APPENDIX D

Crash and Operational Data (Existing and Future Conditions)

This appendix includes a technical memorandum analyzing safety and operations data for OR 22 (W). Also, attached are the raw traffic count data at intersections in the study area.

OR 22 West (Derry Overcrossing to Doaks Ferry Road) Expressway Management Plan -- Task 2 - Existing and Future Transportation Conditions

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Executive Summary

Task 2 of the OR 22 (W) Expressway Management Plan for the segment located between Derry Overcrossing (MP 16.94) and Doaks Ferry Road (MP22.04) of the highway is divided into Tasks 2A and 2B. Task 2A examined the existing operational, safety and access conditions and Task 2B examined year 2030 operational conditions for the study area mentioned above.

Historical data and background planning documents provided by the Oregon Department of Transportation (ODOT) were reviewed and compared to the existing traffic conditions. The documents reviewed included:

- The September and August 2001 Willamette River Bridges to Greenwood Rd OR 22 Expressway Refinement Plan
- 1999 Oregon Highway Plan
- Oregon Administrative Rules Access Spacing Standards (OAR 734-051-0115)

The operational evaluation for Task 2A included traffic analyses for the existing traffic conditions for 3 segments and 12 unsignalized intersections along the highway.

Base year volume analysis was conducted using the Sychro model. The results of the analysis show that 3 of the 12 intersections analyzed currently fail and that the segment of OR 22 east of OR 51 experiences higher traffic volumes in the westbound direction resulting in a volume-to-capacity ratio that is at the 0.70 standard. West of OR 51, traffic volumes drop to a level that results in a significantly lower mainline volume-to-capacity ratio.

The safety evaluation for Task 2A included analysis of crash types and calculations of crash rates along OR 22 for the years 2002 through 2006. (The memo of 5/9/07 with 2001-2005 data has been updated.) The results of crash types analysis show high rear-end and angle/turning type crashes in the general vicinity of the intersection of OR 22/Independence Highway, which made it a top 10 percent Safety Priority Index System (SPIS) site for 2004-2006. The OR 22/51 and OR 22/Doaks Ferry Road intersections were listed in the top 5 percent SPIS sites for the years 2003-2005.

The 5-year average crash rates for the segments of OR 22 from the west-end of the study area to the SKATS urban study area (Oak Grove Road) and from the urban study area boundary to the eastern-end of the study area are 0.36 and 0.65 crashes per million vehicle miles, respectively. These crash rates are well below the 5-year statewide average crash rate for other freeways/expressways.

The existing access spacing along OR 22 within the study area was examined to determine whether or not the Oregon Administrative Rule (OAR 734-051-0115) spacing standards are met. Currently, none of the existing access spacing along OR 22 within the study area met the OAR access spacing standards.

The operational evaluation for Task 2B included developing year 2030 design hour volumes and conducting traffic analysis of these volumes for the No-Build condition of the study locations that were evaluated in Task 2A. The process used in developing and analyzing future year design hour volumes is described under Task 2B in this report.

OR 22 segments east of OR 51 and 10 of the 12 intersections evaluated are projected to exceed ODOT's capacity standard in the year 2030. The westbound OR 22 west of OR 51 is also expected to exceed ODOT's capacity. Capacity improvements for the failed segments and intersections will be discussed under Task 5 of this study.

Task 2A – Existing Traffic Conditions

The purpose of this task is to document the existing traffic conditions for the OR 22 (Willamina-Salem Highway) study corridor located between the Derry Overcrossing and Doaks Drive. The following discussion documents the data collection, study methodology and the findings of the operational analysis for the year 2007 existing traffic conditions.

Existing Traffic Volumes

Within the OR 22 study corridor, there are a number of intersecting roadways that include small local streets serving small business and rural homes located outside of the Salem city limits. In addition, there are larger arterials that provide regional access to rural properties and one other state highway (OR 51) that provide regional access to other nearby communities in Polk County. Based on discussions with ODOT staff, a number of these intersections are critical from the perspective of either providing access to adjacent properties or serving as local/regional connectors. As such, traffic data were gathered for the following intersections in developing the OR 22 Expressway Management Plan:

1. OR 22 / Rickreall Road
2. OR 22 / Oak Knoll Golf Course Driveway
3. OR 22 / N. Oak Grove Road
4. OR 22 / S. Oak Grove Road

5. OR 22 / OR 51
6. OR 22 / 52nd Avenue
7. OR 22 / 50th Avenue
8. OR 22 / Eola Bend RV Park Access
9. OR 22 / Mill Street
10. OR 22 / Shaw Street
11. OR 22 / College Drive

To assess the existing conditions at the intersections listed above, manual turning movement counts (3:00 – 6:00 p.m.) were obtained during typical mid-week days in March 2007. In addition to these new traffic counts, historical April 2006 traffic counts were obtained from ODOT staff at the following three intersections:

- OR 22/Greenwood Road
- OR 22/OR 51
- OR 22/Doaks Ferry Road

Given the historical nature of the three 2006 traffic counts, an analysis was performed to determine if any growth adjustments were necessary to reflect upstream and downstream volumes at the more recent 2007 study area traffic counts. From this analysis, it was found that there was no significant increase in traffic volumes that would warrant artificial growth adjustments. Accordingly, a cumulative assessment of all study area traffic counts revealed 4:30 – 5:30 p.m. to be the system peak hour. The traffic count sheets are provided in Attachment A.

Seasonal Variation Adjustment/30th Hour

It is recognized that certain highways in Oregon are prone to traffic volume fluctuations due to the effects of seasonal variation. Typically, the summer months experience higher traffic volumes due to additional traffic from recreation enthusiasts and vacationers, while non-summer months tend to experience lower traffic volumes. Using the methodology outlined by ODOT's Transportation Planning Analysis Unit, a seasonal adjustment factor of 1.09 was calculated for movements along the OR 22 study corridor, 1.07 for movements along the OR 51 corridor, and 1.06 for movements off of the remaining side-street study intersections[1]. These adjustment factors were applied to the weekday p.m. peak hour intersection turning movement counts to represent the 30th highest hour volume, or the base year volume. After accounting for seasonal variation in traffic, the adjusted turning movement counts were balanced and rounded to the nearest five vehicles per hour as shown in Figure 1. This figure is provided in Attachment B

Study Methodology

A Synchro model was constructed for the study corridor using the roadway geometries and the adjusted 30th hour traffic volumes. This model was used to assess existing operations along the study corridor.

[1] Located within the study corridor is the Oak Knoll Permanent Automatic Traffic Recorder Station (27-006). Based on a historical review of average weekday traffic volumes, a seasonal adjustment factor of 1.09 was calculated for the OR 22 corridor. For OR 51, there is no representative ATR station nearby. Accordingly, the Seasonal Trend Methodology was utilized to generate a seasonal adjustment factor of 1.07. Finally, a fairly conservative adjustment factor of 1.06 was applied to all remaining movements on non ODOT highways to remain consistent with previous planning studies along the study corridor.

To ensure that the analyses are based on a worst-case scenario, the peak 15-minute flow rates during the peak hours were used in the evaluation of all intersection levels of service. For this reason, the analyses reflect conditions that are only likely to occur for the worst 15 minutes out of each typical peak hour. Traffic conditions during all other weekday time periods and throughout the weekend will likely operate under better conditions than described in this report. A summary of the existing lane configurations and traffic control devices are shown in Figure 2. The traffic operations summary worksheets and figures for the study intersections are also provided in Attachment B.

Performance Measures

The 1999 Oregon Highway Plan (OHP) outlines specific performance measures to be maintained along ODOT facilities as part of their Highway Mobility Standards. These standards are aimed at maintaining mobility along important road corridors and vary according to functional classification, location, and role within the National Highway System (NHS).

The following intersection performance measures are applicable for facilities within this study:

- Volume-to-capacity ratio of 0.70 for movements along OR 22 given its classification as a Statewide, NHS Expressway.
- Volume-to-capacity ratio of 0.80 for all movements along OR 22 that must stop or yield the right-of-way.

Traffic Operations Analysis

Unsignalized Intersection Analysis

All of the intersections along the OR 22 study corridor are currently unsignalized. For unsignalized intersections, the operations assessment is typically based on the intersection's ability to accommodate the worst or critical movement. This is typically the minor-street stop-controlled movement.

Table 1 provides a summary of the 12 stop-controlled or yield controlled intersection movements in order to determine how all of the critical intersection movements are operating during the existing 30th hour conditions.

Although the intersection of OR 22/College Drive is not part of the formal OR 22 study area, data for this intersection are presented in the appendices. The Project Management Team has noted that there is a potential to link Doaks Ferry Road and College Drive; thus, traffic counts were collected at OR 22/College Drive because this intersection may be a part of solutions for the study area.

The traffic operations summary worksheets and figures for the study intersections are provided in Attachment B.

Table 1. Year 2007 Existing Traffic Conditions, 30th Hour Traffic Volumes

Intersection	Direction	V/C Ratio	Adequate?
OR 22 / Greenwood Road	OR 22 EB Left-turn	0.01	Yes
	OR 22 WB Left-turn	0.06	Yes
	NB Approach	0.08	Yes
	SB Approach	0.19	Yes
OR 22 / Rickreal Road	NB Right-turn	0.04	Yes
OR 22 / Old Knoll GC DW	OR 22 EB Left-turn	0.01	Yes
	SB Approach	0.36	Yes
OR 22 / Oak Grove Road	OR 22 EB Left-turn	0.02	Yes
	SB Approach	0.28	Yes
OR 22 / S. Oak Grove Road	OR 22 WB Left-turn	0.03	Yes
	NB Approach	0.12	Yes
OR 22 / OR 51	OR 22 EB Left-turn	0.05	Yes
	OR 22 WB Left-turn	1.01	No
	NB Right-turn	0.72	Yes
	NB Through/Left-turn	>2.0	No
	SB Approach	>2.0	No
OR 22 / 52nd Ave	OR 22 EB Left-turn	0.01	Yes
	SB Approach	0.46	Yes
OR 22 / 50th Ave	OR 22 EB Left-turn	0.02	Yes
	OR 22 WB Left-turn	0.01	Yes
	NB Approach	0.01	Yes
	SB Approach	1.06	No
OR 22 / Eola Bend RV Park	OR 22 WB Left-turn	0.04	Yes
	NB Approach	0.47	Yes
OR 22 / Mill Street	OR 22 EB Left-turn	0.02	Yes
	SB Approach	0.10	Yes
OR 22 / Shaw Street	OR 22 EB Left-turn	0.01	Yes
	OR 22 WB Left-turn	0.01	Yes
	NB Approach	0.08	Yes
	SB Approach	0.04	Yes
OR 22 / Doaks Ferry Road	OR 22 EB Left-turn	0.80	Yes
	SB Approach	>2.0	No

As shown in Table 1, all intersections currently operate within acceptable volume-to-capacity ratios with the exception of the OR 22/OR 51, OR 22/50th Avenue, and OR 22/Doaks Ferry Road intersections. At the OR 22/51 intersection, the westbound left-turn, northbound through/left-turn, and shared southbound approach all operate above capacity. At the OR 22/50th Avenue and OR 22/Doaks Ferry Road intersections, the southbound approaches operate above capacity as well. The failing operations at these minor-street movements can be attributed to the heavy traffic demand along the OR 22.

The intersections of OR 22/50TH Avenue and OR 22/Doaks Ferry Road operated within the acceptable mobility standard in the 2001 OR 22 Expressway Refinement Plan.

Mainline Capacity Analysis

Analyses of the mainline volume-to-capacity ratio along three critical segments of OR 22 are provided in Table 2 below. These ratios were calculated using the HCM (Highway Capacity Manual) 2000 Multilane Highways Methodology.

Table 2. OR 22 Mainline Existing 30th Hour V/C Ratios

Segment	Direction	V/C*	Adequate?
Greenwood Road to OR 51	Eastbound	0.32	Yes
	Westbound	0.43	Yes
OR 51 to 50th Avenue	Eastbound	0.38	Yes
	Westbound	0.56	Yes
50th Avenue to Doaks Ferry Road	Eastbound	0.40	Yes
	Westbound	0.57	Yes

* Assumes a free flow speed of 55 mph and a maximum service flow rate of 2,100 pc/h/ln.

As shown in Table 2, the calculated volume-to-capacity ratios for the three critical segments of OR 22 meet the 0.70 performance standard. It should be noted that the segment of OR 22 east of OR 51 experiences higher traffic volumes in the westbound direction resulting in a volume-to-capacity ratio that is proportionally higher than the remainder of the study corridor. This can be attributed to the influence of OR 51. West of OR 51, traffic volumes drop to a level that results in a significantly lower mainline volume-to-capacity ratio. The mainline traffic operations summary worksheets for the three corridor segments are also provided in Attachment B.

Safety Analysis

This safety analysis provides an assessment of vehicular crash history for OR 22 and key intersections along the study area. The study area was divided into three segments to facilitate the crash analysis as shown below.

1. OR 22 from Derry Overcrossing (MP 16.94) to State Farm Road (MP 21.19)
2. OR 22 from State Farm Road (MP 21.19) to Doaks Ferry Road (MP 22.04)
3. OR 51: MP 0.00 to MP 0.25 (beginning at OR 22 and continuing south towards Independence).

Crash data for the most recent 5 years (years 2002 through 2006) available at the time of this analysis were provided by ODOT Crash Analysis Unit. This data was analyzed to calculate

crash rates and identify existing deficiencies and needed improvements to reduce crash rates within the study area.

The following sections summarize the severity and type of crashes for the three segments listed above.

Severity and Type of Crashes for Segment 1

The severity and type of crashes for Segment 1 [OR 22 from Derry Overcrossing (MP 16.94) to State Farm Road (MP 21.19)] are summarized in Table 3. The land use of abutting properties within this segment is mostly farm land.

Table 3. Historical Crash Data 2002–2006 for OR 22 MP 16.94 to MP 21.19

Year	Severity of Crash			Total Crashes	Type of Crash				
	Fatality	Injury	Property Damage		Angle / Turning	Head-On	Rear-End	Fixed Object	Other
2002	0	13	7	20	6	0	2	8	4
2003	1	10	5	16	9	0	6	1	1
2004	0	8	5	13	4	0	5	3	1
2005	0	8	8	16	3	2	7	1	3
2006	0	7	8	15	2	1	7	1	4
Total	1	46	33	80	24	3	27	14	13

Source: ODOT, 2007

Crash reports for the years 2001 through 2005 show a total of 80 crashes on this segment. There were 1 fatal crash (1 percent), 46 injury crashes (58 percent), and 33 property damage only crashes (41 percent).

The most common types of crashes on OR 22 within this segment were angle/turning crashes (30 percent), and rear-end crashes (34 percent). These types of crashes are typical on segments of roadway with high-volume intersections, such as the intersection of OR 22 and OR 51. The majority of crashes on this segment occurred during day light on a dry surface.

The highest concentration (approximately 50 percent) of the turning movement crashes and rear-end crashes within this segment occurred within 500 feet of MP 20.4. This location is in the general vicinity of the intersection of OR 22 and OR 51.

Severity and Type of Crashes for Segment 2

The severity and type of crashes for Segment 2 (OR 22 from State Farm Road to the end of the study area) are summarized in Table 4. This segment is inside the SKATS urban study area.

Table 4. Historical Crash Data 2002–2006 for OR 22 MP 21.19 to MP 22.04

Year	Severity of Crash			Total Crashes	Type of Crash				
	Fatality	Injury	Property Damage		Angle / Turning	Head-On	Rear-End	Fixed Object	Other
2002	0	8	3	11	8	1	2	0	0
2003	0	4	4	8	6	1	1	0	0
2004	0	5	3	8	3	0	1	4	0
2005	0	1	2	3	2	0	1	0	0
2006	0	1	4	5	1	0	3	1	0
Total	0	19	16	35	20	2	8	5	0

Source: ODOT, 2007

Crash reports for the years 2002 through 2006 show a total of 35 crashes on this segment. There were 0 fatal crashes (0 percent), 19 injury crashes (54 percent), and 16 property damage only crashes (46 percent).

The most common types of crashes on OR 22 within this segment were angle/turning crashes (57 percent), and rear-end crashes (23 percent). The majority of crashes occurred during the day on a dry surface.

The highest concentration of the turning movement crashes (approximately 90 percent)and the majority of rear-end crashes within this segment occurred within 500 feet of MP 22.0. This location is in the general vicinity of the intersection of OR 22 and Doaks Ferry Road.

Severity and Type of Crashes for Segment 3

The safety analysis of OR 51 has one segment, beginning at OR 22 and continuing south towards Independence (OR 51, MP 0.00 to MP 0.25).

For the 5-year period, a total of 3 crashes were reported along OR 51 between MP 0.00 and MP 0.25. There was 1 injury crash and 2 crashes resulting in property damage only. Table 5 summarizes the crash history for OR 51 between MP 0.00 and MP 0.25 during the 5-year period.

Table 5. Historical Crash Data 2002–2006 for OR 51 MP 0.00 to MP 0.25

Year	Severity of Crash			Total Crashes	Type of Crash	
	Fatality	Injury	Property Damage		Fixed Object	Other
2002	0	1	1	2	2	0
2003	0	0	1	1	0	1
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total	0	1	2	3	2	1

Source: ODOT, 2007

The most common types of crashes on OR 51 within the study area were fixed-object crashes (67 percent). Two crashes occurred in dry conditions during the day the third crash occurred in icy conditions at night.

Crash Rate Summary

The 5-year average crash rates for segments 1 and 2 were calculated and found to be equal to 0.36 and 0.65 crashes per million vehicle miles respectively. These crash rates are below the statewide average crash rate for other comparable freeways/expressways. See Attachment C for statewide average crash rate and OR 22 crash rate calculations data.

Safety Priority Index System (SPIS)

In addition to crash rates, ODOT also assesses roadway safety via the Safety Priority Index System (SPIS). The SPIS is used to calculate a relative score that takes into account crash frequency, crash rate, and crash severity. SPIS scores are computed for tenth (0.1) of a mile segments. SPIS scores can be compared to determine where safety improvement funds might best be spent. Typically, ODOT places the highest priority locations where SPIS scores fall within the top 10 percent in the entire state.

A roadway segment becomes a SPIS site if a location has three or more crashes; or one or more fatal crashes over a 3-year period.

There are two SPIS locations along OR 22 within the study area. These locations are shown in the top ten percent SPIS locations within the study area. The crash statistics and SPIS scores that are shown in Table 6 are based on crash data for the years 2003 through 2005.

Table 6. Top 10 Percent SPIS Locations within the Study Area (2007)

Highway	Beg. MP	End MP	Length	AADT	Total Crashes	Fatal	A*	B*	C*	PDO	% Rank	SPIS Score
OR 22	20.30	20.42	0.12	29,200	14	0	1	1	5	14	90	45.69

Source: ODOT, 2007 (2004-2006 data)
*Severity of Crashes: A = severe injury; B = moderate injury; C = minor injury

Access Conditions

The study area is designated as an expressway. The purpose of the expressway classification is to maintain mobility by providing for safe and efficient high-speed and high-volume traffic movements. Its primary function is to provide for interurban travel and connections to ports and major recreational areas with minimal interruptions. The existence of multiple access points into the study area represents interruptions or conflict points that hinder the roadway from functioning in the manner intended by the expressway designation. Conflict points are locations along a roadway at which a high user crossing, merging with, or diverging from a road or driveway conflicts with other motorist use the same road or driveway. Drivers make more mistakes and are more likely to have crashes when they are presented with complex driving situations created by numerous conflict points.

One of the most effective strategies for promoting increased safety and improved mobility is to manage access to the highway. Access management involves planning the location, design and operation of driveway, medians and intersections to provide access while, at the same time preserving safety and roadway efficiency. Access management involves:

- Restricting the number of direct access to major surface streets
- Providing reasonable indirect access
- Effectively designing driveways
- Enforcing safe and efficient spacing of driveways to limit the number and locations of conflict points

Currently there are approximately 56 private accesses and 14 public accesses to OR 22 within the study area. None of the access locations meet the applicable OAR access spacing standard for this highway, as shown in Table 7.

Table 7. Access Management Spacing Standards for Private and Public Approaches on Statewide Highways

Posted Speed (5)	Rural Expressway ** (Feet)*	Rural (Feet)*	Urban Expressway ** *** (Feet)*	Urban *** (Feet)*	STA (Feet)*
≥55	5280	1320	2640	1320	
50	5280	1100	2640	1100	
40 & 45	5280	990	2640	990	
30 & 35	770	720	(6)		
≤25	550	520	(6)		

Source: OAR 734-051-0115

NOTE: Refer to explanatory notes that follow Table 3 for the numbers in parenthesis; however, these notes are not relevant to the OR 22 study.
* Measurement of the approach road spacing is from center to center on the same side of the roadway.
** Spacing for Expressway at-grade intersections only. See the OHP for interchange spacing guidelines.
***These standards also apply to Commercial Centers.

Task 2B – Future Traffic Conditions

This memorandum documents the anticipated future 2030 No-Build traffic conditions for the OR 22 (W) Expressway Management Plan (EMP). Included in the memorandum are the travel forecasts and the results of the operational analyses of the future No-Build scenario for the corridor study area between Greenwood Road and Doaks Ferry Road.

Future Growth Forecasts

Future transportation demand estimates for the study area were based on a combination of forecasts from the Salem Keizer Area Transportation Study (SKATS) Transportation Planning Model, ODOT's Future Volume Tables, and a review of growth rates used in previous planning studies along the OR 22 corridor. The No-Build volumes were prepared assuming that no significant transportation improvements are made to the existing study corridor and study area intersections. The lane configurations at each of the study area intersections for the 2030 No-Build analysis are illustrated in Figure 3. This figure is provided in Attachment D.

Travel Forecasts

To forecast 2030 future traffic volumes along the OR 22 study corridor and study area intersections, base year (2005) and future year (2030) model runs were obtained from the SKATS model as an initial starting point. It should be noted that a large portion of the study corridor is on the edge of the SKATS modeling network. As such, not all of the intersecting corridor roadways are included in the model. For those roadways that are included, annual growth rates were calculated using the base year and future year model outputs. These annual growth rates are summarized in Table 8.

Table 8. SKATS Model Annual Growth Rate Calculations

Roadway Segment	Direction of Travel	
	Eastbound / Northbound	Westbound / Southbound
Oak Grove Road (north of OR 22)	13%	4.8%
OR 51 (south of OR 22)	1.1%	1.1%
OR 22 (west of Oak Grove Road)	3.9%	3.9%
OR 22 (east of Oak Grove Road)	3.9%	3.9%
Doaks Ferry Road (north of OR 22)	9.7%	5.9%
OR 22 (west of Doaks Ferry Road)	3.4%	3.5%

As shown in Table 8, annual growth rates along the OR 22 corridor are projected to range from approximately 3.5 percent at the east end of the study corridor to 3.9 percent at the west end of the study corridor. Growth along OR 51 is projected to occur at approximately 1.1 percent per year. Growth along Doaks Ferry Road is projected to be relatively high due to a significant amount of new development expected in the West Salem area. Growth along Oak Grove Road is also projected to be high; however it should be noted that base and future year traffic volumes in the model are still relatively low, which cause the growth rates appear to be more significant than they really are.

In addition to the SKATS model output, ODOT's Future Volume Tables were reviewed. These tables contain ADT values for all state highways and can be used to develop historic growth trends. Based on a review of these tables, annual growth rates of 3.1 percent to 3.6 percent were calculated at different points along the OR 22 study corridor. For OR 51, an annual growth rate of 1.4 percent was calculated along that section of highway just south of OR 22.

Comparing the SKATS model growth rates to the ODOT Future Volume Tables, the two sets of growth rates are relatively similar. As such, a combination of growth rates from the two sources were utilized for the purposes of developing 2030 No-Build traffic volumes along the OR 22 study corridor. Table 9 outlines the resulting 2030 No-Build annual growth rates used for different segments of the study corridor.

Table 9. 2030 No-Build Annual Growth Rates

Roadway Segment	Direction of Travel	
	Eastbound / Northbound	Westbound / Southbound
Oak Grove Road (north of OR 22)	13%	4.8%
OR 51 (south of OR 22)	1.4%	1.4%
OR 22 (west of OR 51)	3.2%	3.2%
OR 22 (east of OR 51)	3.6%	3.6%
Doaks Ferry Road (north of OR 22)	9.7%	5.9%
All other intersecting roadways	2.5%*	2.5%*

* With the exception of the previously noted roadways, the intersecting side streets are not included in the SKATS model. As such, an annual growth rate of 2.5% was applied to be consistent with previous planning efforts.

Because the application of growth rate estimates to turning movement counts can sometimes underestimate/overestimate future traffic volumes, traffic volume forecasts for some intersection turning movements were derived using the procedures outlined in National Cooperative Highway Research Program (NCHRP) Report 2-55. This procedure accounts for a combination of existing turning movement counts, and base and future year model forecasts as outlined below.

- Measured turning movement volumes and patterns are used as a starting point.
- The percentage change in the model's base and future year traffic volume for each movement is calculated.
- The numerical change (delta) in the model's traffic volumes is calculated.
- The results obtained from the percentage and numerical change calculations are averaged to obtain the 2025 analysis traffic volume.

As previously stated, the OR 22 (W) EMP study corridor essentially lies on the edge of the SKATS modeling network. As such, only the regionally significant OR 51 and Doaks Ferry Road segments are included in the model along with OR 22. The above outlined process was applied to the OR 22/OR 51 and OR 22/Doaks Ferry Road intersections. The balanced results of this procedure coupled with the application of the segment growth rate estimates outlined in Table 9 are illstrated in Figure 4. This figure is provided in Attachment D.

Year 2030 No-Build Traffic Operations Analyses

An operational analysis was conducted for the OR 22 study corridor to evaluate the future 2030 No-Build 30th Hour traffic conditions. This analysis was performed using Synchro to analyze the operations at the individual intersections. The OR 22 mainline volume-to-capacity ratios, unsignalized study intersections were analyzed using procedures described in the 2000 Highway Capacity Manual (HCM).

Performance Measures

The Oregon Highway Plan (1999) (OHP) outlines specific performance measures to be maintained along ODOT facilities as part of their Highway Mobility Standards. These standards are aimed at maintaining mobility along important road corridors and vary according to functional classification, location, and role within the National Highway System (NHS).

The following intersection performance measures are applicable for facilities within this study:

- Volume-to-capacity ratio of 0.70 for movements along OR 22 given its classification as a Statewide, NHS Expressway.
- Volume-to-capacity ratio of 0.80 for all movements along OR 22 that must stop or yield the right-of-way.

Unsignalized Intersection Analysis

All of the intersections along the OR 22 study corridor are assumed to remain unsignalized in the year 2030. For unsignalized intersections, the operations assessment is typically based on the intersection's ability to accommodate the worst or critical movement. This is typically the minor-street stop-controlled movement. Table 10 provides a summary of all stop-controlled or yield controlled intersection movements in order to determine how all of the critical intersection movements are operating during the existing 30th hour conditions.

Table 10. Unsignalized Intersection Analysis Results

Intersection	Direction	V/C Ratio	
		Existing 2007 Traffic Conditions	Future 2030 No-Build Traffic Conditions
OR 22 / Greenwood Road	OR 22 EB Left-turn	0.01	0.06
	OR 22 WB Left-turn	0.06	0.33
	NB Approach	0.08	>2.0
	SB Approach	0.19	>2.0
OR 22 / Rickreal Road	NB Right-turn	0.04	0.15
OR 22 / Old Knoll GC DW	OR 22 EB Left-turn	0.01	0.09
	SB Approach	0.36	0.41
OR 22 / Oak Grove Road	OR 22 EB Left-turn	0.02	0.12
	SB Approach	0.28	>2.0
OR 22 / S. Oak Grove Road	OR 22 WB Left-turn	0.03	0.15
	NB Approach	0.12	>2.0
OR 22 / OR 51	OR 22 EB Left-turn	0.05	0.36
	OR 22 WB Left-turn	1.01	>2.0
	NB Right-turn	0.72	>2.0
	NB Through/Left-turn	>2.0	>2.0
	SB Approach	>2.0	>2.0
OR 22 / 52nd Ave	OR 22 EB Left-turn	0.01	0.01
	SB Approach	0.46	0.85
OR 22 / 50th Ave	OR 22 EB Left-turn	0.02	0.23
	OR 22 WB Left-turn	0.01	0.05
	NB Approach	0.01	0.04
	SB Approach	1.06	>2.0
OR 22 / Eola Bend RV Park	OR 22 WB Left-turn	0.04	0.28
	NB Approach	0.47	>2.0
OR 22 / Mill Street	OR 22 EB Left-turn	0.02	0.60
	SB Approach	0.10	>2.0
OR 22 / Shaw Street	OR 22 EB Left-turn	0.01	0.01
	OR 22 WB Left-turn	0.01	0.10
	NB Approach	0.08	0.71
	SB Approach	0.04	1.36
OR 22 / Doaks Ferry Road	OR 22 EB Left-turn	0.80	>2.0
	SB Approach	>2.0	>2.0

Note: Shaded cells represent that the movement is forecast to exceed ODOT's 0.80 performance standard.

The traffic operations summary worksheets for the study intersections are provided in Attachment D.

As shown in Table 10, a projected increase in traffic volumes along the OR 22 corridor will result in a significant number of critical minor street approaches operating well above capacity. In addition, major street left-turns at the more regionally significant OR 22/OR 51 and OR 22/Doaks Ferry Road intersection are also projected to operate above capacity by the year 2030. These operational results are relatively consistent with previous long-term forecasts for the OR 22 study corridor and suggest that intersection improvements and access management techniques will need to be addressed.

Mainline Capacity Analysis

Year 2030 analyses of the mainline volume-to-capacity ratios along three critical segments of OR 22 are provided in Table 11. These ratios were calculated using the HCM (Highway Capacity Manual) 2000 Multilane Highways Methodology.

Table 11. OR 22 Mainline 2030 Future No-Build 30th Hour V/C Ratios

Segment	Direction	V/C*	
		Existing 2007 Conditions	Future 2030 No-Build Conditions
Greenwood Road to OR 51	Eastbound	0.32	0.64
	Westbound	0.43	0.78
OR 51 to 50th Avenue	Eastbound	0.38	0.74
	Westbound	0.56	0.99
50th Avenue to Doaks Ferry Road	Eastbound	0.40	0.76
	Westbound	0.57	1.00

Note: Shaded cells indicate that the highway segment is forecast to exceed to the 0.70 performance standard.
* Assumes a free flow speed of 55 mph and a maximum service flow rate of 2,100 pc/h/ln.

As shown in Table 11, the calculated volume-to-capacity ratios for the three critical segments of OR 22 are projected to operate near or slightly above the 0.70 performance standard in the eastbound direction. In the westbound direction, the segments located east of OR 51 are forecast to operate at or near the effective capacity of the highway. West of OR 51, traffic volumes drop to a level that results in a significantly lower volume-to-capacity ratio. However, the westbound direction is still forecast to operate just above the performance standard. These results indicate that mainline capacity improvements will need to be addressed for particular segments of the study corridor.

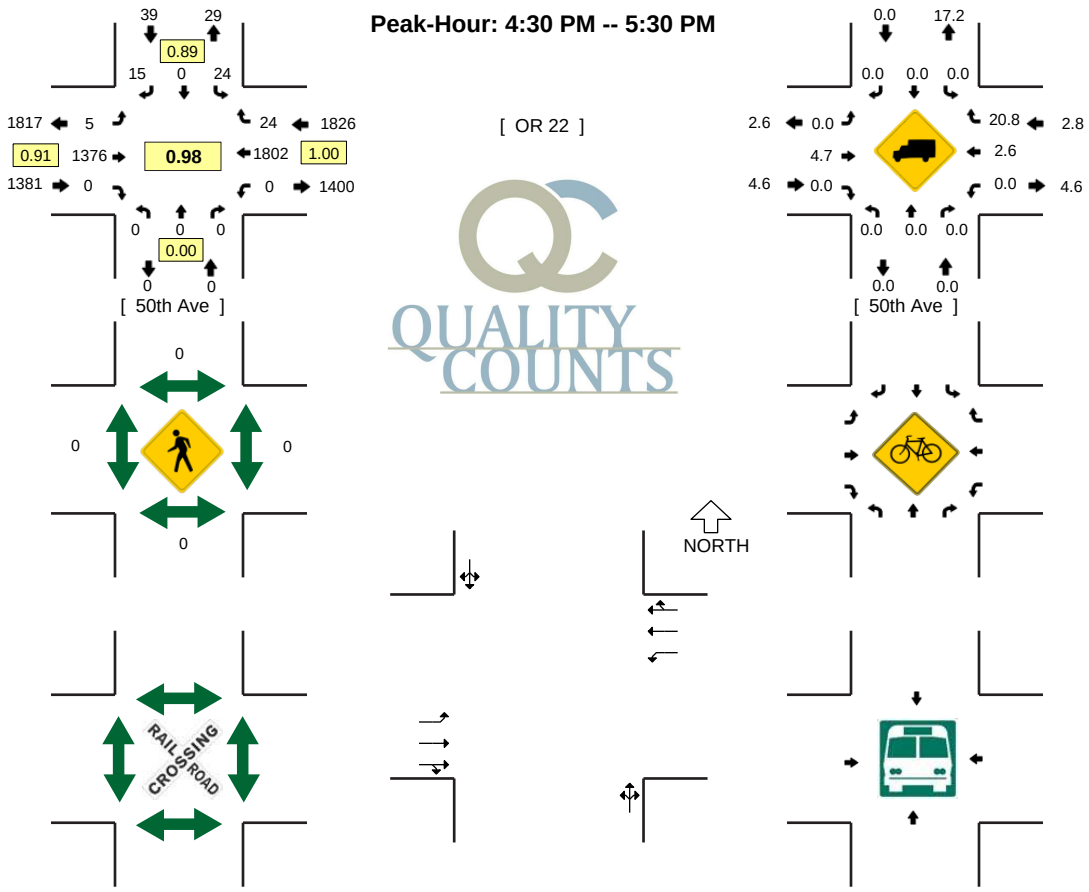
Attachment A
Traffic Counts

Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: 50th Ave--OR 22
WEATHER:

QC JOB #: 10236401
DATE: 3/7/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	50th Ave (Northbound)				50th Ave (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	0	0	1		6	0	1		3	235	0		0	236	1		483	1898
2:15 PM	0	0	0		3	0	1		1	248	0		0	263	1		517	1969
2:30 PM	1	0	2		3	0	1		0	259	0		1	286	3		556	2043
2:45 PM	0	0	1		1	0	4		2	267	0		0	280	3		558	2114
3:00 PM	0	0	0		3	0	2		2	267	0		0	301	3		578	2209
3:15 PM	0	0	0		1	0	2		1	294	0		1	338	5		642	2334
3:30 PM	1	0	2		1	0	1		0	341	0		3	333	4		686	2464
3:45 PM	0	0	1		4	0	2		2	418	0		0	391	5		823	2729
4:00 PM	0	0	1		6	0	3		2	304	0		1	412	4		733	2884
4:15 PM	0	0	0		6	0	2		2	367	0		0	464	5		846	3088
4:30 PM	0	0	0		5	0	6		0	379	0		0	428	7		825	3227
4:45 PM	0	0	0		3	0	3		2	309	0		0	465	9		791	3195
5:00 PM	0	0	0		8	0	5		1	324	0		0	474	4		816	3278
5:15 PM	0	0	0		8	0	1		2	364	0		0	435	4		814	3246
5:30 PM	0	0	0		2	0	2		2	295	0		0	433	2		736	3157
5:45 PM	0	0	0		2	0	4		1	278	0		0	393	4		682	3048
6:00 PM	0	0	0		2	0	0		3	230	0		0	371	1		607	2839
6:15 PM	0	0	0		4	0	1		0	234	0		0	313	4		556	2581
6:30 PM	0	0	0		1	0	0		1	209	0		0	272	3		486	2331
6:45 PM	0	0	0		1	0	1		1	178	0		0	267	1		449	2098
7:00 PM	0	0	0		0	0	0		0	147	0		0	210	1		358	1849
7:15 PM	0	0	0		1	0	0		0	154	0		0	199	2		356	1649
7:30 PM	0	0	0		2	0	0		0	137	0		0	207	4		350	1513
7:45 PM	0	0	0		0	0	2		1	103	0		1	166	2		275	1339

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		20	0	24		0	1516	0		0	1712	28		3300
Heavy Trucks	0	0	0		0	0	0		0	64	0		0	80	0		144
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

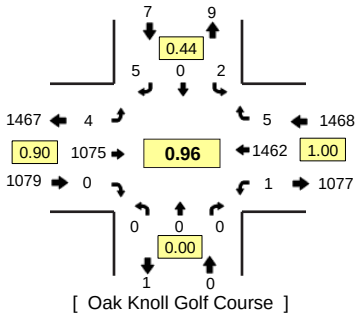
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

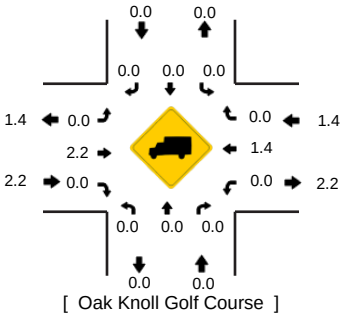
INTERSECTION: Oak Knoll Golf Course--OR 22
WEATHER:

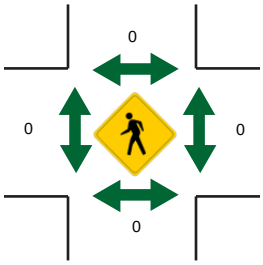
QC JOB #: 10236414
DATE: 3/7/2007

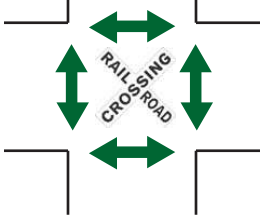
Peak-Hour: 4:30 PM -- 5:30 PM

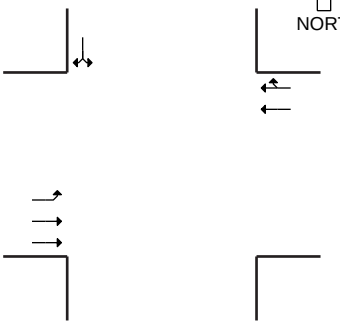


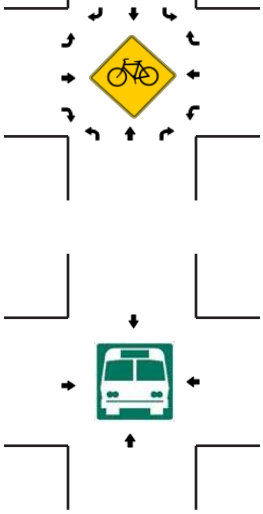
[OR 22]











*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Oak Knoll Golf Co... (Northbound)				Oak Knoll Golf Co... (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0		1	0	1		0	222	0		0	226	0		450	
3:15 PM	0	0	0		0	0	0		2	222	0		0	287	1		512	
3:30 PM	0	0	0		0	0	0		5	278	0		0	278	2		563	
3:45 PM	0	0	0		1	0	0		3	282	0		0	307	2		595	2120
4:00 PM	0	0	0		2	0	1		2	244	0		0	334	2		585	2255
4:15 PM	0	0	0		4	0	2		3	285	0		0	361	4		659	2402
4:30 PM	0	0	0		2	0	2		1	300	0		1	360	1		667	2506
4:45 PM	0	0	0		0	0	1		0	237	0		0	372	1		611	2522
5:00 PM	0	0	0		0	0	0		3	256	0		0	378	2		639	2576
5:15 PM	0	0	0		0	0	2		0	282	0		0	352	1		637	2554
5:30 PM	0	0	0		1	0	1		0	246	0		0	359	2		609	2496
5:45 PM	0	0	0		3	0	4		1	227	0		0	318	1		554	2439

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		8	0	8		4	1200	0		4	1440	4		2668
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	36	0		56
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

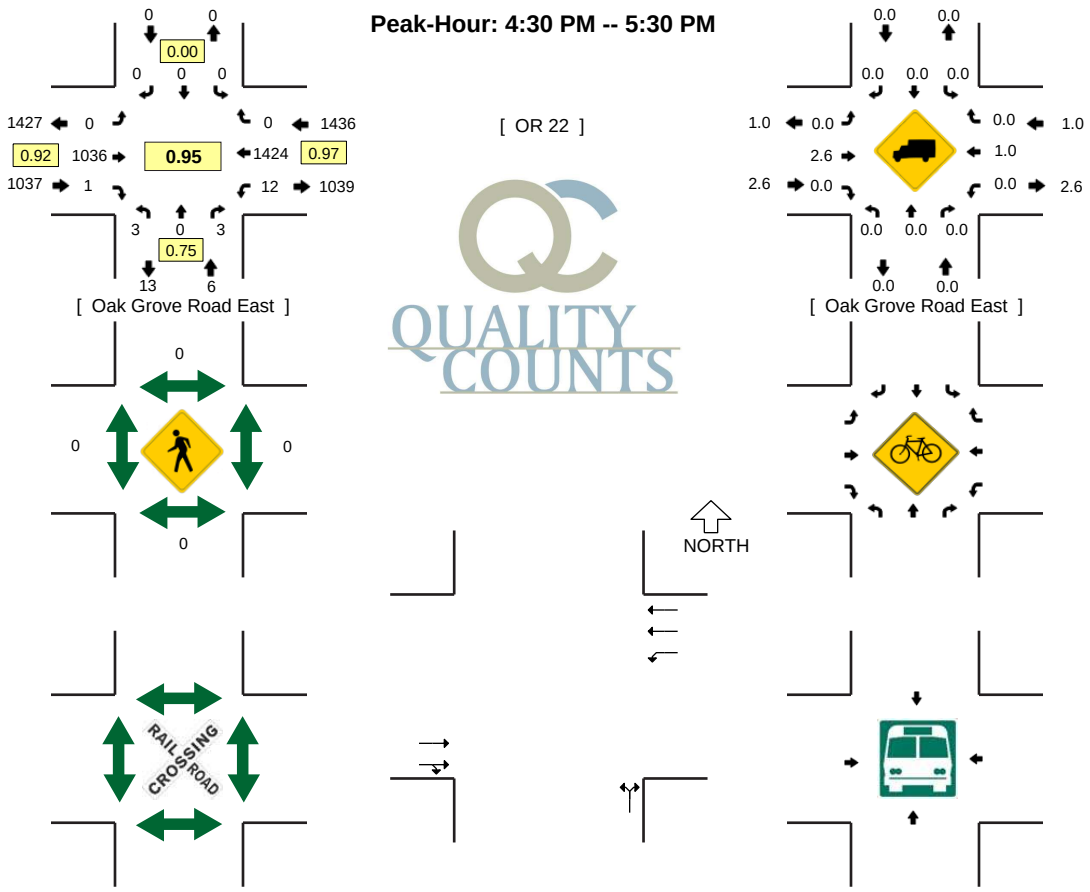
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Oak Grove Road East--OR 22
WEATHER:

QC JOB #: 10236410
DATE: 3/7/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Oak Grove Road Ea... (Northbound)				Oak Grove Road Ea... (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	2		0	0	0		0	216	1		0	227	0		446	
3:15 PM	3	0	1		0	0	0		0	224	0		0	278	0		506	
3:30 PM	0	0	2		0	0	0		0	252	1		1	272	0		528	
3:45 PM	0	0	0		0	0	0		0	277	0		1	301	0		579	2059
4:00 PM	1	0	1		0	0	0		0	231	2		1	324	0		560	2173
4:15 PM	1	0	2		0	0	0		0	280	1		1	331	0		616	2283
4:30 PM	0	0	2		0	0	0		0	282	0		3	332	0		619	2374
4:45 PM	1	0	0		0	0	0		0	235	1		1	348	0		586	2381
5:00 PM	1	0	0		0	0	0		0	237	0		3	379	0		620	2441
5:15 PM	1	0	1		0	0	0		0	282	0		5	365	0		654	2479
5:30 PM	0	0	1		0	0	0		0	224	1		3	366	0		595	2455
5:45 PM	1	0	0		0	0	0		0	225	0		0	337	0		563	2432

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	4		0	0	0		0	1128	0		20	1460	0		2616
Heavy Trucks	0	0	0		0	0	0		0	44	0		0	8	0		52
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

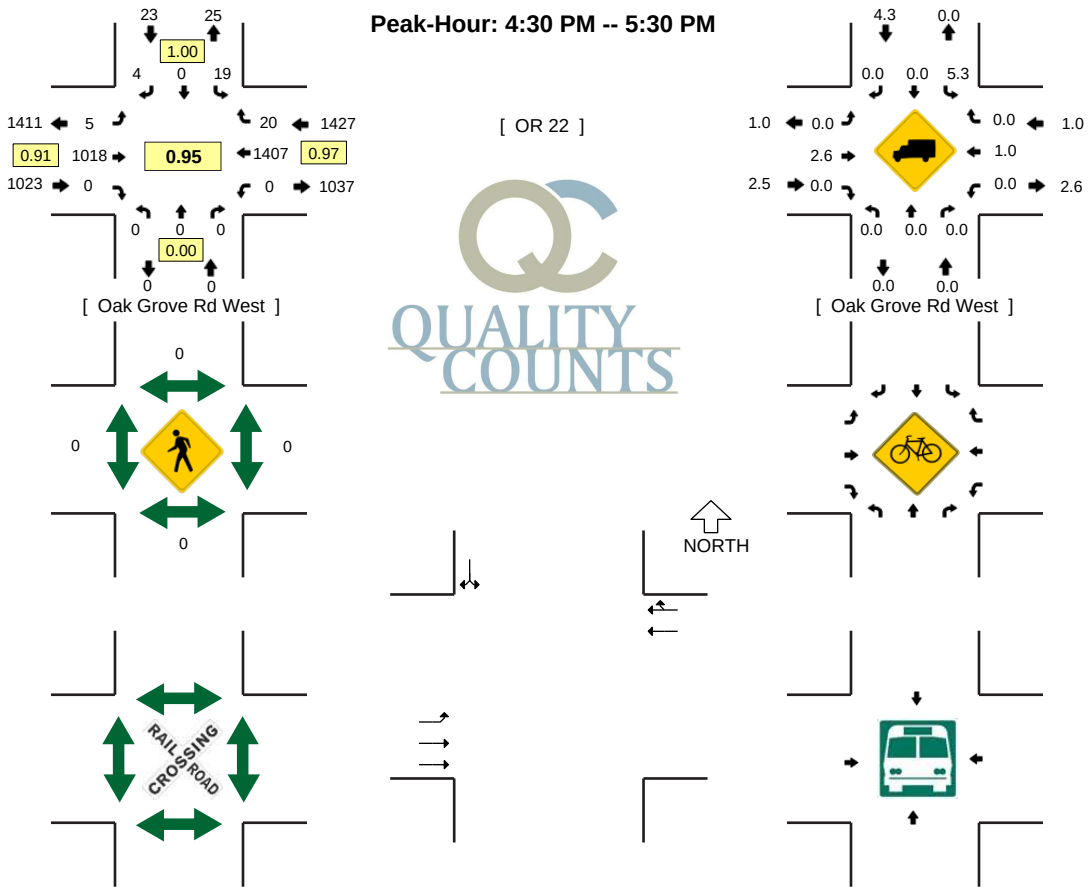
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Oak Grove Rd West--OR 22
WEATHER:

QC JOB #: 10236412
DATE: 3/7/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Oak Grove Rd West (Northbound)				Oak Grove Rd West (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0		5	0	3		2	212	0		0	223	4		449	
3:15 PM	0	0	0		3	0	4		1	221	0		0	275	6		510	
3:30 PM	0	0	0		5	0	4		2	248	0		0	268	4		531	
3:45 PM	0	0	0		0	0	5		0	277	0		0	297	4		583	2073
4:00 PM	0	0	0		4	0	7		0	229	0		0	318	7		565	2189
4:15 PM	0	0	0		6	0	0		2	275	0		0	327	5		615	2294
4:30 PM	0	0	0		7	0	1		2	275	0		0	326	6		617	2380
4:45 PM	0	0	0		4	0	0		1	232	0		0	345	4		586	2383
5:00 PM	0	0	0		5	0	2		0	232	0		0	374	6		619	2437
5:15 PM	0	0	0		3	0	1		2	279	0		0	362	4		651	2473
5:30 PM	0	0	0		1	0	2		1	224	0		0	362	4		594	2450
5:45 PM	0	0	0		5	0	6		2	220	0		0	332	6		571	2435

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		12	0	4		8	1116	0		0	1448	16		2604
Heavy Trucks	0	0	0		0	0	0		0	44	0		0	8	0		52
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

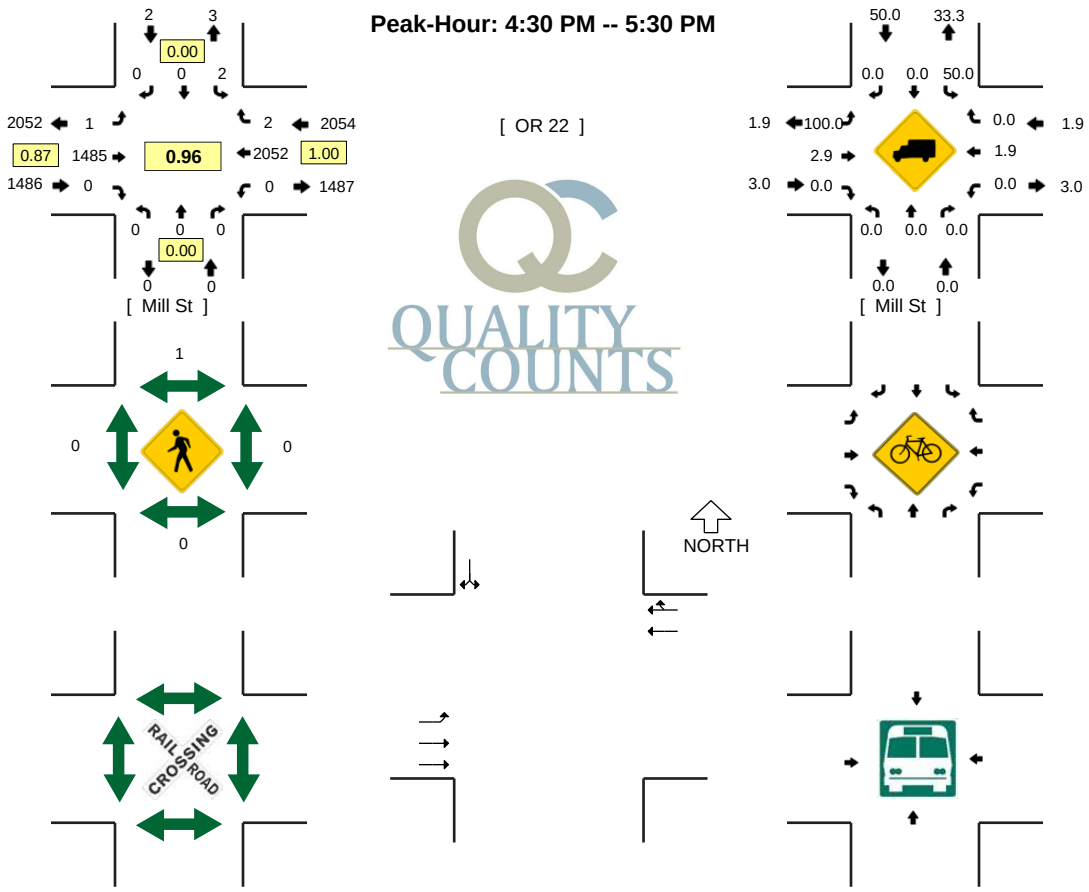
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Mill St--OR 22
WEATHER:

QC JOB #: 10236408
DATE: 3/7/2007

Peak-Hour: 4:30 PM -- 5:30 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Mill St (Northbound)				Mill St (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0		0	1	0		1	274	0		0	314	0		590	
3:15 PM	0	0	0		0	0	0		0	310	0		0	385	0		695	
3:30 PM	0	0	0		0	1	0		0	342	0		0	342	0		685	
3:45 PM	0	0	0		0	3	0		0	447	0		0	422	0		872	2842
4:00 PM	0	0	0		0	2	1		0	324	0		0	455	0		782	3034
4:15 PM	0	0	0		1	0	0		0	378	0		0	480	0		859	3198
4:30 PM	0	0	0		0	0	0		0	425	0		0	499	0		924	3437
4:45 PM	0	0	0		1	0	0		1	323	0		0	525	0		850	3415
5:00 PM	0	0	0		0	0	0		0	344	0		0	515	0		859	3492
5:15 PM	0	0	0		1	0	0		0	393	0		0	513	2		909	3542
5:30 PM	0	0	0		0	0	0		0	307	0		0	471	0		778	3396
5:45 PM	0	0	0		0	0	0		0	293	0		0	441	0		734	3280

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		0	0	0		0	1700	0		0	1996	0		3696
Heavy Trucks	0	0	0		0	0	0		0	36	0		0	60	0		96
Pedestrians		0				4				0				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

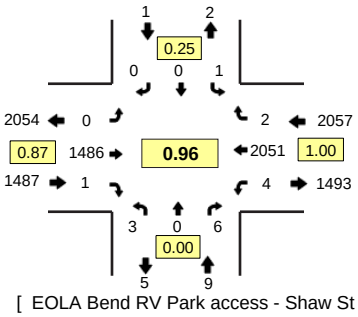
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: EOLA Bend RV Park access - Shaw St--OR 22
WEATHER:

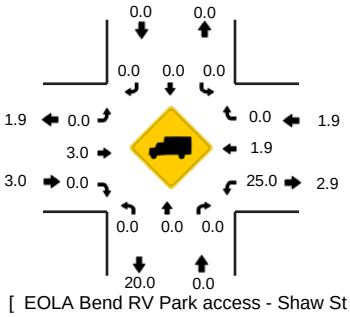
QC JOB #: 10236406
DATE: 3/7/2007

Peak-Hour: 4:30 PM -- 5:30 PM

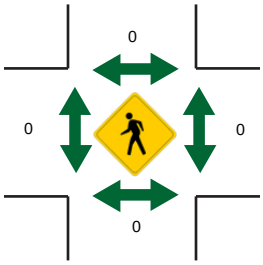


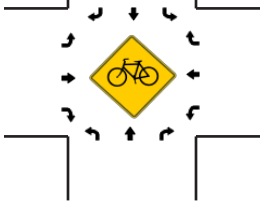
[EOLA Bend RV Park access - Shaw St]

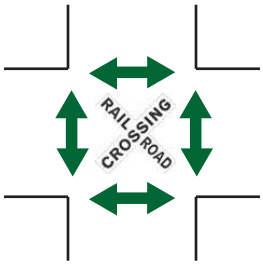
[OR 22]

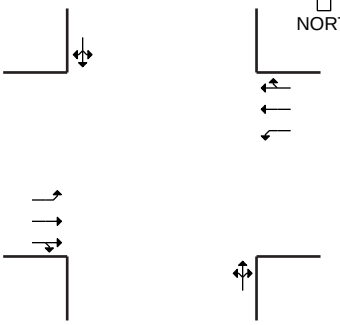


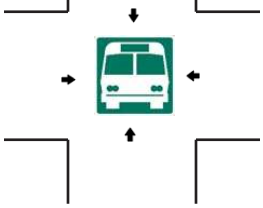
[EOLA Bend RV Park access - Shaw St]











*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	EOLA Bend RV Park... (Northbound)				EOLA Bend RV Park... (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	1		0	0	0		0	274	0		1	314	1		591	
3:15 PM	0	0	1		0	0	0		0	310	0		2	385	2		700	
3:30 PM	0	0	1		0	0	0		0	342	0		1	342	0		686	
3:45 PM	0	0	0		0	0	0		1	445	1		0	422	2		871	2848
4:00 PM	0	0	4		0	0	0		0	320	4		1	455	0		784	3041
4:15 PM	0	0	3		0	0	0		0	379	0		0	480	0		862	3203
4:30 PM	0	0	0		1	0	0		0	424	1		0	499	1		926	3443
4:45 PM	0	0	1		0	0	0		0	324	0		2	525	0		852	3424
5:00 PM	2	0	5		0	0	0		0	344	0		0	513	1		865	3505
5:15 PM	1	0	0		0	0	0		0	394	0		2	514	0		911	3554
5:30 PM	0	0	1		0	0	0		0	307	0		1	471	0		780	3408
5:45 PM	2	0	2		0	0	0		0	293	0		1	439	1		738	3294

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		4	0	0		0	1696	4		0	1996	4		3704
Heavy Trucks	0	0	0		0	0	0		0	36	0		0	60	0		96
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

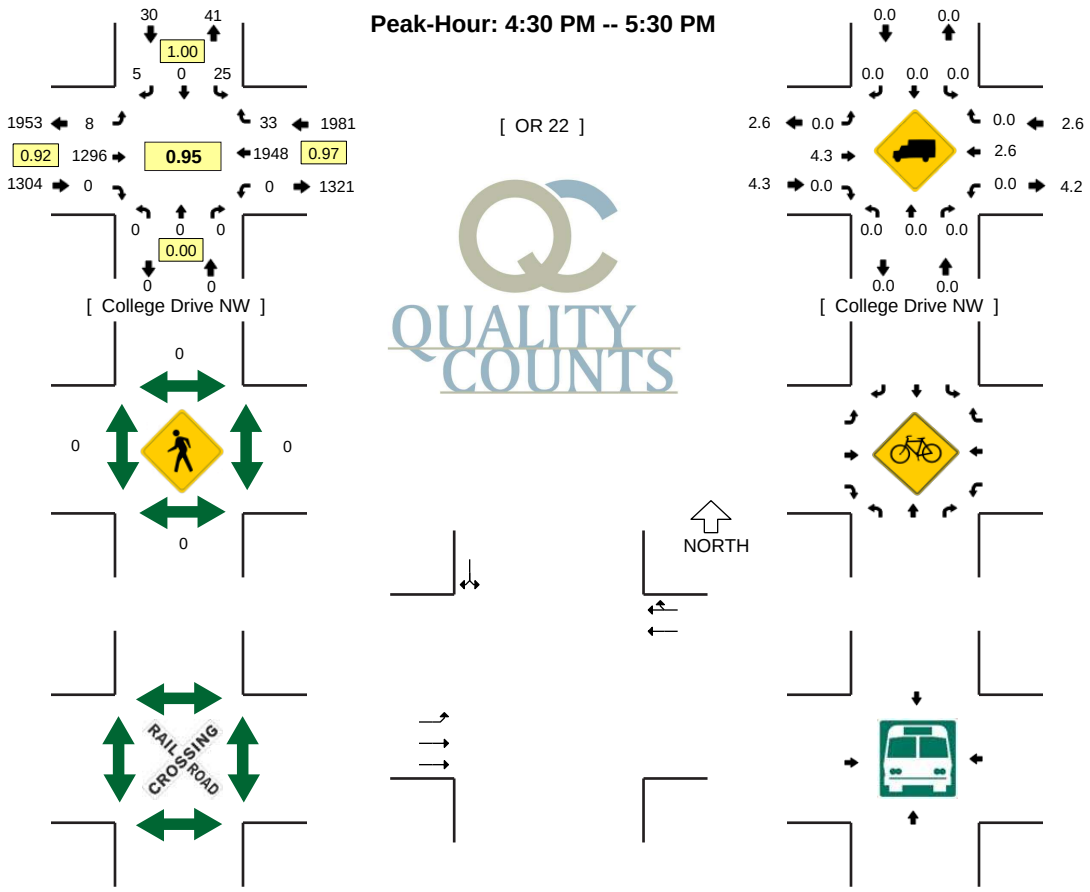
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: College Drive NW--OR 22
WEATHER:

QC JOB #: 10236417
DATE: 3/7/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	College Drive NW (Northbound)				College Drive NW (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	0	0	0		2	0	0		3	219	0		0	257	4		485	1942
2:15 PM	0	0	0		5	0	2		0	251	0		0	275	3		536	2032
2:30 PM	0	0	0		5	0	0		0	250	0		0	300	9		564	2103
2:45 PM	0	0	0		1	0	0		1	277	0		0	290	8		577	2162
3:00 PM	0	0	0		4	0	4		0	251	0		0	325	13		597	2274
3:15 PM	0	0	0		8	0	3		4	310	0		0	355	13		693	2431
3:30 PM	0	0	0		4	0	2		0	310	0		0	347	9		672	2539
3:45 PM	0	0	0		7	0	0		4	436	0		0	410	5		862	2824
4:00 PM	0	0	0		3	0	2		0	306	0		0	456	9		776	3003
4:15 PM	0	0	0		5	0	0		1	340	0		0	460	8		814	3124
4:30 PM	0	0	0		6	0	1		2	354	0		0	468	9		840	3292
4:45 PM	0	0	0		5	0	1		4	302	0		0	470	8		790	3220
5:00 PM	0	0	0		8	0	2		1	287	0		0	507	8		813	3257
5:15 PM	0	0	0		6	0	1		1	353	0		0	503	8		872	3315
5:30 PM	0	0	0		2	0	0		1	297	0		0	447	8		755	3230
5:45 PM	0	0	0		3	0	0		5	265	0		0	439	11		723	3163
6:00 PM	0	0	0		3	0	0		1	201	0		0	375	0		580	2930
6:15 PM	0	0	0		7	0	3		0	244	0		0	321	7		582	2640
6:30 PM	0	0	0		2	0	0		2	194	0		0	269	9		476	2361
6:45 PM	0	0	0		4	0	0		4	148	0		0	261	26		443	2081
7:00 PM	0	0	0		3	0	0		0	155	0		0	224	17		399	1900
7:15 PM	0	0	0		2	0	0		1	128	0		0	203	1		335	1653
7:30 PM	0	0	0		1	0	1		2	135	0		0	194	5		338	1515
7:45 PM	0	0	0		3	0	1		0	107	0		0	175	5		291	1363

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		24	0	4		4	1412	0		0	2012	32		3488
Heavy Trucks	0	0	0		0	0	0		0	48	0		0	48	0		96
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

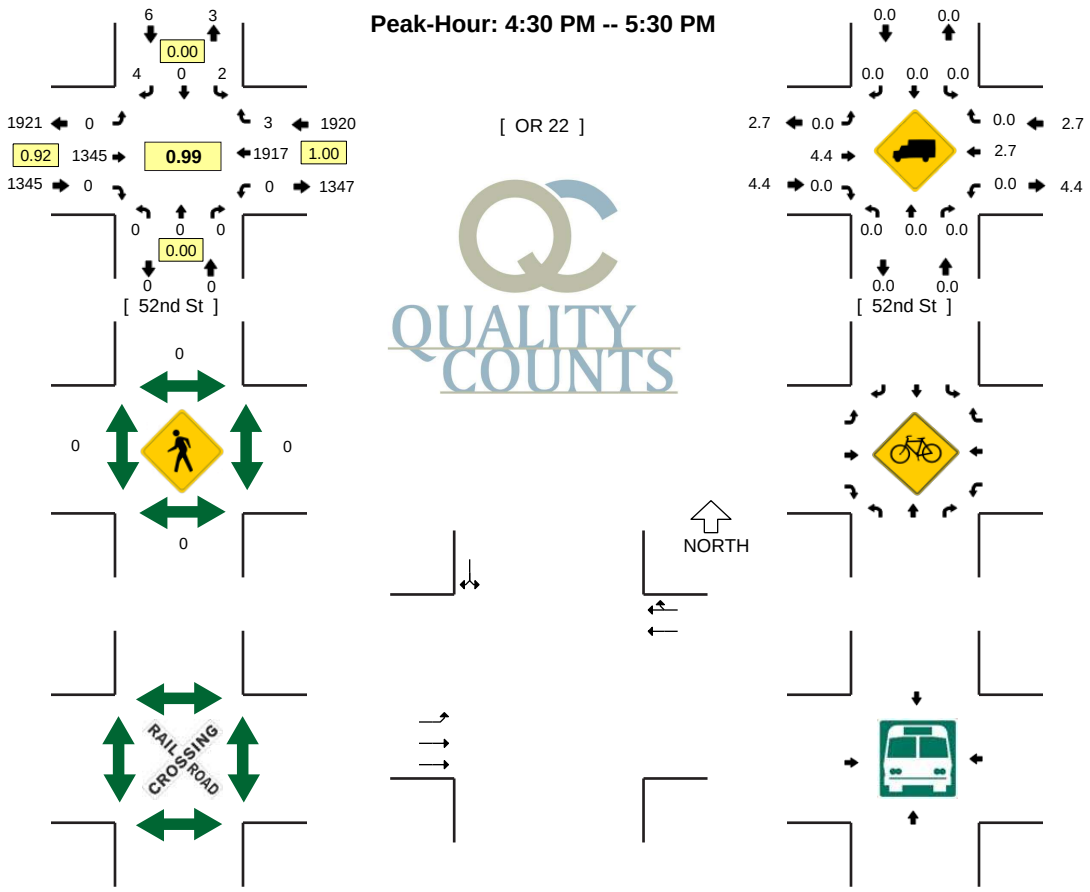
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: 52nd St--OR 22
WEATHER:

QC JOB #: 10236404
DATE: 3/7/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	52nd St (Northbound)				52nd St (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0		3	0	0		0	291	0		0	335	0		629	
3:15 PM	0	0	0		1	0	0		0	339	0		0	427	2		769	
3:30 PM	0	0	0		7	0	1		0	399	0		0	381	0		788	
3:45 PM	0	0	0		2	0	0		0	453	0		0	454	1		910	3096
4:00 PM	0	0	0		0	0	0		1	301	0		0	437	2		741	3208
4:15 PM	0	0	0		1	0	0		0	367	0		0	463	0		831	3270
4:30 PM	0	0	0		0	0	0		0	365	0		0	458	2		825	3307
4:45 PM	0	0	0		1	0	4		0	298	0		0	494	1		798	3195
5:00 PM	0	0	0		1	0	0		0	318	0		0	501	0		820	3274
5:15 PM	0	0	0		0	0	0		0	364	0		0	464	0		828	3271
5:30 PM	0	0	0		0	0	0		0	295	0		0	469	2		766	3212
5:45 PM	0	0	0		0	0	0		0	279	0		0	412	6		697	3111

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0		0	0	0		0	1456	0		0	1856	0		3312
Heavy Trucks	0	0	0		0	0	0		0	60	0		0	20	0		80
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

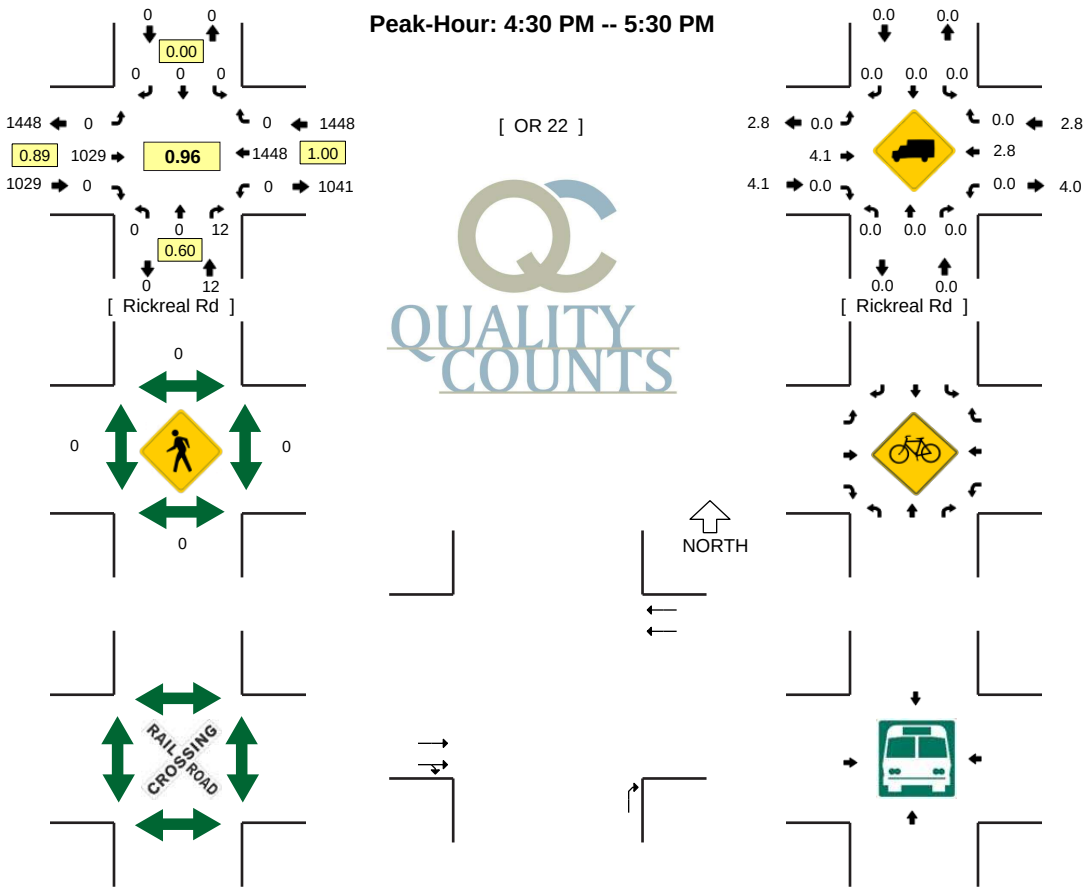
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Rickreal Rd--OR 22
WEATHER:

QC JOB #: 10236416
DATE: 3/7/2007

Peak-Hour: 4:30 PM -- 5:30 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Rickreal Rd (Northbound)				Rickreal Rd (Southbound)				OR 22 (Eastbound)				OR 22 (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	8		0	0	0		0	210	1		0	218	0		437	
3:15 PM	0	0	9		0	0	0		0	213	0		0	260	0		482	
3:30 PM	0	0	7		0	0	0		0	272	0		0	273	0		552	
3:45 PM	0	0	6		0	0	0		0	277	0		0	291	0		574	2045
4:00 PM	0	0	7		0	0	0		0	235	0		0	305	0		547	2155
4:15 PM	0	0	11		0	0	0		0	276	0		0	366	0		653	2326
4:30 PM	0	0	5		0	0	0		0	288	0		0	353	0		646	2420
4:45 PM	0	0	2		0	0	0		0	234	0		0	382	0		618	2464
5:00 PM	0	0	4		0	0	0		0	233	0		0	359	0		596	2513
5:15 PM	0	0	1		0	0	0		0	274	0		0	354	0		629	2489
5:30 PM	0	0	5		0	0	0		0	218	0		0	365	0		588	2431
5:45 PM	0	0	3		0	0	0		0	209	0		0	333	0		545	2358

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	20		0	0	0		0	1152	0		0	1412	0		2584
Heavy Trucks	0	0	0		0	0	0		0	44	0		0	52	0		96
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 3/19/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Attachment B
HCM Existing Intersection Capacity

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1288	1	13	1730	3	3
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	1356	1	14	1821	4	4
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			1357		2294	678
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1357		2294	678
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		89	99
cM capacity (veh/h)			513		33	399

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	904	453	14	911	911	7
Volume Left	0	0	14	0	0	4
Volume Right	0	1	0	0	0	4
cSH	1700	1700	513	1700	1700	61
Volume to Capacity	0.53	0.27	0.03	0.54	0.54	0.12
Queue Length (ft)	0	0	2	0	0	9
Control Delay (s)	0.0	0.0	12.2	0.0	0.0	72.0
Lane LOS			B			F
Approach Delay (s)	0.0		0.1			72.0
Approach LOS						F

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	1275	1	492	1719	17	1	0	275	1	0	13
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (veh/h)	16	1342	1	518	1809	18	1	0	289	1	0	14
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	1827			1343			3328	4237	672	3557	4229	914
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1827			1343			3328	4237	672	3557	4229	914
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			0			0	0	28	0	0	95
cM capacity (veh/h)	339			514			0	0	403	0	0	280

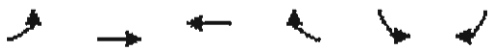
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	16	895	448	518	1206	621	1	289	15
Volume Left	16	0	0	518	0	0	1	0	1
Volume Right	0	0	1	0	0	18	0	289	14
cSH	339	1700	1700	514	1700	1700	0	403	0
Volume to Capacity	0.05	0.53	0.26	1.01	0.71	0.37	Err	0.72	Err
Queue Length (ft)	4	0	0	354	0	0	Err	138	Err
Control Delay (s)	16.1	0.0	0.0	70.0	0.0	0.0	Err	33.6	Err
Lane LOS	C			F			F	D	F
Approach Delay (s)	0.2			15.5			Err		Err
Approach LOS							F		F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	82.8%	ICU Level of Service	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1568	6	14	2223	4	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	1704	7	15	2416	4	24
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			1711		2946	855
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1711		2946	855
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		61	92
cM capacity (veh/h)			367		11	301

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	1136	575	15	1208	1208	28
Volume Left	0	0	15	0	0	4
Volume Right	0	7	0	0	0	24
cSH	1700	1700	367	1700	1700	60
Volume to Capacity	0.67	0.34	0.04	0.71	0.71	0.47
Queue Length (ft)	0	0	3	0	0	46
Control Delay (s)	0.0	0.0	15.2	0.0	0.0	110.1
Lane LOS			C			F
Approach Delay (s)	0.0		0.1			110.1
Approach LOS						F

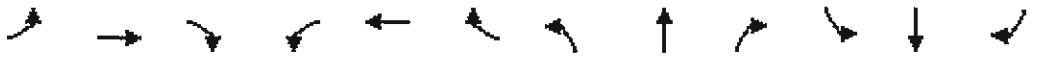
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	80.5%	ICU Level of Service	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	160	1437	2186	35	3	66
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	168	1513	2301	37	4	78
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	2338				3413	1169
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2338				3413	1169
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	20				0	59
cM capacity (veh/h)	211				1	189

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	168	756	756	1534	804	81
Volume Left	168	0	0	0	0	4
Volume Right	0	0	0	0	37	78
cSH	211	1700	1700	1700	1700	23
Volume to Capacity	0.80	0.44	0.44	0.90	0.47	3.51
Queue Length (ft)	143	0	0	0	0	Err
Control Delay (s)	66.9	0.0	0.0	0.0	0.0	Err
Lane LOS	F					F
Approach Delay (s)	6.7			0.0		Err
Approach LOS						F

Intersection Summary				
Average Delay	200.7			
Intersection Capacity Utilization	93.5%	ICU Level of Service		E



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	1191	4	29	1682	4	1	0	11	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	3	1254	4	31	1771	4	1	0	13	1	1	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	1775			1258			2210	3098	629	2480	3098	887
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1775			1258			2210	3098	629	2480	3098	887
tC, single (s)	4.1			4.2			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			94			95	100	97	92	89	100
cM capacity (veh/h)	355			538			22	11	430	14	11	291

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	3	836	422	31	1180	594	14	4
Volume Left	3	0	0	31	0	0	1	1
Volume Right	0	0	4	0	0	4	13	1
cSH	355	1700	1700	538	1700	1700	168	18
Volume to Capacity	0.01	0.49	0.25	0.06	0.69	0.35	0.08	0.19
Queue Length (ft)	1	0	0	4	0	0	7	14
Control Delay (s)	15.2	0.0	0.0	12.1	0.0	0.0	28.4	242.3
Lane LOS	C			B			D	F
Approach Delay (s)	0.0			0.2			28.4	242.3
Approach LOS							D	F

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	61.8%	ICU Level of Service		B

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1263	0	0	1715	0	13
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	1329	0	0	1805	0	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1329		2232	665
vC1, stage 1 conf vol					1329	
vC2, stage 2 conf vol					903	
vCu, unblocked vol			1329		2232	665
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			526		139	407

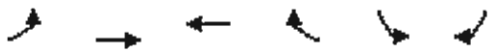
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1
Volume Total	886	443	903	903	15
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	15
cSH	1700	1700	1700	1700	407
Volume to Capacity	0.52	0.26	0.53	0.53	0.04
Queue Length (ft)	0	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	0.0	14.2
Lane LOS					B
Approach Delay (s)	0.0		0.0		14.2
Approach LOS					B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	56.0%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	4	1272	1710	5	2	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	4	1339	1800	5	2	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1805				2481	903
vC1, stage 1 conf vol					1803	
vC2, stage 2 conf vol					678	
vCu, unblocked vol	1805				2481	903
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	98
cM capacity (veh/h)	346				94	284

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	4	669	669	1200	605	8
Volume Left	4	0	0	0	0	2
Volume Right	0	0	0	0	5	6
cSH	346	1700	1700	1700	1700	180
Volume to Capacity	0.01	0.39	0.39	0.71	0.36	0.05
Queue Length (ft)	1	0	0	0	0	4
Control Delay (s)	15.5	0.0	0.0	0.0	0.0	26.0
Lane LOS	C					D
Approach Delay (s)	0.0			0.0		26.0
Approach LOS						D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	1269	1711	22	20	4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	5	1336	1801	23	24	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1824				2491	912
vC1, stage 1 conf vol					1813	
vC2, stage 2 conf vol					678	
vCu, unblocked vol	1824				2491	912
tC, single (s)	4.1				6.9	6.9
tC, 2 stage (s)					5.9	
tF (s)	2.2				3.5	3.3
p0 queue free %	98				73	98
cM capacity (veh/h)	340				88	280

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	5	668	668	1201	624	28
Volume Left	5	0	0	0	0	24
Volume Right	0	0	0	0	23	5
cSH	340	1700	1700	1700	1700	99
Volume to Capacity	0.02	0.39	0.39	0.71	0.37	0.28
Queue Length (ft)	1	0	0	0	0	27
Control Delay (s)	15.8	0.0	0.0	0.0	0.0	55.1
Lane LOS	C					F
Approach Delay (s)	0.1			0.0		55.1
Approach LOS						F

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1551	2224	3	2	4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	0	1633	2341	3	2	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2344				3159	1172
vC1, stage 1 conf vol					2343	
vC2, stage 2 conf vol					816	
vCu, unblocked vol	2344				3159	1172
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	98
cM capacity (veh/h)	213				49	188

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	0	816	816	1561	784	7
Volume Left	0	0	0	0	0	2
Volume Right	0	0	0	0	3	5
cSH	1700	1700	1700	1700	1700	97
Volume to Capacity	0.00	0.48	0.48	0.92	0.46	0.07
Queue Length (ft)	0	0	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	45.0
Lane LOS						E
Approach Delay (s)	0.0			0.0		45.0
Approach LOS						E

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	78.4%	ICU Level of Service	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	1548	0	0	2211	26	0	0	0	26	0	16
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	5	1629	0	0	2327	27	0	0	0	31	0	19
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											1	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2355			1629			2823	3995	815	3166	3981	1177
vC1, stage 1 conf vol										2341	2341	
vC2, stage 2 conf vol										825	1640	
vCu, unblocked vol	2355			1629			2823	3995	815	3166	3981	1177
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)										6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			100	100	100	4	100	90
cM capacity (veh/h)	211			395			7	3	321	32	44	187

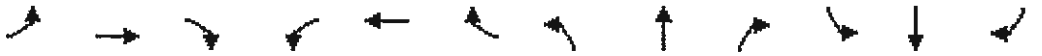
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	5	815	815	1552	803	0	49
Volume Left	5	0	0	0	0	0	31
Volume Right	0	0	0	0	27	0	19
cSH	211	1700	1700	1700	1700	1700	47
Volume to Capacity	0.02	0.48	0.48	0.91	0.47	0.00	1.06
Queue Length (ft)	2	0	0	0	0	0	112
Control Delay (s)	22.5	0.0	0.0	0.0	0.0	0.0	288.3
Lane LOS	C					A	F
Approach Delay (s)	0.1			0.0		0.0	288.3
Approach LOS						A	F

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	78.8%	ICU Level of Service	C	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	1	1589	2247	2	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	1	1673	2365	2	2	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2367				3205	1184
vC1, stage 1 conf vol					2366	
vC2, stage 2 conf vol					838	
vCu, unblocked vol	2367				3205	1184
tC, single (s)	6.1				7.8	6.9
tC, 2 stage (s)					6.8	
tF (s)	3.2				4.0	3.3
p0 queue free %	98				90	100
cM capacity (veh/h)	49				25	185

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	1	836	836	1577	791	2
Volume Left	1	0	0	0	0	2
Volume Right	0	0	0	0	2	0
cSH	49	1700	1700	1700	1700	25
Volume to Capacity	0.02	0.49	0.49	0.93	0.47	0.10
Queue Length (ft)	2	0	0	0	0	7
Control Delay (s)	80.4	0.0	0.0	0.0	0.0	166.3
Lane LOS	F					F
Approach Delay (s)	0.1			0.0		166.3
Approach LOS						F

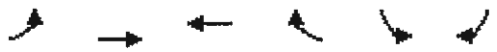
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	79.1%	ICU Level of Service	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	1590	1	4	2246	2	3	0	6	1	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	0	1674	1	4	2364	2	4	0	7	1	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								1			1	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2366			1675			2865	4049	837	3218	4048	1183
vC1, stage 1 conf vol							1674	1674		2374	2374	
vC2, stage 2 conf vol							1191	2375		844	1675	
vCu, unblocked vol	2366			1675			2865	4049	837	3218	4048	1183
tC, single (s)	4.1			4.6			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.5			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			95	100	98	96	100	100
cM capacity (veh/h)	209			290			64	44	314	30	43	185

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	0	1116	559	4	1576	790	11	1
Volume Left	0	0	0	4	0	0	4	1
Volume Right	0	0	1	0	0	2	7	0
cSH	1700	1700	1700	290	1700	1700	137	30
Volume to Capacity	0.00	0.66	0.33	0.01	0.93	0.46	0.08	0.04
Queue Length (ft)	0	0	0	1	0	0	6	3
Control Delay (s)	0.0	0.0	0.0	17.6	0.0	0.0	33.4	130.0
Lane LOS				C			D	F
Approach Delay (s)	0.0			0.0			33.4	130.0
Approach LOS							D	F

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	79.1%	ICU Level of Service	C	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	9	1413	2123	36	27	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	9	1487	2235	38	32	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2273				3016	1136
vC1, stage 1 conf vol					2254	
vC2, stage 2 conf vol					763	
vCu, unblocked vol	2273				3016	1136
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	96				42	97
cM capacity (veh/h)	228				55	199

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	9	744	744	1490	783	38
Volume Left	9	0	0	0	0	32
Volume Right	0	0	0	0	38	6
cSH	228	1700	1700	1700	1700	62
Volume to Capacity	0.04	0.44	0.44	0.88	0.46	0.61
Queue Length (ft)	3	0	0	0	0	63
Control Delay (s)	21.5	0.0	0.0	0.0	0.0	129.1
Lane LOS	C					F
Approach Delay (s)	0.1			0.0		129.1
Approach LOS						F

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	76.5%	ICU Level of Service	C

CALCULATION/DESIGN RECORD

Kittelson & Associates, Inc.
Transportation Planning/Traffic Engineering
Baltimore • Ft. Lauderdale • Orlando • Portland
http://www.kittelson.com

DATE 4/10 PROJECT # 8439

PROJECT NAME OR 22

SUBJECT SEGMENT V/C OR 22 BY JXH SHEET # 1 OF 1

* 2007 EXISTING 30TH HOUR VOLS *

→ GREENWOOD TO OR 51

WB VOL = 1275 ↖
EB VOL = 1700 ↘

→ OR 51 TO 50TH

WB VOL = 2220
EB VOL = 1500

→ 50TH TO DOANES FERRY

WB VOL = 2240
EB VOL = 1590

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Existing 2007 PM
Highway:	OR 22
From/To:	OR 51 to 50th Ave
Jurisdiction:	ODOT
Analysis Year:	2007
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	5		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.3	mph	1.5	mph
Free-flow speed	58.8	mph	58.5	mph

VOLUME

Direction	1		2	
Volume, V	1275	vph	1700	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	336		447	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	679	pcphpl	905	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	679	pcphpl	905	pcphpl
Free-flow speed, FFS	58.8	mph	58.5	mph
Avg. passenger-car travel speed, S	58.8	mph	58.5	mph
Level of service, LOS	B		B	
Density, D	11.6	pc/mi/ln	15.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

$V/C = \frac{V_p}{C}$

EB

$= \frac{679}{2100^*}$

$= 0.32$ EB

WB

$= \frac{905}{2100}$

$= 0.43$ WB

* C = BASED ON ASSUMED FREE FLOW SPEED OF 55 mph
- LOS E = CAPACITY
- MAXIMUM SERVICE FLOW RATE (pc/h/ln) = 2100

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Existing 2007 PM
Highway:	OR 22
From/To:	OR 51 to 50th Ave
Jurisdiction:	ODOT
Analysis Year:	2007
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	6		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.5	mph	1.5	mph
Free-flow speed	58.5	mph	58.5	mph

VOLUME

Direction	1		2	
Volume, V	1500	vph	2220	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	395		584	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	798	pcphpl	1182	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	798	pcphpl	1182	pcphpl
Free-flow speed, FFS	58.5	mph	58.5	mph
Avg. passenger-car travel speed, S	58.5	mph	58.5	mph
Level of service, LOS	B		C	
Density, D	13.6	pc/mi/ln	20.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

$v/c = \frac{vp}{c}$

EB

$= \frac{798}{2100}$

$= 0.38$ EB

WB

$= \frac{1182}{2100}$

$= 0.56$ WB

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Existing 2007 PM
Highway:	OR 22
From/To:	50th Ave to Doaks
Jurisdiction:	ODOT
Analysis Year:	2007
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	6		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.5	mph	1.5	mph
Free-flow speed	58.5	mph	58.5	mph

VOLUME

Direction	1		2	
Volume, V	1590	vph	2240	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	418		589	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	846	pcphpl	1193	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	846	pcphpl	1193	pcphpl
Free-flow speed, FFS	58.5	mph	58.5	mph
Avg. passenger-car travel speed, S	58.5	mph	58.5	mph
Level of service, LOS	B		C	
Density, D	14.5	pc/mi/ln	20.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

$$v/c = \frac{vp}{c}$$

EB

$$= \frac{846}{2100}$$

$$= 0.40 \text{ EB}$$

WB

$$= \frac{1193}{2100}$$

$$= 0.57 \text{ WB}$$

6.3 Multi-Lane Highways

Analysis procedures for uninterrupted-flow multi-lane highways are provided in Chapter 21 of the *HCM*. Highways analyzed with this procedure must maintain a minimum of two travel lanes in each direction, would typically have direct access allowed through driveways and at-grade intersections, and must maintain uninterrupted flow. Highways with access limited to on-ramps and off-ramps should be analyzed using the Basic Freeway Segment methodology. In addition, highways experiencing interrupted flow from influences such as traffic signals and on-street parking should be analyzed using a different methodology, such as the Urban Streets methodology from the *HCM*.

These procedures are very similar to those previously described for basic freeway segments, with slightly different input data needs. The most notable differences include the need to account for median type and access density. For a complete description of the analysis methodology, refer to Chapter 21 of the *HCM*.

While the *HCM* methodology uses level of service as a performance measure (based on vehicle density in passenger cars per mile per lane), volume/capacity ratios can be calculated from this analysis for comparison against ODOT's adopted mobility standards by following the steps listed below. Note that separate volume/capacity ratios must be calculated for each direction of travel.

1. Assuming level of service E/F threshold represents capacity, determine the segment capacity by interpolating between the values for "maximum service flow rate" at level of service E displayed in Exhibit 21-2 of the *HCM* for the appropriate free-flow speed. Free-flow speed will be either calculated by this methodology or assumed.
2. Divide the calculated flow rate (v_p) by the interpolated capacity to obtain a volume/capacity ratio.

EXHIBIT 21-2. LOS CRITERIA FOR MULTILANE HIGHWAYS

		LOS				
Free-Flow Speed	Criteria	A	B	C	D	E
60 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	40
	Average speed (mi/h)	60.0	60.0	59.4	56.7	55.0
	Maximum volume to capacity ratio (v/c)	0.30	0.49	0.70	0.90	1.00
	Maximum service flow rate (pc/h/ln)	660	1080	1550	1980	2200
55 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	41
	Average speed (mi/h)	55.0	55.0	54.9	52.9	51.2
	Maximum v/c	0.29	0.47	0.68	0.88	1.00
	Maximum service flow rate (pc/h/ln)	600	990	1430	1850	2100
50 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	43
	Average speed (mi/h)	50.0	50.0	50.0	48.9	47.5
	Maximum v/c	0.28	0.45	0.65	0.86	1.00
	Maximum service flow rate (pc/h/ln)	550	900	1300	1710	2000
45 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	45
	Average speed (mi/h)	45.0	45.0	45.0	44.4	42.2
	Maximum v/c	0.26	0.43	0.62	0.82	1.00
	Maximum service flow rate (pc/h/ln)	490	810	1170	1550	1900

Note:
The exact mathematical relationship between density and volume to capacity ratio (v/c) has not always been maintained at LOS boundaries because of the use of rounded values. Density is the primary determinant of LOS. LOS F is characterized by highly unstable and variable traffic flow. Prediction of accurate flow rate, density, and speed at LOS F is difficult.

The LOS criteria reflect the shape of the speed-flow and density-flow curves, particularly as speed remains relatively constant across LOS A to D but is reduced as capacity is approached. For FFS of 60, 55, 50, and 45 mi/h, Exhibit 21-2 gives the average speed, the maximum value of v/c, the maximum density, and the corresponding maximum service flow rate for each LOS.

As with other LOS criteria, the maximum service flow rates in Exhibit 21-2 are stated in terms of flow rate based on the peak 15-min volume. Demand or forecast hourly volumes generally are divided by the peak-hour factor (PHF) to reflect a maximum hourly flow rate before comparison with the criteria of Exhibit 21-2. Using the basic speed-flow curves (see Exhibit 21-3), the relationships between LOS, flow, and speed can be analyzed.

DETERMINING FFS

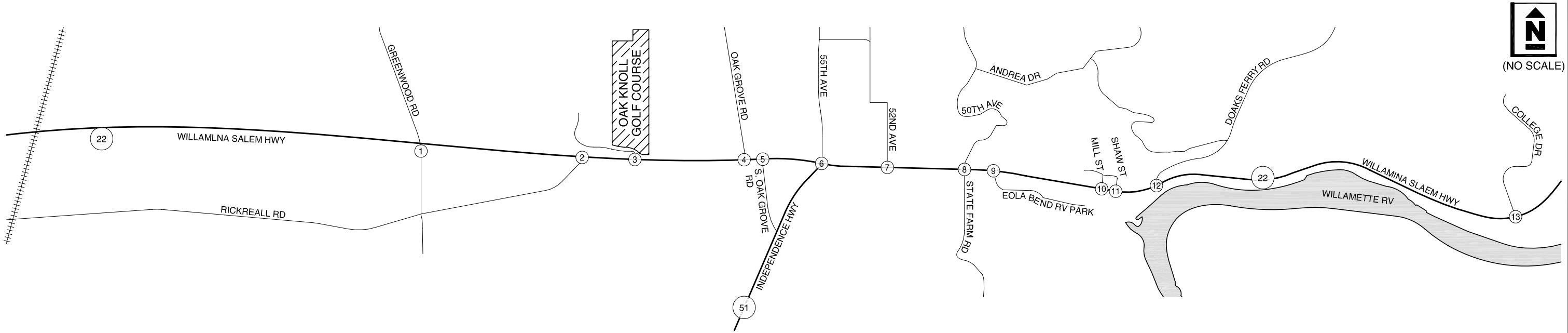
FFS is measured using the mean speed of passenger cars operating in low-to-moderate flow conditions (up to 1,400 pc/h/ln). Mean speed is virtually constant across this range of flow rates. Field measurement and estimation with guidelines provided in this chapter are methods that can be used to determine FFS.

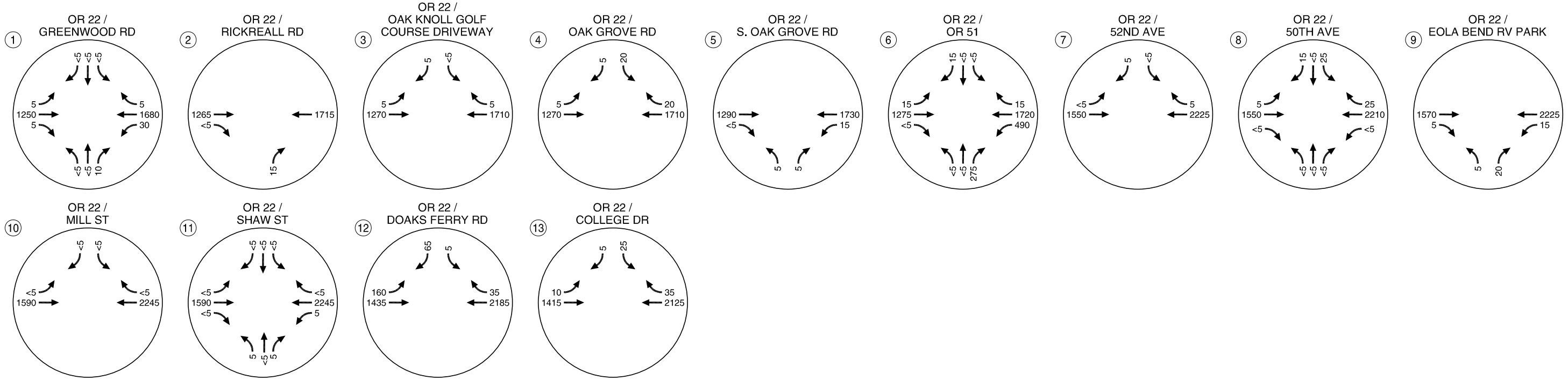
The field measurement procedure is for those who prefer to gather data directly or to incorporate the measurements into a speed-monitoring program. However, field measurements are not necessary to apply the method.

The FFS of a highway can be determined directly from a speed study conducted in the field. If field-measured data are used, no adjustments need to be made to FFS. The speed study should be conducted along a reasonable length of highway within the segment under evaluation; for example, an upgrade should not be selected within a site that is generally level. Any speed measurement technique acceptable for other types of traffic engineering speed studies can be used.

FFS occurs at flow rates ≤ 1,400 pc/h/ln

The field study should be conducted in the more stable regime of low-to-moderate flow conditions (up to 1,400 pc/h/ln). If the speed study must be conducted at a flow rate of more than 1,400 pc/h/ln, the FFS can be found by using the model speed-flow curve, assuming that data on traffic volumes are recorded at the same time.





LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

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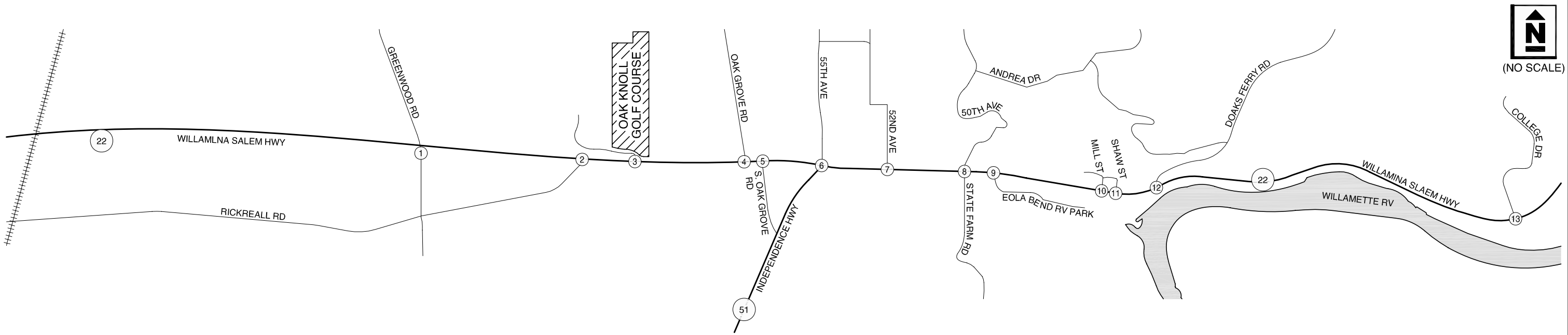
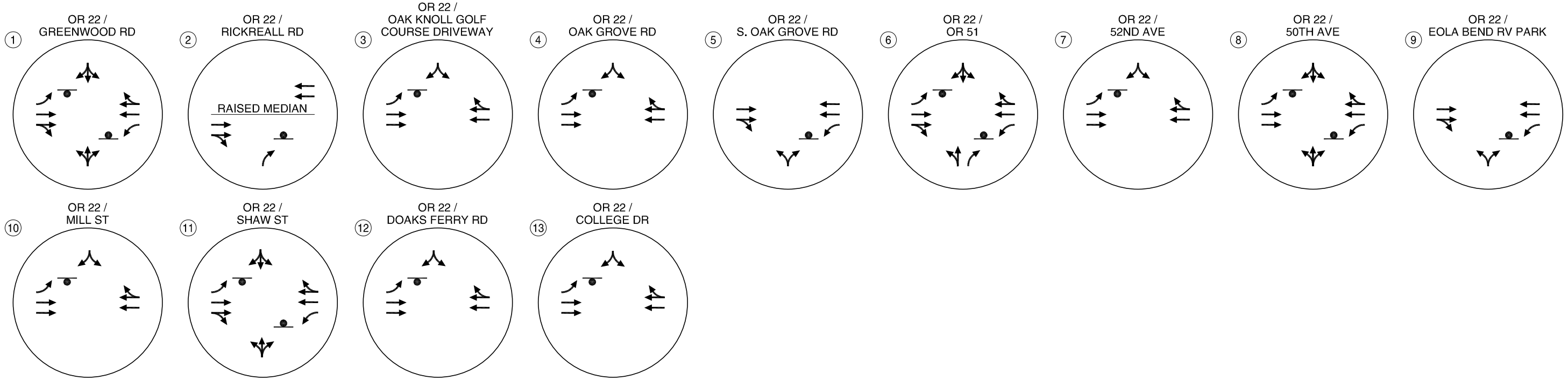
YEAR 2007 EXISTING TRAFFIC CONDITIONS
30TH HOUR BALANCED TRAFFIC VOLUMES

FIGURE
1





LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

EXISTING LANE CONFIGURATIONS &
TRAFFIC CONTROL DEVICES

FIGURE
2

Attachment C
Crash Rate Information

TABLE II: FIVE-YEAR COMPARISON OF STATE HIGHWAY CRASH RATES

Table II presents a comparison of state highway crash rates for the past five years, for urban and rural areas, by functional classification. Mileage is shown for the current data year only.

See Table IV for information on official highway mileage and VMT data.

JURISDICTION AND FUNCTIONAL CLASSIFICATION	MILES*	2006 Rate	2005 Rate	2004 Rate	2003 Rate	2002 Rate
TOTAL STATE HWY SYSTEM	**7,461.60**	**0.85**	**0.86**	**0.79**	**0.99**	**0.93**
Interstate Freeways	729.57	0.39	0.41	0.37	0.42	0.37
Other Fwys/Expressways	52.26	0.78	0.80	0.78	0.87	0.81
Non-Freeways (Combined)	6,679.77	1.26	1.24	1.13	1.46	1.39
Other Principal Arterials	3,283.55	1.29	1.27	1.16	1.53	1.48
Minor Arterials	1,966.58	1.14	1.14	1.02	1.20	1.07
Urban Collectors	8.86	0.68	1.19	1.23	2.08	5.66
Rural Major Collectors	1,383.18	1.11	1.14	0.93	1.26	1.09
Rural Minor Collectors	34.71	0.66	1.30	0.32	1.30	3.38
Rural Local	2.89	16.52	4.23	2.68	8.06	0.00
URBAN HWY SYSTEM	**826.58**	**1.14**	**1.16**	**1.08**	**1.47**	**1.37**
Interstate Freeways	176.15	0.48	0.51	0.50	0.61	0.50
Other Fwys/Expressways	52.26	0.78	0.80	0.78	0.87	0.81
Non-Freeways (Combined)	598.17	2.06	2.04	1.84	2.71	2.61
Other Principal Arterials	515.27	2.06	2.05	1.85	2.74	2.64
Minor Arterials	74.04	2.09	1.94	1.77	2.41	2.26
Urban Collectors	8.86	0.68	1.19	1.23	2.08	5.66
Urban Cities	**609.50**	**1.20**	**1.21**	**1.15**	**1.60**	**1.45**
Interstate Freeways	126.00	0.52	0.53	0.53	0.64	0.55
Other Fwys/Expressways	46.20	0.76	0.78	0.76	0.89	0.68
Non-Freeways (Combined)	437.30	2.24	2.26	2.05	3.14	2.86
Other Principal Arterials	388.71	2.23	2.25	2.04	3.15	2.88
Minor Arterials	46.94	2.38	2.38	2.21	2.98	2.55
Urban Collectors	1.65	1.84	1.78	1.51	1.68	7.46
Suburban Areas	**217.08**	**0.88**	**0.95**	**0.79**	**0.90**	**0.96**
Interstate Freeways	50.15	0.35	0.44	0.35	0.48	0.27
Other Fwys/Expressways	6.06	0.98	1.05	1.06	0.66	1.91
Non-Freeways (Combined)	160.87	1.45	1.39	1.17	1.29	1.48
Other Principal Arterials	126.56	1.45	1.44	1.22	1.34	1.51
Minor Arterials	27.10	1.52	1.04	0.71	0.60	1.19
Urban Collectors	7.21	0.42	0.94	0.84	3.10	1.04
RURAL HWY SYSTEM	**6,635.02**	**0.60**	**0.61**	**0.54**	**0.63**	**0.60**
Interstate Freeways	553.42	0.28	0.31	0.25	0.26	0.25
Non-Freeways (Combined)	6,081.60	0.80	0.80	0.72	0.87	0.82
Other Principal Arterials	2,768.28	0.72	0.69	0.64	0.77	0.76
Minor Arterials	1,892.54	0.95	1.00	0.88	1.03	0.90
Rural Major Collectors	1,383.18	1.11	1.14	0.93	1.26	1.09
Rural Minor Collectors	34.71	0.66	1.30	0.32	1.30	3.38
Rural Local	2.89	16.52	4.23	2.68	8.06	0.00
Rural Cities	**251.54**	**0.78**	**0.79**	**0.84**	**1.04**	**0.95**
Interstate Freeways	19.00	0.07	0.12	0.03	0.04	0.04
Non-Freeways (Combined)	232.54	1.04	1.01	1.11	1.40	1.23
Other Principal Arterials	127.92	0.94	0.90	0.99	1.28	1.16
Minor Arterials	59.52	1.23	1.23	1.62	1.67	1.43
Rural Major Collectors	44.85	1.35	1.40	0.95	1.68	1.48
Rural Minor Collectors	0.25	4.57	0.00	0.00	0.00	0.00
Rural Areas	**6,383.48**	**0.59**	**0.60**	**0.52**	**0.60**	**0.58**
Interstate Freeways	534.42	0.29	0.32	0.26	0.27	0.27
Non-Freeways (Combined)	5,849.06	0.78	0.78	0.69	0.82	0.78
Other Principal Arterials	2,640.36	0.70	0.68	0.62	0.72	0.72
Minor Arterials	1,833.02	0.93	0.98	0.84	0.97	0.86
Rural Major Collectors	1,338.33	1.08	1.11	0.93	1.20	1.04
Rural Minor Collectors	34.46	0.36	1.40	0.35	1.40	3.65
Rural Local	2.89	16.52	4.23	2.68	8.06	0.00

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Willamina-Salem Hwy (Hwy 30, Route 22) mile point 16.94 to mile point 22.04

1-1-2002 through 12-31-2006

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2006														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FIXED / OTHER OBJECT	0	0	2	2	0	0	0	2	0	1	1	0	0	1
HEAD-ON	0	1	0	1	0	2	0	0	1	1	0	0	0	0
NON-COLLISION	0	1	0	1	0	1	0	1	0	1	0	0	0	0
REAR-END	0	5	5	10	0	6	0	7	2	9	1	3	0	0
SIDESWIPE - MEETING	0	2	1	3	0	3	1	1	2	1	2	0	0	1
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	1	0	0
2006 TOTAL	0	9	12	21	0	12	1	15	5	17	4	5	0	2
YEAR: 2005														
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	1	0	1	0	0	0	1
HEAD-ON	0	2	0	2	0	3	0	0	2	2	0	2	0	0
NON-COLLISION	0	1	0	1	0	1	2	1	0	1	0	0	0	0
REAR-END	0	4	4	8	0	7	1	4	4	7	1	1	0	0
SIDESWIPE - OVERTAKING	0	1	1	2	0	3	0	1	1	0	2	0	0	0
TURNING MOVEMENTS	0	1	4	5	0	2	1	4	1	5	0	3	0	0
2005 TOTAL	0	9	10	19	0	16	4	11	8	16	3	6	0	1
YEAR: 2004														
ANGLE	0	2	0	2	0	4	0	2	0	2	0	2	0	0
FIXED / OTHER OBJECT	0	3	2	5	0	3	0	1	4	1	4	2	0	5
MISCELLANEOUS	0	0	1	1	0	0	0	1	0	0	1	0	0	0
REAR-END	0	2	4	6	0	3	0	4	2	6	0	1	1	0
SIDESWIPE - OVERTAKING	0	1	0	1	0	1	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	4	1	5	0	8	0	4	1	4	1	4	0	0
2004 TOTAL	0	12	8	20	0	19	0	13	7	14	6	9	1	5
YEAR: 2003														
ANGLE	0	1	0	1	0	2	0	1	0	1	0	1	0	0
FIXED / OTHER OBJECT	0	1	0	1	0	2	0	1	0	1	0	0	0	1
HEAD-ON	0	0	1	1	0	0	0	0	1	0	1	0	0	0
PARKING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	0	0	0
REAR-END	0	4	3	7	0	6	0	3	4	5	2	3	0	0
TURNING MOVEMENTS	1	7	5	13	1	17	1	9	4	10	3	9	0	0
2003 TOTAL	1	14	9	24	1	29	1	15	9	18	6	13	0	1
YEAR: 2002														
ANGLE	0	1	0	1	0	1	0	0	1	1	0	1	0	0
FIXED / OTHER OBJECT	0	5	3	8	0	7	0	4	4	2	6	0	0	7
HEAD-ON	0	1	0	1	0	1	0	0	1	1	0	0	0	0
NON-COLLISION	0	1	0	1	0	3	0	1	0	0	1	1	0	0
PEDESTRIAN	0	1	0	1	0	1	0	1	0	1	0	0	0	1
REAR-END	0	2	2	4	0	6	0	2	2	3	1	0	0	1
SIDESWIPE - OVERTAKING	0	1	1	2	0	1	1	2	0	2	0	0	0	0
TURNING MOVEMENTS	0	9	4	13	0	19	1	11	2	6	7	9	0	0
2002 TOTAL	0	21	10	31	0	39	2	21	10	16	15	11	0	9

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Willamina-Salem Hwy (Hwy 30, Route 22) mile point 16.94 to mile point 22.04
1-1-2002 through 12-31-2006

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
FINAL TOTAL	1	65	49	115	1	115	8	75	39	81	34	44	1	18

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Independence Hwy (Hwy 193, Route 51) mile point 0.00 to mile point 0.25 in Polk County
1-1-2002 through 12-31-2006

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2003														
MISCELLANEOUS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2003 TOTAL	0	0	1	1	0	0	0	1	0	1	0	0	0	0
YEAR: 2002														
FIXED / OTHER OBJECT	0	1	1	2	0	1	0	1	1	1	1	0	0	2
2002 TOTAL	0	1	1	2	0	1	0	1	1	1	1	0	0	2
FINAL TOTAL	0	1	2	3	0	1	0	2	1	2	1	0	0	2

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

Five Year OR 22 Crash History by Segment
January 1, 2001 through December 31, 2005

Both Directions					***Number of Crashes***				***Average Annual Crash Rate*** [1]
Segment Description	***Milepost From***	***To***	***Segment Length (Miles)***	***2003 Average Annual Daily Traffic (AADT)***	***Property Damage Only***	***Injury***	***Fatal***	***Total***	
Salem Rural Area	16.94	21.19	4.25	28,740					
5 Years					33	47	1	81	
(Average Annual)					7	9	0	16	0.36
Salem Suburban Area	21.19	22.15	0.96	34,600					
5 Years					16	21	1	38	
(Average Annual)					3	4	0	8	0.63
Total/Overall	38.13	43.34	5.21	63340					
5 Years					49	68	2	119	
(Average Annual)*					10	14	0	24	0.20

[1] Crashes per Million Vehicle Miles

Note: Average annual "total" column may not agree with component total due to rounding.

Five Year OR 22 Crash History by Segment
January 1, 2002 through December 31, 2006

Both Directions	*Milepost*		*Segment Length (Miles)*	*2003 Average Annual Daily Traffic (AADT)*	*Number of Crashes*				*Average Annual Crash Rate*[1]
Segment Description	*From*	*To*			*Property Damage Only*	*Injury*	*Fatal*	*Total*	
Salem Rural Area	16.94	21.19	4.25	28,740					
5 Years					33	46	1	80	
(Average Annual)					7	9	0	16	0.36
Salem Suburban Area	21.19	22.04	0.85	34,600					
5 Years					19	16	0	35	
(Average Annual)					4	3	0	7	0.65
Total/Overall	38.13	43.23	5.10	63340					
5 Years					52	62	1	115	
(Average Annual)*					10	12	0	23	0.20

[1] Crashes per Million Vehicle Miles
Note: Average annual "total" column may not agree with component total due to rounding.

Five Year OR 51 Crash History by Segment
January 1, 2002 through December 31, 2006

Both Directions	*Milepost*		*Segment Length (Miles)*	*2003 Average Annual Daily Traffic (AADT)*	*Number of Crashes*				*Average Annual Crash Rate*[1]
Segment Description	*From*	*To*			*Property Damage Only*	*Injury*	*Fatal*	*Total*	
Highway to Independence Rural Area	0.00	0.25	0.25	7,100					
5 Years					2	1	0	3	
(Average Annual)					0	0	0	1	0.93
Total/Overall	0.00	0.25	0.25	7,100					
5 Years					2	1	0	3	
(Average Annual)*					0	0	0	1	0.93

[1] Crashes per Million Vehicle Miles
Note: Average annual "total" column may not agree with component total due to rounding.

Attachment D
HCM Future Intersection Capacity

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2508	2	23	3269	5	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	2640	2	24	3441	6	6
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			2642		4410	1321
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2642		4410	1321
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			85		0	96
cM capacity (veh/h)			163		1	150

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	1760	882	24	1721	1721	12
Volume Left	0	0	24	0	0	6
Volume Right	0	2	0	0	0	6
cSH	1700	1700	163	1700	1700	2
Volume to Capacity	1.04	0.52	0.15	1.01	1.01	6.45
Queue Length (ft)	0	0	13	0	0	Err
Control Delay (s)	0.0	0.0	31.0	0.0	0.0	Err
Lane LOS			D			F
Approach Delay (s)	0.0		0.2			Err
Approach LOS						F

Intersection Summary			
Average Delay	19.3		
Intersection Capacity Utilization	110.4%	ICU Level of Service	G

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	26	2485	2	650	3274	31	1	0	364	1	0	17
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (veh/h)	27	2616	2	684	3446	33	1	0	383	1	0	18
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	3479			2618			5781	7519	1309	6194	7504	1739
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3479			2618			5781	7519	1309	6194	7504	1739
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	64			0			0	0	0	0	0	77
cM capacity (veh/h)	75			164			0	0	152	0	0	78

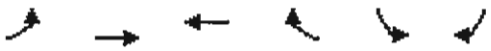
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	27	1744	874	684	2298	1181	1	383	19
Volume Left	27	0	0	684	0	0	1	0	1
Volume Right	0	0	2	0	0	33	0	383	18
cSH	75	1700	1700	164	1700	1700	0	152	0
Volume to Capacity	0.36	1.03	0.51	4.18	1.35	0.69	Err	2.51	Err
Queue Length (ft)	35	0	0	Err	0	0	Err	829	Err
Control Delay (s)	78.1	0.0	0.0	1486.6	0.0	0.0	Err	747.1	Err
Lane LOS	F			F			F	F	F
Approach Delay (s)	0.8			244.3			Err		Err
Approach LOS							F		F

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	129.7%	ICU Level of Service		H

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2845	11	26	3957	6	35
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	3092	12	28	4301	7	38
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			3104		5305	1552
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3104		5305	1552
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			72		0	63
cM capacity (veh/h)			103		0	102

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	2062	1043	28	2151	2151	45
Volume Left	0	0	28	0	0	7
Volume Right	0	12	0	0	0	38
cSH	1700	1700	103	1700	1700	1
Volume to Capacity	1.21	0.61	0.28	1.27	1.27	40.65
Queue Length (ft)	0	0	26	0	0	Err
Control Delay (s)	0.0	0.0	53.0	0.0	0.0	Err
Lane LOS			F			F
Approach Delay (s)	0.0		0.3			Err
Approach LOS						F

Intersection Summary			
Average Delay	59.8		
Intersection Capacity Utilization	135.5%	ICU Level of Service	H



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	348	2542	3773	180	5	220
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	366	2676	3972	189	6	259
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	4161				6137	2081
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4161				6137	2081
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	0				0	0
cM capacity (veh/h)	39				0	45

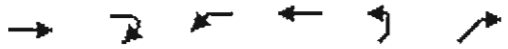
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	366	1338	1338	2648	1513	265
Volume Left	366	0	0	0	0	6
Volume Right	0	0	0	0	189	259
cSH	39	1700	1700	1700	1700	0
Volume to Capacity	9.50	0.79	0.79	1.56	0.89	Err
Queue Length (ft)	Err	0	0	0	0	Err
Control Delay (s)	4024.3	0.0	0.0	0.0	0.0	Err
Lane LOS	F					F
Approach Delay (s)	484.6			0.0		Err
Approach LOS						F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	170.9%	ICU Level of Service	H

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	2442	7	50	3187	7	2	0	17	2	2	2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	5	2571	7	53	3355	7	2	0	20	2	2	2
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	3362			2578			4371	6052	1289	4779	6052	1681
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3362			2578			4371	6052	1289	4779	6052	1681
tC, single (s)	4.1			4.2			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			67			0	100	87	0	0	97
cM capacity (veh/h)	84			162			0	0	157	0	0	85

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	5	1714	864	53	2236	1126	22	7
Volume Left	5	0	0	53	0	0	2	2
Volume Right	0	0	7	0	0	7	20	2
cSH	84	1700	1700	162	1700	1700	0	0
Volume to Capacity	0.06	1.01	0.51	0.33	1.32	0.66	Err	50.74
Queue Length (ft)	5	0	0	33	0	0	Err	Err
Control Delay (s)	50.8	0.0	0.0	37.6	0.0	0.0	Err	Err
Lane LOS	F			E			F	F
Approach Delay (s)	0.1			0.6			Err	Err
Approach LOS							F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	108.1%	ICU Level of Service	F



Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	2461	0	0	3244	0	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	2591	0	0	3415	0	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			2591		4298	1295
vC1, stage 1 conf vol					2591	
vC2, stage 2 conf vol					1707	
vCu, unblocked vol			2591		4298	1295
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	85
cM capacity (veh/h)			171		30	156

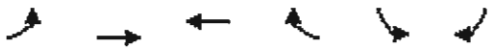
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1
Volume Total	1727	864	1707	1707	24
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	24
cSH	1700	1700	1700	1700	156
Volume to Capacity	1.02	0.51	1.00	1.00	0.15
Queue Length (ft)	0	0	0	0	13
Control Delay (s)	0.0	0.0	0.0	0.0	32.2
Lane LOS					D
Approach Delay (s)	0.0		0.0		32.2
Approach LOS					D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	103.0%	ICU Level of Service	F

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	7	2474	3235	9	3	9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	7	2604	3405	9	4	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3415				4727	1707
vC1, stage 1 conf vol					3410	
vC2, stage 2 conf vol					1317	
vCu, unblocked vol	3415				4727	1707
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	91				72	87
cM capacity (veh/h)	80				12	82

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	7	1302	1302	2270	1145	14
Volume Left	7	0	0	0	0	4
Volume Right	0	0	0	0	9	11
cSH	80	1700	1700	1700	1700	34
Volume to Capacity	0.09	0.77	0.77	1.34	0.67	0.41
Queue Length (ft)	7	0	0	0	0	34
Control Delay (s)	54.7	0.0	0.0	0.0	0.0	170.7
Lane LOS	F					F
Approach Delay (s)	0.2			0.0		170.7
Approach LOS						F

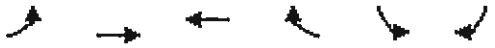
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	109.7%	ICU Level of Service	F



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	9	2468	3236	38	42	8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	9	2598	3406	40	49	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3446				4744	1723
vC1, stage 1 conf vol					3426	
vC2, stage 2 conf vol					1318	
vCu, unblocked vol	3446				4744	1723
tC, single (s)	4.1				6.9	6.9
tC, 2 stage (s)					5.9	
tF (s)	2.2				3.5	3.3
p0 queue free %	88				0	88
cM capacity (veh/h)	77				11	80

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	9	1299	1299	2271	1175	59
Volume Left	9	0	0	0	0	49
Volume Right	0	0	0	0	40	9
cSH	77	1700	1700	1700	1700	13
Volume to Capacity	0.12	0.76	0.76	1.34	0.69	4.58
Queue Length (ft)	10	0	0	0	0	Err
Control Delay (s)	57.8	0.0	0.0	0.0	0.0	Err
Lane LOS	F					F
Approach Delay (s)	0.2			0.0		Err
Approach LOS						F

Intersection Summary			
Average Delay	96.3		
Intersection Capacity Utilization	110.9%	ICU Level of Service	G



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	2821	3887	5	3	6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	0	2969	4092	5	4	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4097				5579	2048
vC1, stage 1 conf vol					4094	
vC2, stage 2 conf vol					1485	
vCu, unblocked vol	4097				5579	2048
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				30	85
cM capacity (veh/h)	42				5	48

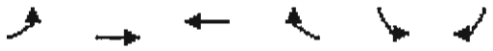
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	0	1485	1485	2728	1369	11
Volume Left	0	0	0	0	0	4
Volume Right	0	0	0	0	5	7
cSH	1700	1700	1700	1700	1700	12
Volume to Capacity	0.00	0.87	0.87	1.60	0.81	0.85
Queue Length (ft)	0	0	0	0	0	47
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	592.0
Lane LOS						F
Approach Delay (s)	0.0			0.0		592.0
Approach LOS						F

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	129.6%	ICU Level of Service	H

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	9	2815	0	0	3867	48	0	0	0	41	0	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	9	2963	0	0	4071	51	0	0	0	48	0	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											1	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4121			2963			5047	7103	1482	5596	7078	2061
vC1, stage 1 conf vol										4096	4096	
vC2, stage 2 conf vol										1501	2982	
vCu, unblocked vol	4121			2963			5047	7103	1482	5596	7078	2061
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)										6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	77			100			100	100	100	0	100	37
cM capacity (veh/h)	41			117			0	0	114	2	5	47

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	9	1482	1482	2714	1407	0	78
Volume Left	9	0	0	0	0	0	48
Volume Right	0	0	0	0	51	0	29
cSH	41	1700	1700	1700	1700	1700	4
Volume to Capacity	0.23	0.87	0.87	1.60	0.83	0.00	21.75
Queue Length (ft)	19	0	0	0	0	0	Err
Control Delay (s)	117.3	0.0	0.0	0.0	0.0	0.0	Err
Lane LOS	F					A	F
Approach Delay (s)	0.4			0.0		0.0	Err
Approach LOS						A	F

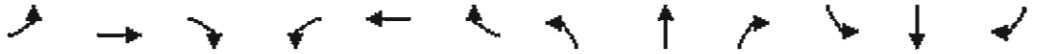
Intersection Summary			
Average Delay	108.4		
Intersection Capacity Utilization	131.9%	ICU Level of Service	H



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	2	2878	3983	4	3	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	2	3029	4193	4	4	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4197				5714	2098
vC1, stage 1 conf vol					4195	
vC2, stage 2 conf vol					1519	
vCu, unblocked vol	4197				5714	2098
tC, single (s)	6.1				7.8	6.9
tC, 2 stage (s)					6.8	
tF (s)	3.2				4.0	3.3
p0 queue free %	40				0	100
cM capacity (veh/h)	4				1	44

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	2	1515	1515	2795	1402	4
Volume Left	2	0	0	0	0	4
Volume Right	0	0	0	0	4	0
cSH	4	1700	1700	1700	1700	1
Volume to Capacity	0.60	0.89	0.89	1.64	0.82	2.61
Queue Length (ft)	20	0	0	0	0	32
Control Delay (s)	1475.3	0.0	0.0	0.0	0.0	4837.1
Lane LOS	F					F
Approach Delay (s)	1.0			0.0		4837.1
Approach LOS						F

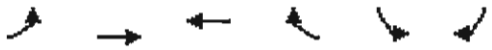
Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	132.5%	ICU Level of Service	H



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	2879	2	7	3982	4	5	0	9	2	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (veh/h)	0	3031	2	7	4192	4	6	0	11	2	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								1			1	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4196			3033			5142	7242	1516	5734	7241	2098
vC1, stage 1 conf vol							3032	3032		4208	4208	
vC2, stage 2 conf vol							2111	4211		1526	3033	
vCu, unblocked vol	4196			3033			5142	7242	1516	5734	7241	2098
tC, single (s)	4.1			4.6			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.5			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			90			39	100	90	0	100	100
cM capacity (veh/h)	38			72			10	5	110	2	4	44

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	0	2020	1012	7	2794	1401	16	2
Volume Left	0	0	0	7	0	0	6	2
Volume Right	0	0	2	0	0	4	11	0
cSH	1700	1700	1700	72	1700	1700	23	2
Volume to Capacity	0.00	1.19	0.60	0.10	1.64	0.82	0.71	1.36
Queue Length (ft)	0	0	0	8	0	0	52	24
Control Delay (s)	0.0	0.0	0.0	60.5	0.0	0.0	325.4	3303.5
Lane LOS				F			F	F
Approach Delay (s)	0.0			0.1			325.4	3303.5
Approach LOS							F	F

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	132.4%	ICU Level of Service	H



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	2583	3881	66	43	8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.85	0.85
Hourly flow rate (veh/h)	17	2719	4085	69	51	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					1	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4155				5513	2077
vC1, stage 1 conf vol					4120	
vC2, stage 2 conf vol					1393	
vCu, unblocked vol	4155				5513	2077
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	58				0	79
cM capacity (veh/h)	40				5	46

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	17	1359	1359	2724	1431	60
Volume Left	17	0	0	0	0	51
Volume Right	0	0	0	0	69	9
cSH	40	1700	1700	1700	1700	6
Volume to Capacity	0.42	0.80	0.80	1.60	0.84	10.76
Queue Length (ft)	37	0	0	0	0	Err
Control Delay (s)	150.5	0.0	0.0	0.0	0.0	Err
Lane LOS	F					F
Approach Delay (s)	0.9			0.0		Err
Approach LOS						F

Intersection Summary			
Average Delay	86.7		
Intersection Capacity Utilization	131.8%	ICU Level of Service	H

CALCULATION/DESIGN RECORD

Kittelson & Associates, Inc.
Transportation Planning/Traffic Engineering
Baltimore • Ft. Lauderdale • Orlando • Portland
http://www.kittelson.com

DATE 4/16 PROJECT # 8439

PROJECT NAME OR 22

SUBJECT SEGMENT V/C OR 22 BY JXH SHEET # OF

2030 NO-BUILD 30th HOUR

→ GREENWOOD TO OR 51

WB VOL = 3080
EB VOL = 2510

→ OR 51 TO 50th

WB VOL = ~~4100~~ 3920
EB VOL = ~~3850~~ 2910

→ 50th TO DOAKS FERRY

WB VOL = 4140 3950
EB VOL = 2910 3000

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Future 2030 NoBuild PM
Highway:	OR 22
From/To:	Greenwood to OR 51
Jurisdiction:	ODOT
Analysis Year:	2030
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	5		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	55.0	mph	55.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.3	mph	1.5	mph
Free-flow speed	53.8	mph	53.5	mph

VOLUME

Direction	1		2	
Volume, V	2510	vph	3080	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	661		811	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	1336	pcphpl	1640	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1336	pcphpl	1640	pcphpl
Free-flow speed, FFS	53.8	mph	53.5	mph
Avg. passenger-car travel speed, S	53.8	mph	52.5	mph
Level of service, LOS	C		D	
Density, D	24.9	pc/mi/ln	31.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Future 2030 NoBuild PM
Highway:	OR 22
From/To:	OR 51 to 50th Ave
Jurisdiction:	ODOT
Analysis Year:	2030
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	6		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	55.0	mph	55.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.5	mph	1.5	mph
Free-flow speed	53.5	mph	53.5	mph

VOLUME

Direction	1		2	
Volume, V	2910	vph	3920	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	766		1032	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	1549	pcphpl	2087	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1549	pcphpl	2087	pcphpl
Free-flow speed, FFS	53.5	mph	53.5	mph
Avg. passenger-car travel speed, S	53.0	mph		mph
Level of service, LOS	D		F	
Density, D	29.2	pc/mi/ln		pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	JXH
Agency/Co:	Kittelson
Date:	4/10/2007
Analysis Period:	Future 2030 NoBuild PM
Highway:	OR 22
From/To:	50th Ave to Doaks
Jurisdiction:	ODOT
Analysis Year:	2030
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	6		6	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0*	mph	0.0*	mph
Access points adjustment, FA	1.5	mph	1.5	mph
Free-flow speed	58.5	mph	58.5	mph

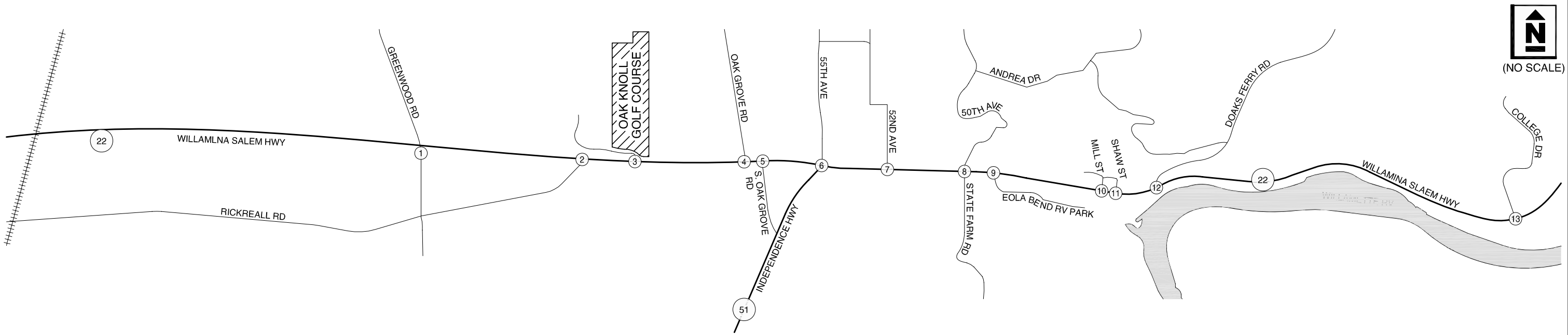
VOLUME

Direction	1		2	
Volume, V	3000	vph	3950	vph
Peak-hour factor, PHF	0.95		0.95	
Peak 15-minute volume, v15	789		1039	
Trucks and buses	2	%	2	%
Recreational vehicles	1	%	1	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.988		0.988	
Flow rate, vp	1597	pcphpl	2103	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1597	pcphpl	2103	pcphpl
Free-flow speed, FFS	58.5	mph	58.5	mph
Avg. passenger-car travel speed, S	57.7	mph	54.4	mph
Level of service, LOS	D		E	
Density, D	27.7	pc/mi/ln	38.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

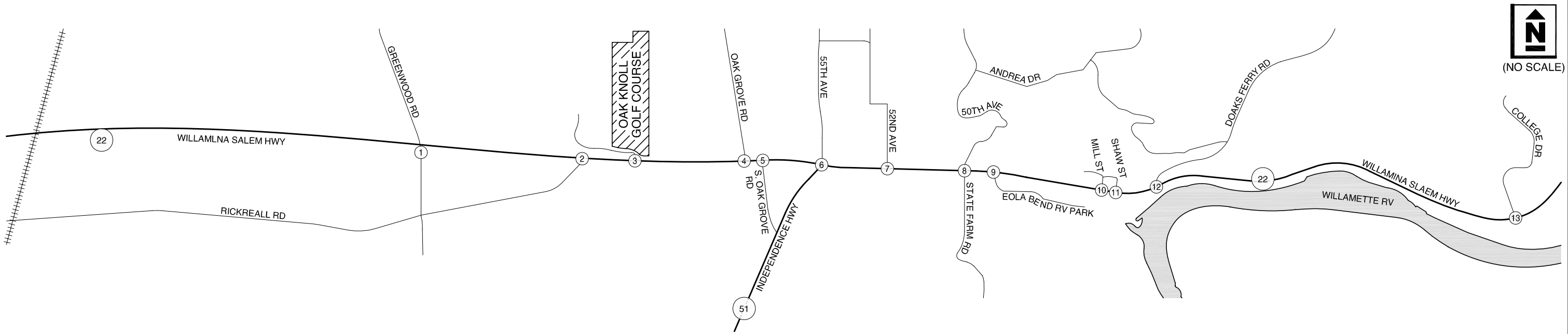


LEGEND

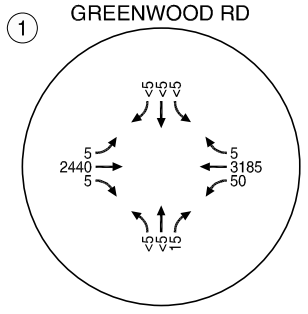
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

2030 NO-BUILD ASSUMED LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES

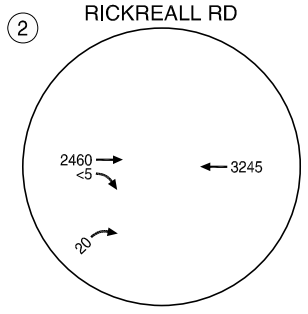
FIGURE 3



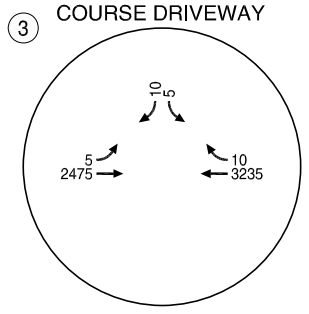
1 OR 22 / GREENWOOD RD



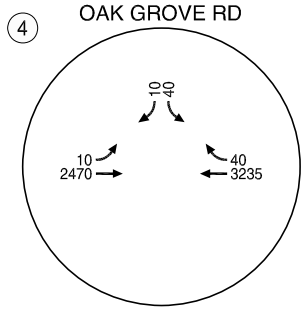
2 OR 22 / RICKREALL RD



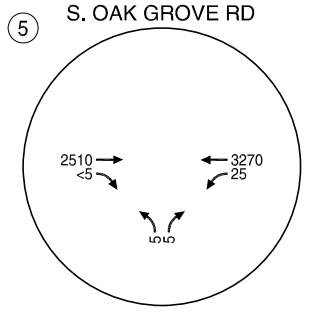
3 OR 22 / OAK KNOLL GOLF COURSE DRIVEWAY



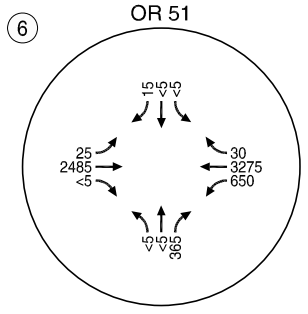
4 OR 22 / OAK GROVE RD



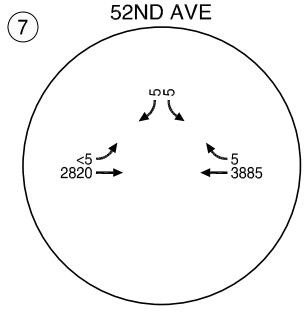
5 OR 22 / S. OAK GROVE RD



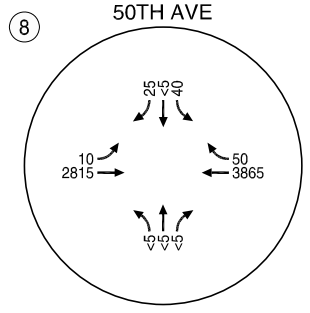
6 OR 22 / OR 51



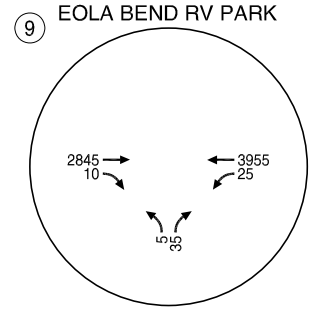
7 OR 22 / 52ND AVE



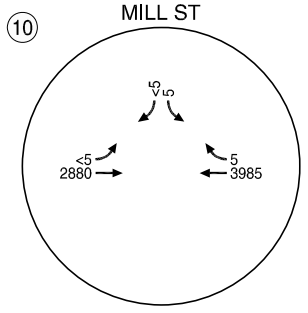
8 OR 22 / 50TH AVE



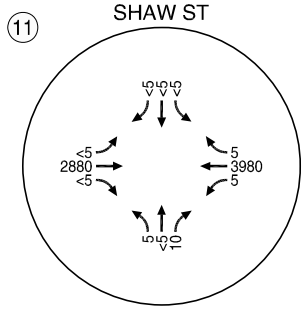
9 OR 22 / EOLA BEND RV PARK



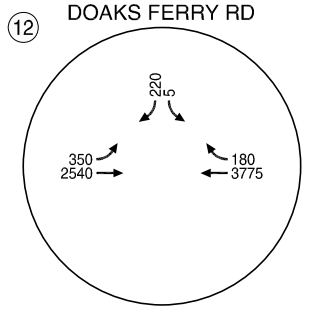
10 OR 22 / MILL ST



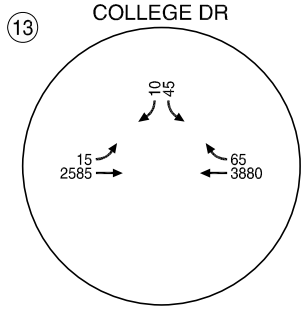
11 OR 22 / SHAW ST



12 OR 22 / DOAKS FERRY RD



13 OR 22 / COLLEGE DR



LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

YEAR 2030 FUTURE TRAFFIC CONDITIONS
30TH HOUR BALANCED TRAFFIC VOLUMES

FIGURE 4