I-5 Interchange 14 (Green Springs)
City of Ashland, Jackson County

Interchange Area Management Plan

Technical Memorandum #3:
Summary of Existing Conditions Analyses

Prepared for

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Introduction and Background

This memorandum provides a summary of existing traffic operations analysis findings related to I-5 Interchange 14 (Green Springs Interchange). Analysis of existing and future conditions was originally conducted for the *Traffic Analysis Report* (TAR) for the I-5 Interchanges 14 and 19 (Green Springs and North Ashland Interchanges), dated August 22, 2006. This IAMP effort focuses only on Interchange 14. A separate IAMP addressing Interchange 19 is being prepared concurrently with the Interchange 14 IAMP project.

Although the TAR analyzed future traffic operations, this memorandum reviews only the sections of the TAR pertaining to existing conditions. The present IAMP project will develop revised future traffic volume projections that will be based on a new regional travel demand model. This memorandum also provides an inventory of existing roadways, plus the traffic signal warrant and safety analyses presented in the TAR.

Analysis Area

The Green Springs Interchange consists of a standard diamond interchange in the southeastern area of Ashland. Ashland Street (OR 66, Green Springs Highway) is the cross street, which connects with OR 99 (Rogue Valley Highway) approximately one mile to the west.

The existing interchange comprises a two lane bridge (OR 66) over I-5 with unsignalized ramp terminals at both ends. As noted in Technical Memorandum #1, Definition and Background, the bridge and ramps are functionally obsolete to serve long-range transportation needs.

The Green Springs Interchange analysis area stretches along OR 66 between its intersections with Tolman Creek Road and Oak Knoll Drive/East Main Street. The overall length of this roadway segment is just under one mile and is characterized by suburban commercial development with multiple closely-spaced private accesses.

Figure 1 illustrates the analysis area, showing existing lane configurations and traffic control at all analysis area intersections. Table 1 provides roadway names, jurisdictional authorities, functional classifications, posted speeds (if available), number of lanes and operational standards for analysis area roadways. This information was collected through a site visit and review of the 1999 Oregon Highway Plan (OHP), the 2003 Highway Design Manual (HDM), the City of Ashland Transportation System Plan (TSP), and the Ashland Municipal Code.

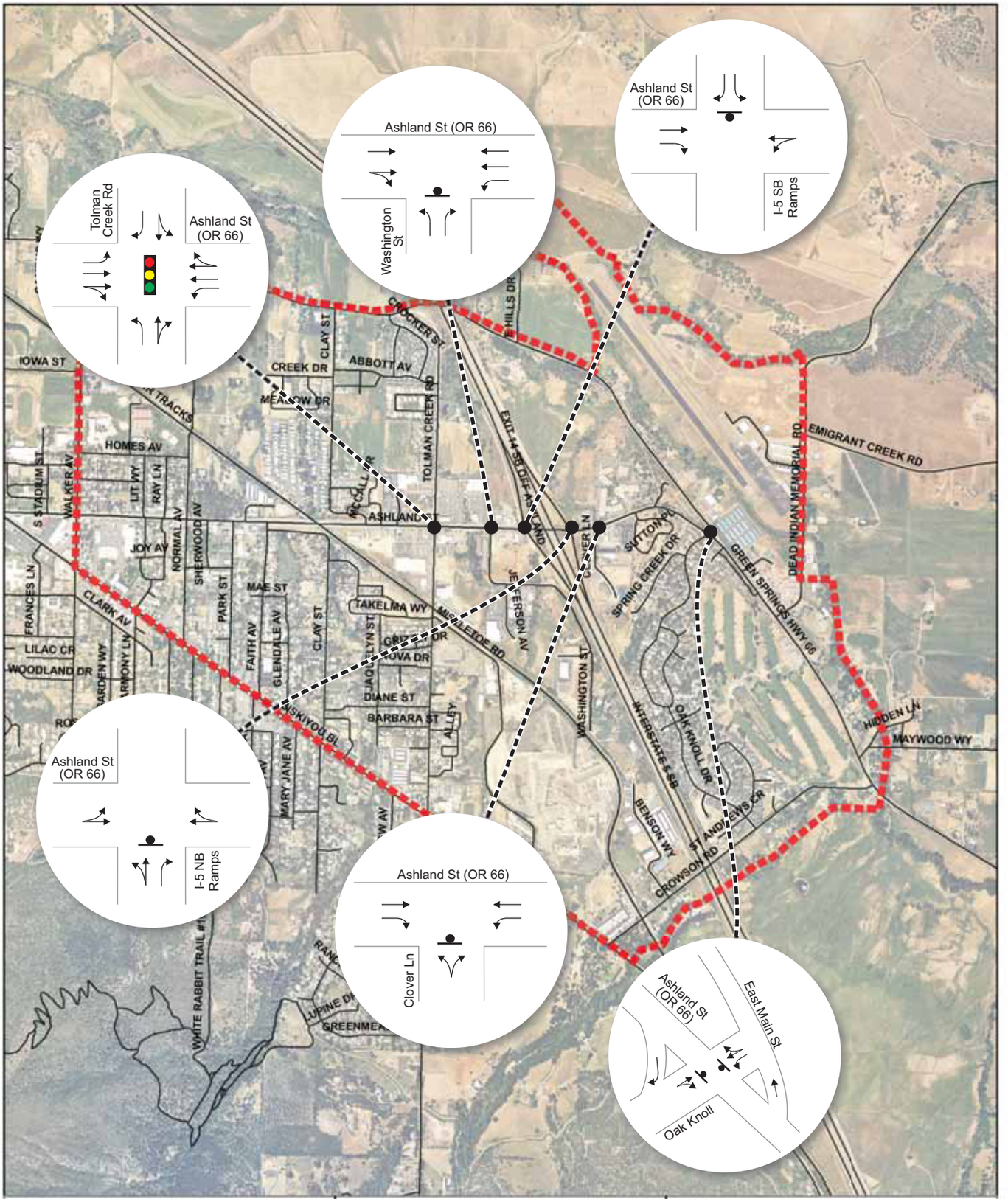

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Figure 1

Existing Lane Configurations and Traffic Control Devices

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Table 1. Analysis Area Roadway Inventory

Roadway/Highway Name	Jurisdiction	ODOT Functional Classification	City Functional Classification	Posted Speed	Lanes	Operational Standard (v/c ratio) OHP[1]	HDM[2]	City[4]
I-5 (Pacific Highway No. 1)	ODOT	Interstate Hwy, NHS[5], FR[6]	-	65	4	0.80	0.75	-
I-5 Ramp terminal Intersections	ODOT	Interstate Hwy, NHS[5], FR[6]	-	-	1	0.85	0.75	-
Ashland Street (OR 66, Green Springs Highway)	ODOT	District Hwy	Boulevard	35	2,3,5[3]	0.90	0.85	0.90
Tolman Creek Road	City of Ashland	-	Avenue	30	2	-	-	0.90
Washington Street	City of Ashland	-	Neighborhood Collector	25	2	-	-	0.90
Clover Lane	City of Ashland	-	Local Street	-	2	-	-	0.90
Oak Knoll Drive	City of Ashland	-	Avenue	-	2	-	-	0.90
East Main Street	City of Ashland	-	Avenue	-	2	-	-	0.90

Notes:
1. Source: 1999 Oregon Highway Plan (OHP), Table 6. Standards apply to planning and design projects of existing and no-build conditions through the planning horizon (2030).
2. Source: 2003 Highway Design Manual (HDM), Table 10-1. Standards apply to planning and project design projects of build conditions through the planning horizon (2030).
3. Five lanes west of I-5, 3 lanes between I-5 and Sutton Place, 2 lanes on I-5 overcrossing and between Sutton Place and Oak Knoll Drive/East Main Street
4. Ashland Municipal Code requires that traffic operations on City facilities do not exceed capacity (v/c < 1.00) and defers to ODOT standards for intersections with State highways within the City. OHP District Highway mobility standard is shown.
5. NHS: National Highway System
6. FR: Freight Route

Traffic Counts

Traffic counts, conducted on May 16, 2006, consisted of 16-hour and 3-hour AM and PM peak period counts at analysis area intersections, and a 24-hour count on the I-5 mainline. The counts included full FHWA 13-class vehicle classifications. Table 2 below provides a list of all intersection count locations including the count type.

Table 2. Intersection Turning Movement Count Locations and Types

Location	Type of Count
I-5 mainline, both directions, North of Green Springs Interchange	24 hour
OR 66 (Ashland Street) at Tolman Creek Road	16-hour (6 AM – 10 PM)
Ashland Street at Washington Street	3-hour AM and PM
Green Springs Interchange 14: Southbound Ramps at Ashland Street	16-hour (6 AM – 10 PM)
Green Springs Interchange 14: Northbound Ramps at Ashland Street	16-hour (6 AM – 10 PM)
Ashland Street at Clover Lane	3-hour AM and PM
Ashland Street at Main Street / Oak Knoll Drive	3-hour AM and PM

Note: All 16-hour and 3-hour counts conducted May 16, 2006. 24-hour I-5 mainline count conducted from 22:00 May 15 to 22:00 May 16, 2006.

Traffic volumes are typically subject to seasonal variation. Therefore, the traffic counts conducted in May needed to be seasonally adjusted to roughly correspond to traffic volumes that are seen in the peak month, which is typically July or August. The ODOT Transportation Planning Analysis Unit (TPAU) has developed procedures to convert traffic volumes taken at any time of the year to peak month volumes. The TAR employed the TPAU methodology to adjust the May 2006 volumes. Year 2006 seasonally adjusted PM peak hour volumes are shown in Figure 2.

Existing Traffic Operations

Intersection Analyses

Table 3 summarizes the results for all analysis area intersections and also presents agency operational standards to enable comparison with intersection results. Table 4 summarizes queuing on critical approach legs at the same intersections. Critical movements at unsignalized intersections are typically the minor street left turns or, in the case of single-lane approaches, the minor street approaches. These movements are required to yield to all other movements at the intersection and thus are subject to the longest delays and have least capacity. Left turns from the major street are also subject to delays since motorists making these maneuvers must also yield to on-coming major street traffic.

Table 3. Existing (Year 2006) PM Peak Hour Traffic Operations Analysis Results

Intersection	Critical Movement	v/c Ratio	LOS	Operational Standard (v/c ratio)		
				OHP[1]	HDM[2]	City[3]
Ashland St (OR 66) & Tolman Creek Rd	n/a[4]	0.52	C	0.90	0.85	0.90
Ashland St (OR 66) & Washington St	NBL	0.69	C	0.90	0.85	0.90
Ashland St (OR 66) & I-5 SB Ramps	SBL/T/R	**>1.00**	**F**	0.85	0.75	-
Ashland St (OR 66) & I-5 NB Ramps	NBL/T/R	**>1.00**	**F**	0.85	0.75	-
Ashland St (OR 66) & Clover Lane	NBL/R	0.26	A	0.90	0.85	0.90
Ashland St (OR 66) & E. Main/Oak Knoll	SBL[5]	0.24	B	0.90	0.85	0.90

Notes:

1. 1999 Oregon Highway Plan Mobility Standards (Table 6)
2. 2003 ODOT Highway Design Manual Mobility Standards (Table 10-1)
3. Ashland Municipal Code requires that traffic operations on City facilities do not exceed capacity (v/c < 1.00) and defers to ODOT standards for intersections with State highways within the City. OHP District Highway mobility standard is shown.
4. Signalized intersection. LOS and v/c are for overall intersection.
5. Refers to left turn from Main Street to Ashland Street.

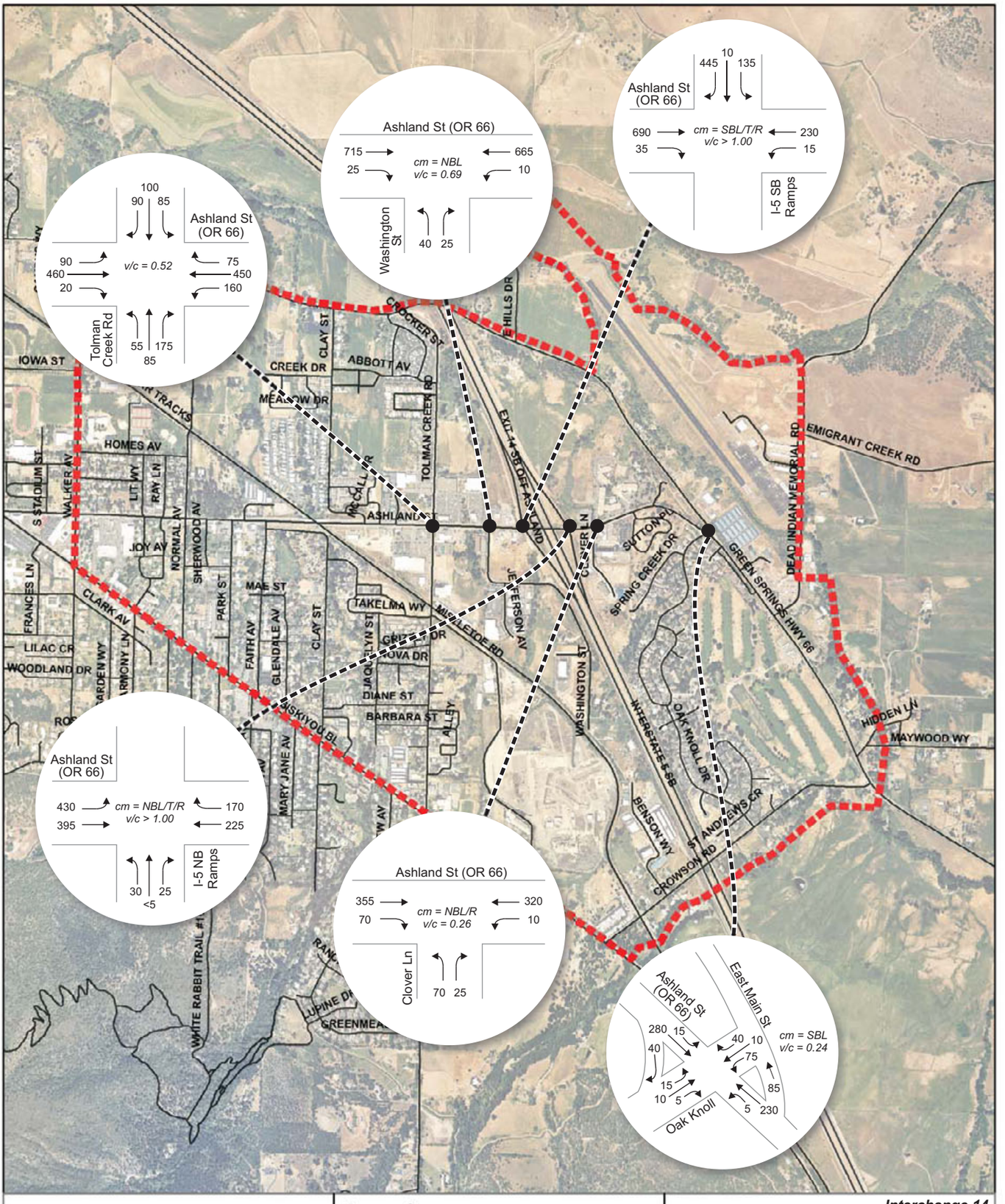

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Figure 2

Existing (2006) PM Peak Hour Traffic Volumes and Intersection Operations

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Table 4. Existing (Year 2006) 30th Highest Hour 95th Percentile Queues

Intersection	Movement	95% Queue
Ashland St (OR 66) & Tolman Creek Rd	EBL	125
	WBL	150[1]
	NBL	100[1]
	SBL	100[1]
Ashland St (OR 66) & Washington St	WBL	25
	NBL	75[1]
Ashland St (OR 66) & I-5 SB Ramps	WBL/T	50
	SBL/T/R	675[2]
Ashland St (OR 66) & I-5 NB Ramps	EBL/T	600[3]
	NBL/T/R	375
Ashland St (OR 66) & Clover Ln	WBL/T	50
	NBL/R	75
Ashland St (OR 66) & E. Main/Oak Knoll	NBL/T/R	50
	SBL	75[1]

Notes:
1. Storage bay at or above capacity.
2. Queue extends into ramp deceleration area.
3. Queue extends into adjacent intersection(s).

Under seasonally adjusted volume conditions, analysis shows that critical v/c ratios at both ramp terminal intersections exceed mobility standards and also that demand exceeds available capacity. Queuing on both exit ramps, and especially the southbound ramp, is significant because of limited gaps on Ashland Street for left turning vehicles, combined with substantial right-turning volumes from the southbound exit ramp. The 95th percentile queue on the southbound exit ramp is calculated to extend into the deceleration area of the ramp. Left turning vehicles from eastbound Ashland Street to the northbound I-5 entrance ramp are delayed because of conflicts with high westbound through volumes. These delays result in queuing over the bridge that is calculated to spill over into the southbound ramp terminal intersection.

It should be noted that it is impossible to *measure* existing intersection operating conditions at a v/c of greater than 1.00, even though Table 3 appears to indicate otherwise. Volume to capacity ratios in excess of 1.00 cannot occur, but rather represent conditions where demand exceeds capacity. For existing conditions, v/c ratios in excess of 1.00 result from the application of seasonal adjustment factors to existing volumes. The v/c ratios greater than 1.00 shown in Table 3 resulted from analysis based on seasonally adjusted volumes.

Freeway Ramp Merge/Diverge Analysis

Analyses were conducted for each of the merge and diverge segments for the entrance and exit ramps at the interchange under existing 30th highest hour traffic volume conditions. The analyses showed that traffic operations at each of the ramp merge and diverge sections meet the OHP mobility standard for interstate freeways.

Safety Analysis

The TAR conducted a thorough safety analysis to determine if there were any significant documented safety issues within the analysis area and to recommend measures at specific locations or general strategies for improving overall safety.

The safety analysis included a review of crash history data supplied by the ODOT Crash Analysis and Reporting Unit for the period between January 1, 2002 and December 31, 2004, which are the three most recent full years for which crash data is available. The analysis also examined ODOT Safety Priority Index System (SPIS) data and compared calculated crash rates from analysis area roadways with statewide averages.

Overall, analysis found no apparent crash patterns at any of the study area intersections or freeway segments, and no single intersection demonstrated a significant safety problem. However, taken together, the crashes on Ashland Street between the I-5 northbound and southbound ramps warranted a SPIS score ranking in the top 10% statewide. A total of eleven crashes were reported during the three-year study period on Ashland Street between Clover Lane and the I-5 southbound ramps. These crashes resulted in a total of six injuries. The primary types of crashes documented along this segment were turning and rear end. Rear end crashes are often caused by driver inattention in congested conditions, while the turning crashes may be a symptom of drivers accepting small gaps at unsignalized intersections.

The TAR identified three actions that could contribute to greater nominal safety along the Ashland Street corridor:

- Installation of traffic signals at the ramp terminals
- Consolidation or elimination of access points in the vicinity of the ramp terminals
- Geometric improvements to roadway associated with construction of new interchange overcrossing of I-5 at Ashland Street.

Future Conditions

The TAR provided traffic operations analysis of interchange area roadways for no-build and various build alternatives under future traffic conditions: 2010 year of build and 2030 plan horizon year. The analysis was prepared prior to completion of the new Rogue Valley MPO Transportation Demand Model (RVMPO model), which did not include data for the Ashland area. Consequently, future traffic volumes were developed using a TPAU-approved methodology that involved determination of growth factors based on historical growth. In the intervening months, the RVMPO model has come online. Therefore, the analysis performed for this IAMP will revise future traffic volume projections, and they will be based on the projected population, household and employment data used in the RVMPO model.

Signal Warrant Analysis

The need for traffic signals at intersections is established by evaluating existing and projected traffic conditions against traffic signal warrants contained in the *2003 Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD provides eight signal warrants that consider different conditions under which a new signal may be warranted. The most commonly applied signal warrants are based on traffic volumes, although the MUTCD contains signal warrants based on crash experience, coordinated signal systems, and warrants for signals at pedestrian and school crossings. Several volume-based MUTCD warrants were analyzed at the ramp terminal intersections for existing conditions (year 2006).

For years 2010 and 2030 conditions TPAU preliminary traffic signal warrants were evaluated. The TPAU preliminary warrants are based on MUTCD warrants, but require less data. TPAU developed these warrants for the purpose of projecting future traffic signal needs.

The analyses showed that only the southbound ramp terminal intersection meet any traffic signal warrants. Despite failing intersection operations, the northbound ramp terminal intersection was not shown to meet

signal warrants. As noted earlier, the TAR only evaluated MUTCD warrants under existing conditions. An examination of MUTCD warrants under *future* conditions indicate that one or more MUTCD signal warrants may be met as early as year 2008. Further analysis will be performed as a part of the IAMP process.

The TAR noted that signalization of only the southbound ramp terminal without also signalizing the northbound ramp terminal would counteract the operational benefits of signalization at the southbound ramp terminals. The TAR also noted that all build options for Interchange 14 include signalized intersections at both the northbound and southbound ramp terminals.

Access Management

The TAR provided an assessment of existing public and private accesses along Ashland Street within the interchange influence area, as well as a review of access management standards as listed in the 1999 Oregon Highway Plan (OHP).

According to the OHP Table 16: Minimum spacing standards applicable to freeway interchanges with two-lane crossroads specifies the following minimums for fully developed urban area type:

- 750 feet distance to the first approach on the right; right in/right out
- 1320 feet distance to the first intersection where left turns are allowed
- 750 feet distance between the last right in/right out approach and the start of taper for the entrance ramp

The TAR noted, however, that increasing the number of lanes on Ashland Street over I-5 may cause stricter spacing standards to apply. OHP Table 17: Minimum spacing standards applicable to freeway interchanges with multi-lane crossroads specifies a longer distance (990 feet, instead of 750 feet) as the minimum distance between the last approach road and the start of the taper for the entrance ramp.

The TAR listed the following non-conforming accesses in the vicinity of Green Springs Interchange 14:

- The intersection of Tolman Creek Road is less than 1320 feet from the southbound ramp terminal. The distance is estimated to be approximately 1100 feet.
- The intersection of Washington Street is less than 1320 feet from the southbound ramp terminal. The distance is estimated to be approximately 350 feet.
- The intersection of Clover Lane is less than 1320 feet from the northbound ramp terminal. The distance is estimated to be approximately 250 feet.
- The intersection of Sutton Place is less than 1320 feet from the northbound ramp terminal. The distance is estimated to be approximately 750 feet.
- Driveways serving high-volume commercial establishments on both sides of Ashland Street to the east and west of I-5 are less than 1320 feet from the ramp terminals.

No determination was made as to which public and private approaches have valid access permits.

The TAR provided a list of changes to the local street network that would be necessary to fully comply with the OHP Access Management Standards. Most of the changes consisted of relocating streets away from the interchange crossroads. Specific access management actions will be identified as part of the IAMP process.

Bicycle and Pedestrian Facilities

The TAR provided a discussion of the provision of pedestrian and bicycle facilities as a component of the interchange improvement project. This section provides a summary of this discussion.

In the preparation of the TAR, the traffic engineer assumed that provisions would be made for pedestrians and bicyclists.

Oregon Revised Statues (ORS) govern the provision of bicycle and pedestrian facilities. ORS 366.514 (Use of highway fund for footpaths and bicycle trails) specifies, in part, that "…reasonable amounts shall be expended as necessary to provide footpaths and bicycle trails, including curb cuts or ramps as part of the project. Footpaths and bicycle trails, including curb cuts or ramps as part of the project, shall be provided wherever a highway, road or street is being constructed, reconstructed or relocated."

ORS 366.514 does provide for exceptions. ORS 366.514 (2) states:

> "Footpaths and trails are not required to be established under subsection (1) of this section:
>
> (a) Where the establishment of such paths and trails would be contrary to public safety;
>
> (b) If the cost of establishing such paths and trails would be excessively disproportionate to the need or probable use; or
>
> (c) Where sparsity of population, other available ways or other factors indicate an absence of any need for such paths and trails."

There are numerous examples of interchanges being designed with specific facilities for pedestrians and bicyclists. The South Medford Interchange, which is scheduled for construction during 2006 through 2009, is one example near Ashland. No evidence has been presented to suggest that improvements designed to accommodate pedestrians and bicyclists at the Green Springs Interchange would be contrary to public safety.

The cost of providing bicycle and pedestrian facilities was not estimated. The cost of building the project without bicycle and pedestrian facilities also was not estimated. Such cost estimates were beyond the scope of the TAR, so no judgment was made as to whether the cost of providing such facilities would be "excessively disproportionate."

The Ashland area is well known for outdoor activities, including bicycling and walking. Additionally, the TSP and Comprehensive Plan emphasize that the transportation system should accommodate all travel modes, including walking and biking. Pedestrian and bike facilities are located along Ashland Street on both sides of the interchange. The narrow roadway width on the interchange overcrossing roadway presents a significant barrier to use by pedestrians and cyclists. The TAR noted that it would be unlikely that the "absence of any need" criterion could be met to justify elimination of facilities for bicyclists and pedestrians at the interchange.

ODOT's usual signal plans provide for preformed detector loops in bicycle lanes and pushbuttons for actuation by pedestrians. The design for the South Medford Interchange used these features. Low volumes of bicycle and pedestrian activity during the peak hour are unlikely to have any measurable impact on traffic signal operations when actuated signals are used. Actuation by pedestrians may cause more time to be given to a particular movement than would be required for the vehicles for that cycle. Pedestrians and bicyclists may also cause motorists to be delayed when making certain turning movements, such as right turns. Potential conflicts between motorists and pedestrians and bicyclists were judged to be so low at both intersections that no adjustments were considered in the TAR when evaluating peak hour traffic operations.

The decision by the traffic engineer to evaluate peak hour traffic operations without specifically testing for the presence of pedestrians should not be used as justification by the roadway or signal designers to eliminate crosswalks, curb ramps, pedestrian signals, or detection. The roadway and signal designers should comply with appropriate provisions from ODOT's *Highway Design Manual* and the *Manual on Uniform Traffic Control Devices.*