)		854.2			184.2			9.0			91.8	
Approach LOS		F			F			A			F	

Intersection Summary			
HCM Average Control Delay	283.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	139.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1670	780	0	910	470	0	0	0	1010	0	530
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1704	796	0	929	480	0	0	0	1031	0	541
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	62
Lane Group Flow (vph)	0	1704	796	0	929	480	0	0	0	516	515	479
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		57.2	105.0		57.2	105.0				38.8	38.8	38.8
Effective Green, g (s)		58.2	105.0		58.2	105.0				38.8	38.8	38.8
Actuated g/C Ratio		0.55	1.00		0.55	1.00				0.37	0.37	0.37
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1924	1521		1836	1582				609	609	506
v/s Ratio Prot		c0.49			0.28					0.31	0.31	
v/s Ratio Perm			0.52			0.30						c0.35
v/c Ratio		0.89	0.52		0.51	0.30				0.85	0.85	0.95
Uniform Delay, d1		20.5	0.0		14.5	0.0				30.4	30.4	32.1
Progression Factor		1.60	1.00		1.23	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.1		0.9	0.4				10.6	10.5	26.8
Delay (s)		33.3	0.1		18.8	0.4				41.0	40.8	58.8
Level of Service		C	A		B	A				D	D	E
Approach Delay (s)		22.8			12.5			0.0			47.1	
Approach LOS		C			B			A			D	

Intersection Summary			
HCM Average Control Delay	27.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1630	1040	0	1000	1160	400	0	420	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1663	1061	0	1020	1184	408	0	429	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1663	1061	0	1020	1184	408	0	412	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.3	105.0		65.3	105.0	30.7		30.7			
Effective Green, g (s)		66.3	105.0		66.3	105.0	30.7		30.7			
Actuated g/C Ratio		0.63	1.00		0.63	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2213	1615		2257	1599	898		459			
v/s Ratio Prot		0.47			0.29		0.13					
v/s Ratio Perm			0.66			c0.74			c0.26			
v/c Ratio		0.75	0.66		0.45	0.74	0.45		0.90			
Uniform Delay, d1		13.6	0.0		10.0	0.0	30.3		35.6			
Progression Factor		0.86	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.2	0.9		0.7	3.1	0.4		19.8			
Delay (s)		12.8	0.9		10.6	3.1	30.7		55.5			
Level of Service		B	A		B	A	C		E			
Approach Delay (s)		8.2			6.6			43.4			0.0	
Approach LOS		A			A			D			A	

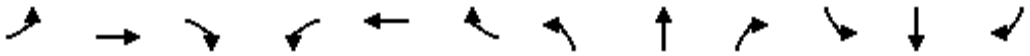
Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885			1370	1468	1805	1783		1703	1756	
Flt Permitted		0.95			0.70	1.00	0.52	1.00		0.17	1.00	
Satd. Flow (perm)		1803			999	1468	993	1783		297	1756	
Volume (vph)	10	50	0	130	10	540	10	400	110	600	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	0	133	10	551	10	408	112	612	398	10
RTOR Reduction (vph)	0	0	0	0	0	79	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	0	0	143	472	10	510	0	612	407	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.0			14.0	40.5	30.0	28.9		59.4	54.3	
Effective Green, g (s)		14.0			14.0	40.5	30.0	28.9		59.4	54.3	
Actuated g/C Ratio		0.17			0.17	0.50	0.37	0.36		0.73	0.67	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		310			172	803	377	633		674	1171	
v/s Ratio Prot						c0.19	0.00	0.29		c0.30	0.23	
v/s Ratio Perm		0.03			c0.14	0.13	0.01			c0.37		
v/c Ratio		0.20			0.83	0.59	0.03	0.81		0.91	0.35	
Uniform Delay, d1		28.9			32.6	14.5	16.4	23.7		18.3	5.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			27.6	1.1	0.0	10.6		16.0	0.8	
Delay (s)		29.2			60.1	15.6	16.4	34.3		34.3	6.7	
Level of Service		C			E	B	B	C		C	A	
Approach Delay (s)		29.2			24.8			33.9			23.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	4.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

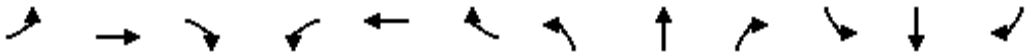


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1765		1770	1779		1770	1854		1770	1856	
Flt Permitted	0.23	1.00		0.23	1.00		0.35	1.00		0.49	1.00	
Satd. Flow (perm)	431	1765		431	1779		648	1854		905	1856	
Volume (vph)	10	260	140	10	280	120	100	290	10	160	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	265	143	10	286	122	102	296	10	163	398	10
RTOR Reduction (vph)	0	24	0	0	19	0	0	1	0	0	1	0
Lane Group Flow (vph)	10	384	0	10	389	0	102	305	0	163	407	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.4	18.5		19.4	18.5		32.4	26.1		31.4	25.6	
Effective Green, g (s)	19.4	18.5		19.4	18.5		32.4	26.1		31.4	25.6	
Actuated g/C Ratio	0.29	0.27		0.29	0.27		0.48	0.39		0.47	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	485		142	489		417	719		497	706	
v/s Ratio Prot	c0.00	0.22		0.00	c0.22		0.02	0.16		c0.03	c0.22	
v/s Ratio Perm	0.02			0.02			0.09			0.12		
v/c Ratio	0.07	0.79		0.07	0.80		0.24	0.42		0.33	0.58	
Uniform Delay, d1	17.9	22.6		17.9	22.6		10.2	15.1		10.7	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	8.6		0.2	8.7		0.3	0.4		0.4	3.4	
Delay (s)	18.2	31.2		18.2	31.4		10.5	15.5		11.1	20.0	
Level of Service	B	C		B	C		B	B		B	B	
Approach Delay (s)		30.9			31.1			14.3			17.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.91			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1770	1821		1770	1833			1673			1776	
Flt Permitted	0.40	1.00		0.11	1.00			0.87			0.64	
Satd. Flow (perm)	739	1821		214	1833			1487			1162	
Volume (vph)	20	630	110	220	420	50	200	20	400	40	20	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	20	643	112	224	429	51	204	20	408	41	20	10
RTOR Reduction (vph)	0	8	0	0	5	0	0	70	0	0	6	0
Lane Group Flow (vph)	20	747	0	224	475	0	0	562	0	0	65	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	38.8	37.4		44.2	40.1			24.4			24.4	
Effective Green, g (s)	38.8	37.4		44.2	40.1			24.4			24.4	
Actuated g/C Ratio	0.50	0.48		0.57	0.51			0.31			0.31	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	387	874		203	944			466			364	
v/s Ratio Prot	0.00	0.41		c0.06	0.26							
v/s Ratio Perm	0.02			c0.57				c0.38			0.06	
v/c Ratio	0.05	0.85		1.10	0.50			1.21			0.18	
Uniform Delay, d1	10.3	17.8		16.3	12.4			26.8			19.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	8.2		93.6	0.4			111.5			0.2	
Delay (s)	10.3	26.0		109.9	12.8			138.2			19.7	
Level of Service	B	C		F	B			F			B	
Approach Delay (s)		25.6			43.7			138.2			19.7	
Approach LOS		C			D			F			B	

Intersection Summary			
HCM Average Control Delay	63.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	77.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0			4.0	
Lane Util. Factor	1.00		0.88				1.00	0.95			0.95	
Frt	1.00		0.85				1.00	1.00			0.96	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	1800		2707				1597	3505			3297	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	1800		2707				1597	3505			3297	
Volume (vph)	240	0	830	0	0	0	440	740	0	0	730	250
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	245	0	847	0	0	0	449	755	0	0	745	255
RTOR Reduction (vph)	0	0	42	0	0	0	0	0	0	0	31	0
Lane Group Flow (vph)	245	0	805	0	0	0	449	755	0	0	969	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Prot		custom				Prot					
Protected Phases	8		1 8				1	6			2	
Permitted Phases												
Actuated Green, G (s)	21.7		58.8				33.1	74.3			37.2	
Effective Green, g (s)	21.7		58.8				33.1	75.3			38.2	
Actuated g/C Ratio	0.21		0.56				0.32	0.72			0.36	
Clearance Time (s)	4.0						4.0	5.0			5.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	372		1516				503	2514			1199	
v/s Ratio Prot	c0.14		0.30				c0.28	0.22			c0.29	
v/s Ratio Perm												
v/c Ratio	0.66		0.53				0.89	0.30			0.81	
Uniform Delay, d1	38.2		14.5				34.3	5.4			30.1	
Progression Factor	1.00		1.00				1.17	0.81			1.00	
Incremental Delay, d2	4.2		0.4				16.2	0.3			5.9	
Delay (s)	42.4		14.8				56.1	4.6			36.0	
Level of Service	D		B				E	A			D	
Approach Delay (s)		21.0			0.0			23.8			36.0	
Approach LOS		C			A			C			D	

Intersection Summary			
HCM Average Control Delay	26.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	0.88	1.00	1.00		0.97	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	1.00	1.00	0.99		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	0.85	1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1721	2656	1805	1746		2918	3340		1805	4940	
Flt Permitted		0.72	1.00	0.40	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1300	2656	756	1746		2918	3340		1805	4940	
Volume (vph)	210	10	1020	50	10	10	490	970	10	10	1410	140
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	214	10	1041	51	10	10	500	990	10	10	1439	143
RTOR Reduction (vph)	0	0	6	0	8	0	0	0	0	0	10	0
Lane Group Flow (vph)	0	224	1035	51	12	0	500	1000	0	10	1572	0
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm		pm+ov	Perm			Prot			Prot		
Protected Phases		8	1		4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		21.9	46.7	21.9	21.9		24.8	69.6		1.5	46.3	
Effective Green, g (s)		21.9	46.7	21.9	21.9		24.8	69.6		1.5	46.3	
Actuated g/C Ratio		0.21	0.44	0.21	0.21		0.24	0.66		0.01	0.44	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		271	1282	158	364		689	2214		26	2178	
v/s Ratio Prot			c0.19		0.01		0.17	0.30		0.01	c0.32	
v/s Ratio Perm		0.17	0.20	0.07								
v/c Ratio		0.83	0.81	0.32	0.03		0.73	0.45		0.38	0.72	
Uniform Delay, d1		39.7	25.3	35.3	33.1		37.0	8.5		51.3	24.1	
Progression Factor		1.00	1.00	1.00	1.00		1.12	0.67		0.93	0.96	
Incremental Delay, d2		18.3	3.8	1.2	0.0		2.9	0.5		6.8	1.6	
Delay (s)		58.0	29.1	36.4	33.2		44.3	6.2		54.4	24.7	
Level of Service		E	C	D	C		D	A		D	C	
Approach Delay (s)		34.2			35.5			18.9			24.9	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

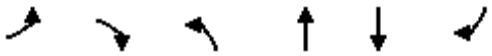
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1670	780	0	910	470	0	0	0	1010	0	530
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1704	796	0	929	480	0	0	0	1031	0	541
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	53
Lane Group Flow (vph)	0	1704	796	0	929	480	0	0	0	516	515	488
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		56.3	105.0		56.3	105.0				39.7	39.7	39.7
Effective Green, g (s)		57.3	105.0		57.3	105.0				39.7	39.7	39.7
Actuated g/C Ratio		0.55	1.00		0.55	1.00				0.38	0.38	0.38
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1894	1521		1807	1582				623	623	518
v/s Ratio Prot		c0.49			0.28					0.31	0.31	
v/s Ratio Perm			0.52			0.30						c0.36
v/c Ratio		0.90	0.52		0.51	0.30				0.83	0.83	0.94
Uniform Delay, d1		21.3	0.0		15.1	0.0				29.6	29.5	31.5
Progression Factor		0.80	1.00		0.79	1.00				1.00	1.00	1.00
Incremental Delay, d2		4.9	0.8		1.0	0.4				8.9	8.8	25.8
Delay (s)		22.0	0.8		12.9	0.4				38.5	38.4	57.3
Level of Service		C	A		B	A				D	D	E
Approach Delay (s)		15.3			8.6			0.0			44.9	
Approach LOS		B			A			A			D	

Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1630	1040	0	1000	1160	400	0	420	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1663	1061	0	1020	1184	408	0	429	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1663	1061	0	1020	1184	408	0	412	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.3	105.0		65.3	105.0	30.7		30.7			
Effective Green, g (s)		66.3	105.0		66.3	105.0	30.7		30.7			
Actuated g/C Ratio		0.63	1.00		0.63	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2213	1615		2257	1599	898		459			
v/s Ratio Prot		0.47			0.29		0.13					
v/s Ratio Perm			0.66			c0.74			c0.26			
v/c Ratio		0.75	0.66		0.45	0.74	0.45		0.90			
Uniform Delay, d1		13.6	0.0		10.0	0.0	30.3		35.6			
Progression Factor		0.57	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.2	0.9		0.7	3.1	0.4		19.8			
Delay (s)		9.0	0.9		10.6	3.1	30.7		55.5			
Level of Service		A	A		B	A	C		E			
Approach Delay (s)		5.8			6.6			43.4			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

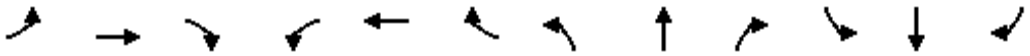
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1752	1482	1641	1863	1759	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1752	1482	1641	1863	1759	
Volume (vph)	200	500	540	420	420	200
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	510	551	429	429	204
RTOR Reduction (vph)	0	428	0	0	19	0
Lane Group Flow (vph)	204	82	551	429	614	0
Heavy Vehicles (%)	3%	9%	10%	2%	3%	4%
Turn Type		Perm	Prot			
Protected Phases	4		5	2	6	
Permitted Phases		4				
Actuated Green, G (s)	13.9	13.9	29.0	64.1	31.1	
Effective Green, g (s)	13.9	13.9	29.0	64.1	31.1	
Actuated g/C Ratio	0.16	0.16	0.34	0.75	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	283	240	553	1389	636	
v/s Ratio Prot	c0.12		c0.34	0.23	c0.35	
v/s Ratio Perm		0.06				
v/c Ratio	0.72	0.34	1.00	0.31	0.97	
Uniform Delay, d1	34.2	32.0	28.4	3.6	26.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.7	0.9	37.1	0.1	27.0	
Delay (s)	42.9	32.9	65.5	3.7	53.9	
Level of Service	D	C	E	A	D	
Approach Delay (s)	35.7			38.5	53.9	
Approach LOS	D			D	D	

Intersection Summary			
HCM Average Control Delay	41.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885			1370	1468	1805	1783		1703	1756	
Flt Permitted		0.95			0.70	1.00	0.52	1.00		0.17	1.00	
Satd. Flow (perm)		1803			999	1468	993	1783		297	1756	
Volume (vph)	10	50	0	130	10	540	10	400	110	600	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	0	133	10	551	10	408	112	612	398	10
RTOR Reduction (vph)	0	0	0	0	0	79	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	0	0	143	472	10	510	0	612	407	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.0			14.0	40.5	30.0	28.9		59.4	54.3	
Effective Green, g (s)		14.0			14.0	40.5	30.0	28.9		59.4	54.3	
Actuated g/C Ratio		0.17			0.17	0.50	0.37	0.36		0.73	0.67	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		310			172	803	377	633		674	1171	
v/s Ratio Prot						c0.19	0.00	0.29		c0.30	0.23	
v/s Ratio Perm		0.03			c0.14	0.13	0.01			c0.37		
v/c Ratio		0.20			0.83	0.59	0.03	0.81		0.91	0.35	
Uniform Delay, d1		28.9			32.6	14.5	16.4	23.7		18.3	5.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			27.6	1.1	0.0	10.6		16.0	0.8	
Delay (s)		29.2			60.1	15.6	16.4	34.3		34.3	6.7	
Level of Service		C			E	B	B	C		C	A	
Approach Delay (s)		29.2			24.8			33.9			23.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	4.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99			1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.96		1.00	0.86			0.92			1.00	
Flt Protected		0.98		0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1785		1770	1456			1660			1786	
Flt Permitted		0.90		0.74	1.00			1.00			0.86	
Satd. Flow (perm)		1632		1374	1456			1660			1549	
Volume (vph)	10	10	10	400	10	270	0	120	160	130	440	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	10	10	408	10	276	0	122	163	133	449	10
RTOR Reduction (vph)	0	6	0	0	177	0	0	87	0	0	2	0
Lane Group Flow (vph)	0	24	0	408	109	0	0	198	0	0	590	0
Confl. Bikes (#/hr)									3			
Heavy Vehicles (%)	0%	0%	0%	2%	0%	12%	0%	6%	3%	12%	3%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.4		16.4	16.4			21.5			21.5	
Effective Green, g (s)		16.4		16.4	16.4			21.5			21.5	
Actuated g/C Ratio		0.36		0.36	0.36			0.47			0.47	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		583		491	520			778			726	
v/s Ratio Prot					0.07			0.12				
v/s Ratio Perm		0.01		c0.30							c0.38	
v/c Ratio		0.04		0.83	0.21			0.25			0.81	
Uniform Delay, d1		9.6		13.5	10.2			7.4			10.5	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.0		11.4	0.2			0.2			6.9	
Delay (s)		9.6		24.9	10.4			7.5			17.4	
Level of Service		A		C	B			A			B	
Approach Delay (s)		9.6			18.9			7.5			17.4	
Approach LOS		A			B			A			B	

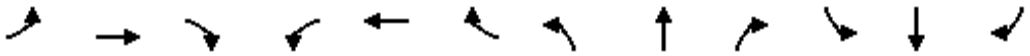
Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1765		1770	1779		1770	1854		1770	1856	
Flt Permitted	0.23	1.00		0.23	1.00		0.35	1.00		0.49	1.00	
Satd. Flow (perm)	431	1765		431	1779		648	1854		905	1856	
Volume (vph)	10	260	140	10	280	120	100	290	10	160	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	265	143	10	286	122	102	296	10	163	398	10
RTOR Reduction (vph)	0	24	0	0	19	0	0	1	0	0	1	0
Lane Group Flow (vph)	10	384	0	10	389	0	102	305	0	163	407	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.4	18.5		19.4	18.5		32.4	26.1		31.4	25.6	
Effective Green, g (s)	19.4	18.5		19.4	18.5		32.4	26.1		31.4	25.6	
Actuated g/C Ratio	0.29	0.27		0.29	0.27		0.48	0.39		0.47	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	485		142	489		417	719		497	706	
v/s Ratio Prot	c0.00	0.22		0.00	c0.22		0.02	0.16		c0.03	c0.22	
v/s Ratio Perm	0.02			0.02			0.09			0.12		
v/c Ratio	0.07	0.79		0.07	0.80		0.24	0.42		0.33	0.58	
Uniform Delay, d1	17.9	22.6		17.9	22.6		10.2	15.1		10.7	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	8.6		0.2	8.7		0.3	0.4		0.4	3.4	
Delay (s)	18.2	31.2		18.2	31.4		10.5	15.5		11.1	20.0	
Level of Service	B	C		B	C		B	B		B	B	
Approach Delay (s)		30.9			31.1			14.3			17.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.86		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1821		1770	1833		1770	1596		1770	1770	
Flt Permitted	0.40	1.00		0.11	1.00		0.74	1.00		0.25	1.00	
Satd. Flow (perm)	739	1821		214	1833		1374	1596		459	1770	
Volume (vph)	20	630	110	220	420	50	200	20	400	40	20	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	20	643	112	224	429	51	204	20	408	41	20	10
RTOR Reduction (vph)	0	8	0	0	5	0	0	206	0	0	7	0
Lane Group Flow (vph)	20	747	0	224	475	0	204	222	0	41	23	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	38.8	37.4		44.2	40.1		24.4	24.4		24.4	24.4	
Effective Green, g (s)	38.8	37.4		44.2	40.1		24.4	24.4		24.4	24.4	
Actuated g/C Ratio	0.50	0.48		0.57	0.51		0.31	0.31		0.31	0.31	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	387	874		203	944		430	500		144	554	
v/s Ratio Prot	0.00	0.41		c0.06	0.26			0.14			0.01	
v/s Ratio Perm	0.02			c0.57			c0.15			0.09		
v/c Ratio	0.05	0.85		1.10	0.50		0.47	0.44		0.28	0.04	
Uniform Delay, d1	10.3	17.8		16.3	12.4		21.6	21.3		20.2	18.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	8.2		93.6	0.4		3.7	2.8		1.1	0.0	
Delay (s)	10.3	26.0		109.9	12.8		25.3	24.2		21.3	18.6	
Level of Service	B	C		F	B		C	C		C	B	
Approach Delay (s)		25.6			43.7			24.5			20.2	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	77.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			1.00	
Frt		1.00	0.85				1.00	1.00			0.98	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1612	1538				1597	3505			1775	
Flt Permitted		0.76	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1285	1538				1597	3505			1775	
Volume (vph)	270	0	590	0	0	0	340	750	0	0	830	160
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	276	0	602	0	0	0	347	765	0	0	847	163
RTOR Reduction (vph)	0	0	475	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	276	127	0	0	0	347	765	0	0	1004	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		14.0	14.0				35.0	82.0			43.0	
Effective Green, g (s)		14.0	14.0				35.0	83.0			44.0	
Actuated g/C Ratio		0.13	0.13				0.33	0.79			0.42	
Clearance Time (s)		4.0	4.0				4.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		171	205				532	2771			744	
v/s Ratio Prot							c0.22	0.22			c0.57	
v/s Ratio Perm		c0.21	0.08									
v/c Ratio		1.61	0.62				0.65	0.28			1.35	
Uniform Delay, d1		45.5	43.0				29.8	2.9			30.5	
Progression Factor		1.00	1.00				1.00	1.27			1.00	
Incremental Delay, d2		301.7	5.5				5.4	0.2			165.9	
Delay (s)		347.2	48.5				35.2	4.0			196.4	
Level of Service		F	D				D	A			F	
Approach Delay (s)		142.4			0.0			13.7			196.4	
Approach LOS		F			A			B			F	

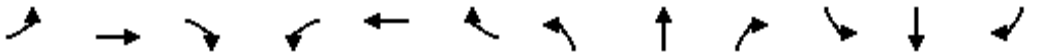
Intersection Summary			
HCM Average Control Delay	112.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85			0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1511			1796		1697	3340		1805	3505	1464
Flt Permitted	0.74	1.00			0.25		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1331	1511			457		1697	3340		1805	3505	1464
Volume (vph)	200	10	1160	50	10	10	590	890	10	10	1290	110
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1184	51	10	10	602	908	10	10	1316	112
RTOR Reduction (vph)	0	433	0	0	5	0	0	1	0	0	0	27
Lane Group Flow (vph)	204	761	0	0	66	0	602	917	0	10	1316	85
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm			Perm			Prot			Prot		Perm
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								2
Actuated Green, G (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Effective Green, g (s)	14.0	14.0			14.0		41.0	77.5		1.5	38.0	38.0
Actuated g/C Ratio	0.13	0.13			0.13		0.39	0.74		0.01	0.36	0.36
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	177	201			61		663	2465		26	1268	530
v/s Ratio Prot		c0.50					c0.35	0.27		0.01	c0.38	
v/s Ratio Perm	0.15				0.14							0.06
v/c Ratio	1.15	3.78			1.08		0.91	0.37		0.38	1.04	0.16
Uniform Delay, d1	45.5	45.5			45.5		30.2	5.0		51.3	33.5	22.7
Progression Factor	1.00	1.00			1.00		0.55	0.47		1.25	1.18	1.46
Incremental Delay, d2	114.6	1265.0			138.7		14.0	0.3		0.9	20.0	0.0
Delay (s)	160.1	1310.5			184.2		30.7	2.6		64.8	59.4	33.2
Level of Service	F	F			F		C	A		E	E	C
Approach Delay (s)		1142.7			184.2			13.7			57.4	
Approach LOS		F			F			B			E	

Intersection Summary			
HCM Average Control Delay	387.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	150.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



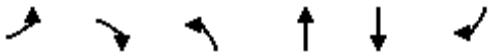
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1670	780	0	940	470	0	0	0	1000	0	560
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1704	796	0	959	480	0	0	0	1020	0	571
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	55
Lane Group Flow (vph)	0	1704	796	0	959	480	0	0	0	510	510	516
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		54.9	105.0		54.9	105.0				41.1	41.1	41.1
Effective Green, g (s)		55.9	105.0		55.9	105.0				41.1	41.1	41.1
Actuated g/C Ratio		0.53	1.00		0.53	1.00				0.39	0.39	0.39
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1848	1521		1763	1582				645	645	536
v/s Ratio Prot		c0.49			0.29					0.31	0.31	
v/s Ratio Perm			0.52			0.30						c0.38
v/c Ratio		0.92	0.52		0.54	0.30				0.79	0.79	0.96
Uniform Delay, d1		22.5	0.0		16.2	0.0				28.2	28.2	31.2
Progression Factor		1.56	1.00		1.27	1.00				1.00	1.00	1.00
Incremental Delay, d2		1.0	0.1		1.1	0.5				6.6	6.6	29.3
Delay (s)		36.3	0.1		21.6	0.5				34.7	34.7	60.5
Level of Service		D	A		C	A				C	C	E
Approach Delay (s)		24.8			14.5			0.0			44.0	
Approach LOS		C			B			A			D	

Intersection Summary			
HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1620	1040	0	990	1160	410	0	410	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1653	1061	0	1010	1184	418	0	418	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	1653	1061	0	1010	1184	418	0	401	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.8	105.0		65.8	105.0	30.2		30.2			
Effective Green, g (s)		66.8	105.0		66.8	105.0	30.2		30.2			
Actuated g/C Ratio		0.64	1.00		0.64	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2230	1615		2274	1599	884		452			
v/s Ratio Prot		0.47			0.28		0.14					
v/s Ratio Perm			0.66			c0.74			c0.26			
v/c Ratio		0.74	0.66		0.44	0.74	0.47		0.89			
Uniform Delay, d1		13.2	0.0		9.7	0.0	30.8		35.8			
Progression Factor		0.90	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.2	0.8		0.6	3.1	0.4		18.5			
Delay (s)		13.0	0.8		10.3	3.1	31.2		54.3			
Level of Service		B	A		B	A	C		D			
Approach Delay (s)		8.2			6.4			42.8			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

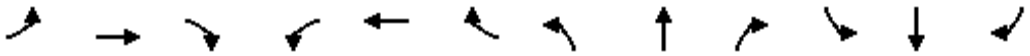
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	210	530	540	420	420	200
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	214	541	551	429	429	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2061	531	633			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2061	531	633			
tC, single (s)	6.4	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	0	0	40			
cM capacity (veh/h)	24	535	913			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	755	980	633
Volume Left	214	551	0
Volume Right	541	0	204
cSH	75	913	1700
Volume to Capacity	10.04	0.60	0.37
Queue Length 95th (ft)	Err	105	0
Control Delay (s)	Err	13.5	0.0
Lane LOS	F	B	
Approach Delay (s)	Err	13.5	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	3194.9		
Intersection Capacity Utilization	140.5%	ICU Level of Service	H
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885	1615		1382	1468	1805	1780		1703	1756	
Flt Permitted		0.95	1.00		0.70	1.00	0.52	1.00		0.15	1.00	
Satd. Flow (perm)		1812	1615		1016	1468	993	1780		263	1756	
Volume (vph)	10	50	10	90	10	530	10	410	120	600	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	10	92	10	541	10	418	122	612	398	10
RTOR Reduction (vph)	0	0	8	0	0	449	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	2	0	102	92	10	530	0	612	407	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.6	13.6		13.6	13.6	29.6	28.5		58.7	53.6	
Effective Green, g (s)		13.6	13.6		13.6	13.6	29.6	28.5		58.7	53.6	
Actuated g/C Ratio		0.17	0.17		0.17	0.17	0.37	0.35		0.73	0.67	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		307	274		172	249	377	632		662	1172	
v/s Ratio Prot							0.00	0.30		c0.30	0.23	
v/s Ratio Perm		0.03	0.00		c0.10	0.06	0.01			c0.37		
v/c Ratio		0.20	0.01		0.59	0.37	0.03	0.84		0.92	0.35	
Uniform Delay, d1		28.7	27.7		30.8	29.5	16.2	23.8		19.2	5.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3	0.0		5.4	0.9	0.0	12.6		18.7	0.8	
Delay (s)		29.0	27.7		36.2	30.5	16.2	36.4		37.9	6.6	
Level of Service		C	C		D	C	B	D		D	A	
Approach Delay (s)		28.8			31.4			36.0			25.4	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	29.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

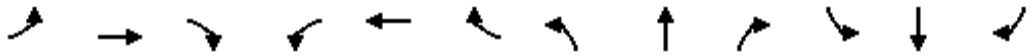
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	40	30	400	10	330	10	150	100	270	350	10
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	41	31	408	10	337	10	153	102	276	357	10
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	1480	1189	362	1189	1143	204	367			255		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1480	1189	362	1189	1143	204	367			255		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	79	72	96	0	93	59	99			78		
cM capacity (veh/h)	48	147	687	103	156	812	1202			1254		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	82	755	265	643
Volume Left	10	408	10	276
Volume Right	31	337	102	10
cSH	153	170	1202	1254
Volume to Capacity	0.53	4.44	0.01	0.22
Queue Length 95th (ft)	66	Err	1	21
Control Delay (s)	52.8	Err	0.4	5.1
Lane LOS	F	F	A	A
Approach Delay (s)	52.8	Err	0.4	5.1
Approach LOS	F	F		

Intersection Summary			
Average Delay	4331.5		
Intersection Capacity Utilization	108.1%	ICU Level of Service	G
Analysis Period (min)	15		

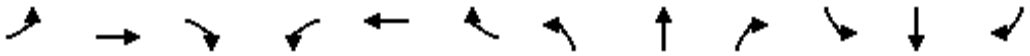
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.94		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1768		1770	1757		1770	1853		1770	1783	
Flt Permitted	0.31	1.00		0.30	1.00		0.25	1.00		0.28	1.00	
Satd. Flow (perm)	583	1768		563	1757		458	1853		530	1783	
Volume (vph)	130	290	150	10	180	110	120	270	10	30	400	160
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	133	296	153	10	184	112	122	276	10	31	408	163
RTOR Reduction (vph)	0	19	0	0	24	0	0	2	0	0	13	0
Lane Group Flow (vph)	133	430	0	10	272	0	122	284	0	31	558	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	30.4	25.5		21.3	20.4		24.4	17.9		39.0	28.5	
Effective Green, g (s)	30.4	25.5		21.3	20.4		24.4	17.9		39.0	28.5	
Actuated g/C Ratio	0.39	0.33		0.28	0.26		0.32	0.23		0.50	0.37	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	321	582		169	463		255	429		541	657	
v/s Ratio Prot	c0.03	c0.24		0.00	0.15		c0.04	0.15		0.01	c0.31	
v/s Ratio Perm	0.13			0.02			0.11			0.02		
v/c Ratio	0.41	0.74		0.06	0.59		0.48	0.66		0.06	0.85	
Uniform Delay, d1	16.4	23.0		20.9	24.8		20.0	27.0		10.5	22.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	4.9		0.1	1.9		1.4	3.8		0.2	13.0	
Delay (s)	17.2	27.9		21.0	26.7		21.4	30.8		10.7	35.5	
Level of Service	B	C		C	C		C	C		B	D	
Approach Delay (s)		25.5			26.5			28.0			34.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	77.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		0.98		1.00	0.99			0.92			1.00	
Flt Protected		1.00		0.95	1.00			0.98			0.97	
Satd. Flow (prot)		1834		1770	1851			1689			1813	
Flt Permitted		1.00		0.10	1.00			0.85			0.63	
Satd. Flow (perm)		1834		184	1851			1463			1178	
Volume (vph)	0	690	80	210	430	20	180	40	300	60	50	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	704	82	214	439	20	184	41	306	61	51	0
RTOR Reduction (vph)	0	5	0	0	2	0	0	52	0	0	0	0
Lane Group Flow (vph)	0	781	0	214	457	0	0	479	0	0	112	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		36.6		44.7	44.7			24.4			24.4	
Effective Green, g (s)		36.6		44.7	44.7			24.4			24.4	
Actuated g/C Ratio		0.47		0.58	0.58			0.32			0.32	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		871		191	1073			463			373	
v/s Ratio Prot		0.43		c0.06	0.25							
v/s Ratio Perm				c0.59				c0.33			0.10	
v/c Ratio		0.90		1.12	0.43			1.03			0.30	
Uniform Delay, d1		18.5		16.7	9.0			26.4			19.9	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		11.8		101.2	0.3			51.1			0.5	
Delay (s)		30.3		117.9	9.3			77.4			20.4	
Level of Service		C		F	A			E			C	
Approach Delay (s)		30.3			43.8			77.4			20.4	
Approach LOS		C			D			E			C	

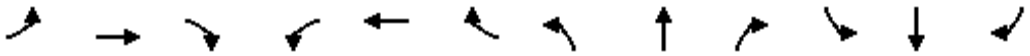
Intersection Summary			
HCM Average Control Delay	46.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	96.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0			4.0	
Lane Util. Factor	1.00		1.00				1.00	0.95			0.95	
Frt	1.00		0.85				1.00	1.00			0.96	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	1800		1538				1597	3505			3280	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	1800		1538				1597	3505			3280	
Volume (vph)	360	0	690	0	0	0	360	750	0	0	730	280
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	367	0	704	0	0	0	367	765	0	0	745	286
RTOR Reduction (vph)	0	0	20	0	0	0	0	0	0	0	35	0
Lane Group Flow (vph)	367	0	684	0	0	0	367	765	0	0	996	0
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	13%	3%	0%	0%	3%	12%
Turn Type	Prot		custom				Prot					
Protected Phases	8		1 8				1	6			2	
Permitted Phases												
Actuated Green, G (s)	25.0		57.4				28.4	71.0			38.6	
Effective Green, g (s)	25.0		57.4				28.4	72.0			39.6	
Actuated g/C Ratio	0.24		0.55				0.27	0.69			0.38	
Clearance Time (s)	4.0						4.0	5.0			5.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	429		841				432	2403			1237	
v/s Ratio Prot	0.20		c0.44				0.23	0.22			c0.30	
v/s Ratio Perm												
v/c Ratio	0.86		0.81				0.85	0.32			0.81	
Uniform Delay, d1	38.3		19.4				36.3	6.6			29.3	
Progression Factor	1.00		1.00				1.11	0.83			1.00	
Incremental Delay, d2	15.3		6.0				13.1	0.3			5.7	
Delay (s)	53.6		25.5				53.4	5.8			34.9	
Level of Service	D		C				D	A			C	
Approach Delay (s)		35.1			0.0			21.3			34.9	
Approach LOS		D			A			C			C	

Intersection Summary			
HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

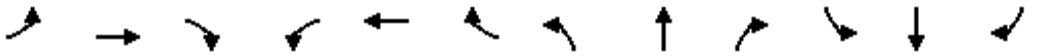
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	0.88	1.00	1.00		0.97	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	1.00	1.00	0.99		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	0.85	1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1721	2656	1805	1746		2918	3340		1805	4953	
Flt Permitted		0.72	1.00	0.41	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1301	2656	777	1746		2918	3340		1805	4953	
Volume (vph)	200	10	1160	50	10	10	590	910	10	10	1290	110
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	204	10	1184	51	10	10	602	929	10	10	1316	112
RTOR Reduction (vph)	0	0	9	0	8	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	214	1175	51	12	0	602	939	0	10	1419	0
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	5%	13%	7%	0%	0%	0%	20%	8%	0%	0%	3%	8%
Turn Type	Perm		pm+ov	Perm			Prot			Prot		
Protected Phases		8	1		4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		21.2	51.5	21.2	21.2		30.3	70.3		1.5	41.5	
Effective Green, g (s)		21.2	51.5	21.2	21.2		30.3	70.3		1.5	41.5	
Actuated g/C Ratio		0.20	0.49	0.20	0.20		0.29	0.67		0.01	0.40	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		263	1404	157	353		842	2236		26	1958	
v/s Ratio Prot			c0.24		0.01		0.21	0.28		0.01	c0.29	
v/s Ratio Perm		0.16	0.20	0.07								
v/c Ratio		0.81	0.84	0.32	0.03		0.71	0.42		0.38	0.72	
Uniform Delay, d1		40.0	23.1	35.8	33.7		33.5	8.0		51.3	26.9	
Progression Factor		1.00	1.00	1.00	1.00		1.12	0.65		0.97	0.86	
Incremental Delay, d2		17.3	4.5	1.2	0.0		2.1	0.4		5.2	1.3	
Delay (s)		57.3	27.6	37.0	33.7		39.4	5.6		55.1	24.6	
Level of Service		E	C	D	C		D	A		E	C	
Approach Delay (s)		32.2			36.1			18.8			24.8	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



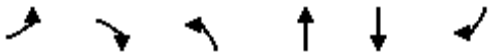
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.98		1.00	0.98				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3471	1521		3312	1582				1649	1649	1369
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3471	1521		3312	1582				1649	1649	1369
Volume (vph)	0	1690	810	0	940	470	0	0	0	1000	0	560
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1724	827	0	959	480	0	0	0	1020	0	571
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	47
Lane Group Flow (vph)	0	1724	827	0	959	480	0	0	0	510	510	524
Confl. Peds. (#/hr)	1		1	1		1						
Heavy Vehicles (%)	0%	4%	4%	0%	9%	0%	0%	0%	0%	4%	0%	18%
Turn Type			Free			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			Free			Free						4
Actuated Green, G (s)		53.7	105.0		53.7	105.0				42.3	42.3	42.3
Effective Green, g (s)		54.7	105.0		54.7	105.0				42.3	42.3	42.3
Actuated g/C Ratio		0.52	1.00		0.52	1.00				0.40	0.40	0.40
Clearance Time (s)		5.0			5.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1808	1521		1725	1582				664	664	552
v/s Ratio Prot		c0.50			0.29					0.31	0.31	
v/s Ratio Perm			0.54			0.30						c0.38
v/c Ratio		0.95	0.54		0.56	0.30				0.77	0.77	0.95
Uniform Delay, d1		23.9	0.0		17.0	0.0				27.1	27.1	30.3
Progression Factor		0.75	1.00		0.79	1.00				1.00	1.00	1.00
Incremental Delay, d2		8.8	0.9		1.2	0.5				5.3	5.3	26.3
Delay (s)		26.8	0.9		14.6	0.5				32.4	32.4	56.6
Level of Service		C	A		B	A				C	C	E
Approach Delay (s)		18.4			9.9			0.0			41.1	
Approach LOS		B			A			A			D	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		1.00			
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		0.98			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1615		3574	1599	3072		1571			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1615		3574	1599	3072		1571			
Volume (vph)	0	1640	1050	0	980	1160	410	0	420	0	0	0
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1673	1071	0	1000	1184	418	0	429	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	16	0	0	0
Lane Group Flow (vph)	0	1673	1071	0	1000	1184	418	0	413	0	0	0
Confl. Peds. (#/hr)							3					
Confl. Bikes (#/hr)									7			7
Heavy Vehicles (%)	0%	3%	0%	0%	1%	1%	14%	0%	1%	0%	0%	0%
Turn Type			Free			Free	Prot		custom			
Protected Phases		2			6		8					
Permitted Phases			Free			Free			8			
Actuated Green, G (s)		65.2	105.0		65.2	105.0	30.8		30.8			
Effective Green, g (s)		66.2	105.0		66.2	105.0	30.8		30.8			
Actuated g/C Ratio		0.63	1.00		0.63	1.00	0.29		0.29			
Clearance Time (s)		5.0			5.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2210	1615		2253	1599	901		461			
v/s Ratio Prot		0.48			0.28		0.14					
v/s Ratio Perm			0.66			c0.74			c0.26			
v/c Ratio		0.76	0.66		0.44	0.74	0.46		0.90			
Uniform Delay, d1		13.7	0.0		10.0	0.0	30.3		35.6			
Progression Factor		0.58	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		1.3	0.7		0.6	3.1	0.4		19.5			
Delay (s)		9.2	0.7		10.6	3.1	30.7		55.0			
Level of Service		A	A		B	A	C		E			
Approach Delay (s)		5.9			6.5			43.0			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

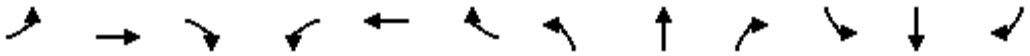
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1752	1482	1641	1863	1760	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1752	1482	1641	1863	1760	
Volume (vph)	210	530	540	420	430	200
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	214	541	551	429	439	204
RTOR Reduction (vph)	0	451	0	0	19	0
Lane Group Flow (vph)	214	90	551	429	624	0
Heavy Vehicles (%)	3%	9%	10%	2%	3%	4%
Turn Type		Perm	Prot			
Protected Phases	4		5	2	6	
Permitted Phases		4				
Actuated Green, G (s)	14.4	14.4	29.0	64.1	31.1	
Effective Green, g (s)	14.4	14.4	29.0	64.1	31.1	
Actuated g/C Ratio	0.17	0.17	0.34	0.74	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	292	247	550	1381	633	
v/s Ratio Prot	c0.12		c0.34	0.23	c0.35	
v/s Ratio Perm		0.06				
v/c Ratio	0.73	0.36	1.00	0.31	0.99	
Uniform Delay, d1	34.2	32.0	28.8	3.8	27.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.1	0.9	38.8	0.1	32.0	
Delay (s)	43.4	32.9	67.6	3.9	59.5	
Level of Service	D	C	E	A	E	
Approach Delay (s)	35.9			39.7	59.5	
Approach LOS	D			D	E	

Intersection Summary			
HCM Average Control Delay	43.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	86.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



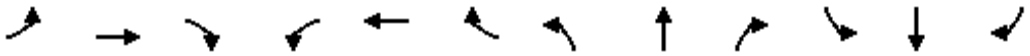
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.99	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1885	1615		1382	1468	1805	1780		1703	1756	
Flt Permitted		0.95	1.00		0.70	1.00	0.52	1.00		0.16	1.00	
Satd. Flow (perm)		1801	1615		1016	1468	993	1780		295	1756	
Volume (vph)	10	50	10	90	10	530	10	410	120	600	390	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	51	10	92	10	541	10	418	122	612	398	10
RTOR Reduction (vph)	0	0	9	0	0	78	0	10	0	0	1	0
Lane Group Flow (vph)	0	61	1	0	102	463	10	530	0	612	407	0
Heavy Vehicles (%)	0%	0%	0%	35%	0%	10%	0%	4%	0%	6%	8%	0%
Turn Type	Perm		Perm	Perm		pm+ov	pm+pt			pm+pt		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		10.8	10.8		10.8	37.2	29.8	28.7		59.1	54.0	
Effective Green, g (s)		10.8	10.8		10.8	37.2	29.8	28.7		59.1	54.0	
Actuated g/C Ratio		0.14	0.14		0.14	0.48	0.38	0.37		0.76	0.69	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		250	224		141	776	391	656		701	1217	
v/s Ratio Prot						c0.20	0.00	0.30		c0.30	0.23	
v/s Ratio Perm		0.03	0.00		c0.10	0.11	0.01			c0.37		
v/c Ratio		0.24	0.01		0.72	0.60	0.03	0.81		0.87	0.33	
Uniform Delay, d1		29.9	28.9		32.1	14.9	15.0	22.1		16.7	4.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.0		16.7	1.2	0.0	10.3		11.6	0.7	
Delay (s)		30.4	28.9		48.8	16.1	15.0	32.4		28.3	5.5	
Level of Service		C	C		D	B	B	C		C	A	
Approach Delay (s)		30.2			21.3			32.1			19.2	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	77.9	Sum of lost time (s)	4.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

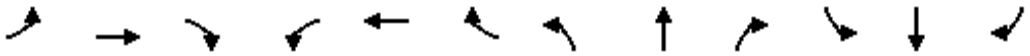
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99			1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.95		1.00	0.85			0.95			1.00	
Flt Protected		0.99		0.95	1.00			1.00			0.98	
Satd. Flow (prot)		1792		1770	1454			1704			1738	
Flt Permitted		0.95		0.70	1.00			0.98			0.76	
Satd. Flow (perm)		1711		1311	1454			1670			1350	
Volume (vph)	10	40	30	400	10	330	10	150	100	270	350	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	41	31	408	10	337	10	153	102	276	357	10
RTOR Reduction (vph)	0	21	0	0	233	0	0	44	0	0	1	0
Lane Group Flow (vph)	0	61	0	408	114	0	0	221	0	0	642	0
Confl. Bikes (#/hr)									3			
Heavy Vehicles (%)	0%	0%	0%	2%	0%	12%	0%	6%	3%	12%	3%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.4		15.4	15.4			26.5			26.5	
Effective Green, g (s)		15.4		15.4	15.4			26.5			26.5	
Actuated g/C Ratio		0.31		0.31	0.31			0.53			0.53	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		528		405	449			887			717	
v/s Ratio Prot					0.08							
v/s Ratio Perm		0.04		c0.31				0.13			c0.48	
v/c Ratio		0.11		1.01	0.25			0.25			0.90	
Uniform Delay, d1		12.4		17.2	12.9			6.3			10.5	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		0.1		46.6	0.3			0.1			13.7	
Delay (s)		12.5		63.8	13.2			6.5			24.2	
Level of Service		B		E	B			A			C	
Approach Delay (s)		12.5			40.6			6.5			24.2	
Approach LOS		B			D			A			C	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.94		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1768		1770	1757		1770	1853		1770	1783	
Flt Permitted	0.31	1.00		0.30	1.00		0.13	1.00		0.58	1.00	
Satd. Flow (perm)	580	1768		551	1757		237	1853		1089	1783	
Volume (vph)	130	290	150	10	180	110	120	270	10	30	400	160
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	133	296	153	10	184	112	122	276	10	31	408	163
RTOR Reduction (vph)	0	22	0	0	27	0	0	1	0	0	13	0
Lane Group Flow (vph)	133	427	0	10	269	0	122	285	0	31	558	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	30.0	25.0		21.1	20.1		38.7	32.3		29.9	27.5	
Effective Green, g (s)	30.0	25.0		21.1	20.1		38.7	32.3		29.9	27.5	
Actuated g/C Ratio	0.39	0.33		0.28	0.26		0.50	0.42		0.39	0.36	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	576		167	460		263	780		446	639	
v/s Ratio Prot	c0.03	c0.24		0.00	0.15		c0.04	0.15		0.00	c0.31	
v/s Ratio Perm	0.13			0.02			0.19			0.02		
v/c Ratio	0.42	0.74		0.06	0.58		0.46	0.37		0.07	0.87	
Uniform Delay, d1	16.3	23.0		20.7	24.7		14.1	15.2		14.5	23.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	5.1		0.2	1.9		1.3	0.3		0.1	15.3	
Delay (s)	17.2	28.1		20.9	26.6		15.4	15.5		14.6	38.3	
Level of Service	B	C		C	C		B	B		B	D	
Approach Delay (s)		25.6			26.4			15.4			37.1	
Approach LOS		C			C			B			D	

Intersection Summary			
HCM Average Control Delay	27.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	76.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.87		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1834		1770	1828		1770	1616		1770	1817	
Flt Permitted	0.39	1.00		0.10	1.00		0.72	1.00		0.34	1.00	
Satd. Flow (perm)	731	1834		192	1828		1336	1616		642	1817	
Volume (vph)	20	690	80	210	420	60	180	40	300	60	50	10
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	20	704	82	214	429	61	184	41	306	61	51	10
RTOR Reduction (vph)	0	5	0	0	6	0	0	187	0	0	7	0
Lane Group Flow (vph)	20	781	0	214	484	0	184	160	0	61	54	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	40.5	39.1		45.9	41.8		24.4	24.4		24.4	24.4	
Effective Green, g (s)	40.5	39.1		45.9	41.8		24.4	24.4		24.4	24.4	
Actuated g/C Ratio	0.51	0.49		0.58	0.53		0.31	0.31		0.31	0.31	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	390	901		192	960		410	495		197	557	
v/s Ratio Prot	0.00	0.43		c0.06	0.26			0.10			0.03	
v/s Ratio Perm	0.03			c0.59			c0.14			0.09		
v/c Ratio	0.05	0.87		1.11	0.50		0.45	0.32		0.31	0.10	
Uniform Delay, d1	10.1	17.9		15.9	12.2		22.2	21.2		21.1	19.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	8.8		99.0	0.4		3.5	1.7		0.9	0.1	
Delay (s)	10.1	26.7		114.9	12.6		25.7	23.0		22.0	19.8	
Level of Service	B	C		F	B		C	C		C	B	
Approach Delay (s)		26.3			43.7			23.9			20.9	
Approach LOS		C			D			C			C	

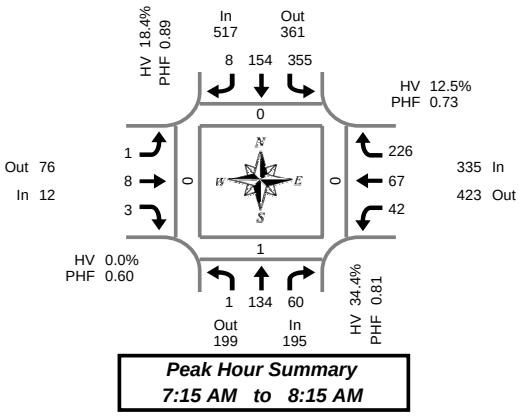
Intersection Summary			
HCM Average Control Delay	31.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	79.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

DKS Associates
TRANSPORTATION SOLUTIONS

Intersection Turn Movement Counts

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:15 AM to 8:15 AM

SW Grahams Ferry Rd & SW Day St

Thursday, June 15, 2006
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	5	4	0	22	10	0	0	0	2	0	0	4	3	21	0	71	0	0	0	0
7:05 AM	1	6	3	0	19	5	1	0	0	0	0	0	0	5	17	0	57	0	0	0	0
7:10 AM	0	10	1	0	14	7	0	0	0	0	0	0	1	4	18	0	55	0	0	0	0
7:15 AM	0	12	4	0	34	12	0	0	0	0	0	0	5	5	16	0	88	0	1	0	0
7:20 AM	0	9	5	0	28	6	0	0	0	1	0	0	1	5	15	0	70	0	0	0	0
7:25 AM	0	13	7	0	23	10	2	0	0	1	0	0	2	8	14	0	80	0	0	0	0
7:30 AM	0	10	6	0	34	14	2	0	0	0	1	0	3	5	7	0	82	0	0	0	0
7:35 AM	0	9	8	0	32	7	2	0	0	0	0	0	2	5	14	0	79	0	0	0	0
7:40 AM	0	7	4	0	31	19	0	0	0	1	0	0	2	8	27	0	99	0	0	0	0
7:45 AM	0	20	4	0	22	18	0	0	0	1	0	0	5	7	27	0	104	0	0	0	0
7:50 AM	1	19	5	0	36	18	1	0	0	1	1	0	5	4	29	0	120	0	0	0	0
7:55 AM	0	8	3	0	27	21	0	0	0	0	0	0	5	6	21	0	91	0	0	0	0
8:00 AM	0	9	6	0	32	10	1	0	0	0	0	0	2	5	22	0	87	0	0	0	0
8:05 AM	0	8	6	0	24	8	0	0	1	2	1	0	6	3	16	0	75	0	0	0	0
8:10 AM	0	10	2	0	32	11	0	0	0	1	0	0	4	6	18	0	84	0	0	0	0
8:15 AM	0	8	2	0	25	13	1	0	0	0	0	0	4	3	16	0	72	0	0	0	0
8:20 AM	0	10	5	0	13	9	0	0	1	0	0	0	1	2	10	0	51	0	0	0	0
8:25 AM	0	4	0	0	32	6	0	0	0	2	0	0	2	5	8	0	59	0	0	0	0
8:30 AM	1	2	4	0	24	4	0	0	0	2	0	0	2	11	13	0	63	0	0	0	0
8:35 AM	0	5	5	0	20	7	1	0	0	0	1	0	3	5	11	0	58	0	0	0	0
8:40 AM	0	7	2	0	18	6	0	0	0	0	0	0	1	1	13	0	48	0	0	0	0
8:45 AM	1	6	3	0	26	14	0	0	0	1	0	0	3	8	12	0	74	0	0	0	0
8:50 AM	0	5	4	0	18	10	0	0	0	4	0	0	1	3	14	0	59	0	0	0	0
8:55 AM	0	6	1	0	14	8	1	0	0	5	0	0	4	2	12	0	53	0	0	0	0
Total Survey	4	208	94	0	600	253	12	0	2	24	4	0	68	119	391	0	1,779	0	1	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	21	8	0	55	22	1	0	0	2	0	0	5	12	56	0	183	0	0	0	0
7:15 AM	0	34	16	0	85	28	2	0	0	2	0	0	8	18	45	0	238	0	1	0	0
7:30 AM	0	26	18	0	97	40	4	0	0	1	1	0	7	18	48	0	260	0	0	0	0
7:45 AM	1	47	12	0	85	57	1	0	0	2	1	0	15	17	77	0	315	0	0	0	0
8:00 AM	0	27	14	0	88	29	1	0	1	3	1	0	12	14	56	0	246	0	0	0	0
8:15 AM	0	22	7	0	70	28	1	0	1	2	0	0	7	10	34	0	182	0	0	0	0
8:30 AM	1	14	11	0	62	17	1	0	0	2	1	0	6	17	37	0	169	0	0	0	0
8:45 AM	1	17	8	0	58	32	1	0	0	10	0	0	8	13	38	0	186	0	0	0	0
Total Survey	4	208	94	0	600	253	12	0	2	24	4	0	68	119	391	0	1,779	0	1	0	0

Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	195	199	394	0	517	361	878	0	12	76	88	0	335	423	758	0	1,059	0	1	0	0
%HV	34.4%				18.4%				0.0%				12.5%				19.3%				
PHF	0.81				0.89				0.60				0.73				0.82				

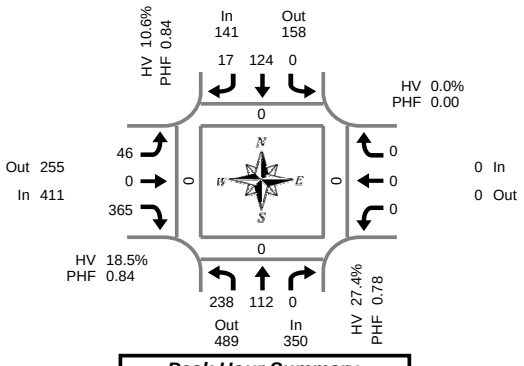
By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	134	60	195	355	154	8	517	1	8	3	12	42	67	226	335	1,059
%HV	0.0%	41.8%	18.3%	34.4%	18.6%	18.8%	0.0%	18.4%	0.0%	0.0%	0.0%	0.0%	16.7%	1.5%	15.0%	12.5%	19.3%
PHF	0.25	0.71	0.71	0.81	0.91	0.68	0.33	0.89	0.25	0.67	0.75	0.60	0.70	0.84	0.68	0.73	0.82

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	2	128	54	0	322	147	8	0	0	7	2	0	35	65	226	0	996	0	1	0	0
7:15 AM	1	134	60	0	355	154	8	0	1	8	3	0	42	67	226	0	1,059	0	1	0	0
7:30 AM	1	122	51	0	340	154	7	0	2	8	3	0	41	59	215	0	1,003	0	0	0	0
7:45 AM	2	110	44	0	305	131	4	0	2	9	3	0	40	58	204	0	912	0	0	0	0
8:00 AM	2	80	40	0	278	106	4	0	2	17	2	0	33	54	165	0	783	0	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



SW Grahams Ferry Rd & SW Tonquin Rd

Thursday, June 15, 2006
7:00 AM to 9:00 AM

Peak Hour Summary
7:20 AM to 8:20 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	12	4	0	0	0	4	3	0	0	0	28	0	0	0	0	0	51	0	0	0	0
7:05 AM	15	6	0	0	0	6	3	0	2	0	26	0	0	0	0	0	58	0	0	0	0
7:10 AM	19	8	0	0	0	5	1	0	1	0	17	0	0	0	0	0	51	0	0	0	0
7:15 AM	7	10	0	0	0	5	1	0	6	0	30	0	0	0	0	0	59	0	0	0	0
7:20 AM	18	9	0	0	0	9	1	0	4	0	25	0	0	0	0	0	66	0	0	0	0
7:25 AM	21	8	0	0	0	5	1	0	5	0	26	0	0	0	0	0	66	0	0	0	0
7:30 AM	8	7	0	0	0	16	1	0	3	0	39	0	0	0	0	0	74	0	0	0	0
7:35 AM	22	7	0	0	0	8	0	0	3	0	33	0	0	0	0	0	73	0	0	0	0
7:40 AM	22	9	0	0	0	10	2	0	4	0	31	0	0	0	0	0	78	0	0	0	0
7:45 AM	29	7	0	0	0	10	2	0	6	0	30	0	0	0	0	0	84	0	0	0	0
7:50 AM	25	20	0	0	0	13	3	0	4	0	40	0	0	0	0	0	105	0	0	0	0
7:55 AM	19	11	0	0	0	10	1	0	7	0	35	0	0	0	0	0	83	0	0	0	0
8:00 AM	21	8	0	0	0	11	1	0	4	0	27	0	0	0	0	0	72	0	0	0	0
8:05 AM	16	15	0	0	0	10	1	0	1	0	24	0	0	0	0	0	67	0	0	0	0
8:10 AM	13	8	0	0	0	16	3	0	2	0	26	0	0	0	0	0	68	0	0	0	0
8:15 AM	24	3	0	0	0	6	1	0	3	0	29	0	0	0	0	0	66	0	0	0	0
8:20 AM	17	11	0	0	0	5	2	0	6	0	18	0	0	0	0	0	59	0	0	0	0
8:25 AM	12	4	0	0	0	10	1	0	3	0	24	0	0	0	0	0	54	0	0	0	0
8:30 AM	14	6	0	0	0	7	3	0	2	0	28	0	0	0	0	0	60	0	0	0	0
8:35 AM	10	5	0	0	0	5	1	0	3	0	23	0	0	0	0	0	47	0	0	0	0
8:40 AM	10	7	0	0	0	4	2	0	2	0	17	0	0	0	0	0	42	0	0	0	0
8:45 AM	12	6	0	0	0	7	4	0	3	0	32	0	0	0	0	0	64	0	0	0	0
8:50 AM	13	8	0	0	0	3	3	0	2	0	22	0	0	0	0	0	51	0	0	0	0
8:55 AM	12	7	0	0	0	3	1	0	3	0	17	0	0	0	0	0	43	0	0	0	0
Total Survey	391	194	0	0	0	188	42	0	79	0	647	0	0	0	0	0	1,541	0	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	46	18	0	0	0	15	7	0	3	0	71	0	0	0	0	0	160	0	0	0	0
7:15 AM	46	27	0	0	0	19	3	0	15	0	81	0	0	0	0	0	191	0	0	0	0
7:30 AM	52	23	0	0	0	34	3	0	10	0	103	0	0	0	0	0	225	0	0	0	0
7:45 AM	73	38	0	0	0	33	6	0	17	0	105	0	0	0	0	0	272	0	0	0	0
8:00 AM	50	31	0	0	0	37	5	0	7	0	77	0	0	0	0	0	207	0	0	0	0
8:15 AM	53	18	0	0	0	21	4	0	12	0	71	0	0	0	0	0	179	0	0	0	0
8:30 AM	34	18	0	0	0	16	6	0	7	0	68	0	0	0	0	0	149	0	0	0	0
8:45 AM	37	21	0	0	0	13	8	0	8	0	71	0	0	0	0	0	158	0	0	0	0
Total Survey	391	194	0	0	0	188	42	0	79	0	647	0	0	0	0	0	1,541	0	0	0	0

Peak Hour Summary
7:20 AM to 8:20 AM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	350	489	839	0	141	158	299	0	411	255	666	0	0	0	0	0	902	0	0	0	0
%HV	27.4%				10.6%				18.5%				0.0%				20.7%				
PHF	0.78				0.84				0.84				0.00				0.83				

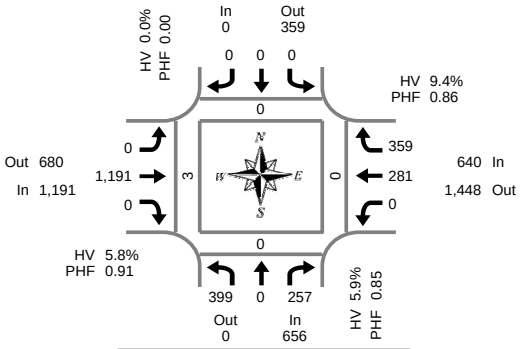
By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	238	112	0	350	0	124	17	141	46	0	365	411	0	0	0	0	902
%HV	35.3%	10.7%	0.0%	27.4%	0.0%	8.1%	29.4%	10.6%	10.9%	0.0%	19.5%	18.5%	0.0%	0.0%	0.0%	0.0%	20.7%
PHF	0.78	0.72	0.00	0.78	0.00	0.84	0.61	0.84	0.68	0.00	0.87	0.84	0.00	0.00	0.00	0.00	0.83

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	217	106	0	0	0	101	19	0	45	0	360	0	0	0	0	0	848	0	0	0	0
7:15 AM	221	119	0	0	0	123	17	0	49	0	366	0	0	0	0	0	895	0	0	0	0
7:30 AM	228	110	0	0	0	125	18	0	46	0	356	0	0	0	0	0	883	0	0	0	0
7:45 AM	210	105	0	0	0	107	21	0	43	0	321	0	0	0	0	0	807	0	0	0	0
8:00 AM	174	88	0	0	0	87	23	0	34	0	287	0	0	0	0	0	693	0	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
7:30 AM to 8:30 AM

I-5 NB Ramp & SW Elligsen Rd

Thursday, June 15, 2006
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	22	0	11	0	0	0	0	0	0	81	0	0	0	22	23	0	159	0	0	0	0
7:05 AM	29	0	9	0	0	0	0	0	0	65	0	0	0	29	27	0	159	0	0	0	0
7:10 AM	17	0	4	0	0	0	0	0	0	56	0	0	0	24	35	0	136	0	1	0	0
7:15 AM	32	0	7	0	0	0	0	0	0	80	0	0	0	9	30	0	158	0	0	0	0
7:20 AM	19	0	12	0	0	0	0	0	0	67	0	0	0	22	31	0	151	0	0	0	0
7:25 AM	17	0	8	0	0	0	0	0	0	73	0	0	0	23	24	0	145	0	0	0	0
7:30 AM	24	0	10	0	0	0	0	0	0	95	0	0	0	21	38	0	188	0	0	0	0
7:35 AM	35	0	16	0	0	0	0	0	0	94	0	0	0	21	42	0	208	0	0	0	0
7:40 AM	35	0	23	0	0	0	0	0	0	99	0	0	0	26	37	0	220	0	0	0	0
7:45 AM	32	0	17	0	0	0	0	0	0	104	0	0	0	31	30	0	214	0	0	0	2
7:50 AM	41	0	21	0	0	0	0	0	0	104	0	0	0	27	31	0	224	0	0	0	0
7:55 AM	35	0	15	0	0	0	0	0	0	116	0	0	0	28	31	0	225	0	0	0	0
8:00 AM	32	0	26	0	0	0	0	0	0	103	0	0	0	19	29	0	209	0	0	0	1
8:05 AM	39	0	29	0	0	0	0	0	0	107	0	0	0	15	24	0	214	0	0	0	0
8:10 AM	33	0	35	0	0	0	0	0	0	87	0	0	0	37	28	0	220	0	0	0	0
8:15 AM	27	0	16	0	0	0	0	0	0	103	0	0	0	14	23	0	183	0	0	0	0
8:20 AM	34	0	23	0	0	0	0	0	0	81	0	0	0	16	21	0	175	0	0	0	0
8:25 AM	32	0	26	0	0	0	0	0	0	98	0	0	0	26	25	0	207	0	0	0	0
8:30 AM	21	0	16	0	0	0	0	0	0	93	0	0	0	18	25	0	173	0	0	0	0
8:35 AM	17	0	11	0	0	0	0	0	0	76	0	0	0	22	38	0	164	0	0	0	0
8:40 AM	20	0	29	0	0	0	0	0	0	79	0	0	0	18	37	0	183	0	0	0	0
8:45 AM	21	0	17	0	0	0	0	0	0	78	0	0	0	16	32	0	164	0	0	0	0
8:50 AM	20	0	16	0	0	0	0	0	0	96	0	0	0	14	35	0	181	0	0	0	0
8:55 AM	20	0	11	0	0	0	0	0	0	72	0	0	0	21	35	0	159	0	0	0	0
Total Survey	654	0	408	0	0	0	0	0	0	2,107	0	0	0	519	731	0	4,419	0	1	0	3

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	68	0	24	0	0	0	0	0	0	202	0	0	0	75	85	0	454	0	1	0	0
7:15 AM	68	0	27	0	0	0	0	0	0	220	0	0	0	54	85	0	454	0	0	0	0
7:30 AM	94	0	49	0	0	0	0	0	0	288	0	0	0	68	117	0	616	0	0	0	0
7:45 AM	108	0	53	0	0	0	0	0	0	324	0	0	0	86	92	0	663	0	0	0	2
8:00 AM	104	0	90	0	0	0	0	0	0	297	0	0	0	71	81	0	643	0	0	0	1
8:15 AM	93	0	65	0	0	0	0	0	0	282	0	0	0	56	69	0	565	0	0	0	0
8:30 AM	58	0	56	0	0	0	0	0	0	248	0	0	0	58	100	0	520	0	0	0	0
8:45 AM	61	0	44	0	0	0	0	0	0	246	0	0	0	51	102	0	504	0	0	0	0
Total Survey	654	0	408	0	0	0	0	0	0	2,107	0	0	0	519	731	0	4,419	0	1	0	3

Peak Hour Summary
7:30 AM to 8:30 AM

By Approach	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	656	0	656	0	0	359	359	0	1,191	680	1,871	0	640	1,448	2,088	0	2,487	0	0	0	3
%HV	5.9%				0.0%				5.8%				9.4%				6.8%				
PHF	0.85				0.00				0.91				0.86				0.94				

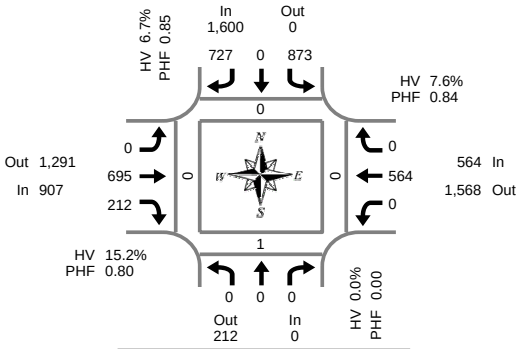
By Movement	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	399	0	257	656	0	0	0	0	0	1,191	0	1,191	0	281	359	640	2,487
%HV	7.0%	0.0%	4.3%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%	5.8%	0.0%	10.3%	8.6%	9.4%	6.8%
PHF	0.92	0.00	0.71	0.85	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.91	0.00	0.82	0.77	0.86	0.94

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	338	0	153	0	0	0	0	0	0	1,034	0	0	0	283	379	0	2,187	0	1	0	2
7:15 AM	374	0	219	0	0	0	0	0	0	1,129	0	0	0	279	375	0	2,376	0	0	0	3
7:30 AM	399	0	257	0	0	0	0	0	0	1,191	0	0	0	281	359	0	2,487	0	0	0	3
7:45 AM	363	0	264	0	0	0	0	0	0	1,151	0	0	0	271	342	0	2,391	0	0	0	3
8:00 AM	316	0	255	0	0	0	0	0	0	1,073	0	0	0	236	352	0	2,232	0	0	0	1

Total Vehicle Summary

Clay Carney
(503) 833-2740



I-5 SB Ramp & SW Elligsen Rd

Thursday, June 15, 2006
7:00 AM to 9:00 AM

Peak Hour Summary
7:30 AM to 8:30 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	0	0	0	52	0	60	0	0	53	17	0	0	42	0	0	224	0	0	0	0
7:05 AM	0	0	0	0	48	0	52	0	0	42	8	0	0	42	0	0	192	0	0	0	0
7:10 AM	0	0	0	0	42	0	46	0	0	52	29	0	0	42	0	0	211	0	0	0	0
7:15 AM	0	0	0	0	66	0	54	0	0	40	22	0	0	35	0	0	217	0	0	0	0
7:20 AM	0	0	0	0	54	0	47	0	0	56	20	0	0	33	0	0	210	0	0	0	0
7:25 AM	0	0	0	0	66	0	64	0	0	42	16	0	0	29	0	0	217	0	0	0	0
7:30 AM	0	0	0	0	68	0	65	0	0	50	19	0	0	29	0	0	231	0	0	0	0
7:35 AM	0	0	0	0	68	0	57	0	0	69	18	0	0	49	0	0	261	0	0	0	0
7:40 AM	0	0	0	0	70	0	64	0	0	70	14	0	0	61	0	0	279	0	0	0	0
7:45 AM	0	0	0	0	67	0	71	0	0	84	30	0	0	53	0	0	305	0	0	0	0
7:50 AM	0	0	0	0	85	0	84	0	0	40	17	0	0	53	0	0	279	0	0	0	0
7:55 AM	0	0	0	0	84	0	77	0	0	55	26	0	0	49	0	0	291	0	1	0	0
8:00 AM	0	0	0	0	80	0	59	0	0	61	15	0	0	40	0	0	255	0	0	0	0
8:05 AM	0	0	0	0	68	0	41	0	0	63	15	0	0	46	0	0	233	0	0	0	0
8:10 AM	0	0	0	0	56	0	53	0	0	50	14	0	0	61	0	0	234	0	0	0	0
8:15 AM	0	0	0	0	75	0	50	0	0	50	16	0	0	43	0	0	234	0	0	0	0
8:20 AM	0	0	0	0	74	0	45	0	0	43	17	0	0	35	0	0	214	0	0	0	0
8:25 AM	0	0	0	0	78	0	61	0	0	60	11	0	0	45	0	0	255	0	0	0	0
8:30 AM	0	0	0	0	71	0	41	0	0	35	15	0	0	38	0	0	200	0	0	0	0
8:35 AM	0	0	0	0	57	0	49	0	0	43	9	0	0	26	0	0	184	0	0	0	0
8:40 AM	0	0	0	0	52	1	31	0	0	57	14	0	0	35	0	0	190	0	0	0	0
8:45 AM	0	0	0	0	67	0	42	0	0	51	11	0	0	31	0	0	202	0	0	0	0
8:50 AM	0	0	0	0	82	1	49	0	0	59	14	0	0	26	0	0	231	0	0	0	0
8:55 AM	0	0	0	0	53	0	44	0	0	36	11	0	0	18	0	0	162	0	0	0	0
Total Survey	0	0	0	0	1,583	2	1,306	0	0	1,261	398	0	0	961	0	0	5,511	0	1	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	0	0	0	142	0	158	0	0	147	54	0	0	126	0	0	627	0	0	0	0
7:15 AM	0	0	0	0	186	0	165	0	0	138	58	0	0	97	0	0	644	0	0	0	0
7:30 AM	0	0	0	0	206	0	186	0	0	189	51	0	0	139	0	0	771	0	0	0	0
7:45 AM	0	0	0	0	236	0	232	0	0	179	73	0	0	155	0	0	875	0	1	0	0
8:00 AM	0	0	0	0	204	0	153	0	0	174	44	0	0	147	0	0	722	0	0	0	0
8:15 AM	0	0	0	0	227	0	156	0	0	153	44	0	0	123	0	0	703	0	0	0	0
8:30 AM	0	0	0	0	180	1	121	0	0	135	38	0	0	99	0	0	574	0	0	0	0
8:45 AM	0	0	0	0	202	1	135	0	0	146	36	0	0	75	0	0	595	0	0	0	0
Total Survey	0	0	0	0	1,583	2	1,306	0	0	1,261	398	0	0	961	0	0	5,511	0	1	0	0

Peak Hour Summary
7:30 AM to 8:30 AM

By Approach	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	212	212	0	1,600	0	1,600	0	907	1,291	2,198	0	564	1,568	2,132	0	3,071	0	1	0	0
%HV		0.0%				6.7%				15.2%				7.6%			9.4%				
PHF		0.00				0.85				0.80				0.84			0.88				

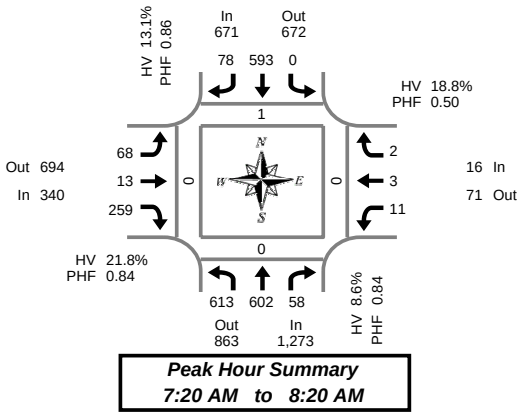
By Movement	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	0	0	873	0	727	1,600	0	695	212	907	0	564	0	564	3,071
%HV	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	10.5%	6.7%	0.0%	14.7%	17.0%	15.2%	0.0%	7.6%	0.0%	7.6%	9.4%
PHF	0.00	0.00	0.00	0.00	0.88	0.00	0.78	0.85	0.00	0.78	0.73	0.80	0.00	0.84	0.00	0.84	0.88

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	0	0	0	770	0	741	0	0	653	236	0	0	517	0	0	2,917	0	1	0	0
7:15 AM	0	0	0	0	832	0	736	0	0	680	226	0	0	538	0	0	3,012	0	1	0	0
7:30 AM	0	0	0	0	873	0	727	0	0	695	212	0	0	564	0	0	3,071	0	1	0	0
7:45 AM	0	0	0	0	847	1	662	0	0	641	199	0	0	524	0	0	2,874	0	1	0	0
8:00 AM	0	0	0	0	813	2	565	0	0	608	162	0	0	444	0	0	2,594	0	0	0	0

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:20 AM to 8:20 AM

SW Boones Ferry Rd & SW 95th Ave

Thursday, June 15, 2006
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	41	38	3	0	0	36	11	0	8	0	19	0	18	5	1	0	180	1	0	0	0
7:05 AM	50	48	1	0	0	41	3	0	4	0	23	0	1	0	0	0	171	0	0	0	0
7:10 AM	48	30	5	0	0	35	2	0	9	2	32	0	0	0	0	0	163	0	0	0	0
7:15 AM	35	49	3	0	0	40	4	0	6	1	16	0	2	0	0	0	156	0	0	0	1
7:20 AM	46	39	2	0	0	44	7	0	4	2	30	0	0	1	0	0	175	0	0	0	0
7:25 AM	48	45	3	0	0	38	12	0	4	0	12	0	0	0	0	0	162	0	0	0	0
7:30 AM	53	39	6	0	0	53	2	0	5	0	27	0	0	0	0	0	185	0	0	0	0
7:35 AM	46	50	9	0	0	55	2	0	7	2	20	0	2	0	0	0	193	0	0	0	0
7:40 AM	48	60	7	0	0	46	4	0	2	0	21	0	1	1	0	0	190	0	0	0	0
7:45 AM	64	60	6	0	0	66	11	0	7	1	25	0	4	0	0	0	244	0	0	0	0
7:50 AM	52	59	6	0	0	41	5	0	7	4	24	0	1	0	0	0	199	1	0	0	0
7:55 AM	56	74	3	0	0	69	3	0	5	1	27	0	1	1	1	0	241	0	0	0	0
8:00 AM	48	39	6	0	0	42	6	0	3	2	18	0	0	0	0	0	164	0	0	0	0
8:05 AM	47	34	2	0	0	49	12	0	3	0	26	0	0	0	1	0	174	0	0	0	0
8:10 AM	52	52	4	0	0	43	8	0	8	0	12	0	1	0	0	0	180	0	0	0	0
8:15 AM	53	51	4	0	0	47	6	0	13	1	17	0	1	0	0	0	193	0	0	0	0
8:20 AM	39	33	6	0	0	38	6	0	6	0	22	0	2	0	0	0	152	0	0	0	0
8:25 AM	56	42	7	0	0	36	4	0	7	1	25	0	0	1	0	0	179	0	0	0	0
8:30 AM	42	28	5	0	0	37	4	0	5	0	11	0	2	1	0	0	135	0	0	0	0
8:35 AM	34	36	0	0	0	41	5	0	7	1	15	0	0	0	0	0	139	0	0	0	0
8:40 AM	34	25	2	0	0	34	7	0	3	0	17	0	0	0	0	0	122	0	0	0	0
8:45 AM	41	28	3	0	0	36	4	0	5	1	22	0	1	1	1	0	143	0	0	0	0
8:50 AM	39	33	7	0	0	52	7	0	9	0	18	0	0	1	0	0	166	0	0	0	0
8:55 AM	40	29	4	0	0	45	7	0	6	0	21	0	1	0	0	0	153	0	0	0	0
Total Survey	1,112	1,021	104	0	0	1,064	142	0	143	19	500	0	38	12	4	0	4,159	2	0	0	1

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	139	116	9	0	0	112	16	0	21	2	74	0	19	5	1	0	514	1	0	0	0
7:15 AM	129	133	8	0	0	122	23	0	14	3	58	0	2	1	0	0	493	0	0	0	1
7:30 AM	147	149	22	0	0	154	8	0	14	2	68	0	3	1	0	0	568	0	0	0	0
7:45 AM	172	193	15	0	0	176	19	0	19	6	76	0	6	1	1	0	684	1	0	0	0
8:00 AM	147	125	12	0	0	134	26	0	14	2	56	0	1	0	1	0	518	0	0	0	0
8:15 AM	148	126	17	0	0	121	16	0	26	2	64	0	3	1	0	0	524	0	0	0	0
8:30 AM	110	89	7	0	0	112	16	0	15	1	43	0	2	1	0	0	396	0	0	0	0
8:45 AM	120	90	14	0	0	133	18	0	20	1	61	0	2	2	1	0	462	0	0	0	0
Total Survey	1,112	1,021	104	0	0	1,064	142	0	143	19	500	0	38	12	4	0	4,159	2	0	0	1

Peak Hour Summary
7:20 AM to 8:20 AM

By Approach	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	1,273	863	2,136	0	671	672	1,343	0	340	694	1,034	0	16	71	87	0	2,300	1	0	0	0
%HV	8.6%				13.1%				21.8%				18.8%				11.9%				
PHF	0.84				0.86				0.84				0.50				0.84				

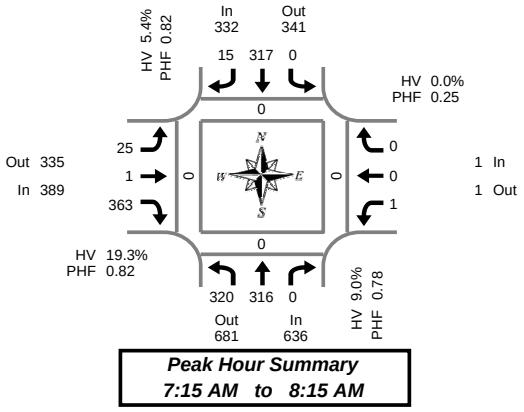
By Movement	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	613	602	58	1,273	0	593	78	671	68	13	259	340	11	3	2	16	2,300
%HV	9.6%	8.3%	0.0%	8.6%	0.0%	13.8%	7.7%	13.1%	13.2%	23.1%	23.9%	21.8%	18.2%	0.0%	50.0%	18.8%	11.9%
PHF	0.89	0.78	0.66	0.84	0.00	0.84	0.75	0.86	0.71	0.46	0.85	0.84	0.39	0.75	0.25	0.50	0.84

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	587	591	54	0	0	564	66	0	68	13	276	0	30	8	2	0	2,259	2	0	0	1
7:15 AM	595	600	57	0	0	586	76	0	61	13	258	0	12	3	2	0	2,263	1	0	0	1
7:30 AM	614	593	66	0	0	585	69	0	73	12	264	0	13	3	2	0	2,294	1	0	0	0
7:45 AM	577	533	51	0	0	543	77	0	74	11	239	0	12	3	2	0	2,122	1	0	0	0
8:00 AM	525	430	50	0	0	500	76	0	75	6	224	0	8	4	2	0	1,900	0	0	0	0

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:15 AM to 8:15 AM

SW Boones Ferry Rd & SW Day St

Thursday, June 15, 2006
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	26	22	0	0	0	23	1	0	1	0	23	0	0	0	0	0	96	0	0	0	0
7:05 AM	24	22	0	0	0	18	2	0	0	0	26	0	0	0	0	0	92	0	0	0	0
7:10 AM	15	28	0	0	0	15	0	0	2	0	19	0	0	0	0	0	79	0	0	0	0
7:15 AM	31	25	0	0	0	28	1	0	1	0	27	0	0	0	0	0	113	0	0	0	0
7:20 AM	18	16	0	0	0	29	2	0	2	1	28	0	0	0	0	0	96	0	0	0	0
7:25 AM	20	24	0	0	0	24	1	0	2	0	26	0	0	0	0	0	97	0	0	0	0
7:30 AM	14	24	0	0	0	20	0	0	2	0	32	0	0	0	0	0	92	0	0	0	0
7:35 AM	28	29	0	0	0	22	0	0	3	0	26	0	0	0	0	0	108	0	0	0	0
7:40 AM	36	22	0	0	0	29	2	0	3	0	34	0	0	0	0	0	126	0	0	0	0
7:45 AM	31	42	0	0	0	29	2	0	1	0	36	0	1	0	0	0	142	0	0	0	0
7:50 AM	37	35	0	0	0	17	4	0	2	0	29	0	0	0	0	0	124	0	0	0	0
7:55 AM	34	25	0	0	0	28	2	0	3	0	47	0	0	0	0	0	139	0	0	0	0
8:00 AM	27	25	0	0	0	37	0	0	1	0	24	0	0	0	0	0	114	0	0	0	0
8:05 AM	20	26	0	0	0	34	0	0	4	0	27	0	0	0	0	0	111	0	0	0	0
8:10 AM	24	23	0	0	0	20	1	0	1	0	27	0	0	0	0	0	96	0	0	0	0
8:15 AM	20	37	0	0	0	23	2	0	3	0	24	0	0	1	0	0	110	0	0	0	0
8:20 AM	13	26	0	0	0	21	1	0	1	0	25	0	0	0	0	0	87	0	0	0	0
8:25 AM	23	23	0	0	1	20	1	0	2	0	23	0	0	0	0	0	93	0	0	0	0
8:30 AM	17	21	0	0	0	29	0	0	2	0	33	0	0	0	0	0	102	0	0	0	0
8:35 AM	23	18	0	0	0	20	0	0	5	0	26	0	0	0	0	0	92	0	0	0	0
8:40 AM	16	20	0	0	0	28	0	0	1	0	15	0	0	0	0	0	80	0	0	0	0
8:45 AM	21	17	0	0	0	13	0	0	2	0	29	0	0	0	0	0	82	0	0	0	0
8:50 AM	19	13	0	0	0	16	0	0	2	0	35	0	0	0	0	0	85	0	0	0	0
8:55 AM	22	12	2	0	0	15	1	0	2	0	13	0	3	0	0	0	70	0	0	0	0
Total Survey	559	575	2	0	1	558	23	0	48	1	654	0	4	1	0	0	2,426	0	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	65	72	0	0	0	56	3	0	3	0	68	0	0	0	0	0	267	0	0	0	0
7:15 AM	69	65	0	0	0	81	4	0	5	1	81	0	0	0	0	0	306	0	0	0	0
7:30 AM	78	75	0	0	0	71	2	0	8	0	92	0	0	0	0	0	326	0	0	0	0
7:45 AM	102	102	0	0	0	74	8	0	6	0	112	0	1	0	0	0	405	0	0	0	0
8:00 AM	71	74	0	0	0	91	1	0	6	0	78	0	0	0	0	0	321	0	0	0	0
8:15 AM	56	86	0	0	1	64	4	0	6	0	72	0	0	1	0	0	290	0	0	0	0
8:30 AM	56	59	0	0	0	77	0	0	8	0	74	0	0	0	0	0	274	0	0	0	0
8:45 AM	62	42	2	0	0	44	1	0	6	0	77	0	3	0	0	0	237	0	0	0	0
Total Survey	559	575	2	0	1	558	23	0	48	1	654	0	4	1	0	0	2,426	0	0	0	0

Peak Hour Summary
7:15 AM to 8:15 AM

By Approach	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	636	681	1,317	0	332	341	673	0	389	335	724	0	1	1	2	0	1,358	0	0	0	0
%HV	9.0%				5.4%				19.3%				0.0%				11.0%				
PHF	0.78				0.82				0.82				0.25				0.84				

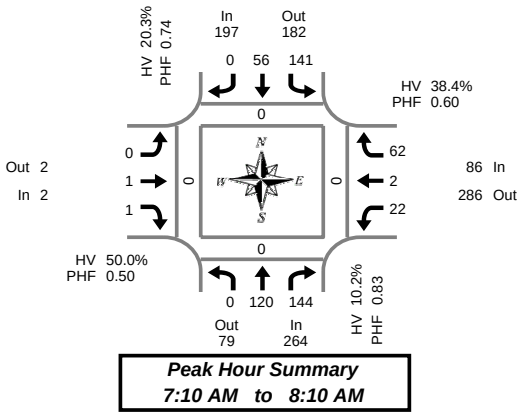
By Movement	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	320	316	0	636	0	317	15	332	25	1	363	389	1	0	0	1	1,358
%HV	11.6%	6.3%	0.0%	9.0%	0.0%	4.7%	20.0%	5.4%	16.0%	0.0%	19.6%	19.3%	0.0%	0.0%	0.0%	0.0%	11.0%
PHF	0.77	0.77	0.00	0.78	0.00	0.80	0.47	0.82	0.78	0.25	0.81	0.82	0.25	0.00	0.00	0.25	0.84

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	314	314	0	0	0	282	17	0	22	1	353	0	1	0	0	0	1,304	0	0	0	0
7:15 AM	320	316	0	0	0	317	15	0	25	1	363	0	1	0	0	0	1,358	0	0	0	0
7:30 AM	307	337	0	0	1	300	15	0	26	0	354	0	1	1	0	0	1,342	0	0	0	0
7:45 AM	285	321	0	0	1	306	13	0	26	0	336	0	1	1	0	0	1,290	0	0	0	0
8:00 AM	245	261	2	0	1	276	6	0	26	0	301	0	3	1	0	0	1,122	0	0	0	0

Total Vehicle Summary

Clay Carney
(503) 833-2740



SW Grahams Ferry Rd & SW Clutter Rd

Thursday, June 15, 2006
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	3	2	0	8	5	0	0	0	0	0	0	0	0	2	0	20	1	0	0	0
7:05 AM	0	6	11	0	5	2	0	0	0	0	0	0	1	0	5	0	30	0	0	0	0
7:10 AM	0	6	12	0	13	3	0	0	0	0	0	0	2	0	7	0	43	0	0	0	0
7:15 AM	0	8	7	0	12	6	0	0	0	1	0	0	1	1	5	0	41	0	0	0	0
7:20 AM	0	6	12	0	11	2	0	0	0	0	0	0	3	0	7	0	41	0	0	0	0
7:25 AM	0	15	12	0	8	1	0	0	0	0	0	0	1	0	2	0	39	0	0	0	0
7:30 AM	0	13	12	0	9	6	0	0	0	0	0	0	1	0	2	0	43	0	0	0	0
7:35 AM	0	16	12	0	7	2	0	0	0	0	0	0	0	1	4	0	42	0	0	0	0
7:40 AM	0	7	16	0	20	4	0	0	0	0	1	0	4	0	2	0	54	0	0	0	0
7:45 AM	0	10	15	0	17	5	0	0	0	0	0	0	3	0	12	0	62	0	0	0	0
7:50 AM	0	11	15	0	11	7	0	0	0	0	0	0	4	0	11	0	59	0	0	0	0
7:55 AM	0	7	15	0	18	9	0	0	0	0	0	0	1	0	5	0	55	0	0	0	0
8:00 AM	0	8	10	0	8	8	0	0	0	0	0	0	1	0	4	0	39	0	0	0	0
8:05 AM	0	13	6	0	7	3	0	0	0	0	0	0	1	0	1	0	31	0	0	0	0
8:10 AM	0	7	9	0	8	5	0	0	0	0	0	0	2	0	4	0	35	0	0	0	0
8:15 AM	0	7	5	0	13	3	0	0	0	0	0	0	2	0	3	0	33	0	0	0	0
8:20 AM	0	10	10	0	14	4	0	0	0	0	0	0	4	0	3	0	45	0	0	0	0
8:25 AM	0	4	3	0	1	4	0	0	0	0	0	0	4	0	4	0	20	0	0	0	0
8:30 AM	0	4	11	0	10	7	0	0	0	0	0	0	1	0	5	0	38	0	0	0	0
8:35 AM	0	3	11	0	10	2	0	0	0	0	0	0	1	0	4	0	31	0	0	0	0
8:40 AM	0	7	8	0	3	8	0	0	0	0	0	0	0	1	3	0	30	0	0	0	0
8:45 AM	0	5	7	0	10	5	0	0	0	0	1	0	2	0	4	0	34	0	0	0	0
8:50 AM	0	6	10	0	7	6	0	0	0	0	0	0	3	0	3	0	35	0	0	0	0
8:55 AM	0	8	1	0	7	4	0	0	0	0	0	0	0	0	2	0	22	0	0	0	0
Total Survey	0	190	232	0	237	111	0	0	0	1	2	0	42	3	104	0	922	1	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	15	25	0	26	10	0	0	0	0	0	0	3	0	14	0	93	1	0	0	0
7:15 AM	0	29	31	0	31	9	0	0	0	1	0	0	5	1	14	0	121	0	0	0	0
7:30 AM	0	36	40	0	36	12	0	0	0	0	1	0	5	1	8	0	139	0	0	0	0
7:45 AM	0	28	45	0	46	21	0	0	0	0	0	0	8	0	28	0	176	0	0	0	0
8:00 AM	0	28	25	0	23	16	0	0	0	0	0	0	4	0	9	0	105	0	0	0	0
8:15 AM	0	21	18	0	28	11	0	0	0	0	0	0	10	0	10	0	98	0	0	0	0
8:30 AM	0	14	30	0	23	17	0	0	0	0	0	0	2	1	12	0	99	0	0	0	0
8:45 AM	0	19	18	0	24	15	0	0	0	0	1	0	5	0	9	0	91	0	0	0	0
Total Survey	0	190	232	0	237	111	0	0	0	1	2	0	42	3	104	0	922	1	0	0	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	264	79	343	0	197	182	379	0	2	2	4	0	86	286	372	0	549	0	0	0	0
%HV	10.2%				20.3%				50.0%				38.4%				18.4%				
PHF	0.83				0.74				0.50				0.60				0.78				

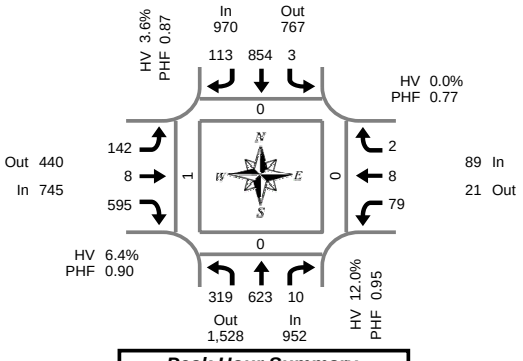
By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	120	144	264	141	56	0	197	0	1	1	2	22	2	62	86	549
%HV	0.0%	15.8%	5.6%	10.2%	15.6%	32.1%	0.0%	20.3%	0.0%	0.0%	#####	50.0%	13.6%	50.0%	46.8%	38.4%	18.4%
PHF	0.00	0.68	0.78	0.83	0.73	0.58	0.00	0.74	0.00	0.25	0.25	0.50	0.50	0.50	0.55	0.60	0.78

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	108	141	0	139	52	0	0	0	1	1	0	21	2	64	0	529	1	0	0	0
7:15 AM	0	121	141	0	136	58	0	0	0	1	1	0	22	2	59	0	541	0	0	0	0
7:30 AM	0	113	128	0	133	60	0	0	0	0	1	0	27	1	55	0	518	0	0	0	0
7:45 AM	0	91	118	0	120	65	0	0	0	0	0	0	24	1	59	0	478	0	0	0	0
8:00 AM	0	82	91	0	98	59	0	0	0	0	1	0	21	1	40	0	393	0	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:30 PM to 5:30 PM

SW Boones Ferry Rd & SW 95th Ave

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	28	44	1	0	0	55	13	0	14	4	66	0	7	0	0	0	232	0	0	0	0
4:05 PM	29	53	4	0	0	70	12	1	10	0	60	0	4	2	0	0	244	0	0	0	0
4:10 PM	35	45	1	1	0	71	5	0	10	0	41	0	2	0	1	0	211	0	0	0	0
4:15 PM	28	45	0	0	1	75	21	0	8	1	49	0	5	2	0	0	235	0	0	0	0
4:20 PM	21	53	1	0	0	82	6	0	8	2	55	0	2	0	0	0	230	0	0	0	0
4:25 PM	19	42	1	0	1	48	9	0	9	2	45	0	2	0	0	0	178	0	0	0	0
4:30 PM	30	43	0	0	2	71	10	0	11	2	49	0	5	0	0	0	223	0	0	0	0
4:35 PM	21	51	0	0	0	65	12	0	12	2	60	0	6	1	0	0	230	0	0	0	1
4:40 PM	28	44	0	0	1	64	6	0	6	2	56	0	9	1	0	0	217	0	0	0	0
4:45 PM	26	55	0	0	0	84	6	0	13	0	52	0	7	2	2	0	247	0	0	0	0
4:50 PM	32	53	0	0	0	86	12	0	6	0	40	0	7	0	0	0	236	0	0	0	0
4:55 PM	36	43	1	0	0	82	10	0	5	1	42	0	8	0	0	0	228	0	0	0	0
5:00 PM	24	51	3	0	0	67	7	0	8	0	38	0	9	1	0	0	208	0	0	0	0
5:05 PM	22	51	0	0	0	56	12	0	17	0	64	0	9	2	0	0	233	0	0	0	0
5:10 PM	24	60	3	0	0	81	5	0	16	0	48	0	5	1	0	0	243	0	0	0	0
5:15 PM	22	55	1	0	0	75	8	0	17	0	46	0	5	0	0	0	229	0	0	0	0
5:20 PM	30	54	0	1	0	68	14	0	14	0	58	0	5	0	0	0	243	0	0	0	0
5:25 PM	24	63	2	1	0	55	11	0	17	1	42	0	4	0	0	0	219	0	0	0	0
5:30 PM	30	57	0	0	0	51	6	0	7	0	52	0	3	3	0	0	209	0	0	0	0
5:35 PM	29	39	1	0	0	58	13	0	17	0	42	0	6	2	0	0	207	0	0	0	0
5:40 PM	30	66	1	0	0	55	17	0	16	0	33	0	3	0	0	0	221	0	0	0	0
5:45 PM	38	41	1	0	0	67	12	0	10	0	39	0	1	2	0	0	211	0	0	0	0
5:50 PM	31	47	4	0	0	53	12	0	14	1	30	0	6	1	0	0	199	0	0	0	0
5:55 PM	48	54	2	1	0	38	5	0	9	0	32	0	5	1	1	0	195	0	0	0	0
Total Survey	685	1,209	27	4	5	1,577	244	1	274	18	1,139	0	125	21	4	0	5,328	0	0	0	1

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	92	142	6	1	0	196	30	1	34	4	167	0	13	2	1	0	687	0	0	0	0
4:15 PM	68	140	2	0	2	205	36	0	25	5	149	0	9	2	0	0	643	0	0	0	0
4:30 PM	79	138	0	0	3	200	28	0	29	6	165	0	20	2	0	0	670	0	0	0	1
4:45 PM	94	151	1	0	0	252	28	0	24	1	134	0	22	2	2	0	711	0	0	0	0
5:00 PM	70	162	6	0	0	204	24	0	41	0	150	0	23	4	0	0	684	0	0	0	0
5:15 PM	76	172	3	2	0	198	33	0	48	1	146	0	14	0	0	0	691	0	0	0	0
5:30 PM	89	162	2	0	0	164	36	0	40	0	127	0	12	5	0	0	637	0	0	0	0
5:45 PM	117	142	7	1	0	158	29	0	33	1	101	0	12	4	1	0	605	0	0	0	0
Total Survey	685	1,209	27	4	5	1,577	244	1	274	18	1,139	0	125	21	4	0	5,328	0	0	0	1

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	952	1,528	2,480	2	970	767	1,737	0	745	440	1,185	0	89	21	110	0	2,756	0	0	0	1
%HV	12.0%				3.6%				6.4%				0.0%				7.1%				
PHF	0.95				0.87				0.90				0.77				0.96				

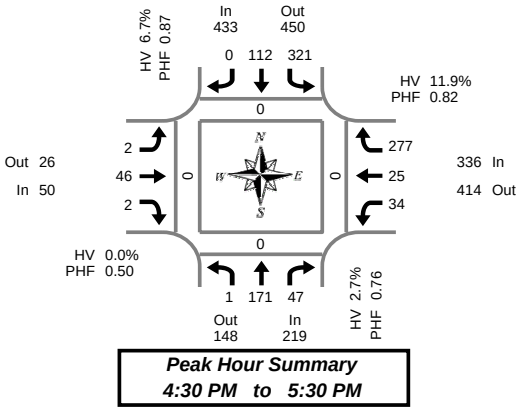
By Movement	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	319	623	10	952	3	854	113	970	142	8	595	745	79	8	2	89	2,756
%HV	20.4%	7.9%	0.0%	12.0%	0.0%	3.0%	8.0%	3.6%	4.9%	12.5%	6.7%	6.4%	0.0%	0.0%	0.0%	0.0%	7.1%
PHF	0.85	0.91	0.42	0.95	0.25	0.85	0.86	0.87	0.71	0.33	0.89	0.90	0.76	0.50	0.25	0.77	0.96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW 95th Ave				Westbound SW 95th Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	333	571	9	1	5	853	122	1	112	16	615	0	64	8	3	0	2,711	0	0	0	1
4:15 PM	311	591	9	0	5	861	116	0	119	12	598	0	74	10	2	0	2,708	0	0	0	1
4:30 PM	319	623	10	2	3	854	113	0	142	8	595	0	79	8	2	0	2,756	0	0	0	1
4:45 PM	329	647	12	2	0	818	121	0	153	2	557	0	71	11	2	0	2,723	0	0	0	0
5:00 PM	352	638	18	3	0	724	122	0	162	2	524	0	61	13	1	0	2,617	0	0	0	0

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:30 PM to 5:30 PM

SW Grahams Ferry Rd & SW Day St

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	11	6	0	19	4	0	0	0	8	0	0	4	0	14	0	66	0	0	0	0
4:05 PM	0	16	7	0	28	6	0	0	2	13	0	0	3	0	23	0	98	0	0	0	0
4:10 PM	0	16	2	0	42	5	2	0	0	4	0	0	4	0	21	0	96	0	0	0	0
4:15 PM	0	11	2	0	24	9	0	0	0	8	0	0	1	5	26	0	86	0	0	0	0
4:20 PM	0	7	5	0	14	9	0	0	0	1	0	0	6	1	30	0	73	0	0	0	0
4:25 PM	0	8	4	0	29	8	0	0	0	4	0	0	3	1	21	0	78	0	0	0	0
4:30 PM	1	10	8	0	26	10	0	0	0	8	1	0	8	0	19	0	91	0	0	0	0
4:35 PM	0	17	5	0	22	9	0	0	2	4	0	0	4	1	20	0	84	0	0	0	0
4:40 PM	0	14	2	0	27	11	0	0	0	10	0	0	6	1	21	0	92	0	0	0	0
4:45 PM	0	18	2	0	35	7	0	0	0	4	1	0	5	2	16	0	90	0	0	0	0
4:50 PM	0	18	0	0	21	10	0	0	0	4	0	0	5	1	23	0	82	0	0	0	0
4:55 PM	0	12	6	0	30	6	0	0	0	1	0	0	4	0	18	0	77	0	0	0	0
5:00 PM	0	6	5	0	27	9	0	0	0	2	0	0	2	2	28	0	81	0	0	0	0
5:05 PM	0	18	8	0	20	8	0	0	0	2	0	0	0	1	21	0	78	0	0	0	0
5:10 PM	0	16	1	0	36	7	0	0	0	6	0	0	0	1	25	0	92	0	0	0	0
5:15 PM	0	23	6	0	31	8	0	0	0	1	0	0	0	7	29	0	105	0	0	0	0
5:20 PM	0	8	2	0	25	18	0	0	0	1	0	0	0	4	26	0	84	0	0	0	0
5:25 PM	0	11	2	0	21	9	0	0	0	3	0	0	0	5	31	0	82	0	0	0	0
5:30 PM	0	11	3	0	25	6	1	0	0	4	0	0	4	1	20	0	75	0	0	0	0
5:35 PM	0	10	1	0	29	14	2	0	1	1	0	0	0	7	20	0	85	0	0	0	0
5:40 PM	0	13	4	0	31	5	0	0	0	3	0	0	1	5	30	0	92	0	0	0	0
5:45 PM	0	7	1	0	22	6	0	0	0	3	0	0	3	2	20	0	64	0	0	0	0
5:50 PM	0	8	3	0	15	10	0	0	0	1	0	0	7	2	24	0	70	0	0	0	0
5:55 PM	0	6	6	0	16	13	0	0	0	2	0	0	4	2	29	0	78	0	0	0	0
Total Survey	1	295	91	0	615	207	5	0	5	98	2	0	74	51	555	0	1,999	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	43	15	0	89	15	2	0	2	25	0	0	11	0	58	0	260	0	0	0	0
4:15 PM	0	26	11	0	67	26	0	0	0	13	0	0	10	7	77	0	237	0	0	0	0
4:30 PM	1	41	15	0	75	30	0	0	2	22	1	0	18	2	60	0	267	0	0	0	0
4:45 PM	0	48	8	0	86	23	0	0	0	9	1	0	14	3	57	0	249	0	0	0	0
5:00 PM	0	40	14	0	83	24	0	0	0	10	0	0	2	4	74	0	251	0	0	0	0
5:15 PM	0	42	10	0	77	35	0	0	0	5	0	0	0	16	86	0	271	0	0	0	0
5:30 PM	0	34	8	0	85	25	3	0	1	8	0	0	5	13	70	0	252	0	0	0	0
5:45 PM	0	21	10	0	53	29	0	0	0	6	0	0	14	6	73	0	212	0	0	0	0
Total Survey	1	295	91	0	615	207	5	0	5	98	2	0	74	51	555	0	1,999	0	0	0	0

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	219	148	367	0	433	450	883	0	50	26	76	0	336	414	750	0	1,038	0	0	0	0
%HV	2.7%				6.7%				0.0%				11.9%				7.2%				
PHF	0.76				0.87				0.50				0.82				0.92				

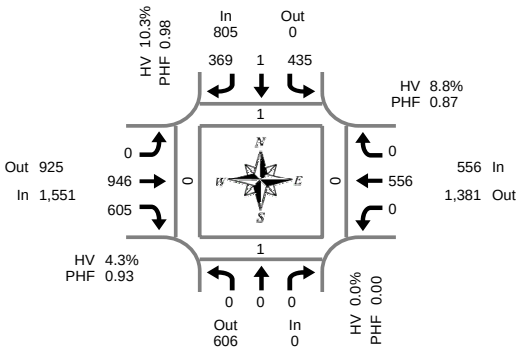
By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	171	47	219	321	112	0	433	2	46	2	50	34	25	277	336	1,038
%HV	0.0%	3.5%	0.0%	2.7%	6.2%	8.0%	0.0%	6.7%	0.0%	0.0%	0.0%	0.0%	35.3%	0.0%	10.1%	11.9%	7.2%
PHF	0.25	0.75	0.62	0.76	0.87	0.80	0.00	0.87	0.25	0.52	0.50	0.50	0.47	0.39	0.81	0.82	0.92

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	1	158	49	0	317	94	2	0	4	69	2	0	53	12	252	0	1,013	0	0	0	0
4:15 PM	1	155	48	0	311	103	0	0	2	54	2	0	44	16	268	0	1,004	0	0	0	0
4:30 PM	1	171	47	0	321	112	0	0	2	46	2	0	34	25	277	0	1,038	0	0	0	0
4:45 PM	0	164	40	0	331	107	3	0	1	32	1	0	21	36	287	0	1,023	0	0	0	0
5:00 PM	0	137	42	0	298	113	3	0	1	29	0	0	21	39	303	0	986	0	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:30 PM to 5:30 PM

I-5 SB Ramp & SW Elligsen Rd

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	25	1	18	0	0	74	29	0	0	35	0	0	182	0	0	0	0
4:05 PM	0	0	0	0	29	0	27	0	0	95	41	1	0	68	0	1	260	0	0	0	0
4:10 PM	0	0	0	0	22	0	28	0	0	70	44	0	0	47	0	0	211	0	0	0	0
4:15 PM	0	0	0	0	37	0	18	0	0	78	66	0	0	56	0	0	255	0	0	0	0
4:20 PM	0	0	0	0	36	0	24	0	0	81	51	0	0	48	0	0	240	0	0	0	0
4:25 PM	0	0	0	0	35	0	35	0	0	73	30	0	0	47	0	0	220	0	0	0	0
4:30 PM	0	0	0	0	41	0	27	0	0	79	49	0	0	38	0	0	234	0	0	0	0
4:35 PM	0	0	0	0	25	0	38	0	0	95	36	0	0	52	0	0	246	0	0	0	0
4:40 PM	0	0	0	0	37	0	25	0	0	85	40	0	0	42	0	0	229	0	0	0	0
4:45 PM	0	0	0	0	40	0	31	0	0	88	54	0	0	40	0	0	253	0	0	0	0
4:50 PM	0	0	0	0	35	0	38	0	0	78	67	0	0	58	0	0	276	0	0	0	0
4:55 PM	0	0	0	0	33	0	27	0	0	70	58	0	0	24	0	0	212	0	0	0	0
5:00 PM	0	0	0	0	28	0	34	0	0	63	53	0	0	45	0	0	223	0	0	0	0
5:05 PM	0	0	0	0	46	1	31	0	0	82	46	0	0	45	0	0	251	0	1	0	0
5:10 PM	0	0	0	0	36	0	26	0	0	65	55	0	0	59	0	0	241	0	0	0	0
5:15 PM	0	0	0	0	38	0	23	0	0	85	44	0	0	48	0	0	238	1	0	0	0
5:20 PM	0	0	0	0	35	0	35	0	0	88	54	0	0	52	0	1	264	0	0	0	0
5:25 PM	0	0	0	0	41	0	34	0	0	68	49	0	0	53	0	1	245	0	0	0	0
5:30 PM	0	0	0	0	36	0	23	0	0	66	35	0	0	42	0	0	202	0	0	0	0
5:35 PM	0	0	0	0	49	0	44	0	0	65	47	0	0	46	0	0	251	0	0	0	0
5:40 PM	0	0	0	0	38	0	23	0	0	55	31	0	0	76	0	0	223	0	0	0	0
5:45 PM	0	0	0	0	42	0	38	0	0	70	46	0	0	53	0	0	249	0	0	0	0
5:50 PM	0	0	0	0	41	0	37	0	0	51	37	0	0	51	0	1	217	0	0	0	0
5:55 PM	0	0	0	0	53	0	36	0	0	58	27	0	0	42	0	0	216	0	0	0	0
Total Survey	0	0	0	0	878	2	720	0	0	1,782	1,089	1	0	1,167	0	4	5,638	1	1	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	76	1	73	0	0	239	114	1	0	150	0	1	653	0	0	0	0
4:15 PM	0	0	0	0	108	0	77	0	0	232	147	0	0	151	0	0	715	0	0	0	0
4:30 PM	0	0	0	0	103	0	90	0	0	259	125	0	0	132	0	0	709	0	0	0	0
4:45 PM	0	0	0	0	108	0	96	0	0	236	179	0	0	122	0	0	741	0	0	0	0
5:00 PM	0	0	0	0	110	1	91	0	0	210	154	0	0	149	0	0	715	0	1	0	0
5:15 PM	0	0	0	0	114	0	92	0	0	241	147	0	0	153	0	2	747	1	0	0	0
5:30 PM	0	0	0	0	123	0	90	0	0	186	113	0	0	164	0	0	676	0	0	0	0
5:45 PM	0	0	0	0	136	0	111	0	0	179	110	0	0	146	0	1	682	0	0	0	0
Total Survey	0	0	0	0	878	2	720	0	0	1,782	1,089	1	0	1,167	0	4	5,638	1	1	0	0

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	606	606	0	805	0	805	0	1,551	925	2,476	0	556	1,381	1,937	2	2,912	1	1	0	0
%HV	0.0%				10.3%				4.3%				8.8%				6.8%				
PHF	0.00				0.98				0.93				0.87				0.96				

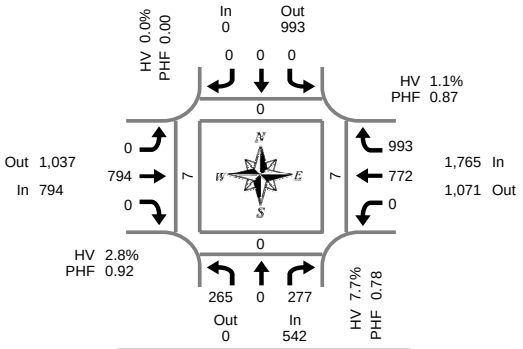
By Movement	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	0	0	435	1	369	805	0	946	605	1,551	0	556	0	556	2,912
%HV	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	18.2%	10.3%	0.0%	4.2%	4.3%	4.3%	0.0%	8.8%	0.0%	8.8%	6.8%
PHF	0.00	0.00	0.00	0.00	0.91	0.25	0.93	0.98	0.00	0.88	0.84	0.93	0.00	0.87	0.00	0.87	0.96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 SB Ramp				Southbound I-5 SB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	395	1	336	0	0	966	565	1	0	555	0	1	2,818	0	0	0	0
4:15 PM	0	0	0	0	429	1	354	0	0	937	605	0	0	554	0	0	2,880	0	1	0	0
4:30 PM	0	0	0	0	435	1	369	0	0	946	605	0	0	556	0	2	2,912	1	1	0	0
4:45 PM	0	0	0	0	455	1	369	0	0	873	593	0	0	588	0	2	2,879	1	1	0	0
5:00 PM	0	0	0	0	483	1	384	0	0	816	524	0	0	612	0	3	2,820	1	1	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

I-5 NB Ramp & SW Elligsen Rd

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	32	0	26	0	0	0	0	0	0	53	0	0	0	45	47	0	203	0	0	1	0
4:05 PM	29	0	32	0	0	0	0	0	0	61	0	0	0	52	57	0	231	0	0	0	0
4:10 PM	24	0	22	0	0	0	0	0	0	44	0	0	0	67	71	0	228	0	0	0	0
4:15 PM	15	0	15	0	0	0	0	0	0	64	0	0	0	69	81	0	244	0	0	0	0
4:20 PM	22	0	26	0	0	0	0	0	0	68	0	0	0	50	52	0	218	0	0	0	0
4:25 PM	11	0	18	0	0	0	0	0	0	51	0	0	0	45	53	0	178	0	0	0	0
4:30 PM	9	0	33	0	0	0	0	0	0	58	0	0	0	84	64	0	248	0	0	0	0
4:35 PM	31	0	22	0	0	0	0	0	0	58	0	0	0	53	72	0	236	0	0	0	0
4:40 PM	14	0	20	0	0	0	0	0	0	70	0	0	0	52	81	0	237	0	0	0	0
4:45 PM	23	0	11	0	0	0	0	0	0	79	0	0	0	66	78	0	257	0	0	1	1
4:50 PM	32	0	18	0	0	0	0	0	0	57	0	0	0	44	78	0	229	0	0	0	0
4:55 PM	21	0	29	0	0	0	0	0	0	59	0	0	0	52	50	0	211	0	0	3	2
5:00 PM	21	0	22	0	0	0	0	0	0	61	0	0	0	64	83	0	251	0	0	0	1
5:05 PM	14	0	21	0	0	0	0	0	0	78	0	0	0	64	96	0	273	0	0	0	0
5:10 PM	21	0	33	0	0	0	0	0	0	71	0	0	0	82	84	0	291	0	0	0	1
5:15 PM	23	0	22	0	0	0	0	0	0	66	0	0	0	76	101	0	288	0	0	0	0
5:20 PM	28	0	33	0	0	0	0	0	0	64	0	0	0	67	100	0	292	0	0	0	2
5:25 PM	35	0	33	0	0	0	0	0	0	53	0	0	0	52	86	0	259	0	0	0	0
5:30 PM	16	0	15	0	0	0	0	0	0	55	0	0	0	60	81	0	227	0	0	2	0
5:35 PM	12	0	23	0	0	0	0	0	0	71	0	0	0	63	78	0	247	0	0	0	0
5:40 PM	19	0	17	0	0	0	0	0	0	80	0	0	0	82	78	0	276	0	0	1	0
5:45 PM	22	0	18	0	0	0	0	0	0	66	0	0	0	48	62	0	216	0	0	0	0
5:50 PM	18	0	21	0	0	0	0	0	0	57	0	0	0	57	63	0	216	0	0	0	0
5:55 PM	21	0	24	0	0	0	0	0	0	60	0	0	0	57	55	0	217	0	1	0	0
Total Survey	513	0	554	0	0	0	0	0	0	1,504	0	0	0	1,451	1,751	0	5,773	0	1	8	7

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	85	0	80	0	0	0	0	0	0	158	0	0	0	164	175	0	662	0	0	1	0
4:15 PM	48	0	59	0	0	0	0	0	0	183	0	0	0	164	186	0	640	0	0	0	0
4:30 PM	54	0	75	0	0	0	0	0	0	186	0	0	0	189	217	0	721	0	0	0	0
4:45 PM	76	0	58	0	0	0	0	0	0	195	0	0	0	162	206	0	697	0	0	4	3
5:00 PM	56	0	76	0	0	0	0	0	0	210	0	0	0	210	263	0	815	0	0	0	2
5:15 PM	86	0	88	0	0	0	0	0	0	183	0	0	0	195	287	0	839	0	0	0	2
5:30 PM	47	0	55	0	0	0	0	0	0	206	0	0	0	205	237	0	750	0	0	3	0
5:45 PM	61	0	63	0	0	0	0	0	0	183	0	0	0	162	180	0	649	0	1	0	0
Total Survey	513	0	554	0	0	0	0	0	0	1,504	0	0	0	1,451	1,751	0	5,773	0	1	8	7

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	542	0	542	0	0	993	993	0	794	1,037	1,831	0	1,765	1,071	2,836	0	3,101	0	0	7	7
%HV	7.7%				0.0%				2.8%				1.1%				2.7%				
PHF	0.78				0.00				0.92				0.87				0.89				

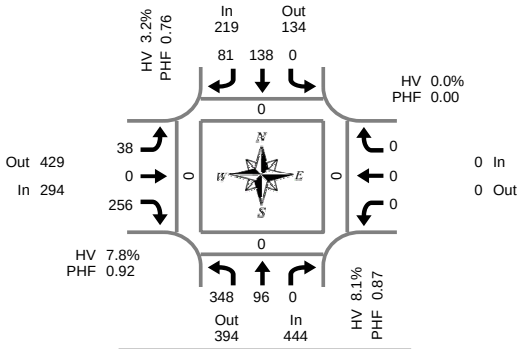
By Movement	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	265	0	277	542	0	0	0	0	0	794	0	794	0	772	993	1,765	3,101
%HV	14.3%	0.0%	1.4%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	2.8%	0.0%	1.0%	1.1%	1.1%	2.7%
PHF	0.77	0.00	0.79	0.78	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.92	0.00	0.86	0.86	0.87	0.89

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 NB Ramp				Southbound I-5 NB Ramp				Eastbound SW Elligsen Rd				Westbound SW Elligsen Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	263	0	272	0	0	0	0	0	0	722	0	0	0	679	784	0	2,720	0	0	5	3
4:15 PM	234	0	268	0	0	0	0	0	0	774	0	0	0	725	872	0	2,873	0	0	4	5
4:30 PM	272	0	297	0	0	0	0	0	0	774	0	0	0	756	973	0	3,072	0	0	4	7
4:45 PM	265	0	277	0	0	0	0	0	0	794	0	0	0	772	993	0	3,101	0	0	7	7
5:00 PM	250	0	282	0	0	0	0	0	0	782	0	0	0	772	967	0	3,053	0	1	3	4

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Grahams Ferry Rd & SW Tonquin Rd

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	17	4	0	0	0	7	3	0	2	0	18	0	0	0	0	0	51	0	0	0	0
4:05 PM	31	4	0	0	0	16	6	0	4	0	16	0	0	0	0	0	77	0	0	0	0
4:10 PM	32	14	0	0	0	17	6	0	1	0	28	0	0	0	0	0	98	0	0	0	0
4:15 PM	33	4	0	0	0	12	7	0	1	0	19	0	0	0	0	0	76	0	0	0	0
4:20 PM	21	4	0	0	0	13	6	0	2	0	18	0	0	0	0	0	64	0	0	0	0
4:25 PM	33	5	0	0	0	12	4	0	2	0	17	0	0	0	0	0	73	0	0	0	0
4:30 PM	27	6	0	0	0	15	8	0	4	0	18	0	0	0	0	0	78	0	0	0	0
4:35 PM	20	12	0	0	0	10	6	0	1	0	19	0	0	0	0	0	68	0	0	0	0
4:40 PM	24	6	0	0	0	20	5	0	2	0	22	0	0	0	0	0	79	0	0	0	0
4:45 PM	28	12	0	0	0	17	5	0	2	0	24	0	0	0	0	0	88	0	0	0	0
4:50 PM	33	6	0	0	0	11	7	0	3	0	19	0	0	0	0	0	79	0	0	0	0
4:55 PM	26	10	0	0	0	13	4	0	2	0	25	0	0	0	0	0	80	0	0	0	0
5:00 PM	23	5	0	0	0	11	5	0	5	0	26	0	0	0	0	0	75	0	0	0	0
5:05 PM	30	5	0	0	0	12	10	0	4	0	15	0	0	0	0	0	76	0	0	0	0
5:10 PM	34	8	0	0	0	20	4	0	2	0	18	0	0	0	0	0	86	0	0	0	0
5:15 PM	31	12	0	0	0	13	13	0	1	0	18	0	0	0	0	0	88	0	0	0	0
5:20 PM	32	11	0	0	0	8	9	0	2	0	21	0	0	0	0	0	83	0	0	0	0
5:25 PM	25	5	0	0	0	7	2	0	6	0	21	0	0	0	0	0	66	0	0	0	0
5:30 PM	25	9	0	0	0	7	9	0	5	0	22	0	0	0	0	0	77	0	0	0	0
5:35 PM	27	3	0	0	0	14	7	0	3	0	22	0	0	0	0	0	76	0	0	0	0
5:40 PM	34	10	0	0	0	5	6	0	3	0	25	0	0	0	0	0	83	0	0	0	0
5:45 PM	27	4	0	0	0	10	11	0	3	0	22	0	0	0	0	0	77	0	0	0	0
5:50 PM	19	4	0	0	0	8	11	0	1	0	12	0	0	0	0	0	55	0	0	0	0
5:55 PM	33	7	0	0	0	10	5	0	3	0	11	0	0	0	0	0	69	0	0	0	0
Total Survey	665	170	0	0	0	288	159	0	64	0	476	0	0	0	0	0	1,822	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	80	22	0	0	0	40	15	0	7	0	62	0	0	0	0	0	226	0	0	0	0
4:15 PM	87	13	0	0	0	37	17	0	5	0	54	0	0	0	0	0	213	0	0	0	0
4:30 PM	71	24	0	0	0	45	19	0	7	0	59	0	0	0	0	0	225	0	0	0	0
4:45 PM	87	28	0	0	0	41	16	0	7	0	68	0	0	0	0	0	247	0	0	0	0
5:00 PM	87	18	0	0	0	43	19	0	11	0	59	0	0	0	0	0	237	0	0	0	0
5:15 PM	88	28	0	0	0	28	24	0	9	0	60	0	0	0	0	0	237	0	0	0	0
5:30 PM	86	22	0	0	0	26	22	0	11	0	69	0	0	0	0	0	236	0	0	0	0
5:45 PM	79	15	0	0	0	28	27	0	7	0	45	0	0	0	0	0	201	0	0	0	0
Total Survey	665	170	0	0	0	288	159	0	64	0	476	0	0	0	0	0	1,822	0	0	0	0

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	444	394	838	0	219	134	353	0	294	429	723	0	0	0	0	0	957
%HV	8.1%				3.2%				7.8%				0.0%				6.9%
PHF	0.87				0.76				0.92				0.00				0.93

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

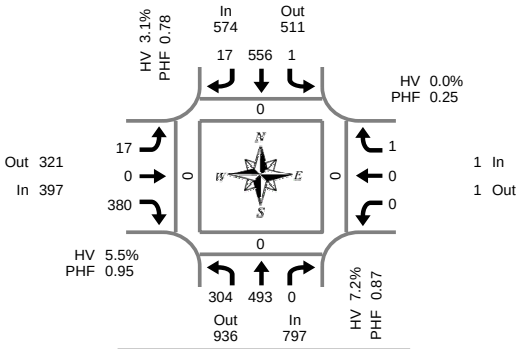
By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	348	96	0	444	0	138	81	219	38	0	256	294	0	0	0	0	957
%HV	9.8%	2.1%	0.0%	8.1%	0.0%	2.9%	3.7%	3.2%	2.6%	0.0%	8.6%	7.8%	0.0%	0.0%	0.0%	0.0%	6.9%
PHF	0.90	0.77	0.00	0.87	0.00	0.77	0.75	0.76	0.68	0.00	0.91	0.92	0.00	0.00	0.00	0.00	0.93

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Tonquin Rd				Westbound SW Tonquin Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	325	87	0	0	0	163	67	0	26	0	243	0	0	0	0	0	911	0	0	0	0
4:15 PM	332	83	0	0	0	166	71	0	30	0	240	0	0	0	0	0	922	0	0	0	0
4:30 PM	333	98	0	0	0	157	78	0	34	0	246	0	0	0	0	0	946	0	0	0	0
4:45 PM	348	96	0	0	0	138	81	0	38	0	256	0	0	0	0	0	957	0	0	0	0
5:00 PM	340	83	0	0	0	125	92	0	38	0	233	0	0	0	0	0	911	0	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:30 PM to 5:30 PM

SW Boones Ferry Rd & SW Day St

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	24	25	0	0	0	28	2	0	2	0	34	0	0	0	0	0	115	0	0	0	0
4:05 PM	26	36	1	0	0	32	0	0	1	0	47	0	1	0	0	0	144	0	0	0	0
4:10 PM	22	32	0	0	0	55	1	0	2	0	37	0	0	0	0	0	149	0	0	0	0
4:15 PM	23	25	0	0	0	55	3	0	2	0	37	0	0	0	0	0	145	0	0	0	0
4:20 PM	32	31	0	0	0	47	0	0	2	0	33	0	0	0	0	0	145	0	0	0	0
4:25 PM	26	31	0	0	0	37	0	0	1	0	31	0	0	0	0	0	126	0	0	0	0
4:30 PM	31	26	0	0	0	36	2	0	1	0	32	0	0	0	0	0	128	0	0	0	0
4:35 PM	23	39	0	0	1	38	1	0	1	0	33	0	0	0	0	0	136	0	0	0	0
4:40 PM	19	35	0	0	0	53	1	0	0	0	32	0	0	0	1	0	141	0	0	0	0
4:45 PM	23	48	0	0	0	57	3	0	0	0	37	0	0	0	0	0	168	0	0	0	0
4:50 PM	22	34	0	0	0	67	2	0	1	0	30	0	0	0	0	0	156	0	0	0	0
4:55 PM	24	26	0	0	0	52	1	0	1	0	36	0	0	0	0	0	140	0	0	0	0
5:00 PM	39	35	0	0	0	30	1	0	3	0	30	0	0	0	0	0	138	0	0	0	0
5:05 PM	24	47	0	0	0	39	1	0	5	0	29	0	0	0	0	0	145	0	0	0	0
5:10 PM	29	43	0	0	0	52	0	0	0	0	28	0	0	0	0	0	152	0	0	0	0
5:15 PM	20	47	0	0	0	46	2	0	3	0	37	0	0	0	0	0	155	0	0	0	0
5:20 PM	23	56	0	0	0	43	1	0	2	0	28	0	0	0	0	0	153	0	0	0	0
5:25 PM	27	57	0	1	0	43	2	0	0	0	28	0	0	0	0	0	157	0	0	0	0
5:30 PM	28	32	0	0	0	24	2	0	0	0	26	0	0	0	0	0	112	0	0	0	0
5:35 PM	30	33	0	0	0	40	3	0	0	0	31	0	0	0	0	0	137	0	0	0	0
5:40 PM	29	41	0	0	0	42	1	0	1	0	19	0	0	0	0	0	133	0	0	0	0
5:45 PM	25	31	0	0	0	54	1	0	0	0	39	0	0	0	0	0	150	0	0	0	0
5:50 PM	21	32	0	0	0	23	4	0	1	0	28	0	0	0	0	0	109	0	0	0	0
5:55 PM	31	37	0	1	0	28	3	0	0	0	27	0	0	0	0	0	126	0	0	0	0
Total Survey	621	879	1	2	1	1,021	37	0	29	0	769	0	1	0	1	0	3,360	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	72	93	1	0	0	115	3	0	5	0	118	0	1	0	0	0	408	0	0	0	0
4:15 PM	81	87	0	0	0	139	3	0	5	0	101	0	0	0	0	0	416	0	0	0	0
4:30 PM	73	100	0	0	1	127	4	0	2	0	97	0	0	0	1	0	405	0	0	0	0
4:45 PM	69	108	0	0	0	176	6	0	2	0	103	0	0	0	0	0	464	0	0	0	0
5:00 PM	92	125	0	0	0	121	2	0	8	0	87	0	0	0	0	0	435	0	0	0	0
5:15 PM	70	160	0	1	0	132	5	0	5	0	93	0	0	0	0	0	465	0	0	0	0
5:30 PM	87	106	0	0	0	106	6	0	1	0	76	0	0	0	0	0	382	0	0	0	0
5:45 PM	77	100	0	1	0	105	8	0	1	0	94	0	0	0	0	0	385	0	0	0	0
Total Survey	621	879	1	2	1	1,021	37	0	29	0	769	0	1	0	1	0	3,360	0	0	0	0

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	797	936	1,733	1	574	511	1,085	0	397	321	718	0	1	1	2	0	1,769	0	0	0	0
%HV	7.2%				3.1%				5.5%				0.0%				5.5%				
PHF	0.87				0.78				0.95				0.25				0.95				

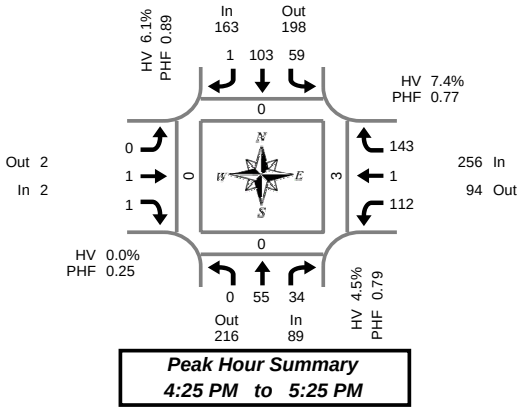
By Movement	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	304	493	0	797	1	556	17	574	17	0	380	397	0	0	1	1	1,769
%HV	13.2%	3.4%	0.0%	7.2%	0.0%	2.9%	11.8%	3.1%	11.8%	0.0%	5.3%	5.5%	0.0%	0.0%	0.0%	0.0%	5.5%
PHF	0.83	0.77	0.00	0.87	0.25	0.79	0.71	0.78	0.47	0.00	0.92	0.95	0.00	0.00	0.25	0.25	0.95

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Boones Ferry Rd				Southbound SW Boones Ferry Rd				Eastbound SW Day St				Westbound SW Day St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	295	388	1	0	1	557	16	0	14	0	419	0	1	0	1	0	1,693	0	0	0	0
4:15 PM	315	420	0	0	1	563	15	0	17	0	388	0	0	0	1	0	1,720	0	0	0	0
4:30 PM	304	493	0	1	1	556	17	0	17	0	380	0	0	0	1	0	1,769	0	0	0	0
4:45 PM	318	499	0	1	0	535	19	0	16	0	359	0	0	0	0	0	1,746	0	0	0	0
5:00 PM	326	491	0	2	0	464	21	0	15	0	350	0	0	0	0	0	1,667	0	0	0	0

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:25 PM to 5:25 PM

SW Grahams Ferry Rd & SW Clutter Rd

Thursday, June 15, 2006
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	6	2	0	5	5	0	0	0	0	0	0	7	0	9	0	34	0	0	0	0
4:05 PM	0	12	3	0	2	6	0	0	0	0	0	0	3	0	11	0	37	0	0	0	0
4:10 PM	0	4	2	0	4	9	0	0	0	0	0	0	9	0	14	0	42	0	0	0	0
4:15 PM	0	5	2	0	6	9	0	0	0	0	0	0	9	0	8	0	39	0	0	0	0
4:20 PM	0	4	2	0	6	4	0	0	0	0	0	0	6	0	9	0	31	0	0	0	0
4:25 PM	0	7	3	0	3	13	0	0	0	0	0	0	10	0	6	0	42	0	0	0	0
4:30 PM	0	5	3	0	5	9	0	0	0	0	0	0	8	0	7	0	37	0	0	0	0
4:35 PM	0	2	1	0	4	10	0	0	0	0	0	0	10	0	21	0	48	0	0	0	0
4:40 PM	0	3	1	0	8	6	0	0	0	0	0	0	8	0	13	0	39	0	0	0	0
4:45 PM	0	4	1	0	8	10	0	0	0	0	0	0	9	0	16	0	48	0	0	0	0
4:50 PM	0	6	8	0	5	9	0	0	0	0	0	0	6	0	12	0	46	0	0	0	0
4:55 PM	0	4	1	0	3	6	0	0	0	0	0	0	9	0	5	0	28	0	0	3	0
5:00 PM	0	2	5	0	4	11	0	0	0	0	0	0	9	0	7	0	38	0	0	0	0
5:05 PM	0	4	1	0	2	7	0	0	0	0	0	0	13	0	18	0	45	0	0	0	0
5:10 PM	0	7	4	0	6	8	1	0	0	0	1	0	11	0	13	0	51	0	0	0	0
5:15 PM	0	8	3	0	5	7	0	0	0	0	0	0	9	0	19	0	51	0	0	0	0
5:20 PM	0	3	3	0	6	7	0	0	0	1	0	0	10	1	6	0	37	0	0	0	0
5:25 PM	0	5	3	0	7	5	1	0	0	0	0	0	9	0	9	0	39	0	0	0	0
5:30 PM	0	5	2	0	4	5	0	0	0	0	0	0	6	0	9	0	31	0	0	0	0
5:35 PM	0	5	3	0	7	16	0	0	0	0	0	0	15	0	10	0	56	0	0	0	0
5:40 PM	0	7	3	0	7	8	0	0	0	0	0	0	6	0	9	0	40	0	0	0	0
5:45 PM	0	3	3	0	4	8	0	0	0	1	0	0	11	1	5	0	36	0	0	0	0
5:50 PM	0	3	1	0	9	10	1	0	1	0	0	0	5	0	6	0	36	0	0	0	0
5:55 PM	0	5	3	0	7	5	1	0	0	0	0	0	16	0	5	0	42	0	0	0	0
Total Survey	0	119	63	0	127	193	4	0	1	2	1	0	214	2	247	0	973	0	0	3	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	22	7	0	11	20	0	0	0	0	0	0	19	0	34	0	113	0	0	0	0
4:15 PM	0	16	7	0	15	26	0	0	0	0	0	0	25	0	23	0	112	0	0	0	0
4:30 PM	0	10	5	0	17	25	0	0	0	0	0	0	26	0	41	0	124	0	0	0	0
4:45 PM	0	14	10	0	16	25	0	0	0	0	0	0	24	0	33	0	122	0	0	3	0
5:00 PM	0	13	10	0	12	26	1	0	0	0	1	0	33	0	38	0	134	0	0	0	0
5:15 PM	0	16	9	0	18	19	1	0	0	1	0	0	28	1	34	0	127	0	0	0	0
5:30 PM	0	17	8	0	18	29	0	0	0	0	0	0	27	0	28	0	127	0	0	0	0
5:45 PM	0	11	7	0	20	23	2	0	1	1	0	0	32	1	16	0	114	0	0	0	0
Total Survey	0	119	63	0	127	193	4	0	1	2	1	0	214	2	247	0	973	0	0	3	0

Peak Hour Summary
4:25 PM to 5:25 PM

By Approach	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	89	216	305	0	163	198	361	0	2	2	4	0	256	94	350	0	510
%HV	4.5%				6.1%				0.0%				7.4%				6.5%
PHF	0.79				0.89				0.25				0.77				0.87

Pedestrians Crosswalk			
North	South	East	West
0	0	3	0

By Movement	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	55	34	89	59	103	1	163	0	1	1	2	112	1	143	256	510
%HV	0.0%	5.5%	2.9%	4.5%	11.9%	2.9%	0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	11.9%	7.4%	6.5%
PHF	0.00	0.72	0.61	0.79	0.70	0.80	0.25	0.89	0.00	0.25	0.25	0.25	0.85	0.25	0.72	0.77	0.87

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Grahams Ferry Rd				Southbound SW Grahams Ferry Rd				Eastbound SW Clutter Rd				Westbound SW Clutter Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	62	29	0	59	96	0	0	0	0	0	0	94	0	131	0	471	0	0	3	0
4:15 PM	0	53	32	0	60	102	1	0	0	0	1	0	108	0	135	0	492	0	0	3	0
4:30 PM	0	53	34	0	63	95	2	0	0	1	1	0	111	1	146	0	507	0	0	3	0
4:45 PM	0	60	37	0	64	99	2	0	0	1	1	0	112	1	133	0	510	0	0	3	0
5:00 PM	0	57	34	0	68	97	4	0	1	2	1	0	120	2	116	0	502	0	0	0	0

17355 SW Boones Ferry Road
Lake Oswego, OR 97035-5217
Phone (503) 635-3618
Fax (503) 635-5395

M e m o r a n d u m

To: Sandi Young, ACIP, City of Wilsonville

From: Todd Chase, AICP, LEED

Copies: Technical Advisory Committee

Date: March 28, 2007

Subject: Task 4.5 Technical Memorandum #3, Annexation/Cost Impact Report, Revised

Project #: 13612

Introduction

This memorandum identifies preliminary fiscal benefits and costs associated with the planned development in the Coffee Creek Industrial Area for two conceptual land use and transportation alternatives. This memorandum covers the following items:

- Determination of the revenues, potential assessed value, and tax revenues generated from new development;
- Determination of the costs to serve the area;
- Anticipated capital costs of providing new urban public facilities, such as roads, sewer, water, and storm water treatment facilities;
- Identification of potential funding sources.

Memorandum Contents

The body of this memorandum contains the following sections:

Development Assumptions

There are two land use/transportation alternatives being evaluated for the Coffee Creek Industrial Area. Both of the alternatives emerged after significant discussion with the project Technical Advisory Committee, and take into account public input received at the initial public open house event.

Alternative 1 "Industrial" follows the precise land use functional plan designations identified by Metro, which includes Regionally Significant Industrial Area (RSIA) designation south of Day Road, and "industrial" designation north of Day Road. Please refer to Figure 1.

Alternative 2 "Industrial/Mixed Employment" also follows Metro's plan designation south of Day Road, but varies from Metro's "industrial" designation for a portion of the planning area north of Day Road. This alternative assumes there to be a combination of industrial and commercial/mixed use development north of Day Road, in the northeastern portion of the study area located between Basalt Creek and Lower Boones Ferry Road. This area has a significant amount of topographic grade change, and there are several rural residential dwellings located within the plan area, and immediately north. The creek basin also provides a natural buffer between planned industrial areas to the west.

Providing housing in close proximity to industrial areas is included in Alternative 2 north of Day Road given the topographic constraints, natural creek buffers, and compatibility of rural housing areas. In this alternative, it is assumed that new "work force" housing would provide rental and homeownership opportunities, at mid-market and affordable price ranges. The location for housing in this area would be potentially beneficial for residents that want to walk or bicycle to work and the shopping opportunities within one-half mile from this site.

Table 1A
Wilsonville Coffee Creek Industrial Plan
Gross Buildable Land Area and Employment/Housing Assumptions*

Location	Industrial Land Area (acres)	Comm. Service Area (acres)	Housing (acres)	Total (acres)
South of Day Road				
Alt.1 & Alt. 2	154.2	9.6	--	**163.8**
North of Day Road				
Alt.1 Industrial	43.5	2.7	--	**46.2**
Alt. 2. Industrial/Mixed Use	20.0	9.0	23.2	**29.1**

** Gross buildable acres are net of development constraints, such as slopes over 15% and Title 3 floodways, wetlands, and locally designated Significant Resource Overlay Zones.*
Source: Otak, Inc.

Table 1B
Wilsonville Coffee Creek Industrial Plan
Employment and Households, 20-Year Forecast*

Location	Industrial Jobs	Comm. Service Jobs	Total Jobs	Work force Housing (dwellings)
South of Day Road				
Alt.1 & Alt. 2	1,387	87	**1,474**	--
North of Day Road				
Alt.1 Industrial	392	24	**416**	--
Alt. 2. Industrial/Mixed Use	180	81	**262**	**232**

**These job density assumptions are consistent with Metro Title 1, Summary of 2040 Growth Concept, effective 2/15/06: 9 jobs/acre, and 10 dwellings/acre.*
Source: Otak, Inc.

Figure 1, Alternative 1

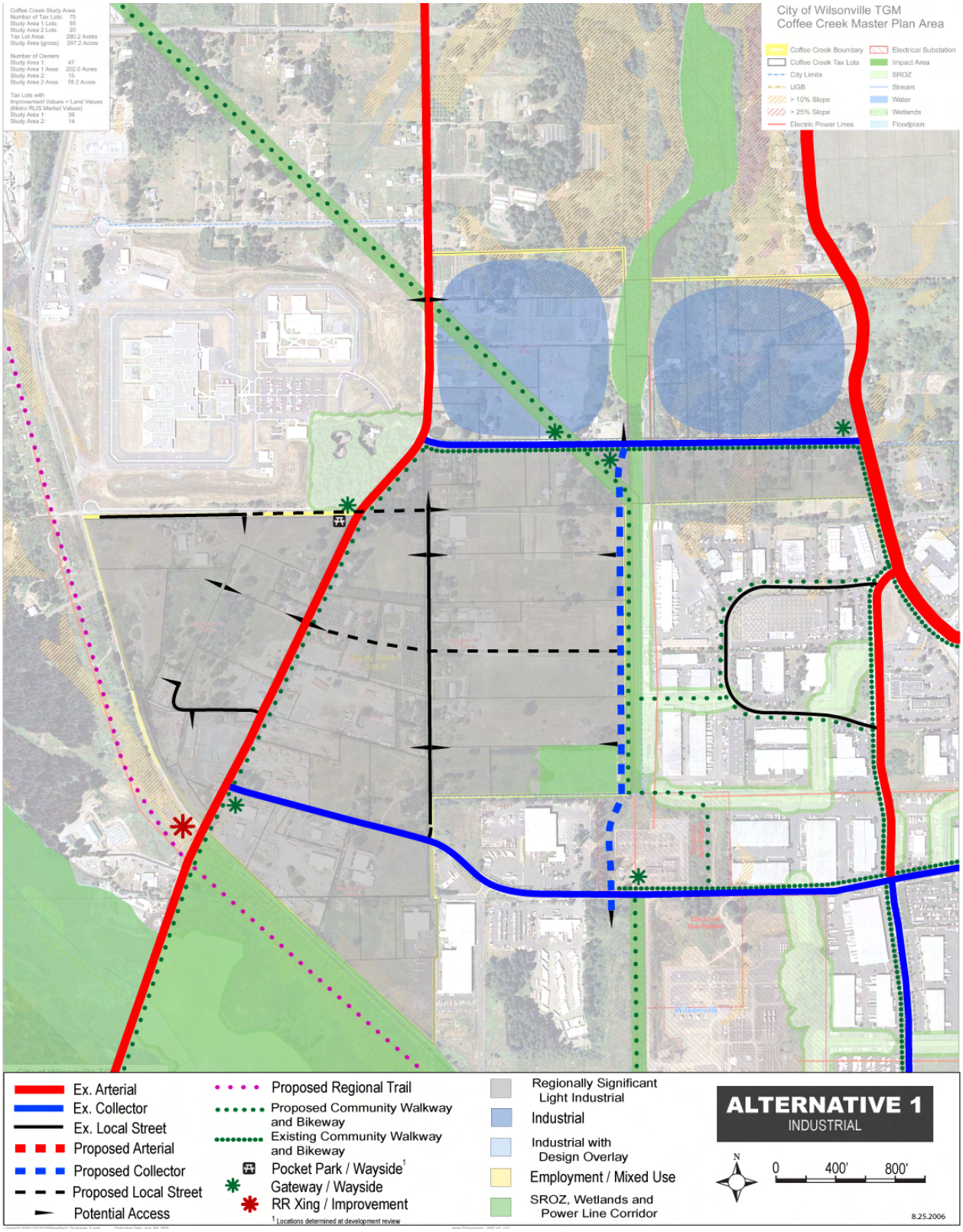
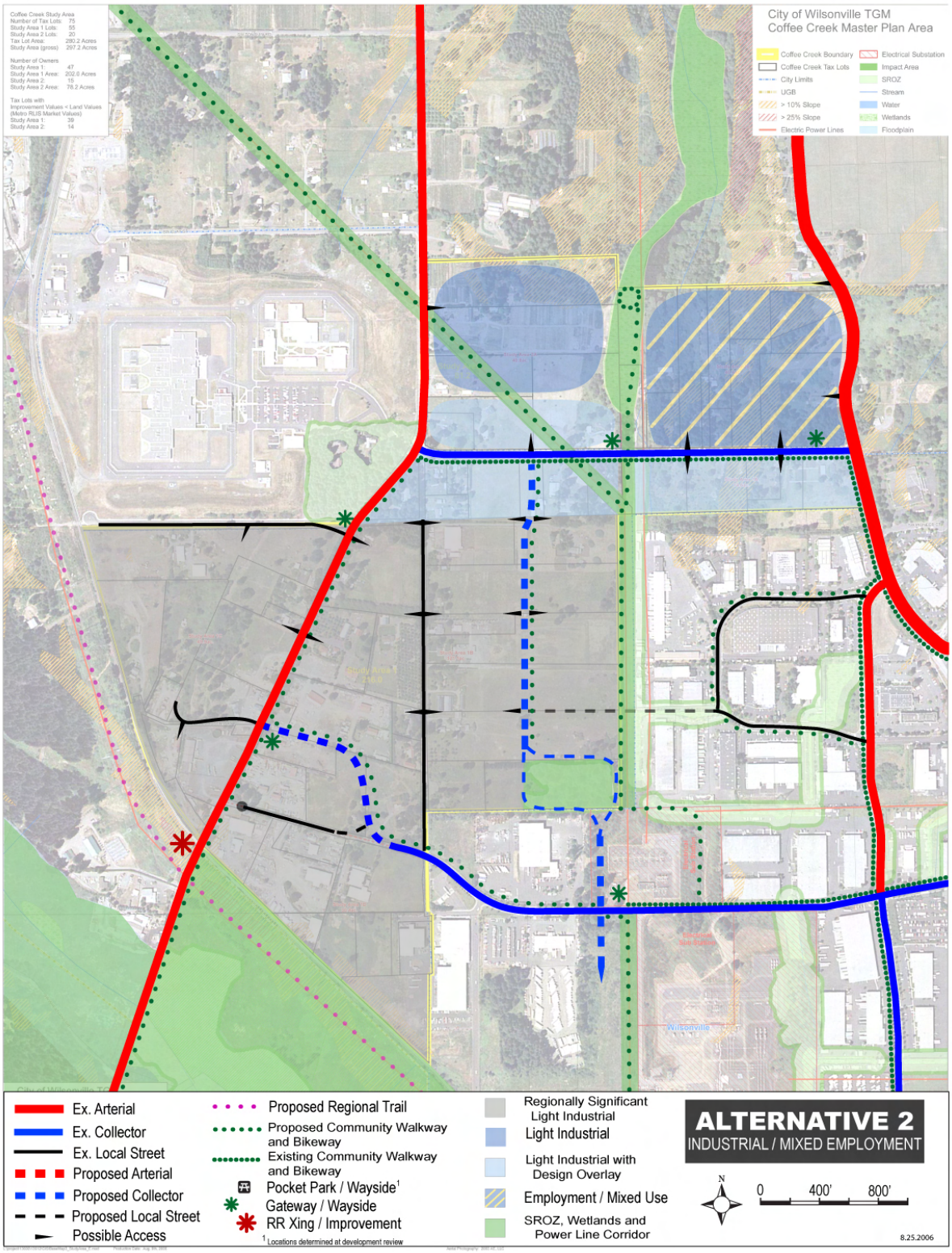


Figure 2, Alternative 2



Public Facility Requirements

Preliminary public facility requirements have been identified for roads, water lines, sewer lines, storm water systems, parks/trails, and wayside improvements. Tables 2-4 summarize the recommended public facilities in vicinity of the planning area.

Transportation Improvements

Traffic analysis was conducted by DKS Associates to ascertain existing and future (year 2030) roadway congestion and service levels at key intersections. Please refer to the DKS Memorandum dated February 12, 2007. Major roadway improvements were identified for the "no build" and "build alternatives."

The list of roadway improvements required to address anticipated growth in and around Wilsonville is extensive, even without annexing Coffee Creek and allowing urban development to occur in that location. Table 2 provides a list of required improvements that are necessary to provide an adequate transportation network with favorable service levels. Please refer to Appendix A for a summary of unit costs used for this analysis.

The total cost of constructing the roadway improvements identified in Table 2 is estimated at $19.7 million in year 2007 dollar amounts. The recommended short-term (years 1-5) improvements include the Kinsman Road extension between Ridder Road and Day Road (project C-24) at a cost of approximately $6.0 million, and a new traffic signal at the Kinsman/Day Road intersection (project S-36) at an estimated cost of $280,000.

Most other improvements reflected on Table 2 are considered to be long-term (beyond year 5) and may need to be added in the City and County TSPs prior to dedicating local or non-local funding for construction.

In addition to the roadway projects listed in Table 2, other improvements would be needed if the Coffee Creek Industrial Area is developed. A list of potential improvement projects that would be required with development limited to the area south of Day Road as per Alternative 1 (master plan area) is included in Table 3. Recommended public facilities for the area north of Day Road (concept plan area) are included in Table 4.

Please refer to Appendix B for a map of existing and planned street improvements.

Table 2 Summary of Transportation Improvements Assumed with No Build Scenario

ID #	Project Name	Prelim. Cost Estimate (millions)*	Priority	Required Amendments	Potential Funding Sources
Transportation Projects					
C-24	Kinsman Road (Day Road to Ridder Road)	$6.00	Years 1-5+	TSP amendment required for Green Street or for 3 lane section	SDCs, Urban Renewal/TIF, Developers
C7	Kinsman Road (Ridder to Boeckman Road)	$3.60	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
S-36	Day Road/Kinsman Road Signal	$0.28	Years 1-5+	no	SDCs, Urban Renewal/TIF, Developers
T-1	Boones Ferry Road/95th Avenue eastbound right turn lane	$0.61	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-2	Boones Ferry Road/95th Avenue westbound left turn pocket	$0.30	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-3	Boones Ferry Road/95th Avenue median	$0.30	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-4	Boones Ferry Road/95th Avenue northbound turn lane	$0.20	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
S-18	Ridder Road/Kinsman Road left turn pockets and signal	$0.58	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-5	Clutter Road/Grahams Ferry Road westbound left turn lane	$0.85	Years 6+	Consistent with County TSP, but requires City TSP amend.	County SDCs, Developers
T-6	Grahams Ferry Road/Clutter Road southbound turn lane	$0.30	Years 6+	Same as T-5	County SDCs, Developers
T-7	Grahams Ferry Road/Clutter Road signal	$0.28	Years 6+	Same as T-5	County SDCs, Developers
T-8	Grahams Ferry Road Railroad Crossing	$4.00	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, ODOT, Metro, TriMet
T-9	Boones Ferry Road widen four-lane section north of Day Road	$2.49	Years 6+	requires City & County TSP amendments	SDCs, Urban Renewal/TIF, Developers
T-10	Tonquin/SW Grahams Ferry Road westbound turn lane	$0.30	Years 6+	in County TSP	County SDCs, Developers
T-11	Tonquin/SW Grahams Ferry Road northbound turn lane	$0.30	Years 6+	in County TSP	County SDCs, Developers
T-12	Tonquin/SW Grahams Ferry Road signal	$0.28	Years 6+	in County TSP	County SDCs, Developers

Cost Summary	**Total**	**Years 1-5**	**Years 6+**
Roads	$16.67	$6.28	$10.39
Rail Crossing	$4.00	0	$4.00
Total	**$20.67**	**$6.28**	**$14.39**

*Notes: * costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.*

Table 3 Summary of Public Improvements
Coffee Creek Master Plan, South of Day Road, Alternative 1
This list identifies projects needed beyond those identified in the 2030 "No Build" Alternative.

ID #	Project Name	Prelim. Cost Estimate (millions)*	Priority	Required Amendments	Potential Funding Sources
Transportation Projects					
T-13A	Day Road/Kinsman left turn pocket	$0.30	Years 1-5	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-14	Kinsman/Day northbound right turn lane	$0.30	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-15A	Grahams Ferry Road (RR-xing to Day Road)	$4.20	Years 6+	in County TSP, but requires City TSP amend.	SDCs,Developers
T-15B	Grahams Ferry Road/Day Road duel southbound left turn lanes	$0.30	Years 6+	Same as T-15A	SDCs,Developers
T-16	Clutter Road Reconstruction	$2.10	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-17	Boones Ferry Road 5-lane section between Day Road and I-5	$2.25	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
P-1	Commerce Circle Trail Connection	$0.27	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
Sanitary Sewer Projects					
SS-1	Kinsman Road - Sewer Main	$0.68	Years 1-5	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-2	Grahams Ferry -Sewer Main	$0.10	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-3	Garden Acres Sewer Main	$0.20	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-4	Clutter Road Sewer Main	$0.28	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-5	Ridder Road Sewer Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers

Table 3 continued - Summary of Public Improvements
Coffee Creek Master Plan, South of Day Road, Alternative 1
This list identifies projects needed beyond those identified in the 2030 "No Build" Alternative.

ID #	Project Name	Prelim. Capital Cost Estimate (millions)*	Priority	Required Amendments	Potential Funding Sources
Water Line Projects					
W-1	Kinsman Road - Water Main	$0.42	Years 1-5	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
W-2	Grahams Ferry -Water Main	$0.45	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
W-3	Clutter Road Sewer Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
Storm Water Projects					
SW-1	Construct Kinsman Road and Grahams Ferry Road as "Greenstreets" with bioswales	cost included w/proj.	on going	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SW-2	Regional Detention/Treatment Pond	$0.30	Years 6+	requires City Facility Plan amendment	SDCs, Developers
Wayside Projects/Parks					
	Construct 3 new waysides	$0.30	Years 6+		SDCs, Urban Renewal/TIF, Developers

Notes:

** Costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.*

Table 3 Cost Summary (site-related improvements)

	Total	Years 1-5	Years 6+
Roads	$7.20	$0.30	$6.90
Pedestrian/Bicycle Pathways	$2.25	0	$2.25
Sewer	$1.53	$0.68	$0.85
Water	$1.14	$0.42	$0.72
Storm water	$0.30	0	$0.30
Waysides	$0.30	0	$0.30
Total	**$12.72**	**$1.40**	**$11.32**

Table 4 Summary of Public Improvements
Coffee Creek Industrial Area, North of Day Road, Alternatives 1 & 2

This list identifies projects needed beyond those identified in the 2030 "No Build" Alternative and South of Day Improvements

ID #	Project Name	Prelim. Capital Cost Estimate (millions)*	Priority	Required Amendments	Potential Funding Sources
Transportation Projects					
T-13B	Day Road/Kinsman left turn pocket	$0.30	Years 6+	in City TSP	SDCs, Urban Renewal/TIF, Developers
T-19	Boones Ferry Road / Day Road duel eastbound turn lanes	$0.60	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-20	Grahams Ferry Road (north of Day Road)	$1.05	Years 6+	in County TSP, requires City TSP amendment	County SDCs, Developers
P-2	Basalt Creek Parallel Trail	$0.09	Years 6+	parks plan amendment	SDCs, Urban Renewal/TIF, Developers
Sanitary Sewer Projects					
SS-6	Day Road - Sewer Main	$0.28	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-7	Boones Ferry Road - Sewer Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-8	North of Kinsman - Sewer Main	$0.20	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
Water Line Projects					
W-4	Grahams Ferry -Water Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
W-5	Boones Ferry Road - Sewer Main	$0.18	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
Storm Water Projects					
SW-3	Basalt Creek Buffer Restoration & Drainage Improvements	$0.15	Years 6+	requires City Facility Plan amendment	SDCs, Developers
Wayside Projects/Parks					
	Construct 1 new wayside	$0.10	Years 6+		SDCs, Urban Renewal/TIF, Developers

Notes:

** Costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.*

Table 4 Cost Summary (site related improvements)

	Total	Years 1-5	Years 6+
Roads	$1.95	0.0	$1.95
Pedestrian/Bicycle Pathways	$0.09	0.0	$0.09
Sewer	$0.75	0.0	$0.75
Water	$0.45	0.0	$0.45
Storm water	$0.15	0.0	$0.15
Waysides	$0.10	0.0	$0.10
Total	**$3.49**	**0.0**	**$3.49**

Sanitary Sewer System

The Coffee Creek Urban Planning Area is located in the United Disposal Interceptor basin subarea. The majority of the Coffee Creek Urban Planning Area was included as Urban Planning Area 4 (UPA-4) in the sewer master plan. This area was assumed to include the Coffee Creek Correctional Institution (on 113-acres) and 313-acres of future industrial land. Future unit flow assumptions for industrial uses were forecasted to be 2,000 gallons/day/acre. After considering factors for average daily flows, the industrial portion of UPA-4 is assumed to generate 626,000 gallons per day (gpd) of sewer flow at build-out.

It should also be noted that the assumptions included in the Preliminary Urban Reserve Plan for Coffee Creek Area 42 (prepared in 1998), calculated sewer flows at 3.0 mgd for the prison and industrial sites, that can serve between 12 and 21 persons per acre. The current sewer master plan assumes 0.8 mgd of average flows from this area, which is consistent with the lower end of the range in employment (12 jobs/acre). The master plan for Coffee Creek Industrial Area (south of Day Road) estimates potential employment to be 9 jobs/gross buildable acre for each Alternative. Hence, the sewer capacity assumptions appear to be in line with current sewer master plan assumptions.

The sewer master plan identifies two specific capital improvements that would be required to adequately serve the majority of the Coffee Creek Planning Area. These include:

- United Disposal Parallel Pipe (CIP-UD1 and listed as SS-1 in Appendix C). Includes construction of a 12-inch line from SMH3503 to SMH0269 to convey peak wastewater flows over a distance of 5,315 feet. The project includes an 8-foot diameter manhole with a diversion weir. Railcrossing will require trenchless technology. Alternative alignments should be investigated to minimize impacts to wetland and natural areas. This project should coordinate with Kinsman Road extension where possible. Estimated cost for the Kinsman segment of this pipe is $680,000. Additional off-site costs were estimated by the City in 2001 to be approximately $1,105,704. After adjusting for cost escalation, the current cost for off-site construction for this project is likely to be approximately $1.47 million.
- Garden Acres Road New Trunk Sewer (CIP-UD3 and SS-3 in Appendix C). Includes a new 12-inch trunk service extension along Garden Acres Road between Day Road and SW Ridder Road

to serve future development. A portion of this project was constructed a few years ago to accommodate the prison demand. Remaining cost for the Garden Acres extension segment of this pipe is approximately $200,000.

Additional sewer line improvements that are recommended for the Planning Area are reflected in the sewer facility maps in Appendix C, and Tables 3 and 4. It is important to note, that all identified projects and cost estimates are made for preliminary planning purposes. Site survey work will need to occur and the City will need to update its sewer system model to determine more accurate on and off-site water system improvements and trunk line size, location and cost.

Storm water Facilities

The City of Wilsonville, Storm water Master Plan Final Report (2001) addresses the management of stormwater runoff quantity and quality within the City's Urban Growth Boundary and adjoining planning areas. The plan specifically addresses Comprehensive Plan Policy 3.1.7 which requires that, *The City of Wilsonville shall develop and maintain an adequate storm drainage system.*

The Coffee Creek Planning Area is located within the Coffee Lake Creek Basin. The north tributary to Basalt Creek is located south of Day Road. Basalt Creek drains into Coffee Creek Lake and extends north of Day Road into the City of Tualatin UGB.

The Storm water Maser Plan identifies potential regional detention facilities in the Coffee Creek Planning Area as effective pollution reduction facilities. Planned facilities in the Planning Area include:

- North Wilsonville Planning Area comprehensive storm drainage system. The former Urban Reserve Area 42 (portion of Coffee Creek Planning Area) requires a system of storm drainage improvements in addition to on-site storm water detention and treatment provided by developers. The off-site public facility improvements are estimated to cost $2.46 million (2001 dollars).

In addition to requiring each new development within the Coffee Creek Industrial Planning Area to detain and treat any projected run off per existing City Code, it is recommended that the planned Kinsman Road and Grahams Ferry Road improvements be constructed as "green streets." Green streets will require a variance from existing City Street Standards to allow bio-swales and pervious surfaces to be used in lieu of curb and gutter to help convey storm water runoff.

Another recommendation is for the City to conduct a Basalt Creek and Coffee Creek sub-basin analysis to better define existing storm water events and flooding-related issues. Future development within the sub-basin should be modeled to ascertain likely impacts of urban development, and to identify impacts of beneficial storm water design standards. The possibility for a new regional storm water detention pond within the Coffee Creek Planning Area should be assessed.

Please refer to Appendix D for a map of existing and planned storm water facilities.

Water Facilities

Prior to the construction of the City of Wilsonville's Willamette Water Treatment Plant in 2002, the City relied on eight underground wells in the Columbia River Aquifer to serve its needs. The Willamette Treatment Plant now provides the majority of the City's water needs, with its main transmission line that runs up Kinsman Road. The Water Master Plan provides a plan for evaluating future water system needs to meet anticipated growth.

The Water Master Plan assumes current water usage rates of 44-gallons per day for industrial (average) and 176-gallons per day (peak) per user. The City's Community Development Department has also assumed that two 1.0 mgd average daily demand (ADD) industrial users will locate in the City by 2020 that will also need to be accommodated. The resulting analysis of water demand indicates that average peak day demand for industrial uses will increase from 1.25 mgd (2000) to 8.35 mgd (2020). Total water demand for the city is forecasted to increase from 6.8 mgd (2000) to 20.02 mgd (2020).

The existing Willamette Treatment Plan combined with existing wells has the capacity to handle approximately 10 mgd of total water demand. Future capacity expansion is planned to include 5 mgd through reservoirs (using aquifer storage and recovery wells) and another 5 mgd through expansion at the Willamette Treatment Plant.

The Water Master Plan includes a capital improvement phasing plan that identifies the need to add 4,220 linear feet of 12-inch water line between Grahams Ferry to Ridder Road and Ridder Road to Garden Acres. A preliminary list of recommended water system improvements for the Coffee Creek Industrial Area is provided in Appendix E, and Tables 3-4.

It is important to note, that all identified projects and cost estimates are made for preliminary planning purposes. Site survey work will need to occur and the City will need to update its water system model to determine more accurate on and off-site water system improvements and trunk line size, location and cost. Hence, additional water system improvements could include a pro rata share of off-site improvements for the new reservoir and pump stations.

Parks and Trails

The Wilsonville Parks and Recreation Master Plan specifically identifies the Northwest Industrial Area as having a strong need for accessible green space and recreation opportunities and

recommends providing parks in this area and/or improving linkages between the Industrial Area and existing parks.

Protecting natural resources is a hallmark of the Comprehensive Plan and the Parks and Recreation Master Plan. Natural resource protection and opportunities to partner with private land owners, as has historically been the case in Wilsonville, should be considered during the planning process for the Coffee Creek Area. Focus should also be placed on creating an interconnected park system including greenways and trails, but also connections for bike, pedestrian, and transit transportation choices.

The recommended plan for the Coffee Creek Industrial Area includes at least four new waysides which can function as strategic "gateway" design features with informational displays that depict area site/building configurations. These waysides should also function as "pocket parks" for local employees and residents with picnic tables and benches.

There are also local and regional pedestrian and bicycle trail connections that are included in the Coffee Creek Industrial Area plan. These pathways can be constructed within existing powerline easement corridors and should connect with Metro's planned regional trail that will parallel the Portland and Western Railroad. Please refer to Appendix F for a map of existing and planned parks and natural areas and trails.

Power, Gas and Telecommunications

This analysis assumes that public power, telecommunications (phone, cable and internet) and natural gas line extensions can be made into the Coffee Creek Industrial Area by private utility companies, as no expense to the City of Wilsonville. Additional coordination will be required with Portland General Electric, Quest, Sprint, Pacific Natural Gas, and other utilities if and when annexation procedures commence.

Fiscal Impact Analysis

The fiscal impact findings are based on the assumption that future development will generate revenue and costs for the City. A fiscal impact analysis is contained herein which presents the estimated revenue from property taxes, fees, and other revenue sources, if the area is annexed and developed—and compares it to the associated administration costs to the public sector. The analysis of public expenditures is based upon the on-site improvements that can be attributed to new development within the Coffee Creek Planning Area Boundary. Any additional public capital improvements that are reflected as No Build Improvements (Table 1) are not included in the calculation of fiscal impacts for this project since they are needed whether or not this area is annexed and developed as planned.

The methodology used to conduct this fiscal impact study is similar to that used in prior fiscal impact assessments that have been conducted in Tualatin, Sherwood, Portland, Gresham, and other cities. The method used generally follows the guidance described in the publication by the Council for Urban Economic Development*, Redevelopment Handbook*, 2003.

The basic methodology includes the following steps:

1. Determine the land use pattern, employment, population, and assessed land value.
2. Estimate revenues associated with land values, employment, and population.
3. Estimate costs of providing services.
4. Compare revenues and costs.
5. Estimate operating and maintenance (O&M) costs upon annexation.
6. Determine net fiscal impact from the City's perspective.

As new development occurs, general government responsibilities will be incurred by the City of Wilsonville. We have assumed the existing cost/revenue structure for the City shall remain as it is today (i.e. Measures 5 & 50 will apply and a consumption tax or other fee structure is not adopted locally or at the state level). It is assumed that with the increase of service responsibilities and costs, the City will receive revenues related to property values and business activities. If costs exceed revenues, a fiscal deficit is incurred; if revenues exceed costs, a surplus is generated. Underlying the analysis is the estimation of revenues and costs associated with annexation and development. Revenue and cost estimates are based on "drivers," which in this analysis are primarily employment, assessed property values, or real market values.

- This analysis focuses exclusively on the revenues and costs associated within the City of Wilsonville.
- Secondary fiscal impacts within the City that result from on-site development within the study area, such as increased population and business activity, are no estimated. .
- Upon annexation, general government services will transfer from Washington County and Clackamas County to the City of Wilsonville.
- The services provided to the study area will be the same as those currently provided to City property owners, businesses, and residents.

- The analysis focuses on revenues that are derived from existing taxes and fees. This includes current mil rates, system development charges, and user fees.

The results of the fiscal impact analysis conclude that there is a positive local fiscal impact that is likely to result upon build out with Alternative 1. As indicated in **Table 5**, the primary fiscal revenue streams to the City would include: local property tax revenues, city enterprise funds (from water and sewer user fees) and city franchise fee revenues (from a portion of utility charges collected by private utilities). These revenues are expected to reach $1.67 million per year upon buildout. Please refer to **Appendix Tables G1 and G-6, G-7 and G-8** for detailed revenue forecasts.

Annual operating expenses for maintaining expanded local roads, water, sewer, storm water and parks systems and indirect administrative costs for urbanizing Coffee Creek are expected to increase with time. Total annual operating expenses are expected to reach $679,000 per year for the area south of Day Road upon buildout. Please refer to **Appendix Tables G-1 through G-5** for a summary of operating expenses.

The net fiscal position for the City of Wilsonville will vary by year, but once build out is achieved the potential revenues from serving the Coffee Creek Industrial area south of Day Road are projected to exceed operating costs by approximately $994,000 per year.

Additional non-local revenues are projected to primarily accrue to Washington County, Metro, and the State of Oregon.

Table 5
Coffee Creek Industrial Area, South of Day Road, Alt. 1
Preliminary Fiscal Revenue and Expense Forecast (Buildout)

Total Cumulative Revenues & Costs (2007 $)	Total (cumulative or capitalized revenues)*	Annualized Value*
City Tax Revenue	$14,251,070	$1,425,107
City Share of State Shared Revenues	$0	$0
City Share of County Revenues (library)	$0	$0
City Enterprise Fund Revenues	$2,480,330	$248,033
City Franchise Fee Revenues	$766,561	$76,656
Subtotal City Revenues	**$16,731,400**	**$1,673,140**
City Operating Expenses*	**($6,794,955)**	**($679,495)**
Net Fiscal Position for City	**$9,936,445**	**$993,645**
Non-Local Revenues		
WA County Tax Revenue	$6,495,189	$649,519
Metro Property Tax	$237,431	$23,743
Metro Excise Tax	$290,288	$29,029
State Income Tax Revenue	$24,092,028	$2,409,203

** based on a 20-year buildout time period; and a capitalization rate of 10%.*
Source: analysis by Otak, Inc.

The area north of Day Road is also expected to provide the City of Wilsonville with positive fiscal impacts once build out is achieved. With Alternative 1, the City is expected to experience approximately $553,000 in annual revenues, and incur approximately $218,000 in annual expenses. This would result in a net positive fiscal position of over $330,000 per year, as indicated in **Table 6.**

Table 6
Coffee Creek Industrial Area, North of Day Road, Alt. 1
Preliminary Fiscal Revenue and Expense Forecast (Buildout)

Total Cumulative Revenues & Costs (2007 $)	Total (cumulative or capitalized revenues)*	Annualized Value*
City Tax Revenue	$4,524,855	$452,485
City Share of State Shared Revenues	$0	$0
City Share of County Revenues (library)	$0	$0
City Enterprise Fund Revenues	$791,657	$79,166
City Franchise Fee Revenues	$216,403	$21,640
Subtotal City Revenues	**$5,532,915**	**$553,292**
City Operating Expenses*	**($2,187,850)**	**($218,785)**
Net Fiscal Position for City	**$3,345,065**	**$334,506**
Selected Non-Local Revenues		
WA County Tax Revenue	$2,091,331	$209,133
Metro Property Tax	$76,448	$7,645
Metro Excise Tax	$93,467	$9,347
State Income Tax Revenue	$6,801,278	$680,128

** based on a 20-year buildout time period; and a capitalization rate of 10%.*
Source: analysis by Otak, Inc.

Development Alternative 2, with more housing and less industrial development than Alternative 2 is not expected to provide a positive fiscal impact. As indicated in **Table 7**, Alternative 2 north of Day Road is projected to result in more revenues than Alternative 1 ($703,000 at buildout) because there are more potential state shared revenues as population rises. However, the annual operating costs are expected to be slightly higher ($752,000) given the need to provide more public services, such as police, fire, safety, parks, and libraries for the 232 new projected households.

As indicated in **Table 7**, the net fiscal position to the City with Alternative 2 (north of Day Road) is projected to be close to breakeven, at negative $49,000 per year.

Table 7
Coffee Creek Industrial Area, North of Day Road, Alt. 2
Preliminary Fiscal Revenue and Expense Forecast (Buildout)

Total Cumulative Revenues & Costs (2007 $)	Total (cumulative or capitalized revenues)*	Annualized Value*
City Tax Revenue	$4,491,024	$449,102
City Share of State Shared Revenues	$160,173	$16,017
City Share of County Revenues (library)	$61,550	$6,155
City Enterprise Fund Revenues	$2,058,496	$205,850
City Franchise Fee Revenues	$256,664	$25,666
Subtotal City Revenues	**$7,027,906**	**$702,791**
City Operating Expenses**	**($7,520,457)**	**($752,046)**
Net Fiscal Position for City	**($492,551)**	**($49,255)**
Selected Non-Local Revenues		
WA County Tax Revenue	$2,167,938	$216,794
Metro Property Tax	$79,249	$7,925
Metro Excise Tax	$96,891	$9,689
State Income Tax Revenue	$4,056,715	$405,671

** based on a 20-year buildout time period; and a capitalization rate of 10%.*
*** Payment assumes 6% interest and 20 year term financing.*
Source: analysis by Otak, Inc.

Regional and State Fiscal Benefits

Primary fiscal benefits to the state include revenues from state personal payroll taxes and corporate income taxes. Because there are wide variations in corporate income taxes (based on 6.6% of Oregon taxable income) it is difficult to measure its fiscal revenue generation potential. Hence, the focus in this analysis is on state payroll tax collections.

New development and related trip generation will lead to increases in vehicle miles and fuel tax and weight-mile tax revenues for Oregon, Washington County and Clackamas County (only a very small portion of the plan area is located in Clackamas County). However, those revenues and related state pass-through tax revenue reimbursements to local governments and related costs are beyond the scope of this analysis and have not been calculated. It should be noted that state pass-through tax reimbursements to local governments, such as fuel taxes, liquor taxes, cigarette taxes, etc. have population-based disbursement formulae which are only affected by local population growth that occurs with Alternative 2 (north of Day Road).

Metro's new Construction Excise Tax, which was approved by the Metro Council in March 2006, is a temporary construction tax to be assessed on construction permits throughout the region to fund planning in new areas brought into the UGB in 2002 and 2004. These tax revenues could generate

up to $290,000 from the area south of Day Road and another $ 75,000 from the area North of Day Road.

In summary, this fiscal impact analysis indicates that the existing development impact fees, review fees, and tax rates in the City of Wilsonville are structured in a manner that could yield positive fiscal impacts from new industrial and commercial developments. The addition of new housing in development Alternative 2 would counter some of the positive fiscal benefit.

Local and Regional Economic Benefits

In addition to the fiscal benefits, the development of the Coffee Creek Industrial Area is expected to result in new construction and permanent economic impacts for the greater Portland-Vancouver Metro Region.

Significant private investment in new buildings, equipment and infrastructure is expected to occur over the next 20 years, if the Coffee Creek Industrial Area is annexed. Preliminary estimates include over $300 million in private investment being leveraged by approximately $20 million in public investment. The construction impact from this scale of private and public investment could result in over 4,000 person years of construction employment. Please refer to **Appendix Tables G-10, G-11 and G-12.**

Preliminary results summarized in **Appendix Table G-9** indicate that total potential employment (full time equivalent) jobs on site could reach 1,474 south of Day Road at buildout. An additional 262 to 416 jobs are projected in the area north of Day Road, with Alternatives 2 and 1, respectively.

These jobs would provide good family wage income to local and regional residents. Total projected payroll is expected to reach $55 million per year south of Day Road, and between $9 and $15 million per year north of Day Road at buildout.

The indirect regional impact of local job growth would eventually be all new to the region, as the region doubles in size over the next 20 to 30 years, according to Metro forecasts. If we assume a local indirect multiplier of 1.5, the regional direct and indirect economic impact from development in the Coffee Creek Industrial Area is projected to reach nearly $165 million, including approximately $135 million for the area south of Day Road, and another $30 million for the area north of Day Road.

The indirect economic impact is created as local direct payroll is deposited in local banks, invested, and expended on local goods and services—which in turn created second round economic impacts. As a portion of the second round economic impacts are invested or spent, the regional indirect impact expands—like the rings that ripple from a stone cast into a pond.

Funding Strategies

As with most successful large master planned developments, the Coffee Creek Industrial Area will require a mix of public and private funding and financing for on- and off-site improvements.

The first step in the funding process entails amendments to local (City of Wilsonville and Washington County) Transportation System Plans to identify the facilities identified in Tables 2, 3 and 4. After the TSP amendment processes occur (assuming there is support from ODOT and other state, Metro and local agencies/stakeholders), the county and/or city can work with ODOT and local stakeholders to update local ordinances (such as the Wilsonville and Washington County Systems Development Charge Methodology), capital improvement programs and the ODOT State Transportation Improvement Program (STIP) to designate appropriate improvements for funding.

As local plan amendments are adopted, funding sources should be identified. Potential local funding sources may include the following:

Local Systems Development Charges—The City of Wilsonville and Washington County SDC methodology could be amended to include capital facilities, such as Kinsman Road extension, Boones Ferry Road realignment, Tonquin Road/Grahams Ferry Road intersection improvements. These facilities are required to accommodate planned urban growth.

A preliminary analysis by Otak indicates that the existing SDC rate system, if applied to the anticipated level of development within the Coffee Creek Industrial Area, could be expected to generate approximately $13.6 million in revenue (area south of Day Road) and approximately $4 million in revenue (area north of Day Road) by the time build out is reached, assuming no SDC waivers are granted.[1] Please refer to **Appendix H**. The SDC analysis has generally concluded that on-site public facility capital costs for water, sewer, parks, and storm water facilities could be covered by SDC revenues from development in Coffee Creek. However, there would likely be a large funding gap for street projects.

The SDC analysis indicates that existing City SDC rates, if applied to new development in Coffee Creek Industrial Area, could fund approximately $4.4 million in street improvements, including $3.4 million from development south of Day Road, and another $1.0 million from development north of Day Road. This is well below the expected street funding cost requirements of $9.2 million, including $7.2 million for development south of Day Road and another $2.0 million for development north of Day Road. Hence, it is likely that existing SDCs would need to increase and additional revenue sources (identified below) would be required.

It should also be noted that in addition to these "site related street improvements" there are several additional transportation improvements that are recommended to accommodate local and regional increases in vehicle trips (even without new development in the Coffee Creek Industrial Area). The cost of these "off-site related improvements" is estimated at $20.1 million, including $16.1 million for streets and an additional $4.0 million for an improved railroad underpass along Grahams Ferry

1 Based on existing City of Wilsonville SDC rates shown in Appendix G. These rates are used for analysis purposes only. Actual rates will not be determined until after the city amends its SDC methodology. It should be noted that the City SDC rates for transportation have been assumed rather than Washington County SDC rates.

Road. Funding these additional improvements will also require a mix of City and County SDCs and other local revenue sources, along with state grants that could apply to the railroad underpass.

Urban Renewal Plan District—Wilsonville may consider expanding its urban renewal district area into a portion of the Coffee Creek Industrial Area. However, the City has recently determined that it is near its capacity for urban renewal district expansion given recent commitments made to accommodate the Villebois Village mixed use community. Notwithstanding the challenge of meeting state and local planning approval regulations regarding the formation or expansion of urban renewal plans (please refer to ORS 457.085), there are significant funding resources that could be obtained using Tax Increment Financing. A preliminary analysis by Otak indicates that potential assessed valuation in the Coffee Creek Industrial Area south of Day Road could increase from $16 million today to approximately $258 million at buildout. This $242 million increase in assessed valuation could support an additional $3.5 million in annual property tax revenues at buildout. If a conservative estimate of 50% site buildout is assumed over the life of the urban renewal district, these net new property tax revenues could support approximately $12 million in capital improvements.[2]

Local Improvement District (LID)—This approach assumes formation of a local improvement district in accordance with local ordinance and state statutes. A LID can be initiated by either the local jurisdiction or affected property owners for specific capital improvements with consent of at least 51% of affected property owners in the LID and at least two-thirds support from councilors. LID assessments result in a lien placed on properties by the local jurisdiction until the assessment is paid in full.

Zone of Benefit Recovery District (ZBR)—This approach is similar to the LID financing method, but is almost always initiated by the private sector and does not require a lien on properties for the assessment.

Combination of LID or ZBR and SDCs—Wilsonville and Washington County can combine LID and SDCs for the construction financing for improvements to collector and arterial roads, such as SW Boones Ferry Road. .

Metro Transportation Improvement Program—Selected arterial improvements, such as SW Boones Ferry Road and selected regional pathway improvements may be funded through the Metro TIP process.

ODOT Statewide Transportation Improvement Program (STIP)—State transportation facilities, such as reconstructing the Portland & Western Rail Road underpass, are eligible for funding through updates to the STIP. Recent preference for improvements required to address freight mobility requirements and dedication of funds from federal and state programs (such as the *ConnectOregon* program re-authorization being considered by the 2007 Oregon Legislature) can help raise the priority of improvements that benefit industrial job growth.

Oregon Immediate Opportunity Program—ODOT grants up to 50% of project ($500,000 cap) based on job creation for street improvements. A letter of intent from employers indicating job hiring and wage estimates is required.

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2 Urban Renewal TIF revenues assume existing local tax rate of $14.3 per $1,000 of assessed valuation for general government and schools, 70% debt: coverage ratio, and 10% capitalization rate.

Infrastructure Grants, Loans and Private Dedications

Water, sewer, storm water and parks facilities are often funded through special district bond issues paid for by customer service charges and commodity charges. As the service provider, the City is expected to provide major trunk line improvements to provide urban sanitary sewer, water, parks and sub-basin storm water facilities in the Coffee Creek Industrial Area. In addition to urban renewal district funding, other state and federal funding sources for infrastructure may include:

Special Public Works Fund—Grants awarded in conjunction with a joint loan application for construction and/or improvement of infrastructure needs to support industrial, manufacturing and certain types of commercial development. Typically covers up to $5,000 per job. Loans can be awarded up to $10 million at a rate of approximately 5.0%+/-. A grant award is based on a financial analysis of the applicant and a debt carrying capacity assessment. (Actual amounts of grant awards are subject to loan application ratios).

Oregon Community Block Grant Program—Grants for infrastructure improvements needed to support a business that will create or retain permanent jobs, the majority of which will be made available to low and moderate income workers. For public infrastructure projects, the ratio is one job per $20,000 invested.

Oregon Industrial Development Revenue Bond Program—Administered by the Oregon Economic and Community Development Department (OECDD) this program is focused on non-retail job creation. Bonds may be issued for manufacturing, processing and tourism facilities. Eligible companies may borrow $500,000 to $10 million though this program, and are obligated to pay back the bondholders.

Public/Private Development Agreements
In addition to these funding sources, major development projects often include advanced financing agreements between private developers and local jurisdictions. With advanced financing agreements, private entities that build public facilities that are on an adopted SDC funding list, can be compensated for a share of their investment by the city after development occurs. For projects that are not on the SDC project list (such as local streets), the City will typically require the adjacent developer to construct "half street" improvements (along property frontage) or allow the developer to build full street improvements. In some instances the developer may opt to create an LID or ZBR or similar benefit district with affected property owners to compensate the developer for a share of specific improvements.

Next Steps

The findings contained in this memorandum shall be presented and discussed with the Coffee Creek Technical Advisory Committee on Friday, February 16, 2007. Information regarding development costs and fiscal impacts will be used to help select a preferred alternative for the Coffee Creek Industrial Area.

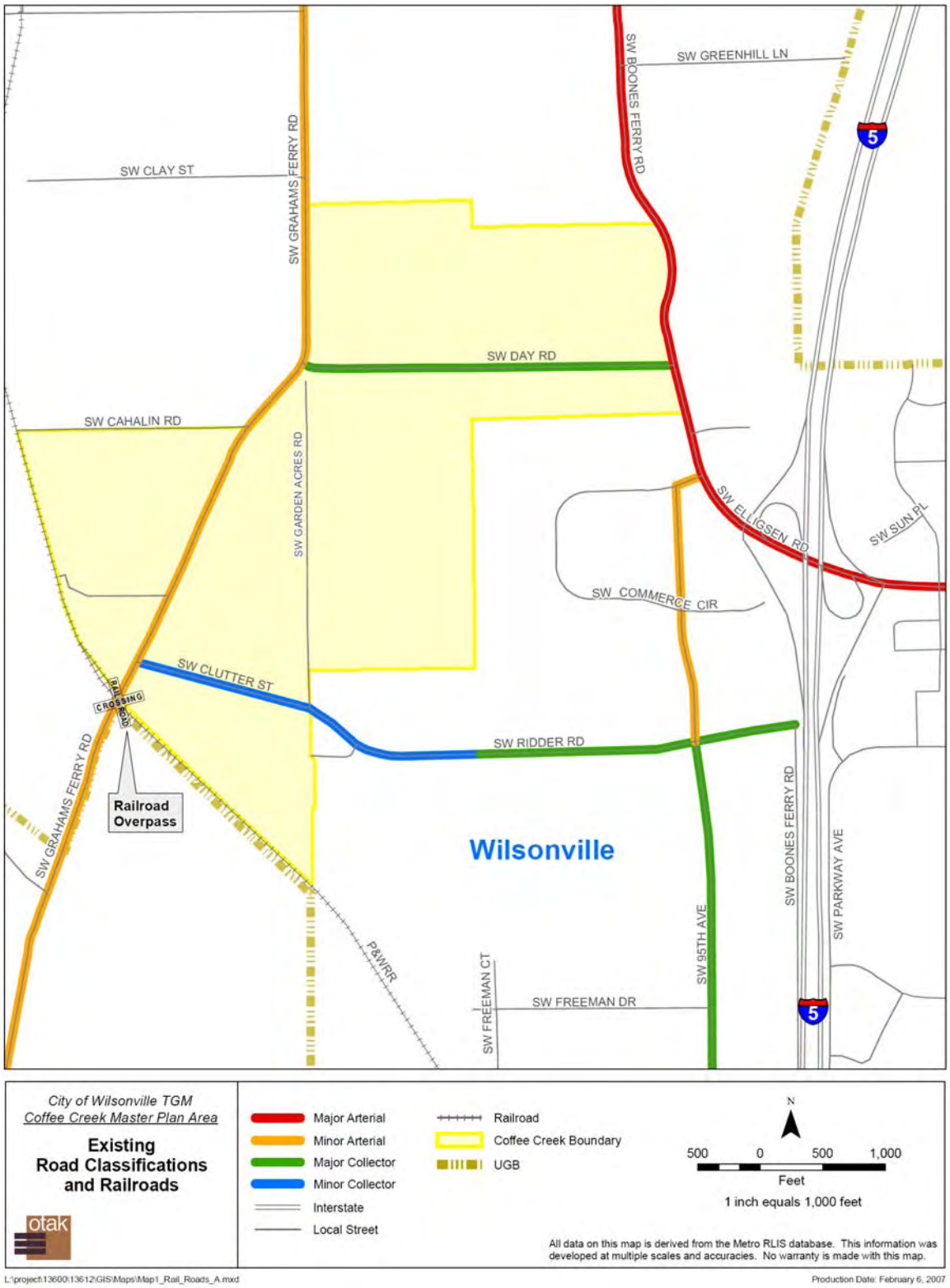
APPENDIX TABLES

Table A-1 Unit Cost Assumptions

	Type	Capital Cost*	Units
Transportation Improvements			
New 3 Lane Arterial (2 travel lanes, center turn lane, bike lanes, sidewalks, street illumination, landscaping)	concrete	$2,000	linear foot
New 2 Lane Collector (2 travel lanes, bike lanes, sidewalks, street illumination, landscaping)	concrete	$1,500	linear foot
Additional Turn Lane	concrete	$300,000	allowance
New 2 Lane Local Street	asphalt	$850	linear foot
Pathway (6 foot hard surface)	asphalt	$100	linear foot
Pathway (6 foot soft surface)	pervious	$60	linear foot
New Traffic Signal		$275,000	each
Modified Traffic Signal		$150,000	each
Rail Bridge Structure Replacement		$4,000,000	allowance
ODOT Interstate Ramp Access Modifications		$1,000,000	allowance
Median (100 feet long, landscaped)		$200,000	each
Water, Sewer & Storm Water Improvements			
Sewer Main Line (21 inch)	Iron	$225	linear foot
Sewer Main Line (18 inch)	Iron	$200	linear foot
Water Main Line (18 inch) with hydrants	PVC	$180	linear foot
Water Main Line (12 inch) with hydrants	PVC	$140	linear foot
Storm Water Pond		$150,000	each
Bio Swales		$50	linear foot
Other Improvements			
Wayside Signage/Landscaping		$200,000	each

** Costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included.*

Compiled by Otak, Inc.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SW BOONES FERRY RD
SW CLAY ST
SW GRAHAMS FERRY RD
SW DAY RD
SW CAHALIN RD
SW GARDEN ACRES RD
SW ELLIGSEN RD
SW SUN PL
SW COMMERCE CIR
SW CLUTTER ST
RAILROAD CROSSING
SW RIDDER RD
Railroad Overpass
Wilsonville
SW PARKWAY AVE
SW 95TH AVE
P&WRR
SW FREEMAN CT
SW FREEMAN DR
5
City of Wilsonville TGM
Coffee Creek Master Plan Area
Existing Road Classifications and Railroads
otak
Major Arterial
Minor Arterial
Major Collector
Minor Collector
Interstate
Local Street
Railroad
Coffee Creek Boundary
UGB
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
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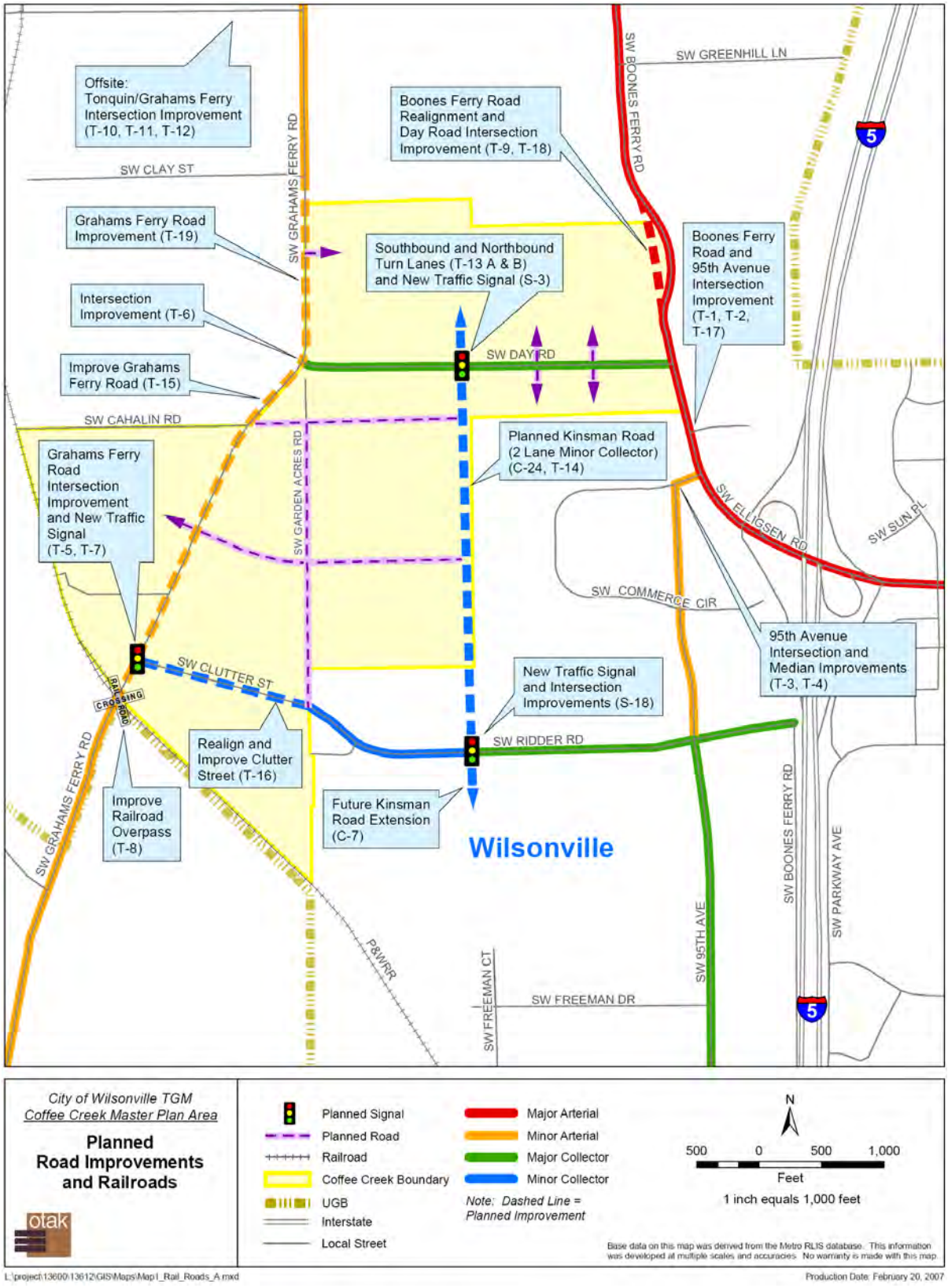
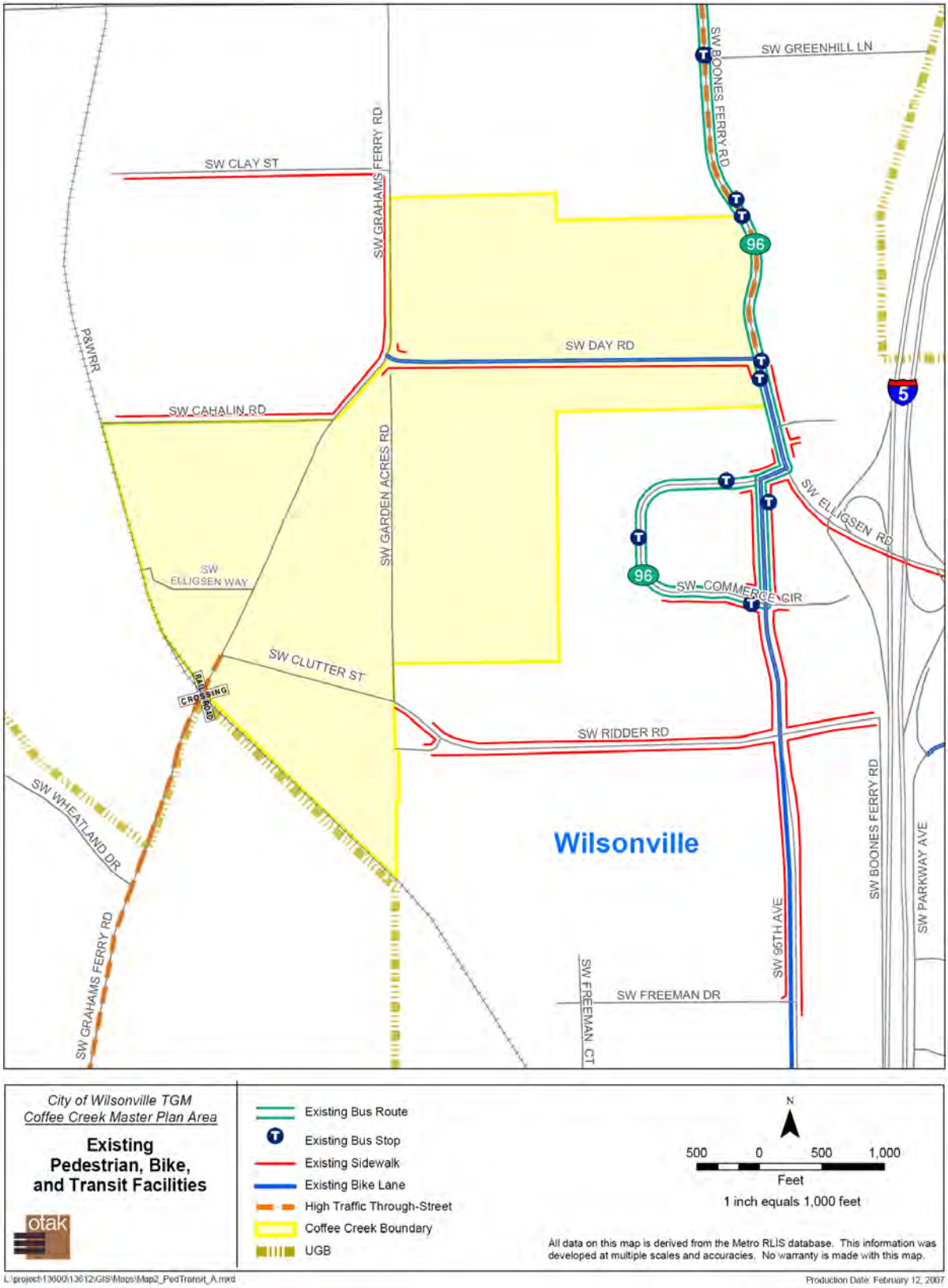
Production Date: February 6, 2007


Offsite: Tonquin/Grahams Ferry Intersection Improvement (T-10, T-11, T-12)
Boones Ferry Road Realignment and Day Road Intersection Improvement (T-9, T-18)
Grahams Ferry Road Improvement (T-19)
Southbound and Northbound Turn Lanes (T-13 A & B) and New Traffic Signal (S-3)
Boones Ferry Road and 95th Avenue Intersection Improvement (T-1, T-2, T-17)
Intersection Improvement (T-6)
Improve Grahams Ferry Road (T-15)
Planned Kinsman Road (2 Lane Minor Collector) (C-24, T-14)
Grahams Ferry Road Intersection Improvement and New Traffic Signal (T-5, T-7)
95th Avenue Intersection and Median Improvements (T-3, T-4)
New Traffic Signal and Intersection Improvements (S-18)
Realign and Improve Clutter Street (T-16)
Improve Railroad Overpass (T-8)
Future Kinsman Road Extension (C-7)
Wilsonville
SW CLAY ST
SW GRAHAMS FERRY RD
SW BOONES FERRY RD
SW GREENHILL LN
SW DAY RD
SW CAHALIN RD
SW GARDEN ACRES RD
SW ELLIGSEN RD
SW SUN PL
SW COMMERCE CIR
SW CLUTTER ST
SW RIDDER RD
SW PARKWAY AVE
SW 95TH AVE
SW FREEMAN CT
SW FREEMAN DR
P&WRR
RAILROAD CROSSING
5
City of Wilsonville TGM
Coffee Creek Master Plan Area
Planned Road Improvements and Railroads
Planned Signal
Planned Road
Railroad
Coffee Creek Boundary
UGB
Interstate
Local Street
Major Arterial
Minor Arterial
Major Collector
Minor Collector
Note: Dashed Line = Planned Improvement
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
Base data on this map was derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
L:\project\13600-13612\GIS\Maps\Map1_Rail_Roads_A.mxd
Production Date: February 20, 2007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SW BOONES FERRY RD
SW CLAY ST
SW GRAHAMS FERRY RD
96
SW DAY RD
P&WRR
SW CAHALIN RD
SW GARDEN ACRES RD
5
SW ELLIGSEN RD
SW ELLIGSEN WAY
96
SW COMMERCE CIR
SW CLUTTER ST
RAILROAD CROSSING
SW RIDDER RD
SW WHEATLAND DR
Wilsonville
SW BOONES FERRY RD
SW PARKWAY AVE
SW GRAHAMS FERRY RD
SW 95TH AVE
SW FREEMAN CT
SW FREEMAN DR
City of Wilsonville TGM
Coffee Creek Master Plan Area
Existing Pedestrian, Bike, and Transit Facilities
otak
Existing Bus Route
Existing Bus Stop
Existing Sidewalk
Existing Bike Lane
High Traffic Through-Street
Coffee Creek Boundary
UGB
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
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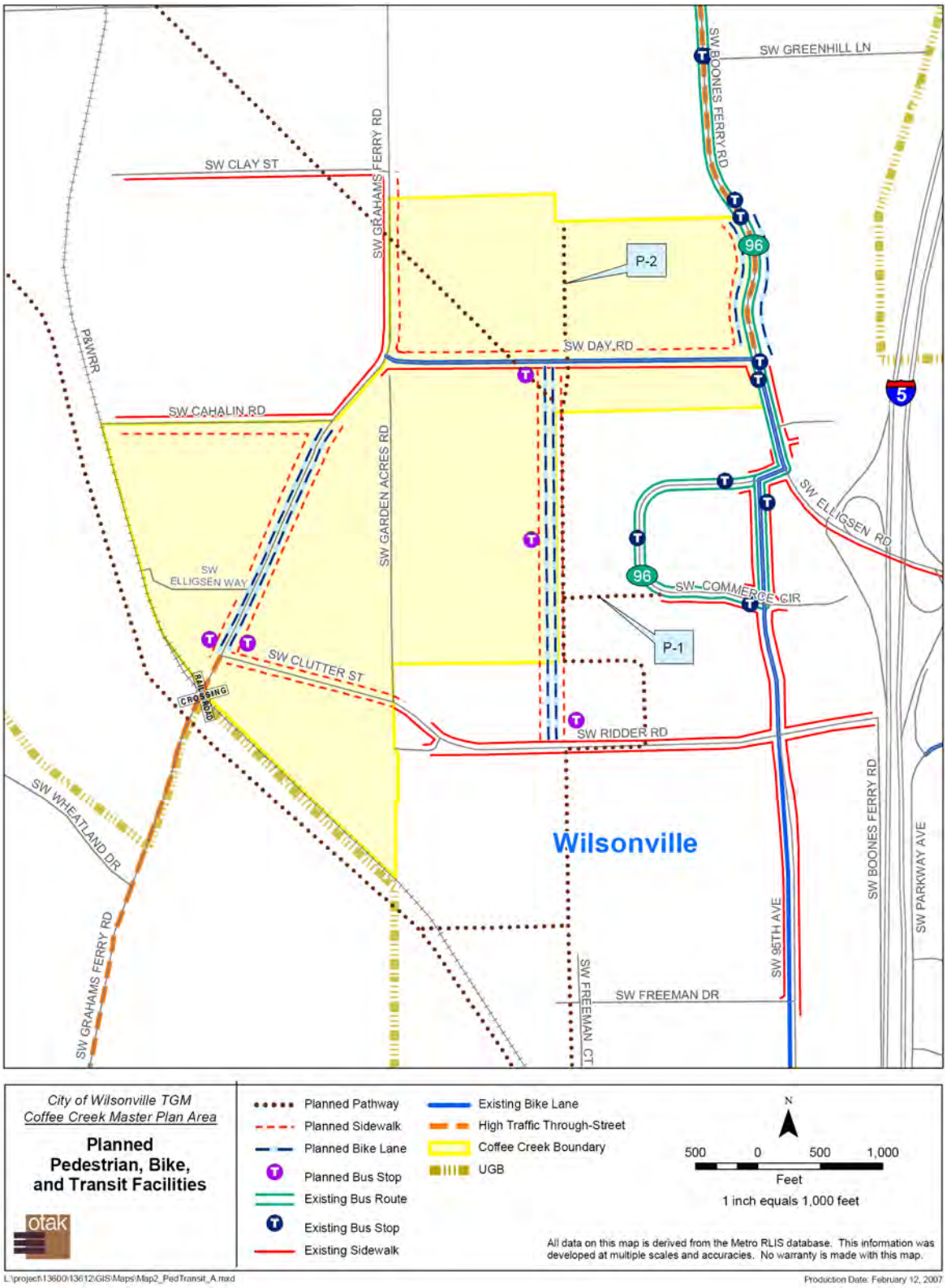
Production Date: February 12, 2007


SW GREENHILL LN
SW BOONES FERRY RD
SW CLAY ST
SW GRAHAMS FERRY RD
P-2
96
SW DAY RD
P&WRR
SW CAHALIN RD
SW GARDEN ACRES RD
5
SW ELLIGSEN RD
SW ELLIGSEN WAY
96
SW COMMERCE CIR
P-1
SW CLUTTER ST
RAILROAD CROSSING
SW RIDDER RD
SW WHEATLAND DR
Wilsonville
SW BOONES FERRY RD
SW PARKWAY AVE
SW 95TH AVE
SW GRAHAMS FERRY RD
SW FREEMAN DR
SW FREEMAN CT
City of Wilsonville TGM
Coffee Creek Master Plan Area
Planned Pedestrian, Bike, and Transit Facilities
otak
Planned Pathway
Planned Sidewalk
Planned Bike Lane
Planned Bus Stop
Existing Bus Route
Existing Bus Stop
Existing Sidewalk
Existing Bike Lane
High Traffic Through-Street
Coffee Creek Boundary
UGB
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
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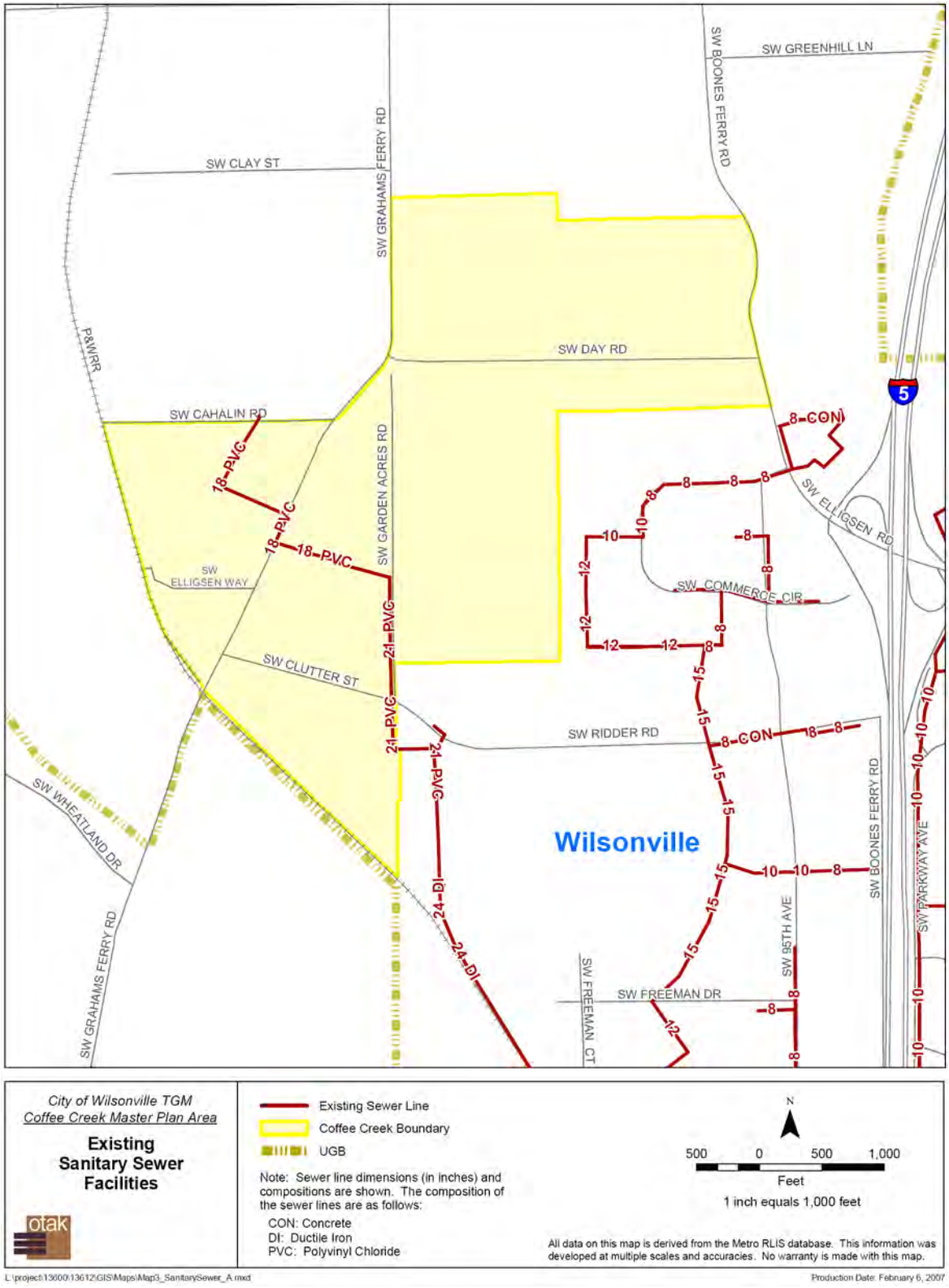
Production Date: February 12, 2007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SW BOONES FERRY RD
SW CLAY ST
SW GRAHAMS FERRY RD
P&WRR
SW DAY RD
SW CAHALIN RD
SW GARDEN ACRES RD
SW ELLIGSEN WAY
SW ELLIGSEN RD
SW COMMERCE CIR
SW CLUTTER ST
SW RIDDER RD
SW WHEATLAND DR
SW GRAHAMS FERRY RD
SW BOONES FERRY RD
SW PARKWAY AVE
SW 95TH AVE
SW FREEMAN DR
SW FREEMAN CT
Wilsonville
5
18-PVC
21-PVC
24-DI
8-CON
8
10
12
15
City of Wilsonville TGM
Coffee Creek Master Plan Area
Existing Sanitary Sewer Facilities
otak
Existing Sewer Line
Coffee Creek Boundary
UGB
Note: Sewer line dimensions (in inches) and compositions are shown. The composition of the sewer lines are as follows:
CON: Concrete
DI: Ductile Iron
PVC: Polyvinyl Chloride
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
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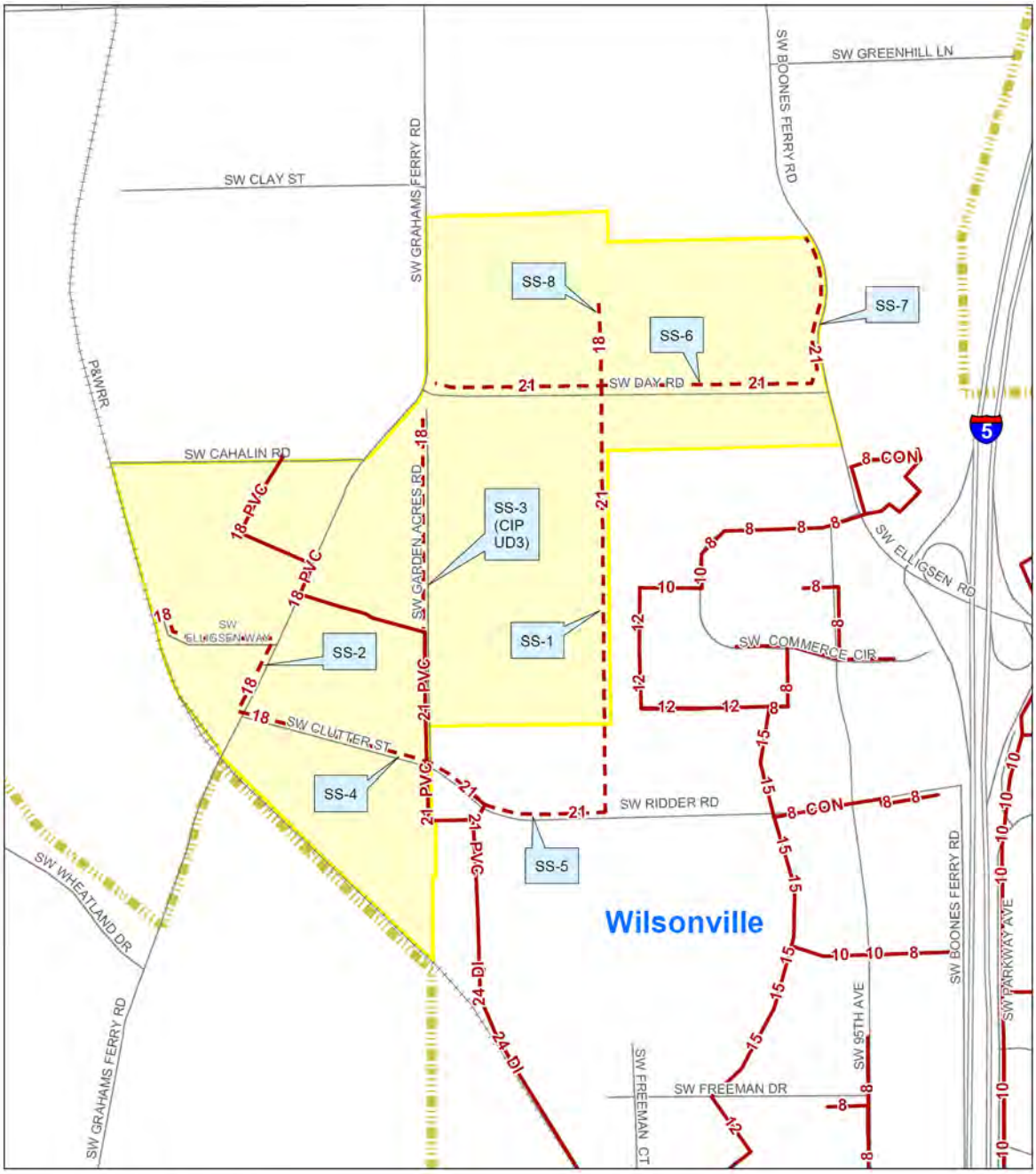
Production Date: February 6, 2007



City of Wilsonville TGM
Coffee Creek Master Plan Area

Planned Sanitary Sewer Facilities

otak

Planned Sewer Line
Existing Sewer Line
Coffee Creek Boundary
UGB

Note: Sewer line dimensions (in inches) and compositions are shown. The composition of the sewer lines are as follows:
CON: Concrete
DI: Ductile Iron
PVC: Polyvinyl Chloride

N
500 0 500 1,000
Feet
1 inch equals 1,000 feet

All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.

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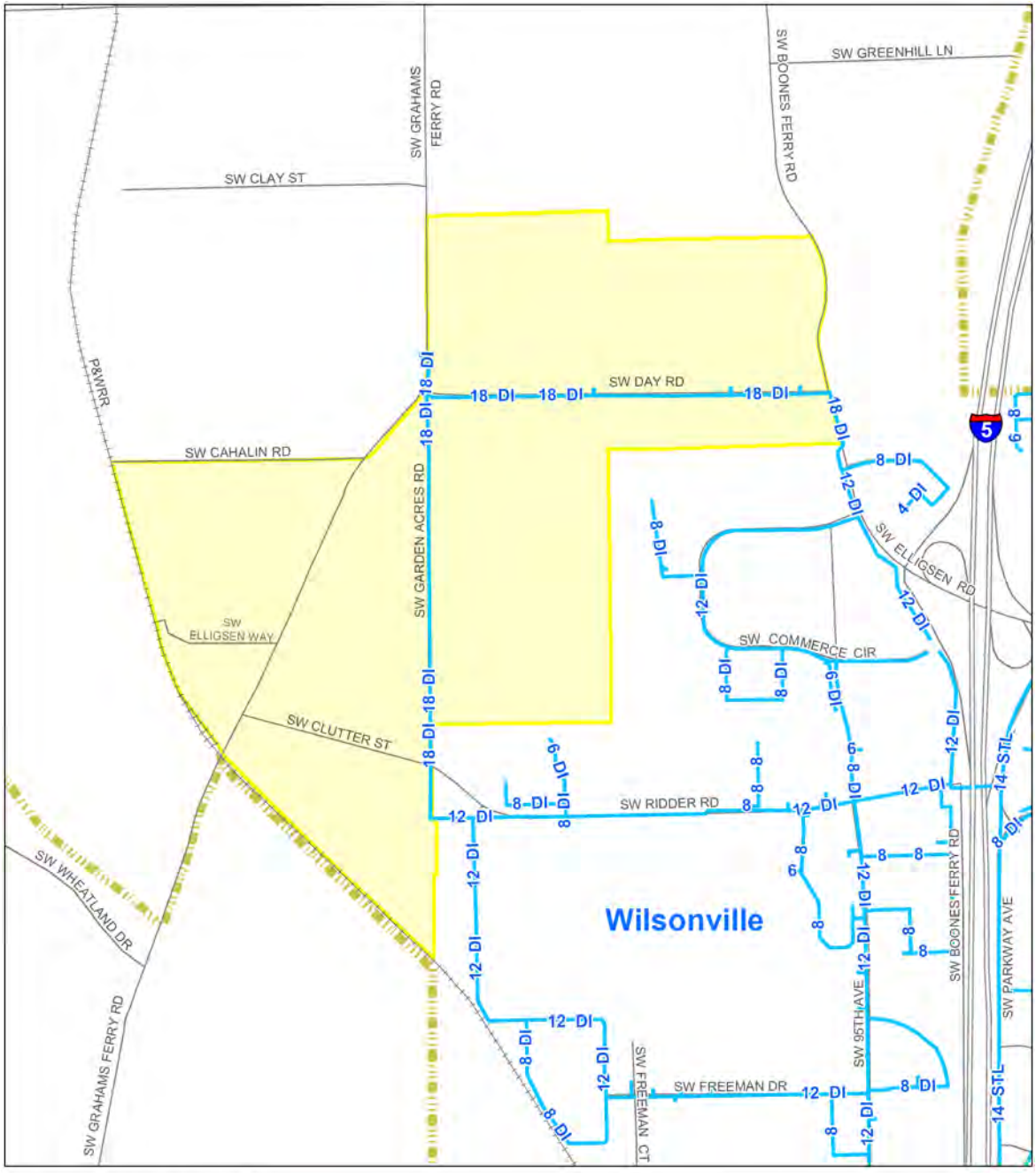
Production Date: February 12, 2007



City of Wilsonville TGM
Coffee Creek Master Plan Area

Existing Water Facilities

Existing Water Line
Coffee Creek Boundary
UGB

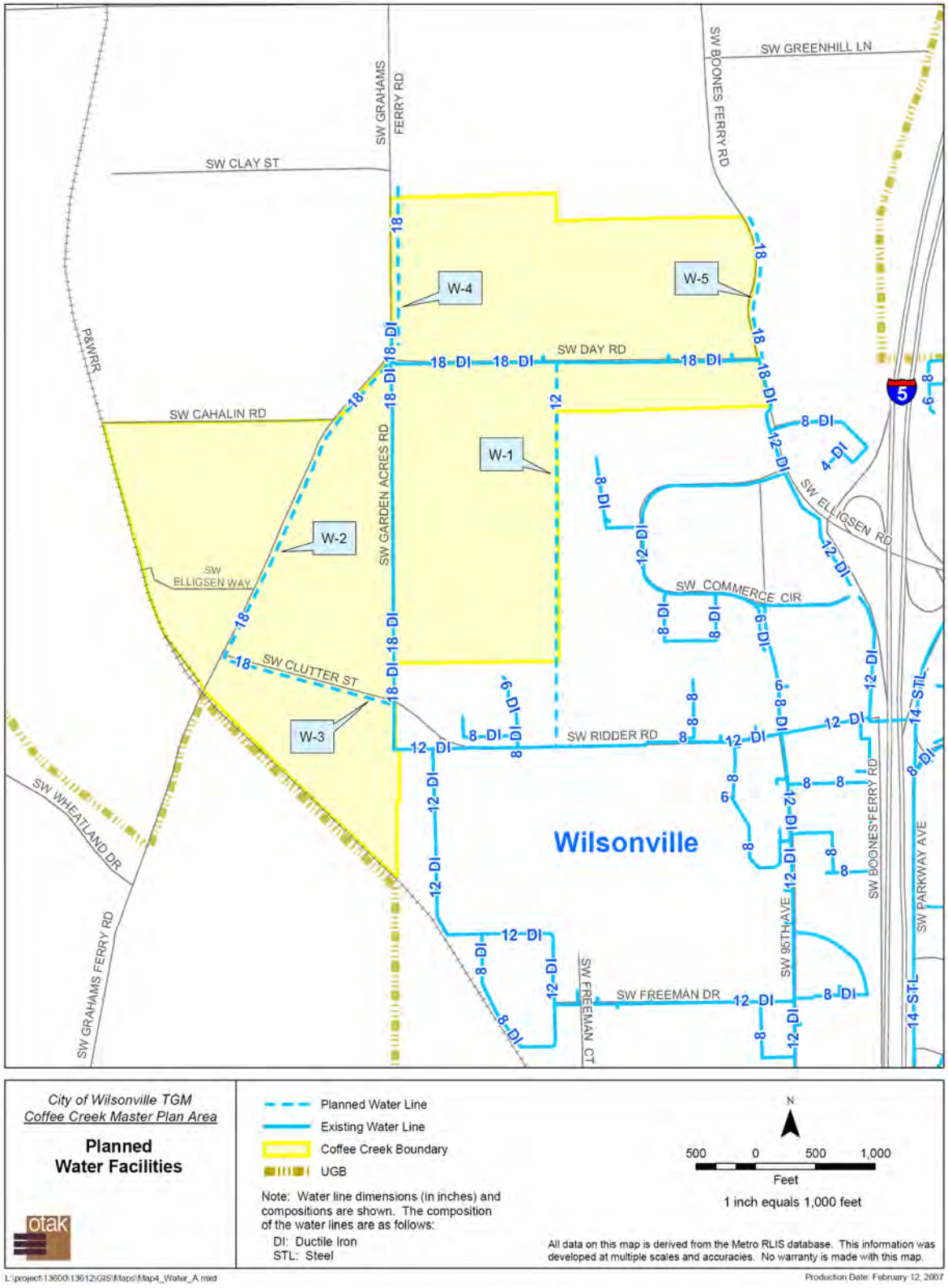
Note: Water line dimensions (in inches) and compositions are shown. The composition of the water lines are as follows:
DI: Ductile Iron
STL: Steel

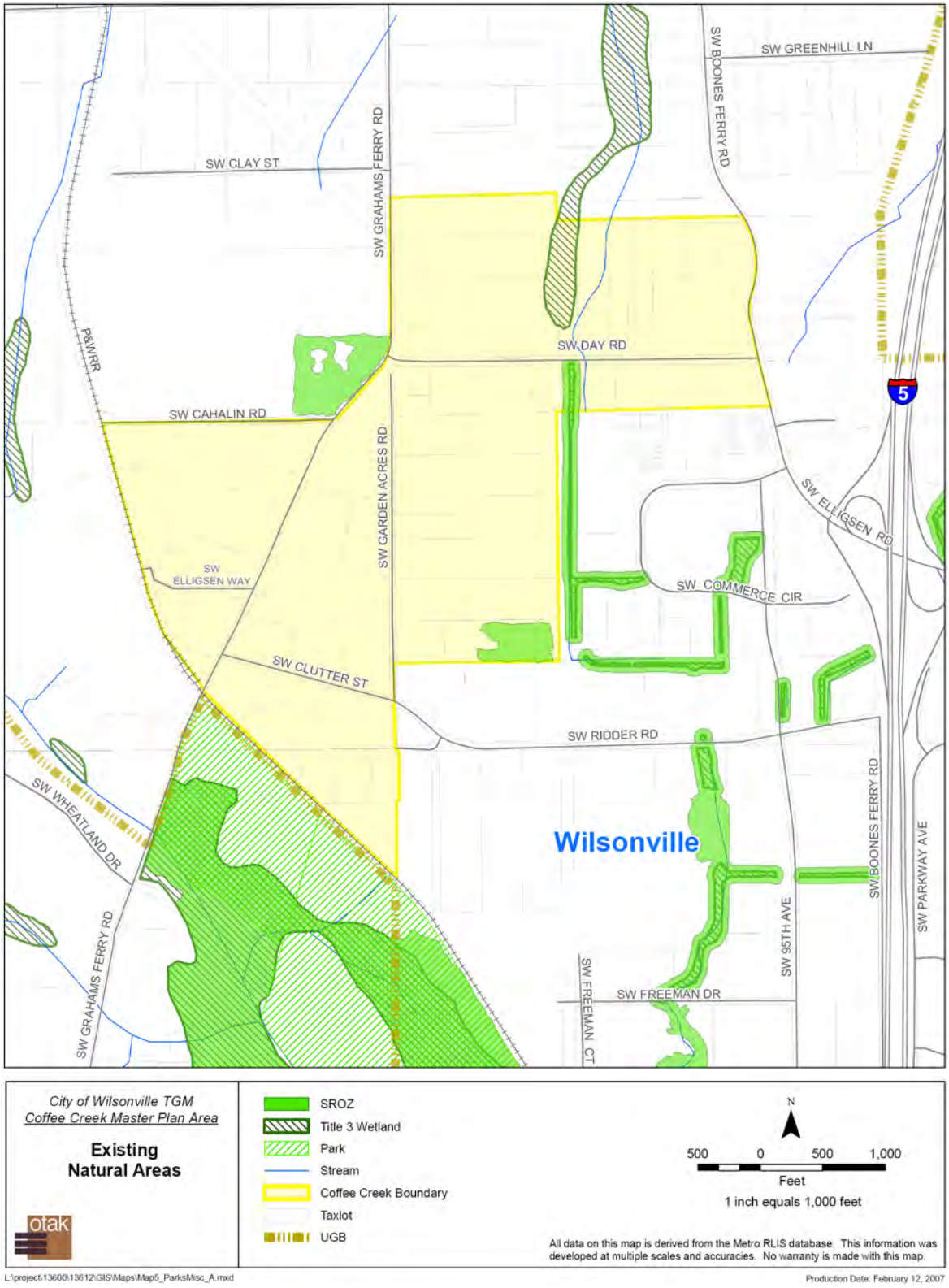
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet

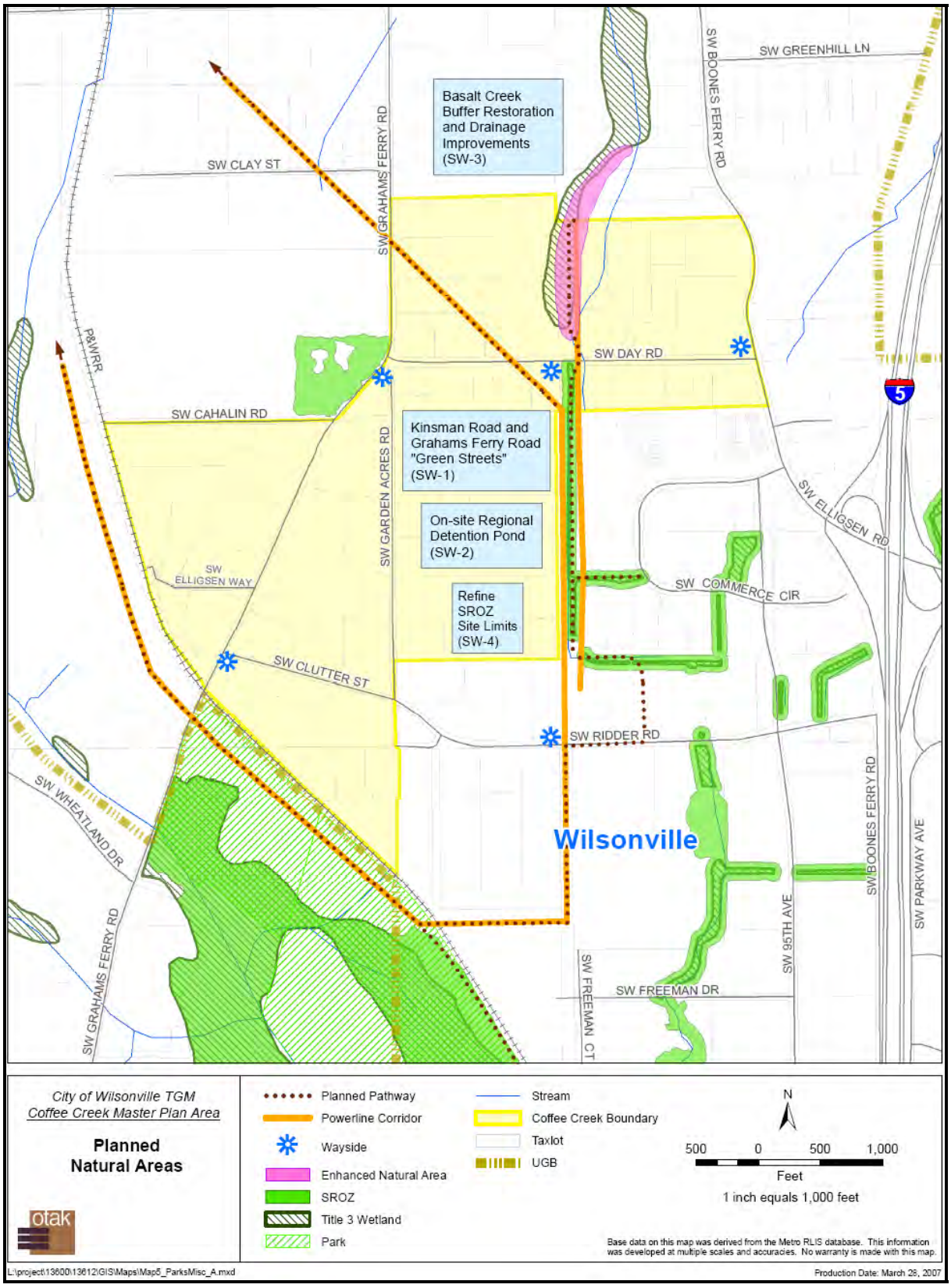
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.

L:\project\13600\13612\GIS\Maps\Map4_Water_A.mxd

Production Date: February 12, 2007


SW GREENHILL LN
SW BOONES FERRY RD
SW GRAHAMS FERRY RD
SW CLAY ST
P&WRR
SW CAHALIN RD
SW GARDEN ACRES RD
SW DAY RD
W-1
W-2
W-3
W-4
W-5
SW ELLIGSEN WAY
SW ELLIGSEN RD
SW COMMERCE CIR
SW CLUTTER ST
SW RIDDER RD
SW WHEATLAND DR
SW FREEMAN DR
SW FREEMAN CT
SW 95TH AVE
SW PARKWAY AVE
Wilsonville
5
City of Wilsonville TGM
Coffee Creek Master Plan Area
Planned
Water Facilities
Planned Water Line
Existing Water Line
Coffee Creek Boundary
UGB
Note: Water line dimensions (in inches) and compositions are shown. The composition of the water lines are as follows:
DI: Ductile Iron
STL: Steel
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
L:\project\13600\13612\GIS\Maps\Map4_Water_A.mxd
Production Date: February 12, 2007


SW GREENHILL LN
SW BOONES FERRY RD
SW CLAY ST
SW GRAHAMS FERRY RD
P&WRR
SW DAY RD
SW CAHALIN RD
SW GARDEN ACRES RD
SW ELLIGSEN RD
SW ELLIGSEN WAY
SW COMMERCE CIR
SW CLUTTER ST
SW RIDDER RD
SW WHEATLAND DR
Wilsonville
SW BOONES FERRY RD
SW PARKWAY AVE
SW 95TH AVE
SW FREEMAN DR
SW FREEMAN CT
SW GRAHAMS FERRY RD
5
City of Wilsonville TGM
Coffee Creek Master Plan Area
Existing
Natural Areas
otak
SROZ
Title 3 Wetland
Park
Stream
Coffee Creek Boundary
Taxlot
UGB
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
All data on this map is derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
L:\project\13600\13612\GIS\Maps\Map5_ParksMisc_A.mxd
Production Date: February 12, 2007


Basalt Creek Buffer Restoration and Drainage Improvements (SW-3)
Kinsman Road and Grahams Ferry Road "Green Streets" (SW-1)
On-site Regional Detention Pond (SW-2)
Refine SROZ Site Limits (SW-4)
SW CLAY ST
SW GRAHAMS FERRY RD
SW BOONES FERRY RD
SW GREENHILL LN
SW DAY RD
SW CAHALIN RD
SW GARDEN ACRES RD
P&WRR
SW ELLIGSEN WAY
SW ELLIGSEN RD
SW COMMERCE CIR
SW CLUTTER ST
SW RIDDER RD
SW WHEATLAND DR
Wilsonville
SW PARKWAY AVE
SW 95TH AVE
SW FREEMAN DR
SW FREEMAN CT
5
City of Wilsonville TGM
Coffee Creek Master Plan Area
Planned Natural Areas
otak
Planned Pathway
Powerline Corridor
Wayside
Enhanced Natural Area
SROZ
Title 3 Wetland
Park
Stream
Coffee Creek Boundary
Taxlot
UGB
N
500 0 500 1,000
Feet
1 inch equals 1,000 feet
Base data on this map was derived from the Metro RLIS database. This information was developed at multiple scales and accuracies. No warranty is made with this map.
L:\project\13600\13612\GIS\Maps\Map5_ParksMisc_A.mxd
Production Date: March 28, 2007

Appendix G-1
Coffee Creek Industrial Area
Summary of Fiscal and Economic Impact Assumptions

	Factor	Units	Source
Cost of Materials Allocation	45%	% of construction costs	RS Means
Cost of Construction Payroll	55%	% of construction costs	RS Means
Average Construction Wage Rate	$45,000	/worker	Oregon Emp. Dept.
Avg. Development Cost - Commercial	$160	/sf of building area	Allowance
Avg. Development Cost - Light Industrial (standard)	$110	/sf of building area	Allowance
Avg. Development Cost-Mixed Use Housing	$175,000	per dwelling unit	Allowance
Vacancy Rate	5%		Allowance
City share of Local Road Cost (public)	0%	of total cost	Allowance
Income and Income Taxes			
Average Wage Rate - Commercial	$29,400	/worker	Oregon Emp. Dept.
Average Wage Rate - Light Industrial	$36,750	/worker	Oregon Emp. Dept.
Employment Assumptions			
State Income Tax Rate	4.5%		Oregon State Dept. of Revenue
Population Density			
Dwelling Units			
People Per Dwelling Unit	2.34	people per dwelling	US Census 2000 for City of Wilsonville
Assessed Value to Market Value Conversion Ratio			
Commercial	0.90		Allowance
Industrial	0.80		Allowance
Residential	0.95		Allowance
Special Assessment	$0.00	Per Sq.Ft. of Land Area	
Property Tax Rates			
Education:			
ESD-NW Regional	$0.1837	/$1000 AV	Washington County Assessor
COLL - Portland	$0.3377	/$1000 AV	Washington County Assessor
SCH - Sherwood (SD-88)	$5.7460	/$1000 AV	Washington County Assessor
General Government			
City of Wilsonville	$2.5500	/$1000 AV	Washington County Assessor
Washington County	$2.6850	/$1000 AV	Washington County Assessor
FIRE and Rescue	$1.5490	/$1000 AV	Washington County Assessor
PORT Portland	$0.0713	/$1000 AV	Washington County Assessor
REG- METRO	$0.0982	/$1000 AV	Washington County Assessor
TV Fire and Rescue	$0.2985	/$1000 AV	Washington County Assessor
UR-Wilsonville DOT	$0.8297	/$1000 AV	Washington County Assessor
Metro Construction Excise Tax	$1.2000	/$1000 AV	Metro
Transit Payroll Tax	0.3%	of payroll	City of Wilsonville
State Shared Revenues (alch. Cig, 911, other)	$22.71	/per capita	City of Wilsonville
Highway Revenues (fuel tax, veh. reg., wmtax)	$46.33	/per capita	City of Wilsonville
Franchise Fees**	$2.08	/$1000 AV	Allowance
Avg. Annual Utilities Paid	$52	per peak pop/job	Allowance based on city data
County Library Shared Revenues	$26.53	/per capita	City of Wilsonville
Enterprise Fund Revenues			
Average Annual Water Rates	$313.44	/dwelling	City of Wilsonville
Average Annual Sewer Rates	$284.76	/dwelling	City of Wilsonville

Average Annual Storm Water Rates	$44.64	/dwelling	City of Wilsonville
Average Annual Road Maintenance	$48.36	/dwelling	City of Wilsonville
Other/Misc. Revenue	10%	of gross revenues	Allowance
Equivalent Dwelling Unit Conversion Factor			
Commercial	33%	times SF/2,500	Allowance
Industrial	50%	times SF/2,500	Allowance

Appendix G-1 (continued)
Coffee Creek Industrial Area
Summary of Fiscal and Economic Impact Assumptions

	Factor	Units	Source
Incremental Operating Costs (avg. annual)			
Policy & Admin.	$1.70	/$1000 AV	City of Wilsonville
Community Development	$1.65	/$1000 AV	City of Wilsonville
Public Works	$3.83	/$1000 AV	City of Wilsonville
Community Services	$0.77	/$1000 AV	City of Wilsonville
Transportation	$1.27	/$1000 AV	City of Wilsonville
Public Safety	$1.40	/$1000 AV	City of Wilsonville
Total Operating Cost Per Household	$2,913	Per household	City of Wilsonville
Operating Cost Adjustment Factor			
Commercial	0.50	times operating cost	Allowance
Industrial	0.25	times operating cost	Allowance
Residential	0.80	times operating cost	Allowance
General Assumptions			
Capitalization Rate for Annual Costs/Revenues	10.0%		Allowance
Economic Impact Multiplier	2.5	times direct income	Allowance
Buildout of site area	20	years	Allowance

** derived from comparable analysis of developed properties in Portland Metro Region.*
*** reflects estimate of charges for electricity, telephone, natural gas and cable TV.*
Source: compiled by Otak, Inc.

Table G-2
Coffee Creek Industrial Area
Estimated Assessed Value at Buildout

Location	Industrial	Comm. Service	Work force Housing	Total
Area of Buildings (SF)				
South of Day Road				
Alt.1 & Alt. 2	1,722,451	107,653	--	--
North of Day Road				
Alt.1 Industrial	549,762	34,360	--	--
Alt. 2. Industrial/Mixed Use	252,901	114,260	232	--
Development Cost Per Unit	$160	$110	$175,000	--
Market Value				
South of Day Road				
Alt.1 & Alt. 2	$275,592,202	$11,841,852	--	$287,434,054
North of Day Road				
Alt.1 Industrial	$87,961,928	$3,779,614	--	$91,741,542
Alt. 2. Industrial/Mixed Use	$40,464,104	$12,568,606	$40,600,000	$93,632,710
Assessed Value Ratio	90%	80%	95%	
Potential New Assessed Value				
South of Day Road				
Alt.1 & Alt. 2	$248,032,982	$9,473,482	--	$257,506,464
North of Day Road				
Alt.1 Industrial	$79,165,735	$3,023,691	--	$82,189,426
Alt. 2. Industrial/Mixed Use	$36,417,693	$10,054,885	$38,570,000	$85,042,578
Existing Assessed Value				
South of Day Road				$15,600,000
North of Day Road				$4,300,000
Net New Assessed Value				
South of Day Road				
Alt.1 & Alt. 2	$233,006,895	$8,899,569	--	**$241,906,464**
North of Day Road				
Alt.1 Industrial	$75,023,929	$2,865,497	--	**$77,889,426**
Alt. 2. Industrial/Mixed Use	$34,576,309	$9,546,481	$36,619,789	**$80,742,578**

Source: Analysis by Otak, Inc. based on Washington County and Clackamas County Assessor records.

Table G-3
Coffee Creek Industrial Area, South of Day Road, Alts 1 and 2
Preliminary Estimated Local Annual Operating Expenses at Buildout

Expenditure	Factor	Units	Buildout Assumptions	Expense	Notes
Policy & Admin.	$1.70	/$1000 AV	$241,906,464	$410,635	annual expense
Community Development	$1.65	/$1000 AV	$241,906,464	$398,171	annual expense
Public Works	$3.83	/$1000 AV	$241,906,464	$926,170	annual expense
Community Services	$0.77	/$1000 AV	$241,906,464	$186,563	annual expense
Transportation	$1.27	/$1000 AV	$241,906,464	$307,360	annual expense
Public Safety	$1.40	/$1000 AV	$241,906,464	$338,083	annual expense
Subtotal				$2,566,983	
Total Unweighted Expense				**$2,566,983**	annual expense
Total Weighted Expense*	0.3	times operating expense		**$679,495**	annual expense

** this adjustment accounts for lower operating cost in commercial and industrial areas:*

Adjustment Weights				weights	applied factor
Commercial	0.50	107,653	sf	6%	0.0
Industrial	0.25	1,722,451	sf	94%	0.2
Residential	0.80	0	sf	0%	0.0
Total		1,830,104		100%	**0.3**

Table G-4
Coffee Creek Industrial Area, North of Day Road, Alt. 1
Preliminary Estimated Local Annual Operating Expenses at Buildout

Expenditure	Factor	Units	Buildout Assumptions	Expense	Notes
Policy & Admin.	$1.70	/$1000 AV	$77,889,426	$132,217	annual expense
Community Development	$1.65	/$1000 AV	$77,889,426	$128,204	annual expense
Public Works	$3.83	/$1000 AV	$77,889,426	$298,210	annual expense
Community Services	$0.77	/$1000 AV	$77,889,426	$60,070	annual expense
Transportation	$1.27	/$1000 AV	$77,889,426	$98,964	annual expense
Public Safety	$1.40	/$1000 AV	$77,889,426	$108,857	annual expense
Subtotal				$826,521	
Total Unweighted Expense				**$826,521**	annual expense
Total Weighted Expense*	0.3	times operating expense		**$218,785**	annual expense

** this adjustment accounts for lower operating cost in commercial and industrial areas:*

Adjustment Weights				weights	applied factor
Commercial	0.50	34,360	sf	6%	0.0
Industrial	0.25	549,762	sf	94%	0.2
Residential	0.80	0	sf	0%	0.0
Total		584,122		100%	**0.3**

Table G-5
Coffee Creek Industrial Area, North of Day Road, Alt. 2
Preliminary Estimated Local Annual Operating Expenses at Buildout

Expenditure	Factor	Units	Buildout Assumptions	Expense	Notes
Industrial/Commercial					
Policy & Admin.	$1.70	/$1000 AV	$44,122,790	$74,898	annual expense
Community Development	$1.65	/$1000 AV	$44,122,790	$72,625	annual expense
Public Works	$3.83	/$1000 AV	$44,122,790	$168,930	annual expense
Community Services	$0.77	/$1000 AV	$44,122,790	$34,028	annual expense
Transportation	$1.27	/$1000 AV	$44,122,790	$56,061	annual expense
Public Safety	$1.40	/$1000 AV	$44,122,790	$61,665	annual expense
Subtotal				$468,208	
Total Unweighted Expense				**$468,208**	annual expense
Total Weighted Expense*	0.3	times operating expense		**$142,377**	annual expense
** this adjustment accounts for lower operating cost in commercial and industrial areas:*					
Adjustment Weights				**weights**	**applied factor**
Commercial	0.50	114,260	sf	22%	0.1
Industrial	0.25	252,901	sf	78%	0.2
Total		367,161		100%	**0.3**
Housing					
Policy & Admin.	$466.04	/per household	262	$121,909	annual expense
Community Development	$451.90	/per household	262	$118,209	annual expense
Public Works	$1,051.14	/per household	262	$274,961	annual expense
Community Services	$211.74	/per household	262	$55,387	annual expense
Transportation	$348.83	/per household	262	$91,249	annual expense
Public Safety	$383.70	/per household	262	$100,370	annual expense
Subtotal				$762,085	
Total Unweighted Expense				**$762,085**	annual expense
Total Weighted Expense*	0.8	times operating expense		**$609,668**	annual expense

Table G-6
Coffee Creek Industrial Area, South of Day Road
Preliminary Estimated Local Annual Tax Revenues at Buildout

Property Tax Rates	Factor	Units	Buildout Assumptions	Revenue	Notes
ESD-NW Regional	0.1837	/$1000 AV	$241,906,464	$44,438	annual revenue
COLL - Portland	0.3377	/$1000 AV	$241,906,464	$81,692	annual revenue
SCH - Sherwood (SD-88)	5.746	/$1000 AV	$241,906,464	$1,389,995	annual revenue
General Government					
City of Wilsonville	2.55	/$1000 AV	$241,906,464	$616,861	annual revenue
UR-Wilsonville DOT	0.8297	/$1000 AV	$241,906,464	$200,710	annual revenue
Washington County	2.685	/$1000 AV	$241,906,464	$649,519	annual revenue
FIRE and Rescue	1.549	/$1000 AV	$241,906,464	$374,713	annual revenue
PORT Portland	0.07129	/$1000 AV	$241,906,464	$17,246	annual revenue
REG- METRO	0.09815	/$1000 AV	$241,906,464	$23,743	annual revenue
TV Fire and Rescue	0.2985	/$1000 AV	$241,906,464	$72,209	annual revenue
Metro Construction Excise Tax	1.2	/$1000 AV	$241,906,464	$290,288	total revenue
Transit Payroll Tax	0.003	of payroll	$53,537,841	$160,614	annual revenue
Subtotal local prop. Tax, fire, police, URD, transit				**$1,425,107**	annual revenue
County Shared Rev. Library	$26.53	/per capita	0	**$0.00**	annual revenue
Franchise Fees	$52.00	/per job	1,474	**$76,656**	annual revenue
State Shared Revenues to City					
General Shared Revenues*	$22.71	/per capita	0	pop	no new pop
Highway Revenues (fuel tax, veh.reg., wmtax)	$46.33	/per capita	0	pop	no new pop
Subtotal State Shared Revenues				**$0**	
Enterprise Fund Revenues to City					
Average Annual Water Rates	$313.44	/E.D.U.	359	$112,476	annual revenue
Average Annual Sewer Rates	$284.76	/E.D.U.	359	$102,184	annual revenue
Average Annual Storm Water Rates	$44.64	/E.D.U.	359	$16,019	annual revenue
Average Annual Road Maintenance	$48.36	/E.D.U.	359	$17,354	annual revenue
Subtotal				**$248,033**	
Subtotal Potential Revenues to City				$1,749,796	
Other/Misc. Revenues & Fees	10%	potential rev.		$174,980	
Total Potential Local Revenues				**$1,924,776**	annual revenue

** includes alcoholic beverage tax, cigarette tax, emergency 911 tax and misc. shared revenues.*

Table G-7
Coffee Creek Industrial Area, North of Day Road Alt. 1
Preliminary Estimated Local Annual Tax Revenues at Buildout

Property Tax Rates	Factor	Units	Buildout Assumptions	Revenue	Notes
ESD-NW Regional	0.1837	/$1000 AV	$77,889,426	$14,308	annual revenue
COLL - Portland	0.3377	/$1000 AV	$77,889,426	$26,303	annual revenue
SCH - Sherwood (SD-88)	5.746	/$1000 AV	$77,889,426	$447,553	annual revenue
General Government					
City of Wilsonville	2.55	/$1000 AV	$77,889,426	$198,618	annual revenue
UR-Wilsonville DOT	0.8297	/$1000 AV	$77,889,426	$64,625	annual revenue
Washington County	2.685	/$1000 AV	$77,889,426	$209,133	annual revenue
FIRE and Rescue	1.549	/$1000 AV	$77,889,426	$120,651	annual revenue
PORT Portland	0.07129	/$1000 AV	$77,889,426	$5,553	annual revenue
REG- METRO	0.09815	/$1000 AV	$77,889,426	$7,645	annual revenue
TV Fire and Rescue	0.2985	/$1000 AV	$77,889,426	$23,250	annual revenue
Metro Construction Excise Tax	1.2	/$1000 AV	$77,889,426	$93,467	total revenue
Transit Payroll Tax	0.003	of payroll	$15,113,952	$45,342	annual revenue
Subtotal local prop. Tax, fire, police, URD, transit				**$452,485**	annual revenue
County Shared Rev. Library	$26.53	/per capita	0	**$0.00**	annual revenue
Franchise Fees	$52.00	/per job	416	**$21,640**	annual revenue
State Shared Revenues to City					
General Shared Revenues*	$22.71	/per capita	0	pop	no new pop
Highway Revenues (fuel tax, veh.reg., wmtax)	$46.33	/per capita	0	pop	no new pop
Subtotal State Shared Revenues				**$0**	
Enterprise Fund Revenues to City					
Average Annual Water Rates	$313.44	/E.D.U.	115	$35,899	annual revenue
Average Annual Sewer Rates	$284.76	/E.D.U.	115	$32,615	annual revenue
Average Annual Storm Water Rates	$44.64	/E.D.U.	115	$5,113	annual revenue
Average Annual Road Maintenance	$48.36	/E.D.U.	115	$5,539	annual revenue
Subtotal				**$79,166**	
Subtotal Potential Revenues to City				$553,292	
Other/Misc. Revenues & Fees	10%	potential rev.		$55,329	
Total Potential Local Revenues				**$608,621**	annual revenue

** includes alcoholic beverage tax, cigarette tax, emergency 911 tax and misc. shared revenues.*

Table G-8
Coffee Creek Industrial Area, North of Day Road Alt. 2
Preliminary Estimated Local Annual Tax Revenues at Buildout

Property Tax Rates	Factor	Units	Buildout Assumptions	Revenue	Notes
ESD-NW Regional	0.1837	/$1000 AV	$80,742,578	$14,832	annual revenue
COLL - Portland	0.3377	/$1000 AV	$80,742,578	$27,267	annual revenue
SCH - Sherwood (SD-88)	5.746	/$1000 AV	$80,742,578	$463,947	annual revenue
General Government					
City of Wilsonville	2.55	/$1000 AV	$80,742,578	$205,894	annual revenue
UR-Wilsonville DOT	0.8297	/$1000 AV	$80,742,578	$66,992	annual revenue
Washington County	2.685	/$1000 AV	$80,742,578	$216,794	annual revenue
FIRE and Rescue	1.549	/$1000 AV	$80,742,578	$125,070	annual revenue
PORT Portland	0.07129	/$1000 AV	$80,742,578	$5,756	annual revenue
REG- METRO	0.09815	/$1000 AV	$80,742,578	$7,925	annual revenue
TV Fire and Rescue	0.2985	/$1000 AV	$80,742,578	$24,102	annual revenue
Metro Construction Excise Tax	1.2	/$1000 AV	$80,742,578	$96,891	total revenue
Transit Payroll Tax	0.003	of payroll	$9,014,922	$27,045	annual revenue
Subtotal local prop. Tax, fire, police, URD, transit				**$449,102**	annual revenue
County Shared Rev. Library	$26.53	/per capita	232	**$6,155**	annual revenue
Franchise Fees	$52.00	/per job	494	**$25,666**	annual revenue
State Shared Revenues to City					
General Shared Revenues*	$22.71	/per capita	232	$5,269	no new pop
Highway Revenues (fuel tax, veh.reg., wmtax)	$46.33	/per capita	232	$10,749	no new pop
Subtotal State Shared Revenues				**$16,017**	
Enterprise Fund Revenues to City					
Average Annual Water Rates	$313.44	/E.D.U.	298	$93,347	annual revenue
Average Annual Sewer Rates	$284.76	/E.D.U.	298	$84,806	annual revenue
Average Annual Storm Water Rates	$44.64	/E.D.U.	298	$13,294	annual revenue
Average Annual Road Maintenance	$48.36	/E.D.U.	298	$14,402	annual revenue
Subtotal				**$205,850**	
Subtotal Potential Revenues to City				$702,791	
Other/Misc. Revenues & Fees	10%	potential rev.		$70,279	
Total Potential Local Revenues				**$773,070**	annual revenue

** includes alcoholic beverage tax, cigarette tax, emergency 911 tax and misc. shared revenues.*

Table G-9

Coffee Creek Industrial Area

Permanent Economic Impacts at Buildout (2007 dollars)

Location	Industrial	Comm. Service	Total
Employment (Full Time Equivalent)			
South of Day Road			
Alt.1 & Alt. 2	1,387	87	**1,474**
North of Day Road			
Alt.1 Industrial	392	24	**416**
Alt. 2. Industrial/Mixed Use	180	81	**262**
Average Wage Rate	$36,750	$29,400	
Direct Annual Payroll			
South of Day Road			
Alt.1 & Alt. 2	$50,988,420	$2,549,421	$53,537,841
North of Day Road			
Alt.1 Industrial	$14,394,240	$719,712	$15,113,952
Alt. 2. Industrial/Mixed Use	$6,621,615	$2,393,307	$9,014,922
Indirect Impact Multiplier			2.5
Total Direct & Indirect Payroll			
South of Day Road			
Alt.1 & Alt. 2			$133,844,603
North of Day Road			
Alt.1 Industrial			$37,784,880
Alt. 2. Industrial/Mixed use			$22,537,305

** job density assumptions consistent with Metro Title 1, Summary of 2040 Growth Concept, effective 2/15/06: 9 jobs/acre, and 10 dwellings/acre. Compiled by Otak, Inc.*

Table G-10

Coffee Creek Industrial Area, South of Day Road, Alt. 1
Preliminary Estimates of Private Development Value and Construction Impacts at Buildout

	Private Buildings	Private Facilities*	Public Facilities**	Total
Cost Share - Preliminary Est.	$287,434,054	$28,743,405	$19,075,000	$297,102,460
Direct Materials Expenditures	$129,345,324	$12,934,532	$8,583,750	$150,863,607
Direct Construction Payroll & Overhead	$158,088,730	$15,808,873	$10,491,250	$184,388,853
Est. Construction Jobs (person years)	3,513	351	233	4,098
Annual Avg. Const. Jobs				205

** Estimated at 10% of building cost*
*** Derived from Appendix B, includes on-site improvements only; excludes no-build improvements.*
Source: compiled by Otak, Inc.

Table G-11
Coffee Creek Industrial Area, South of Day Road, Alt. 2
Preliminary Estimates of Private Development Value and Construction Impacts at Buildout

	Private Buildings	Private Facilities*	Public Facilities**	Total
Cost Share - Preliminary Est.	$287,434,054	$28,743,405	$20,795,000	$336,972,460
Direct Materials Expenditures	$129,345,324	$12,934,532	$9,357,750	$151,637,607
Direct Construction Payroll & Overhead	$158,088,730	$15,808,873	$11,437,250	$185,334,853
Est. Construction Jobs (person years)	3,513	351	254	4,119
Annual Avg. Const. Jobs				206

** Estimated at 10% of building cost*
*** Derived from Appendix B.*
Source: compiled by Otak, Inc.

Table G-12
Coffee Creek Industrial Area, North of Day Road, Alt. 1
Preliminary Estimates of Private Development Value and Construction Impacts at Buildout

	Private Buildings	Private Facilities*	Public Facilities**	Total
Cost Share - Preliminary Est.	$91,741,542	$9,174,154	$3,590,000	$104,505,696
Direct Materials Expenditures	$41,283,694	$4,128,369	$1,615,500	$47,027,563
Direct Construction Payroll & Overhead	$50,457,848	$5,045,785	$1,974,500	$57,478,133
Est. Construction Jobs (person years)	1,121	112	44	1,277
Annual Avg. Const. Jobs				64

** Estimated at 10% of building cost*
*** Derived from Appendix B.*
Source: compiled by Otak, Inc.

Table G-13
Coffee Creek Industrial Area, North of Day Road, Alt. 1
Preliminary Estimates of Private Development Value and Construction Impacts at Buildout

	Private Buildings	Private Facilities*	Public Facilities**	Total
Cost Share - Preliminary Est.	$93,632,710	$9,363,271	$3,590,000	$106,585,981
Direct Materials Expenditures	$42,134,720	$4,213,472	$1,615,500	$47,963,691
Direct Construction Payroll & Overhead	$51,497,991	$5,149,799	$1,974,500	$58,622,290
Est. Construction Jobs (person years)	1,144	114	44	1,303
Annual Avg. Const. Jobs				65

** Estimated at 10% of building cost*
*** Derived from Appendix B.*
Source: compiled by Otak, Inc.

Table H-1
System Development Charge Assumptions

Coffee Creek Industrial Area	Water SDC's	Sewer SDCs	Street SDCs	Supply street SDC's	Stormwater SDCs	Parks SDCs	Total
Single Family Residential							
SDC unit	**EDU**	**EDU**	**EDU**	**PM peak hr trip thru WV IC area**	**ERU**	**EDU**	**Total**
SDC per unit	$4,345	$4,068	$3,082	$0	$482	$2,451	$14,428
Per acre @ 10DU/acre	$43,500	$40,700	$30,800	$0	$4,800	$24,500	$144,300
Multifamily Residential							
SDC unit	**EDU**	**EDU**	**EDU**	**PM peak hr trip thru WV IC area**	**ERU**	**EDU**	**Total**
SDC est. per unit	$2,911	$3,051	$2,150	$0	$323	$1,864	$10,299
Per acre @ 15DU/acre	$29,100	$30,500	$21,500	$0	$3,200	$18,600	$102,900
Industrial							
SDC unit	**acre**	**acre**	**Employee**	**PM peak hr trip thru WV IC area**	**ERU**	**Employee**	**Total**
					Assume half is impervious		
Use per acre	3030 to 8500	713 to 2000	14		10	14	
Use	8500	2000	14		10	14	
Use per unit	850	200					
	10	10					
SDC per unit	$4,345	$4,068	$1,508		$482	$65	
SDC per acre	$43,500	$40,700	$21,100	$0	$4,800	$900	$111,000
Commercial							
SDC unit	**acre**	**acre**	**Employee**	**PM peak hr trip thru WV IC area**	**ERU**	**Employee**	**Total**
					Assume half is impervious		
Use per acre	3320 to 6380	782 to 1500	5		10	5	
Use	3320	782	5		10	5	
	850	200					
	3.9	3.9					
SDC per unit	$4,345	$4,068	$3,898		$482	$65	
SDC per acre	$16,900	$15,900	$19,500	0	$4,800	$300	$57,400

Source: City of Wilsonville, December 2006.

Table H-2
Summary of Potential SDC Revenues*
Coffee Creek Concept Plan Area, North of Day Road

	Water SDCs	Sewer SDCs	Street SDCs	Suppl street SDCs	Storm water SDCs	Parks SDCs	Total
Alternative 1							
Industrial	$1,286,016	$1,203,328	$918,272	$0	$208,896	$39,168	$3,655,680
Commercial	$65,552	$61,336	$55,216	$0	$13,056	$1,632	$196,792
Housing	$0	$0	$0	$0	$0	$0	$0
Subtotal	**$1,351,568**	**$1,264,664**	**$973,488**	**$0**	**$221,952**	**$40,800**	**$3,852,472**
Alternative 2							
Industrial	$591,591	$553,553	$422,422	$0	$96,096	$18,018	$1,681,680
Commercial	$217,985	$203,965	$183,614	$0	$43,416	$5,427	$654,406
Housing	$518,520	$523,160	$494,160	$0	$92,800	$226,200	$1,854,840
Subtotal	**$1,328,096**	**$1,280,678**	**$1,100,196**	**$0**	**$232,312**	**$249,645**	**$4,190,926**

** Based on existing SDC rates for mid-range scenario, summarized in Appendix Table. Analysis by Otak, Inc.*

Table H-3
Coffee Creek Industrial Area, South of Day Road Alt. 1
Summary of SDC Revenues Compared to Capital Costs

	Streets	Water	Sewer	Storm Water	Parks	Ped/Bike	Total
On-Site Revenues/Costs							
SDC Revenues*	$3,448,367	$4,787,632	$4,479,793	$786,216	$144,525	$0	**$13,646,532**
On Site Capital Project Costs	($7,200,000)	($2,250,000)	($7,200,000)	($1,525,000)	($600,000)	($300,000)	**($19,075,000)**
Subtotal	**($3,751,634)**	**$2,537,632**	**($2,720,207)**	**($738,784)**	**($455,475)**	**($300,000)**	**($5,428,468)**
Off-Site & No-Build Projects							
Roads/Infrastructure**	($16,647,578)	$0	**$0**	$0	$0	$0	**($16,647,578)**
Safety (RR-xing)	($4,000,000)	$0	**$0**	$0	$0	$0	**($4,000,000)**
Subtotal	**($20,647,578)**	**$0**	**$0**	**$0**	**$0**	**$0**	**($20,647,578)**
Grand total	**($24,399,211)**	**$2,537,632**	**($2,720,207)**	**($738,784)**	**($455,475)**	**($300,000)**	**($26,076,045)**

** SDC revenue estimates provided in Appendix.*
*** Additional analysis required to determine when new off-site water reservoir and sewer trunk line improvements are needed.*

Table H-4
Coffee Creek Industrial Area, South of Day Road Alt. 2
Summary of SDC Revenues Compared to Capital Costs

	Streets	Water	Sewer	Storm Water	Parks	Ped/Bike	Total
On-Site Revenues/Costs							
SDC Revenues*	$3,448,367	$4,787,632	$4,479,793	$786,216	$144,525	$0	**$13,646,532**
On Site Capital Project costs	($8,920,000)	($2,250,000)	($7,200,000)	($1,525,000)	($600,000)	($300,000)	**($20,795,000)**
Subtotal	**($5,471,634)**	**$2,537,632**	**($2,720,207)**	**($738,784)**	**($455,475)**	**($300,000)**	**($7,148,468)**
Off-Site & No-Build Projects							
Roads/Infrastructure**	($16,647,578)	$0	**$0**	$0	$0	$0	**($16,647,578)**
Safety (RR-xing)	($4,000,000)	$0	**$0**	$0	$0	$0	**($4,000,000)**
Subtotal	**($20,647,578)**	**$0**	**$0**	**$0**	**$0**	**$0**	**($20,647,578)**
Grand total	**($26,119,211)**	**$2,537,632**	**($2,720,207)**	**($738,784)**	**($455,475)**	**($300,000)**	**($27,796,045)**

** SDC revenue estimates provided in Appendix.*
*** Additional analysis required to determine when new off-site water reservoir and sewer trunk line improvements are needed.*
Source: analysis by Otak, Inc.

Table H-5
Coffee Creek Industrial Area, North of Day Road Alt. 1
Summary of SDC Revenues Compared to Capital Costs

	Streets	Water	Sewer	Storm Water	Parks	Ped/Bike	Total
On-Site Revenues/Costs							
SDC Revenues*	$973,488	$1,351,568	$1,264,664	$221,952	$40,800	$0	**$3,852,472**
On Site Capital Project Costs	($1,950,000)	($450,000)	($750,000)	($150,000)	($200,000)	($90,000)	**($3,590,000)**
Subtotal	**($976,512)**	**$901,568**	**$514,664**	**$71,952**	**($159,200)**	**($90,000)**	**$262,472**
Off-Site & No-Build Projects							
Roads/Infrastructure**	$0	$0	**$0**	$0	$0	$0	**$0**
Safety (RR-xing)	$0	$0	**$0**	$0	$0	$0	**$0**
Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Grand total	**($976,512)**	**$901,568**	**$514,664**	**$71,952**	**($159,200)**	**($90,000)**	**$262,472**

** SDC revenue estimates provided in Appendix.*

*** Improvements have already been identified with the area South of Day Road. Additional analysis required to determine when new off-site water reservoir and sewer trunk line improvements are needed.*

Source: analysis by Otak, Inc.

Table H-6
Coffee Creek Industrial Area, North of Day Road Alt. 2
Summary of SDC Revenues Compared to Capital Costs

	Streets	Water	Sewer	Storm Water	Parks	Ped/Bike	Total
On-Site Revenues/Costs							
SDC Revenues*	$1,100,196	$1,328,096	$1,280,678	$232,312	$249,645	$0	**$4,190,926**
On Site Capital Project costs	($1,950,000)	($450,000)	($750,000)	($150,000)	($200,000)	($90,000)	**($3,590,000)**
Subtotal	**($849,805)**	**$878,096**	**$530,678**	**$82,312**	**$49,645**	**($90,000)**	**$600,926**
Off-Site & No-Build Projects							
Roads/Infrastructure**	$0	$0	**$0**	$0	$0	$0	**$0**
Safety (RR-xing)	$0	$0	**$0**	$0	$0	$0	**$0**
Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Grand total	**($849,805)**	**$878,096**	**$530,678**	**$82,312**	**$49,645**	**($90,000)**	**$600,926**

** SDC revenue estimates provided in Appendix.*

*** Improvements have already been identified with the area South of Day Road. Additional analysis required to determine when new off-site water reservoir and sewer trunk line improvements are needed.*

Source: analysis by Otak, Inc.

Coffee Creek Master Plan Appendix

Section H. Fiscal/Annexation Analysis

M e m o r a n d u m

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To: Sandi Young, AICP City of Wilsonville

From: Todd Chase, AICP

Copies: Marah Danielson, ODOT/TGM

Date: March 30, 2007

Subject: Coffee Creek Industrial Area Draft Land Use Code Amendments, Task 7 (revised draft)

Project #: 13612

Introduction

This memorandum identifies draft comprehensive plan and zoning amendments, transportation system plan and capital program amendments that should be considered by the City of Wilsonville for the implementation of the Coffee Creek Industrial Area Master Plan.

We anticipate the city will be exploring at least four options for amending the Comprehensive Plan and Development Code for land use regulations that apply to Coffee Creek. The possible approaches may include:

- Refining the existing Planned Development Industrial – Regionally Significant Industrial Area (PDI-RSIA) land use code;
- Creating a special design overlay zone affecting tax lots abutting Day Road;
- Adopting new minimum thresholds for annexation requests within the Coffee Creek Industrial Area; and
- Allowing green street design standards as a variance to the city's existing urban roadway design standards.

We have not attempted to view all the advantages and disadvantages of each option, but instead have provided the technical recommendations in outline format to help guide future city amendments and policies to achieve project implementation.

This memorandum also identifies other local plans that will need to be updated to abide by Metro Title 14 and Oregon State Land Use Planning Goals.

Existing Comprehensive Plan Policies

The Wilsonville Comprehensive Plan is the overall guiding policy document for the City of Wilsonville. The Comprehensive Plan establishes general policies for land use, transportation, public facilities, housing, economic development, citizen involvement, and

related items. Existing goals and policies which are specific to the Coffee Creek Industrial Area were previously described in Otak's Technical Memorandum #1 dated August 18, 2006. The existing comprehensive plan policies support the City's planning and future annexations of Coffee Creek I (area south of Day Road) but will need to be updated to support planning and annexation of the area North of Day Road.

Wilsonville's current zoning code contains two types of industrial zones: Planned Development Industrial (PDI), and Planned Development Industrial – Regionally Significant Industrial Area (PDI-RSIA). The draft Development Code amendments proposes to keep the PDI-RSIA zoning designation South of Day Road, with the addition of a new Design Overlay Zone for the properties fronting along Day Road.

A key feature of a zoning code is the type of uses allowed outright. A particular issue for Coffee Creek will be the extent to which the development code can reflect a high quality development standard for this important "northern gateway" to the City. The allowed uses within the two types of industrial zoning are generalized in Table 1 as follows.

- **Planned Development Industrial (PDI)** is the City's primary industrial zone. This zone is appropriate for most light manufacturing, warehousing, and distribution, and flex uses. Corporate headquarters and technology campuses are also allowed in PDI zones. Retail and service uses are allowed as long as their uses are limited in floor area as to not exceed 5,000 square feet per use in one building, and not more than 20,000 square feet in multiple buildings. Office uses must not exceed 30% of total floor area within a site. Prohibited uses include any use that violates performance standards regarding: screening of outdoor storage; vibration; emission of odorous gases; night time operations; heat and glare; dangerous substances; liquid and solid wastes; noise; electrical disturbances; discharge standards; open burning; open storage; and inadequate landscaping.

- **Planned Development Industrial – Regionally Significant Industrial Area (PDI-RSIA)** is the City's adopted zone for areas like Coffee Creek that have a Metro 2040 RSIA designation. This zone is similar to the PDI zone, but has more strict regulations regarding the maximum amount of retail, service and office allowed. Technology campuses are allowed in PDI-RSIA zones. Retail and service uses are allowed as long as their uses are limited in floor area as to not exceed 3,000 square feet per use in one building, and not more than 20,000 square feet in multiple buildings. Office uses must not exceed 20% of total floor area within a site. Housing is allowed as long as the floor area does not exceed 10% of the total floor area. Prohibited uses are subject to the same performance standards as in the PDI zone. There is also a lot size restriction for parcels over 50 acres in size (but none of these exist within the Coffee Creek Industrial area).

Table 1 Allowed uses in the Planned Industrial Development (PDI) and Planned Industrial Development – Regionally Significant Industrial Area (PDI-RSIA) Zones

	PDI	PDI - RSIA
Industrial		
Warehousing & distribution	P	P
Outdoor Storage (with proper screening)	P	P
Product assembly and packing	P	P
Light manufacturing and processing	P	P
Motor vehicle services (ancillary only)	P	P
Fabrication	P	P
Office complexes- technology or corporate headquarters	P	P
Call Centers	P	N
Research & Development, laboratories	P	P
Industrial Services	P	P
Product repair, finishing and testing	P	P
Residential		
Residential Uses (not to exceed 10% of total floor area)	N	P
Commercial		
Service or retail uses (not to exceed 5,000 sf in floor area in single building or 20,000 sf within multiple buildings.	P	N
Service or retail uses (not to exceed 3,000 sf in floor area in single building or 20,000 sf within multiple buildings.	P	P
Office complex (not to exceed 30% of total floor area within a site)	P	N
Office complex (not to exceed 20% of total floor area within a site)	P	P
Training facilities with primary purpose to meet industrial needs	P	P
Temporary buildings or structures (removed within 30 days)	P	P
Public and Other		
Public facilities (e.g., utilities, school district bus facilities, public works yards, vehicle storage)	P	P
Accessory Uses, incidental to permitted uses	P	P
Expansion of buildings or uses approved prior to Oct. 25, 2004 of up to 20% of added floor area and/or 10% of added land area	P	P
Other uses, per judgment of Planning Director to be consistent with purpose of the Zone	P	P
Public park and recreation facility and open space	P	P

Source: City of Wilsonville 2006 Development Code, Chapter 4 – Planning and Land Development, and Otak, Inc.
Note: P = permitted; N = not permitted.

Table 1 indicates that the existing Development Code maintains little distinction between the PDI and the PDI-RSIA zones that exists in the current zoning ordinance. Both zones allow similar uses. However, the commercial and office uses are more restricted in the PDI-RSIA zone than in the PDI zone.

Several issues affect the appropriate zoning for the Coffee Creek Industrial Area (south of Day Road):

1. The Day Road Corridor should be developed with high quality buildings and landscaping to provide a favorable market image for the Coffee Creek area, as well as to define this location as the "northern gateway" for the City of Wilsonville.

2. Special considerations for large-lot industrial users. In light of the fact that there are no tax lots greater than 50 acres within the Coffee Creek Industrial Area which would be subject to minimum parcel size requirements, we recommend that the City require coordinated annexations and urban growth boundary amendments among multiple property owners for areas not less than 50 acres at a time. This approach would result in improved coordination among local property owners as new infrastructure is added, and furthers the planning goal for the project to provide large contiguous parcels for industrial development. Otherwise the City runs the risk that these large properties will be subdivided for smaller "standard industrial" users by subsequent property owners (if this land is sold or leased), and risk obtaining adequate private funding to construct needed infrastructure.

3. Special attention should be placed upon addressing significant environmental resource issues in conjunction with future annexation and development of the Coffee Creek Industrial Area. While there are limited wetlands within Coffee Creek, the area does include important drainages that feed Basalt Creek and Coffee Creek Lake. Future development within the Coffee Creek Industrial Area will inevitably exacerbate storm water runoff as impervious surfaces are constructed including roof tops, parking areas, and roadways. It is recommended that in addition to the City's existing standard storm water control measures, a network of "green streets be constructed.

Amendments to policies and implementation measures are needed to clearly implement the city's position of location and use of industrial lands within the Metro UGB.

Draft Comprehensive Plan Amendments

Pg. D-11. Industrial Development

Delete the first 4 sentences and replace with the following:

Wilsonville has a long history of providing for industrial development. The city currently has over 1000 acres of lands zoned for industrial use of which only about 150 acres are vacant. However, the city has insisted on high standards for industrial development with the result that industrial complexes are attractive and are compatible with neighboring residential and commercial uses. Due to the city's location on I-5, it is an attractive location

for warehousing and distribution facilities, and much of the industrial development west of I-5 is developed in this use. The North Wilsonville/Stafford I-5 Interchange was reconstructed to accommodate the large number of trucks from these businesses.

High tech businesses are generally located east of I-5, and employ approximately 4000 people. Wilsonville is a member of Metro and participated in the 2002/2004 Urban Growth Boundary expansion efforts to locate additional industrial lands. In 2002, the area identified as Coffee Creek I (located south of the correctional Facility) was added to the Metro UGB, followed in 2004 by two additional areas, Coffee Creek II, located west of the Correctional Facility, and another area located north of Day Road between Wilsonville and Tualatin. In 2006/2007, the city worked with property owners, consultants, ODOT and abutting jurisdictions to develop a Master Plan for Coffee Creek I in order that a continuing supply of shovel ready industrial lands would be available consistent with Metro direction in the Urban Growth Management Functional Plan.

The city has also amended its Planned Development Industrial Zone to be consistent with Metro guidelines, and has adopted a new Regionally Significant Industrial Zone (RSIA), also consistent with Metro guidelines. Coffee Creek I is designated RSIA on the Metro Title 4 map, and should be so designated on the City's Comprehensive Plan map. The RSIA zone will not be applied to specific property until such time as an annexation, rezone and development proposal is received from property owners.

Draft Zoning Ordinance Amendments

The Coffee Creek Industrial Area Master Plan will provide a framework to guide the development of public facilities and private uses. This means that the policies, zoning, and codes must be consistent with the Master Plan to support the long-term vision. Implementation is strengthened by the supportive City policies including:

- *Establish new design overlay zone for properties along Day Road that are achievable and flexible yet focused on building forms, site layout, landscaping, and transit/pedestrian connectivity.*
- *Adopt new code language that requires coordinated annexation requests for a stated minimum threshold of land area not less than 50 acres at a time, unless this condition cannot be met.*
- *Allow green street design standards as a variation to the City's current roadway design standards for Grahams Ferry Road and Kinsman Road.*

Appendix A includes a draft zoning ordinance for consideration and refinement by the City of Wilsonville.

Day Road Design Overlay Zone

The primary advantage of adopting a design overlay zone for the Day Road Corridor is that it would be consistent with existing City PDI and RSIA zoning, and be focused on the "northern gateway" area that would improve market image for the entire Coffee Creek Industrial Area. Disadvantages include the potential to complicate the development

approval process, and could lead to added development costs that are higher than standard industrial buildings.

It is recommended that the city adopt a simple "form-based" design standard rather than more traditional code that regulates site uses. Advantages of form-based code usually include a more aesthetically pleasing urban environment, with a nice mixture of building roof lines, facades, landscaping and other design treatments. Disadvantages relate primarily to the control of uses within the plan district, which should not be an issue since this is addressed within the base zone.

The draft code presented in Appendix A is intended to incorporate some of the important "form-based code" regulations into the Building Orientation, Design Standards, and Development Standards for properties along Day Road. Those standards would address elements such as: lot size, setbacks, height, massing, landscaping, materials, transit/pedestrian orientation, parking, and circulation.

Implementing Policies and Ordinances

It should also be noted that given the city's objective to provide orderly urbanization of Coffee Creek Industrial Area, future development must also be consistent with existing city public facility plans (including the Wilsonville Transportation System Plan, Sewer Plan, Water Plan, and Parks Plan) as well as other intergovernmental agreements that impact annexation and provision of public services. Hence, the Development Standards included in the draft code reflect a method for ensuring the future development proposals provides adequate public facilities and private cost-sharing arrangements consistent with long-range public facilities improvements.

In addition to the zoning ordinance amendments identified above, the City of Wilsonville will likely need to adopt additional amendments to Comprehensive Plans, Public Facility Plans, Transportation System Plans, and Capital Improvement Programs to implement the Master Plan. A draft list of recommended amendments to the Wilsonville TSP, Washington County TSP is included in Appendix B. A preliminary minor collector green street design standards is provided in Appendix C.

Wilsonville Capital Improvement Program

The existing CIP for the City of Wilsonville identifies the five-year capital improvements plan for the City and lists out funding priorities. Additional projects that are recommended for inclusion in the City's CIP include:

- Kinsman Road Engineering and Permitting (with $500,000 to identify corridor issues, traffic conditions, right-of-way requirements, design sections, land use forecasts, improvement alternatives analysis, capital costs, environmental impacts, and recommendations regarding design sections, alignment, improvement, and phasing/funding);
- Coffee Creek I water transmission line extension along Kinsman Road with approximately $420,000 for planning, design, and capacity improvements;

- Coffee Creek I sanitary sewer transmission line extension along Kinsman Road with approximately $680,000 for planning design, and capacity improvements;
- Coffee Creek Industrial Area SDC Overlay and Urban Renewal Study, with an approximately $60,000 in funding to be scheduled in 2007/08.
- Coffee Creek I survey work and update of the City's water and sewer capacity models, with approximately $40,000 in funding, to be schedule in 2007/08.
- Coffee Creek area storm water sub basin analysis, with approximately $100,000 in funding, to be scheduled in 2008/09.

Note, that all of these recommended CIP improvements (with the exception of the SDC method study) would likely require funding that exceeds existing local SDC funding commitments. Hence, the city should work closely with ODOT and other state and local entities to leverage non-city public and private funding resources.

The city should adopt the Master Plan, and then subsequently complete updates to the City Water and Wastewater Master Plans. There are several preliminary water and sewer improvements identified in the Master Plan that can be incorporated into annual updates of the City's Water and Wastewater Improvement Programs. Pleaser refer to the future public facility recommendations contained in Appendix D.

Other Local Public Facility Plans (including Water and Wastewater)

The city should adopt the Coffee Creek Master Plan, and then subsequently complete updates to the City Water and Wastewater Master Plans. There are several water and sewer improvements identified in the Master Plan that can be incorporated into annual updates of the City's Water and Wastewater Improvement Programs. **Additional water, sewer, parks and storm water facility recommendations are identified in Appendix D.** Following the adoption of the Coffee Creek Master Plan, it is recommended that the city undertake more detailed capacity modeling to refine the public facility projects, including line size, placement, cost, etc.

Preliminary sewer, water, parks, and storm water capital improvements are included in Appendix D. Note, that all of these recommended CIP improvements (with the exception of the SDC method study) would likely require funding that exceeds existing local SDC funding commitments. Hence, the city should work closely with ODOT and other state and local entities to leverage non-city public and private funding resources. This may entail additional funding strategies that could be funded by the City's Urban Renewal Agency pending available funds.

Amendments to the Wilsonville Significant Resource Overlay Zone (SROZ) Inventories and Compliance Policies

The Significant Resource Overlay Zone (SROZ) inventories and compliance policies are included in Chapter 4.139.01 of the Wilsonville Planning and Land Development Ordinance. SROZ policies are described by the city development ordinance as follows:

The purpose of the Significant Resource Overlay Zone is to implement the goals and policies of the Comprehensive Plan relating to natural resources, open space, environment, flood hazard, and the Willamette River Greenway. In addition, the purposes of these regulations are to achieve compliance with the requirements of the Metro Urban Growth Management Functional Plan (UGMFP) relating to Title 3 Water Quality Resource Areas, and that portion of Statewide Planning Goal 5 relating to significant natural resources. It is not the intent of this ordinance to prevent development where the impacts to significant resources can be minimized or mitigated. (Section 4.139.01 SROZ - Purpose)

The lands within the SROZ are shown in Figure 2. During the course of this master planning process it was determined by the City that the SROZ map should be amended and refined by excluding a portion of tax lot 3S102C000600.

Next Steps

The findings contained in this memorandum shall be presented and discussed with the Coffee Creek Technical Advisory Committee on Friday, April 6, 2007. Information regarding development costs and fiscal impacts will be used to help guide final approval and adoption of a preferred alternative for the Coffee Creek Industrial Area.

Appendix A
Chapter 4 Planning and Land Development
Draft Code Amendments

4.135.5---.07 Other Standards

E. Day Road Design Standards

A. Building Siting and Design: All properties along Day Road shall be designed using the following principles:

1. Sites shall be developed to the maximum extent practicable. A maximum setback of 30 feet is required for at least 50% of the building length along Day Road. Rear and side yard setbacks should be consistent with Section 4.135.5 (D).

2. Assure that building placement and orientation and landscaping allow ease of security surveillance, as long as it does not conflict with other stated design standards and performance measures.

3. Design buildings with shapes, colors, materials, textures, lines, and other architectural design features which enhance the character of the zone and complement the surrounding area and development, considering, but not limited to, the following techniques:

   a. Use color, materials, and architectural design to visually reduce the scale and impact of large buildings;

   b. Use building materials and features that are durable and consistent with the proposed use of the building, level of exposure to public view, and exposure to natural elements;

   c. Provide window glazing for at least 25% of the façade facing Day Road.

4. To the extent possible, screen or mask roof-mounted mechanical equipment, except solar collection apparatus, from view;

5. Orient major service activity areas (e.g., loading, delivery and garbage collection, etc.) of the development away from major streets;

6. Arrange use and buildings to maximize opportunities for shared circulation, access, parking, loading, pedestrian walkways and plazas, recreation areas, and transit-related facilities;

B. Display Areas: All display areas shall be located within an office, multi-use or flex-space building. No outdoor display areas are to be visible along Day Road.

C. Landscaping: A landscape buffer of at least 20 feet shall be provided along Day Road. At least fifteen percent of the entire site must be landscaped. Typical landscaping in this zone shall:

1. Consist of a variety of lawn, trees, shrubbery, and ground cover.

2. Highlight public access points to buildings.

3. Buffer loading and utility areas.

4. Incorporate significant trees and other natural features into the site area as much as possible.

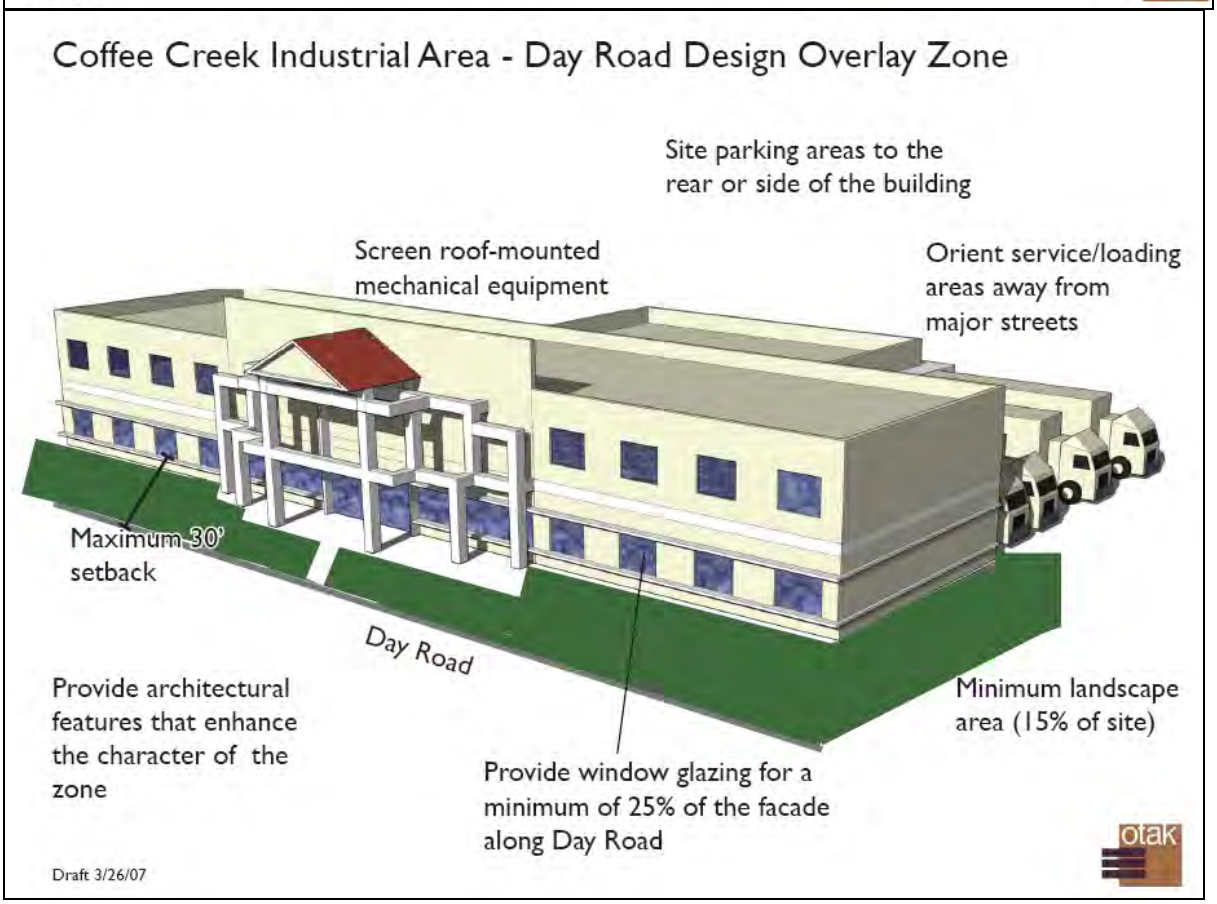
5. Street trees must be provided along street frontages and within required off-street parking lots to help delineate entrances, provide shade and permeable areas for storm water runoff.

D. Screening and outside storage: Outside storage abutting gateway intersections and arterial streets is prohibited. Outside storage in side or rear yards is allowed, provided it is enclosed by a sight-obscuring fence or vegetative screen. Waste and recycle receptacles shall be maintained within an enclosed structure.

E. Performance Standards: The use shall not be of a type or intensity which produces dust, odor, smoke, fumes, noise, glare, heat, or vibrations which are incompatible with other uses allowed in this zone; and the use does not produce off-site impacts that create nuisance as defined by the Oregon D.E.Q. and the City Code section 4.135.5 (.06).

4.700--- xxx Special Requirements within the PDI-RSIA Zone.
In the (PDI-RSIA) zone, the City Council shall only consider annexation requests for contiguous tax lots that are equal to or greater than 50 gross acres in size. Variances can be granted subject to Section 4.196.


Coffee Creek Industrial Area - Day Road Design Overlay Zone
Site parking areas to the rear or side of the building
Orient service/loading areas away from major streets
Screen roof-mounted mechanical equipment
Maximum 30' setback
Provide architectural features that enhance the character of the zone
Day Road
Minimum 20' landscape buffer
Provide window glazing for a minimum of 25% of the facade along Day Road
Draft 3/26/07
otak


Coffee Creek Industrial Area - Day Road Design Overlay Zone
Site parking areas to the rear or side of the building
Screen roof-mounted mechanical equipment
Orient service/loading areas away from major streets
Maximum 30' setback
Day Road
Provide architectural features that enhance the character of the zone
Minimum landscape area (15% of site)
Provide window glazing for a minimum of 25% of the facade along Day Road
Draft 3/26/07
otak

Appendix B
Recommended Transportation Amendments to Wilsonville TSP and Washington County TSP

Table B-1 Summary of Transportation Improvements Assumed with No Build Scenario

ID #	Project Name	Prelim. Cost Estimate (millions)*	Priority	Required TSP Amendments	Potential Funding Sources
Transportation Projects					
C-24	Kinsman Road (Day Road to Ridder Road)	$6.00	Years 1-5 (design) and 6+ (construct)	TSP amendment required for Green Street or for 3 lane section	SDCs, Urban Renewal/TIF, Developers
C7	Kinsman Road (Ridder to Boeckman Road)	$3.60	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
S-36	Day Road/Kinsman Road Signal	$0.28	Same as C-24	no	SDCs, Urban Renewal/TIF, Developers
T-1	Boones Ferry Road/95th Avenue eastbound right turn lane	$0.61	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-2	Boones Ferry Road/95th Avenue westbound left turn pocket	$0.30	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-3	Boones Ferry Road/95th Avenue median	$0.30	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-4	Boones Ferry Road/95th Avenue northbound turn lane	$0.20	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
S-18	Ridder Road/Kinsman Road left turn pockets and signal	$0.58	Years 6+	no	SDCs, Urban Renewal/TIF, Developers
T-5	Clutter Road/Grahams Ferry Road westbound left turn lane	$0.85	Years 6+	Consistent with County TSP, but requires City TSP amend.	County SDCs, Developers
T-6	Grahams Ferry Road/Clutter Road southbound turn lane	$0.30	Years 6+	Same as T-5	County SDCs, Developers
T-7	Grahams Ferry Road/Clutter Road signal	$0.28	Years 6+	Same as T-5	County SDCs, Developers
T-8	Grahams Ferry Road Railroad Crossing	$4.00	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, ODOT, Metro, TriMet
T-9	Day Road/Boones Ferry Road southbound through lane (5 lane section)	$2.49	Years 6+	requires City & County TSP amendments	SDCs, Urban Renewal/TIF, Developers
T-10	Tonquin/SW Grahams Ferry Road westbound turn lane	$0.30	Years 6+	in County TSP	County SDCs, Developers
T-11	Tonquin/SW Grahams Ferry Road northbound turn lane	$0.30	Years 6+	in County TSP	County SDCs, Developers
T-12	Tonquin/SW Grahams Ferry Road signal	$0.28	Years 6+	in County TSP	County SDCs, Developers

*Notes: * costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.*

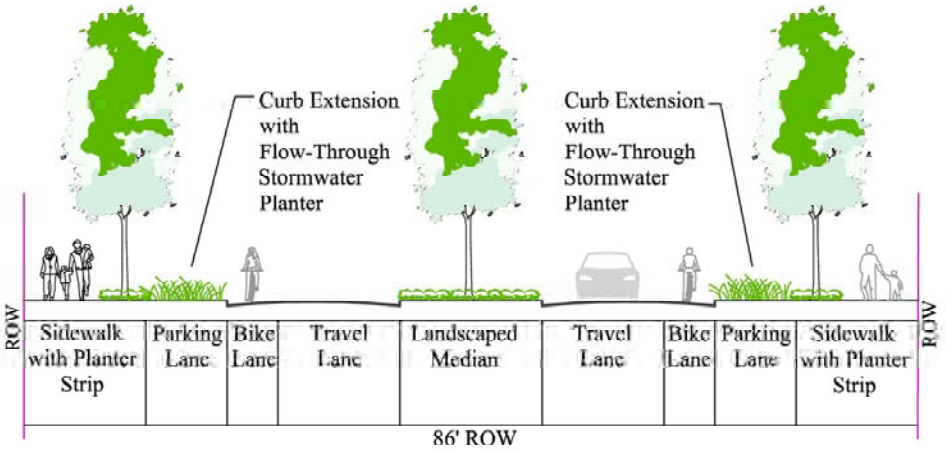
Table B-2 Summary of Transportation Improvements
Coffee Creek Master Plan Preferred Alternative, South of Day Road

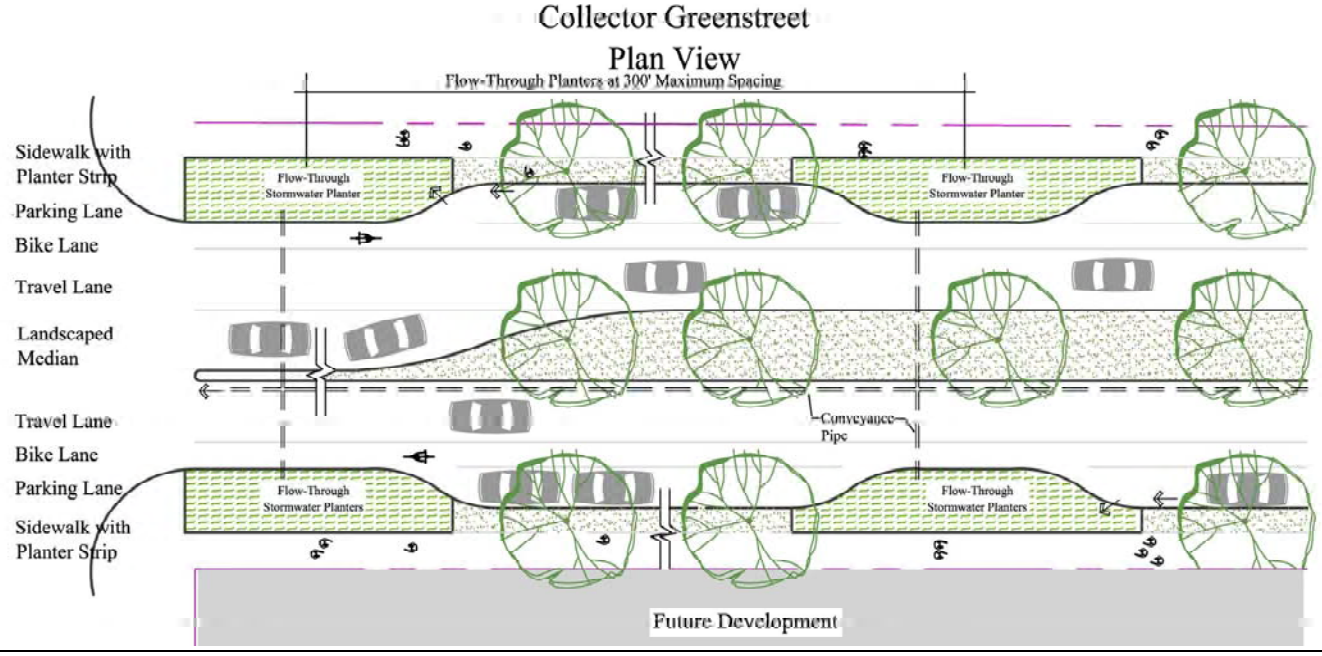
This list identifies projects needed beyond those identified in the 2030 "No Build" Alternative.

ID #	Project Name	Prelim. Cost Estimate (millions)*	Priority	Required TSP Amendments	Potential Funding Sources
Transportation Projects					
T-13A	Day Road/Kinsman left turn pocket	$0.30	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-14	Kinsman/Day northbound right turn lane	$0.30	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-15A	Grahams Ferry Road (RR-xing to Day Road)	$4.20	Years 6+	in County TSP, but requires City TSP amend.	SDCs,Developers
T-15B	Grahams Ferry Road/Day Road duel southbound left turn lanes	$0.30	Years 6+	Same as T-15A	SDCs,Developers
T-16	Clutter Road Reconstruction	$2.10	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
T-17	Boones Ferry Road 5-lane section between Day Road and I-5	$2.25	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers
P-1	Commerce Circle Trail Connection	$0.27	Years 6+	requires City TSP amendment	SDCs, Urban Renewal/TIF, Developers

*Notes: * costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.*

Collector Greenstreet





Appendix C

Recommended Public Facility Amendments to Wilsonville Sanitary Sewer, Water and Parks Plans to Implement Preferred Coffee Creek Master Plan (South of Day Road)

Table 3 Summary of Public Improvements
Coffee Creek Master Plan, Preferred Alternative, South of Day Road

This list identifies projects needed beyond those identified in the 2030 "No Build" Alternative.

ID #	Project Name	Prelim. Cost Estimate (millions)*	Priority	Required Amendments	Potential Funding Sources
Sanitary Sewer Projects					
SS-1	Kinsman Road - Sewer Main	$0.68	Years 1-5	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-2	Grahams Ferry -Sewer Main	$0.10	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-3	Garden Acres Sewer Main	$0.20	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-4	Clutter Road Sewer Main	$0.28	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SS-5	Ridder Road Sewer Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
Water Line Projects					
W-1	Kinsman Road - Water Main	$0.42	Years 1-5	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
W-2	Grahams Ferry -Water Main	$0.45	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
W-3	Clutter Road Sewer Main	$0.27	Years 6+	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
Storm Water Projects					
SW-1	Construct Kinsman Road and Grahams Ferry Road as "Greenstreets" with bioswales	cost included w/proj.	on going	requires City Facility Plan amendment	SDCs, Urban Renewal/TIF, Developers
SW-2	Regional Detention/Treatment Pond	$0.30	Years 6+	requires City Facility Plan amendment	SDCs, Developers
Wayside Projects/Parks					
	Construct 3 new waysides	$0.30	Years 6+		SDCs, Urban Renewal/TIF, Developers

Notes: Costs are in 2007 dollars and reflect "ordinary" design, construction, and right-of-way. Special allowances for environmental mitigation, unstable soils, etc. not included. Compiled by Otak, Inc. and DKS Associates.

Coffee Creek Master Plan Appendix

Section I. Draft Code Amendments