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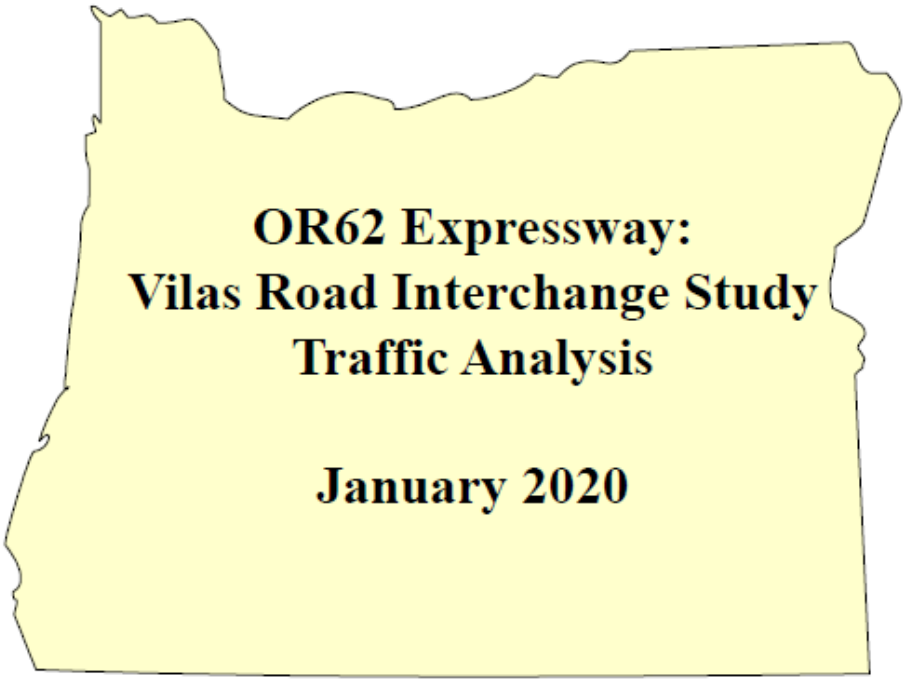

OR62 Expressway: Vilas Road Interchange Study Traffic Analysis

January 2020

Transportation Planning Analysis Unit
Transportation Development Division, Salem, Oregon

FINAL

OR62 Expressway:
Vilas Road Interchange Study
Traffic Analysis

Oregon Department of Transportation
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BACKGROUND INFORMATION

This study focuses exclusively on the feasibility and potential implications of an Interchange with the OR62 Expressway at East Vilas Road (aka Vilas Interchange). The purpose of this analysis is to identify potential traffic impacts and transportation improvements needed to support the proposed Vilas Interchange.

In 2009, the Oregon Legislature enacted the Jobs and Transportation Act (JTA) which earmarked funds for the OR62 project. In the 2012 **"I-5 to Dutton Road Final Environmental Impact Statement" (FEIS)** the preferred alternative proposed a new expressway to bypass existing OR62 (aka Crater Lake Highway) beginning at the I-5/OR62 Interchange (Exit 30 – North Medford Interchange) to approximately Dutton Road north of White City in Jackson County. The OR62 Expressway goals include reducing congestion and improving safety on existing OR62 in Medford and north through White City by redirecting traffic to the expressway. This analysis was performed in a manner to remain consistent with the FEIS including the Access Management Strategy.

The JTA funds are insufficient to cover the entire OR62 Expressway, so for the purpose of this analysis just the JTA funded segment of the OR62 expressway (aka JTA Expressway) is analyzed. The JTA Expressway includes a four-lane, access-controlled expressway extending north from near I-5 in Medford and includes grade separation with free-flowing movements at the southern terminus. At the northern terminus, it connects to Crater Lake Highway (CLH) with an at grade intersection just south of White City. Construction of the JTA Expressway was completed in May 2019 and since its opening has proven to successfully meet the goal of removing traffic volume from CLH.

The project is located on the northern edge of Medford within the urban growth boundary. East Vilas Road is maintained by Jackson County (Figure 1). The Vilas Interchange study area is bounded to the west by Hamrick Road, to the east by Crater Lake Avenue, to the north by Wilson Road, and to the south by Commerce Drive (Figure 2).

Figure 1: Vicinity Map

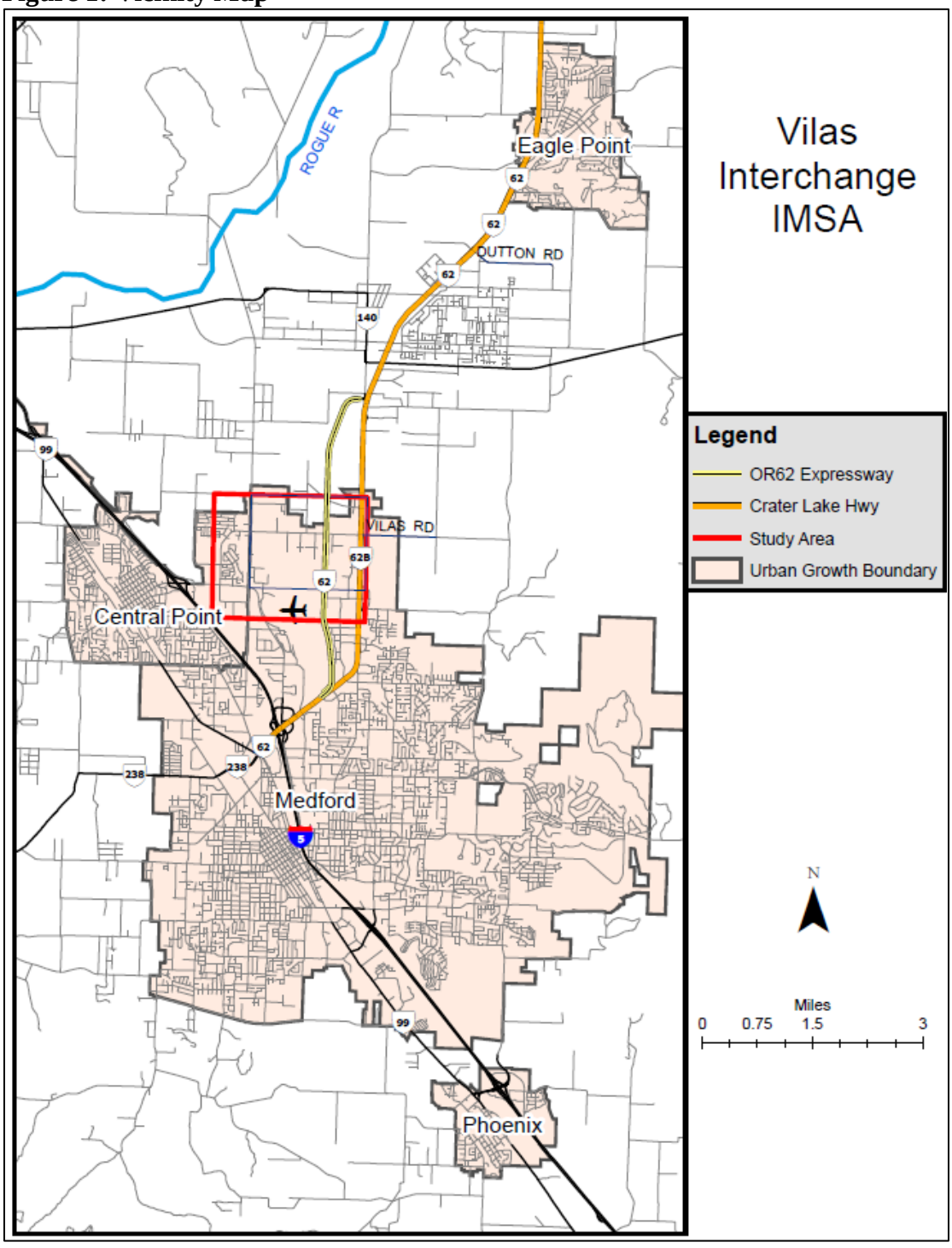
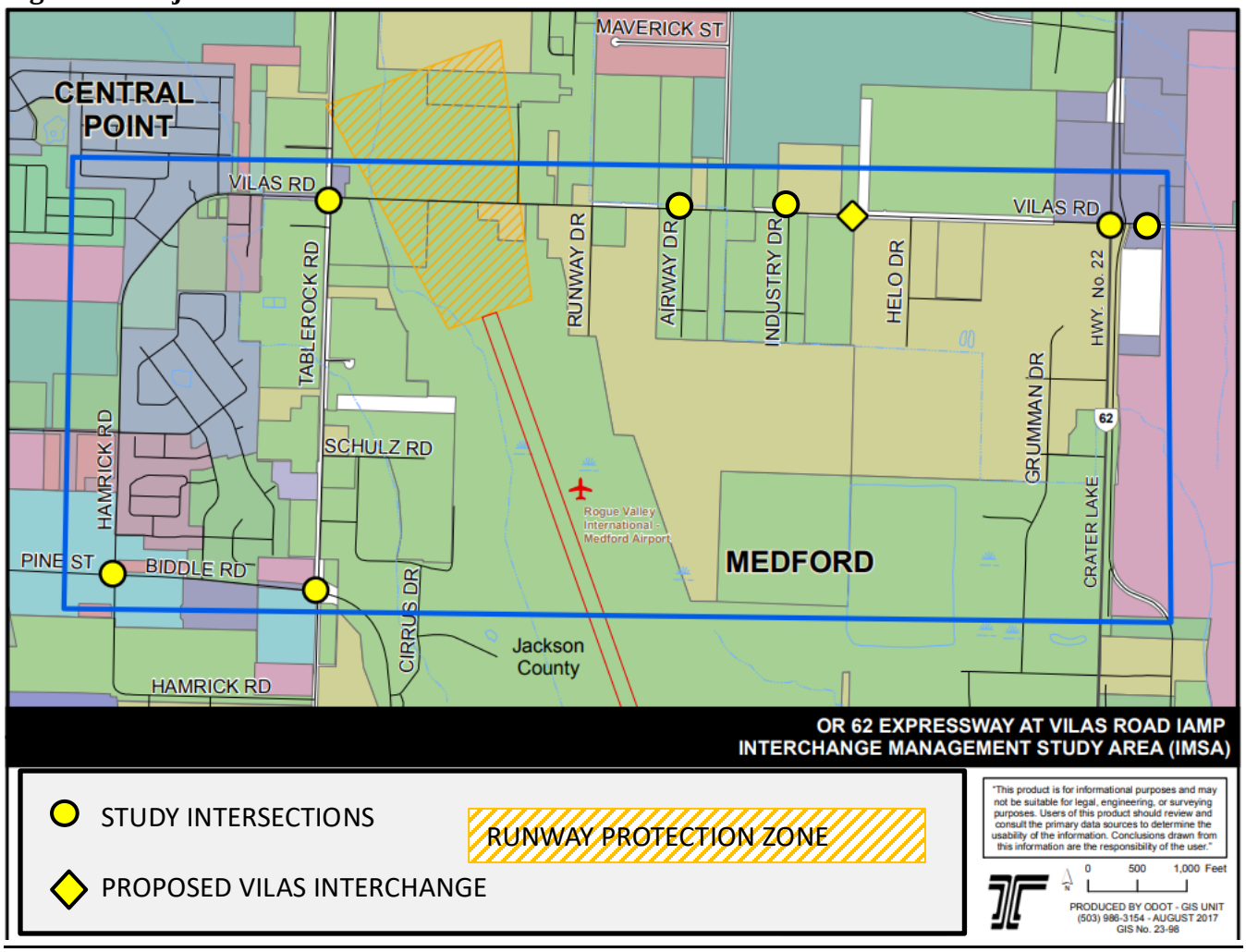


Figure 2: Project Area



This is a refinement of Phase 2 of this analysis. Phase 1 was completed after the July 2018 TAC meeting. In the Phase 1 analysis, all scenarios considered both a two-lane and four-lane East Vilas Road treatment. In the Phase 2 analysis, widening East Vilas Road to four through lanes is a City of Medford / Jackson County Tier 2 project. This simplified the analysis by determining East Vilas Road to be two through lanes for Tier 1 scenarios and four through lanes for Tier 2 scenarios. A roundabout Vilas Interchange type was also initially considered at the ramp terminal; however, the analysis demonstrated the roundabout to be a non-viable solution because one or both of the ramps are over capacity in every scenario. All of the analyses related to the considered but dismissed scenarios are in Appendix A.

A baseline conditions No-Build/No-Mitigation Scenario (**Scenario 0**) was established to represent the JTA Expressway base conditions for the project area for comparison purposes only. This scenario is essentially "do-nothing" to the JTA Expressway representing today's conditions. No modifications were made. The lane geometry, intersection control type, and bike/pedestrian facilities were left as-is.

Based on the traffic analysis findings, at the May 2019 TAC meeting it was decided to move forward with two scenarios:

- **Scenario 1**: JTA Expressway with No Vilas Interchange, 4 lanes on East Vilas Road, including Tier 1 & 2 projects, and additional mitigations.
- **Scenario 2**: JTA Expressway WITH the Vilas Interchange, 4 lanes on East Vilas Road, including Tier 1 & 2 projects, and additional mitigations.

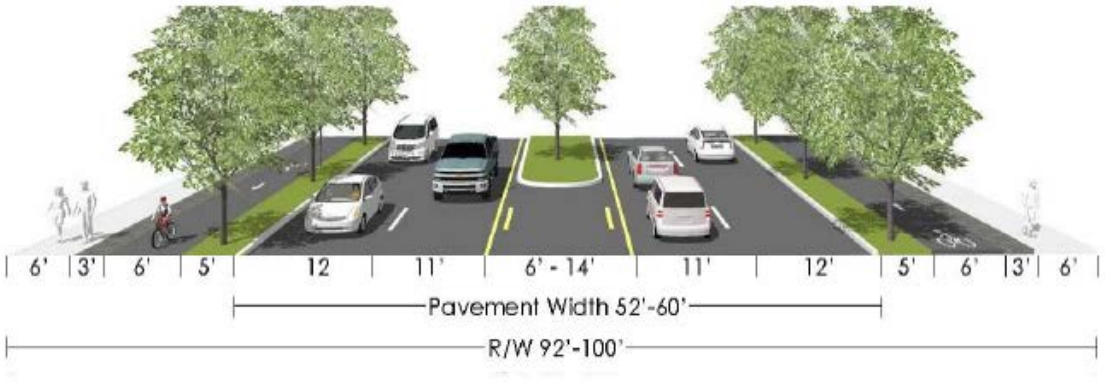
Distilling the alternatives down to just these two allows a singular focus on whether to include the Vilas Interchange or not.

The TAC met again in October 2019 to review the analysis results again, and also to address comments submitted after the draft final narrative was distributed. Pertinent discussion and comments from that meeting are incorporated into this document.

A Runway Protection Zone (RPZ) is present on the north end of the Rogue Valley International – Medford Airport which overlaps an approximately 1,500 feet long section of East Vilas Road from about Rainbow Drive to the Upton Slough (Figure 2). The Federal Aviation Administration (FAA) defines an RPZ as a trapezoidal area off the end of the runway end that serves to enhance the protection of people and property on the ground, as well as to provide adequate space for aircraft to safely maneuver for take-offs and landings. The pavement along this stretch of East Vilas Road may not be widened; however, the current paved width can accommodate a four-lane cross-section and may be restriped, which is adequate for the travel lanes for all proposed scenarios.

However, East Vilas Road is classified as a Minor Urban Arterial and according to the 2018 Medford TSP Functional Classification Design Standards, 100 feet of right-of-way is required to accommodate a five-lane road section, bicycle facilities, and detached sidewalks with a landscaped planter strip (Figure 3). Google Earth reflects a 60 feet wide existing cross-section. A potential design option to accommodate the existing cross section would be 11 feet travel lanes, a three feet wide median, five feet wide planter strip, and an eight feet wide multi-use shared path. This does not meet Medford's design standards, so likely more Right-of-Way (ROW) would need to be acquired within the RPZ. FAA approval for additional work on East Vilas Road will require a "Notice of Proposed Construction" permit.

Figure 3: City of Medford 2018-2038 TSP Major Arterial/Regional Arterial Functional Classification Standards (Low Stress for 40 mph and Higher)



Operational Standards

To evaluate the operational standards for Scenario 1 (JTA Expressway No-Build Vilas Interchange), the 1999 Oregon Highway Plan (OHP) Volume to Capacity Ratio (v/c) targets for a Metropolitan Plan Organization (MPO) were used. The only intersection this causes a different v/c standard to be used than in Scenario 2 (Vilas Interchange Build) is East Vilas Road and Crater Lake Highway (CLH) which has a v/c target of 0.85 for Scenario 1. This is because the ramp terminals obviously do not exist in Scenario 1 and the other intersections follow county or city standards, not the ODOT Highway Design Manual (HDM).

To evaluate Scenario 2, the 2012 ODOT HDM standard of 0.75 is used for the Interstate Highways and Statewide (NHS) Expressways within an MPO when appropriate. Otherwise the Jackson County 0.95 v/c, the City of Central Point LOS D, or the City of Medford LOS D standard is used. It is possible that some intersections currently under Jackson County (or ODOT) jurisdiction may change over time to the City of Medford due to increased volumes, future annexations, UGB expansions, etc. For this reason the LOS D requirement is considered in addition to the v/c. Table 1 summarizes the OHP, HDM, and local v/c standard/target applicable to each intersection.

Table 1: V/C Standards / Targets for each intersection

Intersection	Standard/Target			
	ODOT (V/C Ratio)		Local	
	OHP[1]	HDM[2]	V/C Ratio	LOS
OR62 Expressway	0.85	0.75	NA	NA
E Vilas Rd & Table Rock Rd[7]	NA	NA	0.95[3]	D[5]
E Vilas Rd & Airway Dr/Peace Ln	NA	NA	0.95	D[4]
E Vilas Rd & Lear Wy	NA	NA	0.95	D[4]
E Vilas Rd & Crater Lake Hwy	0.85	0.75	NA	D[4,6]
E Vilas Rd & Crater Lake Ave	NA	NA	0.95	D[4]
Table Rock Rd & Biddle Rd[7]	NA	NA	0.95[3]	D[5]
Biddle Rd & Hamrick Rd	NA	NA	NA	D[5]

[1] Oregon Highway Plan. The 0.85 target applicable to most intersections is based on the classification of OR62 as a "Freight Route on a Statewide Highway" and "Statewide Expressway" and location within a metropolitan planning organization area inside an urban growth boundary. See Table 6 of the OHP, as amended December 21, 2011. Used for Scenario 1 (No-Build scenario).
[2]ODOT Highway Design Manual. Used for Scenario 2 (Build scenario).
[3]Jackson County standard
[4]City of Medford standard
[5]Central Point standard
[6]Jurisdiction of Crater Lake Highway may be transferred from ODOT to City of Medford in which case the LOS D standard would apply.
[7]West leg under Central Point standard is LOS D

SCENARIO DEFINITIONS & DESCRIPTIONS

This iteration of the traffic analysis evaluates two scenarios which both include the Tier 1 and Tier 2 projects from the RVMPO Regional Transportation Plan (RTP) / Medford, and the Central Point, and Jackson County Transportation System Plans (TSP). This was done in order to keep the analysis consistent with these local TSPs because state and federal (for the FEIS) law requires ODOT's traffic analysis to be consistent with the local government's Comprehensive Plan. The JTA Expressway which currently exists is included in both scenarios. East Vilas Road has four through lanes implemented by the Tier 2 City of Medford Project 632 / Jackson County Project R91. Because there is a two-way-left-turn-lane (TWLTL) present, the actual cross section would be five lanes; however, a TWLTL has no bearing on the analysis as there is no way to analyze or simulate its presence.

In both scenarios, available mitigations were used in an attempt to meet the v/c and LOS standards/targets for all intersections. The mitigations applied are listed in Appendix B. The mitigations identified as necessary to meet the intersection v/c and LOS standards will require a local government TSP amendment.

Scenario 1: JTA Expressway No-Build Vilas Interchange Tier 2 includes No Vilas Interchange on the JTA Expressway and is supported by Tier 1 and 2 projects. The lane geometry and bike/pedestrian facilities were modified attempting to meet city and county v/c, LOS, and MMLOS standards. Also signals were added where the Preliminary Signal Warrants (PSW) have been met. The funded Tier 1 projects (see Table 2) and the tentative, unfunded Tier 2 projects within the study area were included (see Table 3). There are other Tier 2 projects that were added into the model runs that were not in the direct study area (Table 4). Also, refer to Appendix C for a map and complete list of Tier 1 and 2 projects. The projects were analyzed as a "bundle" of necessary intersection mitigations.

Scenario 2: JTA Expressway Vilas Interchange Build Tier 2 is a replica of Scenario 1 except that the Tight Diamond Vilas Interchange at East Vilas Road was included and unique intersection mitigations were applied to meet local jurisdiction v/c and LOS standards. Industry Drive is cul-de-sac'd with construction of the Vilas Interchange (per the FEIS) due to the close proximity.

Table 2: Tier 1 Projects within Vilas Interchange Study Area

Project ID	Location	Description	Jurisdiction
216	East Pine St & Hamrick Rd	On the south leg a left turn only lane and a through/right turn lane is created. Add a channelized southbound right turn on the north leg. On the west leg add a 750' acceleration lane.	Central Point
218	East Pine St & Table Rock Rd	Widen west approach to add second eastbound left turn lane.	Central Point
219	Table Rock Rd & E Vilas Rd	Widen to increase capacity, add eastbound lane & shared through-right turn movement	Central Point
R54	Table Rock Rd from Lone Pine Creek to Pine St-Biddle Rd	Widen to three-lane urban minor arterial standard with sidewalks and bike lanes from Lone Pine Creek to Airport Road and to five-lane urban minor arterial standard from Airport Road to Biddle Road	Jackson County
I2	Table Rock Rd/Biddle Rd	Widen the south leg of Table Rock Road to a five-lane cross section and optimize the signal timing/phasing	Jackson County

Project ID	Location	Description	Jurisdiction
I3	Table Rock Rd/E Vilas Rd	Monitor traffic operations at the intersection following construction of the OR62 Bypass. If issues persist, install a second separate left-turn lane and a separate right-turn lane at the westbound approach and optimize the signal timing/phasing	Jackson County
I39	Crater Lake Ave & E Vilas Rd	Re-align Crater Lake Ave to the east and install traffic signal	Medford
I40	Crater Lake Hwy & E Vilas Rd	Monitor needs after construction of Crater Lake Highway Bypass	Medford
R2	E Vilas Rd from east Medford City limits to McLoughlin Dr	Improve to two-lane rural major collector standard (no new travel lanes) for 0.9 miles	Jackson County

Table 3: Tier 2 Projects within Vilas Interchange Study Area

Project ID	Location	Description	Jurisdiction
467	Lear Way, Coker Butte Rd to E Vilas Rd	Construct new major collector roadway (includes center turn-lane, bike facilities, and sidewalks)	Medford
627	Crater Lake Ave, Coker Butte Rd to northern UGB	Construct new major collector roadway (includes center turn-lane, bike facilities, and sidewalks)	Medford
628	Lear Way, E Vilas Rd to northern city limits	Construct new minor collector roadway (includes one lane each direction, bike facilities, and sidewalks)	Medford
632, R91	E Vilas Rd, Table Rock Rd to eastern UGB	Widen to major arterial standard including two lanes in each direction, center turn-lane, bike facilities, and sidewalks	Medford
I43	E Vilas Rd & Airway Dr or Industry Dr	Install traffic signal or roundabout when warranted	Medford
I44	E Vilas Rd & Lear Wy	Install traffic signal or roundabout when warranted	Medford

Table 4: Tier 2 Projects in Model Runs but Outside Direct Study Area

Project ID	Location	Description	Jurisdiction
234	E-W Hamrick Rd extension (south of E. Pine St.)	Extend Hamrick Rd westerly to intersect with Penninger Rd (collector standards).	Central Point
495	Coker Butte Rd, International Way to Lear Way	Upgrade to minor arterial roadway (includes center turn-lane, bike facilities, and sidewalks)	Medford
629	Airway Dr / Industry Dr, E Vilas Rd to Coker Butte Rd	Construct new major collector roadway (includes center turn-lane, bike facilities, and sidewalks)	Medford
630	Springbrook Road, Coker Butte Rd to E Vilas Rd	Construct new major collector roadway (includes center turn-lane, bike facilities, and sidewalks)	Medford
631	East-West collector between Coker Butte Road and E Vilas Road, Crater Lake Highway to eastern UGB	Construct new minor collector roadway (includes one lane each direction, bike facilities, and sidewalks)	Medford

The Jackson County Jail (JAIL-Scenario 2) scenario conducted a reduced sensitivity analysis on the Vilas Interchange Build scenario (Scenario 2), to evaluate the impacts of a proposed jail. The proposed location for a new jail is in an undeveloped area south of East Vilas Road, between Crater Lake Highway and the JTA Expressway. The construction of the jail is in the very preliminary phase given that even initial consideration is dependent upon the passing of a taxing service district in November 2019. Currently just a v/c and LOS analysis is performed and more detailed analyses would be done when (if) the land use process commences. Methodology details can be found in Appendix D.

Additional Mitigations

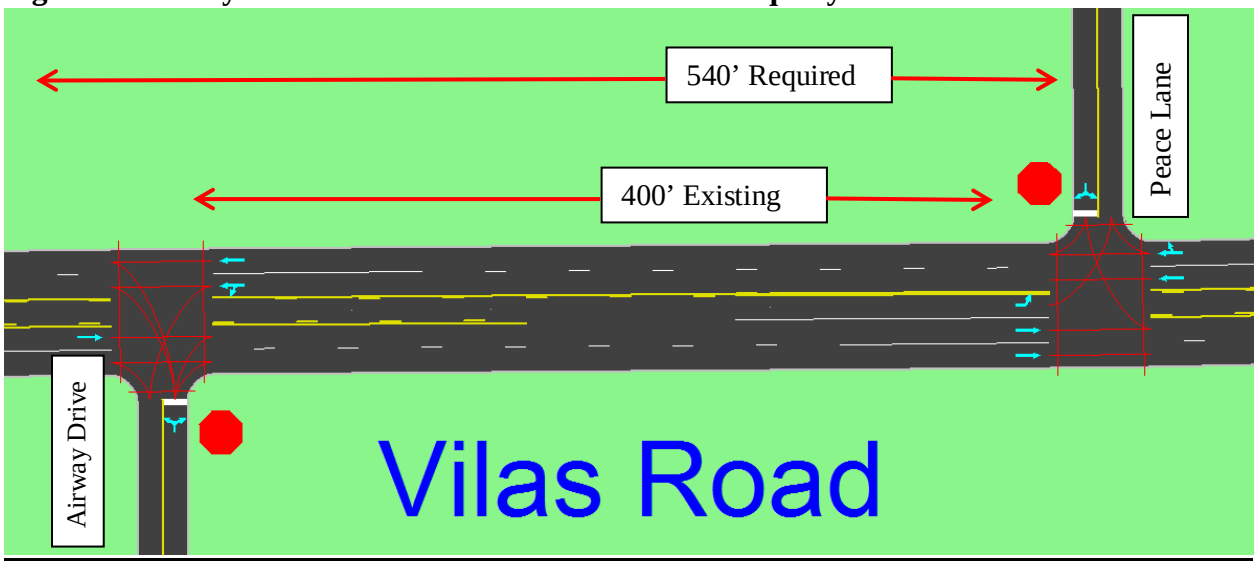
As an additional mitigation in both Scenario 1 and Scenario 2, Peace Lane has been realigned to intersect with East Vilas Road at Airway Drive. This is driven by a few key issues. First, the City of Medford / Jackson County Tier 2 Project (#632 / #R91) which widens East Vilas Road from two through lanes to four. This creates two lane changes when traveling east on East Vilas Road from Airway Drive to make an eastbound left on to Peace Lane instead of only one. This requires more distance than is available between the two intersections. Second, another City Tier 2 Project (#629) constructs a major collector from Coker Butte Road to Airway Drive or Industry Drive. This increases the traffic volume at this intersection. Third, if the Vilas Interchange is built Industry Drive will be cul-de-sac'd (per FEIS Access Management Strategy) and the traffic re-routed through Airway Drive. This would create even more interactions between Peace Lane

and Airway Drive which would further validate the need for the realignment. The individual intersections would cease to function without the realignment because there is not enough space between the two intersections to accommodate the required turn lanes and legal turning movements from one street to the other. Figure 4 depicts a four-lane East Vilas Road scenario and the left turn lanes are at maximum length with the 400 feet of linear space available. See Appendix E for details of this analysis.

Essentially this determination is based on three things:

1. Physics – physical requirements for acceleration, deceleration, etc.
2. Driver limitations – time required for perception, reaction, and decisions.
3. Oregon Vehicle Code – legal signaling distance, turning into the appropriate lane, etc.

Figure 4: Airway Drive and Peace Lane Geometric Adequacy



Scenario Naming Convention

The following naming convention has been implemented to aid in communication and will be used throughout the rest of the document and is shown in Table 5 below.

Table 5: Scenario Names and Descriptions

Name	# of E Vilas Rd through lanes	Vilas Interchange Type	RTP/TSP Projects Included	Peace realigned with Airway	Industry Drive Cul-de-sac'd
Scenario 0	2	None	None	N	N
Scenario 1	4	None	Tier 1&2	Y	N
Scenario 2	4	Tight Diamond	Tier 1&2	Y	Y

VOLUME DEVELOPMENT

Design Hour Volumes (DHVs) were developed using mostly the 2014 traffic counts previously taken for the FEIS, the Jackson County TSP, and local development projects by the Region 3 Traffic Section. It was necessary to obtain additional peak three-hour turning movement counts at the intersections of Airway Drive and Industry Drive with East Vilas Road in November 2017. In August 2018, a new traffic count was obtained at the intersection of Hamrick Road and Biddle Road/Pine Road to incorporate traffic generated by the Costco which opened November 2017. See Appendix F for the full Costco Volume Revision methodology. All of the traffic counts were adjusted to a common 2015 base year to create inputs for the future volume development. The traffic counts are available in Appendix G. Also, the complete process is documented in Appendix G for Existing Volume.

The existing 2015 DHV was post-processed using the RVMPO v4.3 travel demand model to create 2040 volumes. At intersections where traffic counts were not available, such as on the new JTA expressway route, the 2035 SD Full Build Synchro file from the FEIS analysis was used after adjusting the volumes to 2040. The post-processing followed the National Cooperative Highway Research Program (NCHRP) Report 255/765 guidelines. The resulting demand hour volumes (DHV) were balanced across the study area trying to keep the patterns from the FEIS intact as much as possible for consistency. The 2040 DHV's were also converted into average annual daily traffic (AADT) for use in the crash analysis. The future volume development processes and the 2040 DHV's are detailed in Appendix H.

ANALYSIS RESULTS

Volume Change with Vilas Interchange Construction

With the construction of the Vilas Interchange there are inherent shifts in traffic volume. As expected, north of East Vilas Road on Crater Lake Highway (CLH) and Crater Lake Avenue (CLA) there is a volume decrease (about 53% and 15% respectively) because traffic is reallocated to the JTA Expressway (successfully meeting an FEIS goal). East Vilas Road volumes decrease about 20% from the East Project Limit to the Vilas Interchange caused by the through traffic traveling between north of the study area (White City area) and south of the study area being removed from the segment between the Vilas Interchange and CLH. The volume on East Vilas Road west of the Vilas Interchange increases because traffic is pulled from Gregory Road and Antelope Road outside of the study area.

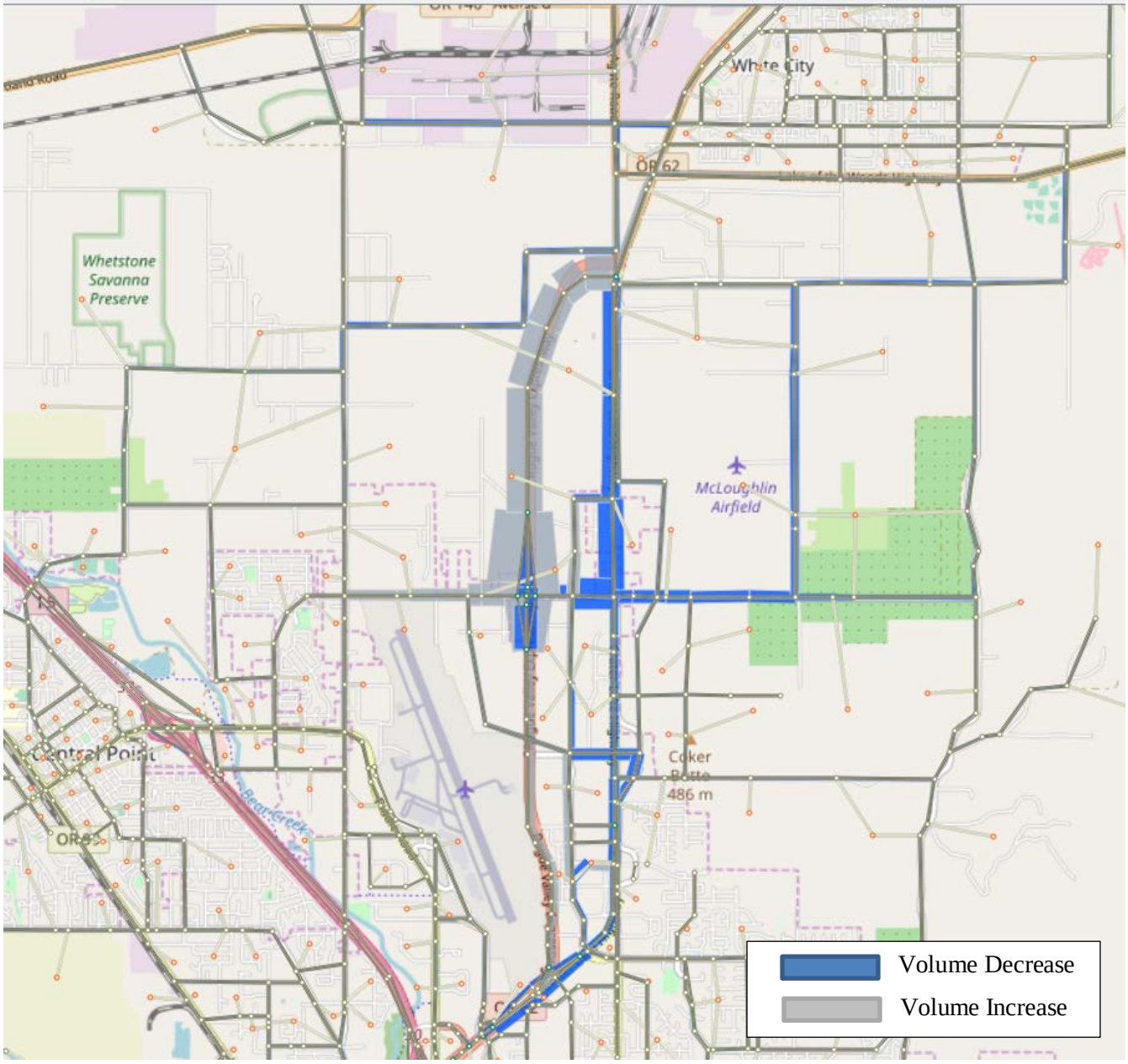
The volumes generally increase and are shifted around with the inclusion of the Tier 1 and 2 projects as they add greater connectivity which makes the network more attractive. This increase can be seen across East Vilas Road. This is partially caused by the widening of East Vilas Road to four through lanes adding capacity. Also, City of

Medford projects construct Lear Way as well as a new major collector roadway connecting Coker Butte Road to East Vilas Road via Industry Drive (or Airway Drive). This new connection contributes to the 25% increase on Industry Drive. South of Biddle Road, Hamrick Road is reduced 36% while the volume on Table Rock Road is increased 29%. The Jackson County Project (#R54) which widens Table Rock Road to a five-lane urban minor arterial probably attracts the volume to Table Rock Road from Hamrick Road.

These changes are diagramed in Appendix I. Note that the percentages depicted on the diagrams are averaged two-way values. As this is a PM peak period analysis, some directional peaking occurs.

Another method to further describe the change in traffic patterns with and without the Vilas Interchange is to review the RVMPO Emme model trip assignment across the network on an area larger than the pre-determined study area (see Figure 2 for study area delineation). Figure 5 shows the change in trip assignment with the Vilas Interchange (vs without the Vilas Interchange) from the southern terminus at I-5 to north of White City. The grey bars depict the volume increase and the blue bars the decrease. Note that the large grey bars at the ramps exist because it is a 100% increase due to the ramps previously not existing. There is greater change north of East Vilas Road than south. Traffic is pulled away from not only CLH, but also outside of the study area: to the east (McLoughlin Drive and Foothill Road) and to the west (Gregory Road and Antelope Road). On East Vilas Road, west of the Vilas Interchange volume increases, while to the east of the Vilas Interchange it decreases. At the southern terminus traffic is pulled off of CLH and reallocated to the JTA Expressway.

Figure 5: Volume Impacts with the Vilas Interchange



To understand some of the traffic shifts in the study area, a select-link analysis was performed using the RVMPO travel demand model to further investigate travel patterns. A select-link analysis tags a particular link in the model, runs the traffic assignment, and then displays all of the traffic that uses that link (i.e. – where it is coming from and where it is going to). In Figure 6 the northbound on-ramp was tagged. It can be seen that the traffic is coming from the southwest and headed to the northeast. Specifically noteworthy is that none of the traffic originates from the area southeast of the proposed interchange. This traffic pattern was further validated with a select link analysis on the southbound off-ramp (Figure 7). The movement is from the northeast to the southwest and no traffic using the southbound off ramp is destined to the area southeast of the interchange. It is not Medford residents using the interchange, it is traffic from further southwest (Central Point area) to areas northeast of Medford (Eagle Point area).

However, an increase in the northbound left movement was seen at the intersection of CLH and East Vilas Road. This is an issue of latent demand. The intersection has been very congested and with the introduction of the interchange the long distance trips (generally between the northeast and southwest) are now using the bypass instead of CLH. This creates more capacity and the local trips that would have preferred to use CLH if it wasn't so congested, but were forced to use alternative routes (e.g. Lear Way) now find a faster route via CLH. The additional northbound left trips are going to Lear Way both northbound and southbound, and to a smaller degree northbound on Peace Lane, and northbound and southbound at Table Rock.

Figure 6: Origin and destination of traffic using northbound on-ramp

Figure 7: Origin and destination of traffic using southbound off-ramp

The model was also used to identify traffic flows at a larger scale. The presence of the interchange increases shorter trips between the southwest and the northeast (Figure 8). This increase in local trips increases congestion and increases travel times. This results in the regional through trips diverting away from the expressway causing an increase in volume on Table Rock Road, Hamrick Road, East Vilas Road, and CLH (Figure 9). This traffic flow pattern change undermines the reason that the expressway was originally built by putting longer distance trips on local roadways and shorter local trips on the highway system. Additionally, on a very high scale it can be seen that the interchange does decrease traffic on CLH north of East Vilas Road, but south of East Vilas Road it is actually increased (Figure 10). This is specifically detrimental because this stretch of CLH is where the densest retail is located.

Figure 8: Origin and destination of traffic from southwest of study area

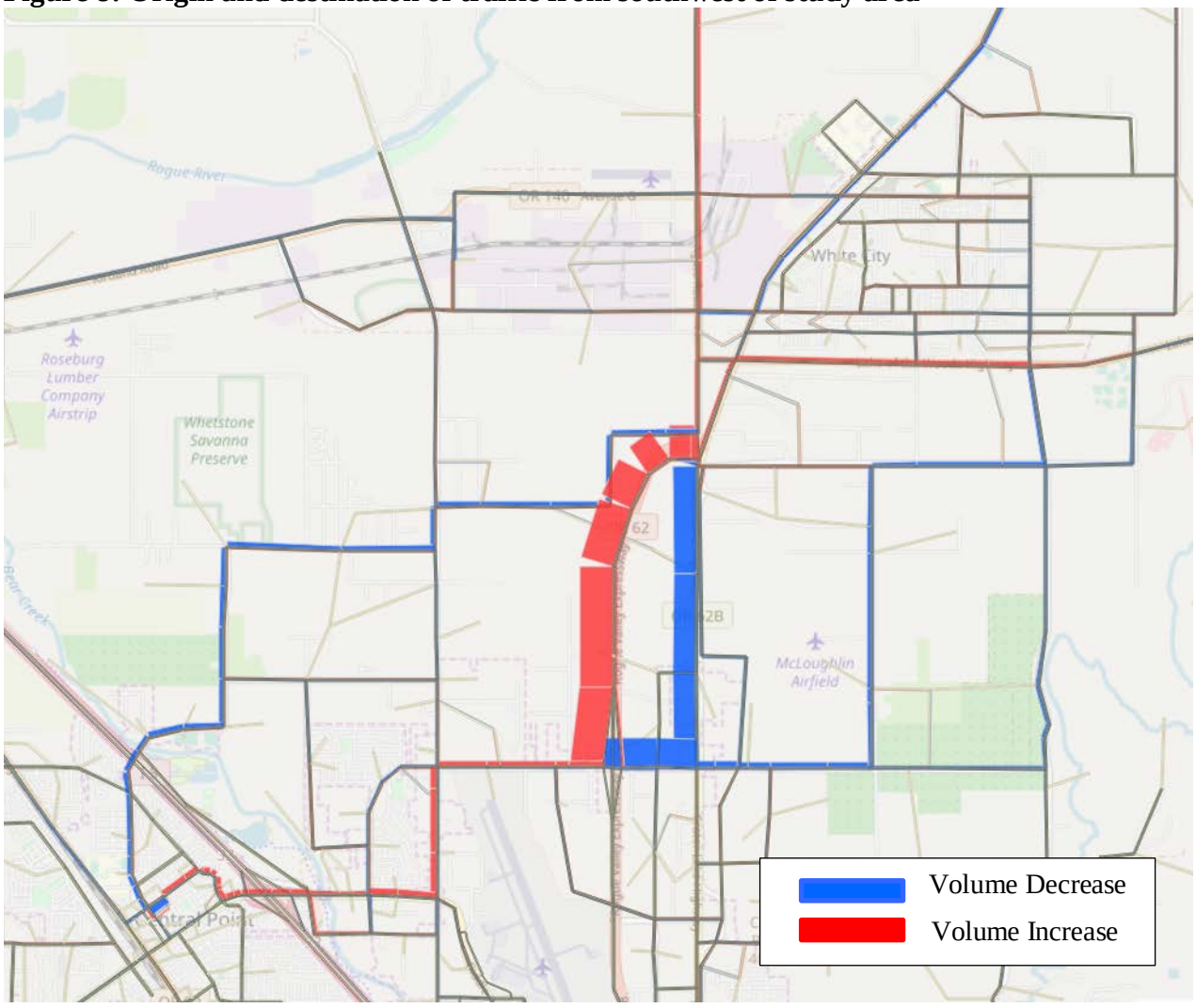


Figure 9: Origin and destination of traffic from northeast of study area

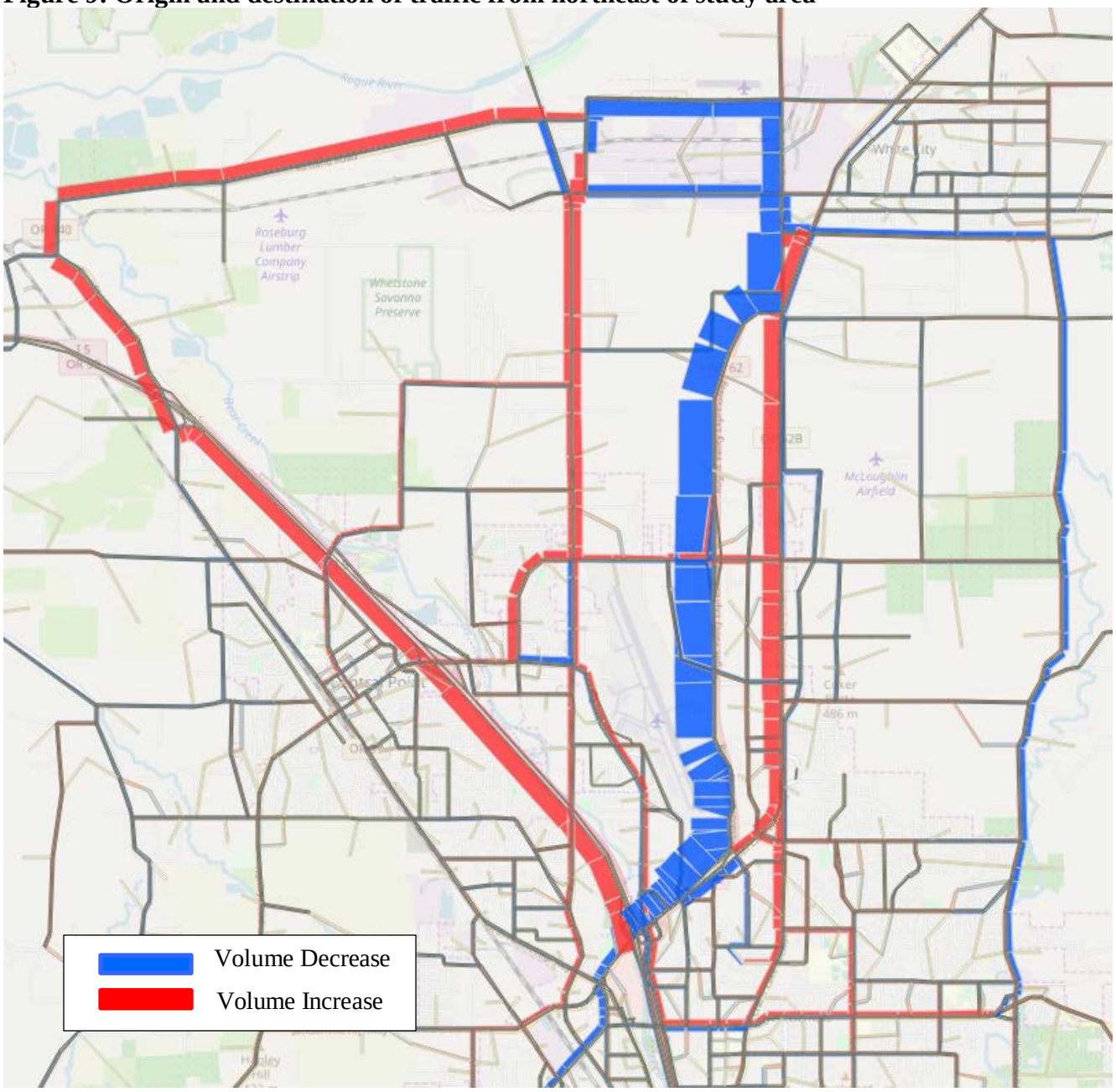
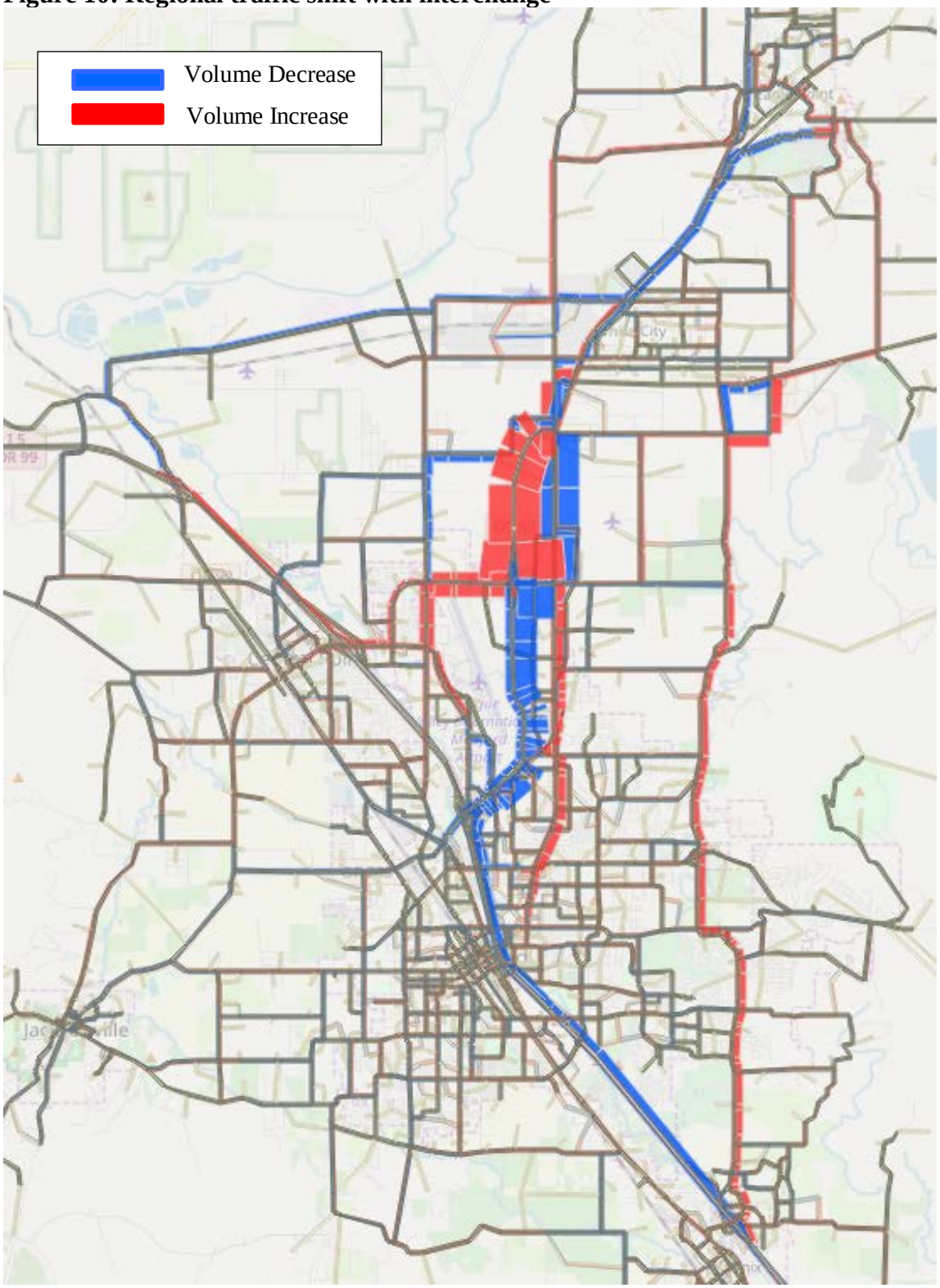


Figure 10: Regional traffic shift with interchange



Mainline & Merge/Diverge/Weave Segments

In 2040, almost all of the mainline free-flow segments, ramps, and merge/diverge sections in the study area are projected to be operating acceptably which can be seen in Table 6. HCS 2010 freeway modules are used to determine the v/c ratio on these segments. These analysis outputs are available in Appendix J. The northbound on-ramp is the only location slightly over the standard. This is an analysis of an afternoon peak period, so a higher v/c may be caused by the increased afternoon northbound commuter traffic to White City.

Table 6: Year 2040 JTA Expressway Mainline and Merge/Diverge/Weave v/c ratios[1]

JTA Expressway Segment and Merge/Diverge Location										
Scenario	**Mainline South of Vilas Interchange**		**Mainline North of Vilas Interchange**		**Between Ramps**		**Diverge - Off Ramps**		**Merge - On Ramps**	
	NB	**SB**	**NB**	**SB**	**NB**	**SB**	**NB**	**SB**	**NB**	**SB**
JTA Build										
Scenario 2	0.51	0.40	0.74	0.62	0.48	0.38	0.52	0.64	**0.76**	0.41

[1]Black-shaded cells indicate that the ODOT HDM 0.75 v/c standard has been exceeded.

Signalized Intersections

Tables 7a and 7b show the v/c ratio and LOS results for all of the signalized intersections. Synchro 9 was used to determine these values and the capacity reports are available in Appendix K. With the Vilas Interchange the v/c is reduced at most intersections (although in some cases it is a minimal change), but increases at the two intersections of Table Rock Road and Lear Way with East Vilas Road. In addition to the Tier 1 and Tier 2 projects, additional mitigations were applied attempting to meet the v/c and LOS standards. These mitigations are listed in Appendix B. These suggested improvements will require local government TSP amendments.

Table 7a: Year 2040 Signalized Intersection v/c Ratios and LOS values[1]

Scenario	Intersection								
	E Vilas Rd &								
	Table Rock Rd	Peace Ln	Airway Dr	Industry Dr	SB Ramp	NB Ramp	Lear Wy	CLH	CLA
No-Build[3]									
Scenario 0	**1.08 E**	NA[2]	NA[2]	NA[2]	NA	**NA**	NA	**1.27 F**	NA[2]
Scenario 1	0.83 D	NA[4]	0.93[4] B	0.89 B	NA	NA	0.78 B	**0.96 E**	0.49 B
JTA Build									
Scenario 2	0.94 D	NA[4]	0.86 C	NA[6]	0.70 B	0.61 C	0.83 B	**0.84[5] D**	0.42 B

[1]Black-shaded cells indicate that the ODOT HDM 0.75 v/c standard, the Jackson County 0.95 v/c standard, the City of Central Point LOS D standard, or the City of Medford LOS D standard has been exceeded.
[2]Unsignalized intersections are listed in Table 8 by both Major and Minor movements.
[3]Scenario 1 (No-Build) for Crater Lake Highway and E Vilas Rd intersection use the OHP v/c standard of 0.85 for Scenario 1 and HDM standard of 0.75 for Scenario 2 (Vilas Interchange Build). If it is transferred to the City of Medford jurisdiction LOS D may be used. The rest of the intersections use the HDM, City of Medford, City of Central Point or Jackson County standards.
[4]When E Vilas Road is widened to four lanes, Peace Lane is realigned to intersect E Vilas Road at Airway Drive creating a single intersection.
[5]If jurisdiction is transferred to the City of Medford the standard of LOS D would be met.
[6]Industry Drive is cul-de-sac'd and reconnected with Airway Drive upon construction of the Vilas Interchange per FEIS Access Management Strategy.

Table 7b: Year 2040 Signalized Intersection v/c Ratios and LOS values[1]

Scenario[2]	Intersection	
	Biddle Rd &	
	Hamrick Rd	Table Rock Rd
No-Build		
Scenario 0	**1.61 F**	**1.41 F**
Scenario 1	0.90 D	0.94 D
JTA Build		
Scenario 2	0.87 D	0.91 D

[1]Black-shaded cells indicate that the ODOT HDM 0.75 v/c standard, the Jackson County 0.95 v/c standard, the City of Central Point LOS D standard, or the City of Medford LOS D standard has been exceeded.
[2]The scenarios use the HDM, City of Medford, City of Central Point or Jackson County standards.

Unsignalized Intersections

Table 8 depicts the unsignalized intersection v/c ratios listed in a major movement / minor movement format. Synchro 9 was used to determine these values and the capacity reports are available in Appendix K. At all intersections, the LOS of the minor movement is unacceptable at E indicating that improvements are needed. Preliminary Signal Warrant (PSW) criteria was used to evaluate if intersections should be signalized. The output tables from the PSW analysis are in Appendix L. PSW's represent a daily traffic version of Warrant #1 from the Manual of Uniform Traffic Control Devices (MUTCD). Meeting PSW's does not mean a signal will be installed. Further study including a full warrant analysis will need to be performed by the applicable jurisdiction and approval gained. Table 9 shows the 2040 PSW status for the unsignalized intersections in the study area.

Table 8: Year 2040 Unsignalized Intersection Operations[1]

Scenario	v/c	LOS[4]	Critical Movement[2]	Control
E Vilas Rd & Peace Ln				
Scenario 0	0.12 / 0.74	**B / E**	EBL / SBL	TWSC[3]
E Vilas Rd & Airway Dr				
Scenario 0	0.04 / 0.50	**B / E**	WBL / NBLR	TWSC[3]
E Vilas Rd & Industry Dr				
Scenario 0	0.04 / 0.50	**B/E**	WBL / NBLR	TWSC[3]

[1]Values for intersection are listed by MAJOR movement / MINOR movement
[2]Eastbound Left (EBL), Southbound Left (SBL), Westbound Left (WBL), Northbound Left Right (NBLR).
[3]Two Way Stop Control (TWSC)
[4]Black shaded cells indicate that the City of Medford Standard LOS D has been exceeded.

Table 9: Year 2040 Preliminary Signal Warrants Met[1]

Scenario	Intersection				
	E Vilas Rd &				
	Peace Ln	Lear Wy	Crater Lake Ave	Airway Dr	Industry Dr
No-Build					
Scenario 0	N	N/A	**Y**	N	**Y**
Scenario 1	**N/A[2]**	**Y**	**Y**	**Y[2]**	**Y**
JTA Build					
Scenario 2	**N/A[2]**	**Y**	**Y**	**Y[2]**	**N/A[3]**

[1]Black shaded cells indicate that preliminary signal warrants (PSW's) have been met. Meeting PSW's does not guarantee that a traffic signal will be installed. The local jurisdiction traffic staff will need to perform an intersection traffic control study. Traffic signal warrants must be met and approval obtained before a traffic signal could be installed.
[2]A Functional Area Calculation (APM v2 4.8.1) is performed to evaluate closely spaced intersections. It is determined that Peace Lane will need to be realigned with Airway Drive and signalized. See Appendix E for calculation details.
[3]Industry Drive is cul-de-sac'd and reconnected with Airway Drive upon construction of the Vilas Interchange per FEIS design.

Jackson County Jail Sensitivity Analysis

The Jackson County Jail scenario (Jail-Scenario 2, see Table 10) conducted a reduced sensitivity analysis on the scenario which includes the Vilas Interchange (Scenario 2), to evaluate the impacts of a proposed jail. The proposed location for a new jail is in an undeveloped area south of East Vilas Road, between Crater Lake Highway and the new JTA Expressway. The construction of the jail is in the very preliminary phase given that even initial consideration is dependent upon the passing of a taxing service district in November 2019. Just a v/c and LOS analysis was performed in this study and more detailed analyses would be done later by the applicant when (if) the land use process commences. Methodology details can be found in Appendix D.

Table 10: Jail Sensitivity Analysis Scenarios Names and Descriptions

Name	# of E Vilas Rd through lanes	Vilas Interchange Type	RTP Projects Included	Peace realigned with Airway	Industry Drive Cul-de-sac'd
Jail – Scenario 2	4	Tight Diamond	Tier 1 and 2	Y	Y

Tables 11a and 11b show the v/c ratio and LOS results for all of the signalized intersections for the Jail scenario. Synchro 9 was used to determine these values and the capacity reports are available in Appendix K. The proposed Jail has a minimal effect. In Jail-Scenario 2, the v/c is slightly elevated at the intersection of Lear Way and East Vilas Road, but the standard is still met.

Table 11a: Year 2040 Jail Sensitivity Analysis Signalized Intersection v/c Ratios and LOS values[1]

	Intersection								
	E Vilas Rd &								
Scenario	Table Rock Rd	Peace Ln	Airway Dr	Industry Dr	SB Ramp	NB Ramp	Lear Wy	CLH	CLA
Scenario 2	0.94 D	NA[2]	0.86 C	NA[4]	0.70 B	0.61 C	0.83 B	**0.84[3] D**	0.42 B
JAIL Scenario 2	0.92 D	0.81 A	0.80 B	NA[4]	0.74 D	0.61 D	0.94 B	**0.86[3] D**	0.28 B

Table 11b: Year 2040 Jail Sensitivity Analysis Signalized Intersection v/c Ratios and LOS values[1]

Scenario	Intersection	
	Biddle Rd &	
	Hamrick Rd	Table Rock Rd
Scenario 2	0.87 D	0.91 D
JAIL Scenario 2	0.86 D	0.87 D

[1]Black-shaded cells indicate that the ODOT HDM 0.75 v/c standard, the Jackson County 0.95 v/c standard, the City of Central Point LOS D standard, or the City of Medford LOS D standard has been exceeded.
[2]When Vilas Road is widened to four lanes, Peace Lane is realigned to intersect Vilas Road at Airway Drive creating a single intersection.
[3]If jurisdiction is transferred to the City of Medford the standard of LOS D would be met.
[4]Industry Drive is cul-de-sac'd and reconnected with Airway Drive upon construction of the Vilas Interchange per FEIS design.

95th Percentile Queuing

Appendix M contains the 2040 95th percentile queuing figures for the project area. Queues shown on figures are a combination of stopped vehicles and vehicles traveling at seven or less miles per hour. The reported queues were created by averaging ten random Sim Traffic micro-simulations together. The Sim Traffic reports are available in Appendix N.

An additional measure for queuing is the percent time blocked for turn storage bays and intersections. Blocking times of five percent or greater are considered significant and are included in the following tables. Together these two parameters give a comprehensive view of the queuing: queue length figures show extent of queuing and percent time blocked shows how much of the peak hour there is blockage.

In Scenario 0, East Vilas Road westbound at Table Rock Road blocks Airway Drive 58% and through Peace Lane and Industry Drive almost 10% of the time. The west and eastbound left turn bays at the intersections of Table Rock Road and Biddle Road as well as Hamrick Road and Biddle Road are blocked over 75% of the time. These results are summarized in Table 12.

Table 12: Scenario 0 Significant Turn Bay and Intersection Blockages

Intersection	Approach	Blocked Turn Bay	Blocked Intersection	Average % Time Blocked
Hamrick Rd & Biddle Rd	EB	EBL		83
	WB	WBL		76
	NB	NBL		25
	SB	SBR		26
Crater Lake Hwy & E Vilas Rd	EB	EBL		57
		EBR		6
	WB		Crater Lake Ave	51
	NB	NBL		63
		NBR		43
	SB	SBR		48
		SBL		70
E Vilas Rd & Peace Ln	WB		Industry Dr	8
Crater Lake Ave & E Vilas Rd	WB	WBLTR		73
	NB	NBLTR		63
Table Rock Rd & E Vilas Rd	EB	EBR		16
	WB		Airway Dr	58
		WBL		43
		WBR		60
	NB	NBL		7
	SB	SBL		13
Table Rock Rd & Biddle Rd	EB	EBL		84
	WB	WBL		75
		WBR		63
	SB	SBL		72
	NB	NBL		18
		NBR		66
Industry Dr & E Vilas Rd	WB	WBL		33
Airway Dr & E Vilas Rd	WB		Peace Ln	8
	Total Blocked Turn Bays	**24**	**Total Blocked Intersections**	**3**

With mitigations and inclusion of the Tier 1 and 2 projects, the No-Build scenario (Scenario 1) improves as seen in Table 13. There are only 2 blocked intersections. The realignment and signalization of the Airway Drive/Peace Lane and E Vilas Road intersection significantly reduces the northbound and southbound turn lane percent time blocked previously displayed. The improvements are largely due to the Tier 2 project which widens East Vilas Road from two through lanes to four.

Table 13: Scenario 1 Significant Turn Bay and Intersection Blockages

Intersection	Approach	Blocked Turn Bay	Blocked Intersection	Average % Time Blocked
Hamrick Rd & Biddle Rd	EB	EBL		70
	WB	WBR		11
	NB	NBL		20
Lear Way & E Vilas Rd	EB	EBL		25
		EBR		18
	WB	WBL		10
		WBR		11
Crater Lake Hwy & E Vilas Rd	EB		Lear Way	14
		EBL		63
		EBR		9
	NB	NBL		70
		NBR		6
	SB	SBR		47
		SBL		41
E Vilas Rd & Peace Ln/Airway Dr	WB	WBL		38
Table Rock Rd & E Vilas Rd	EB	EBL		5
	WB		Airway Dr	45
		WBL		45
		WBR		13
	NB	NBL		16
		NBR		19
	SB	SBL		35
Table Rock Rd & Biddle Rd	WB	WBL		74
		WBR		47
	SB	SBL		49
		SBR		19
	NB	NBL		43
Industry Dr & E Vilas Rd	WB	WBL		31
	NB	NBL		36
	Total Blocked Turn Bays	**27**	**Total Blocked Intersections**	**2**

The construction of the Vilas Interchange causes significant queuing between the northbound and southbound ramps extending east and west (see Table 14). The eastbound queue extends from the northbound ramps to almost a mile past Table Rock Road onto Hamrick Road. The westbound East Vilas Road queue is even worse spanning the entire study area from Table Rock Road to CLH. The southbound ramps are blocked 18% of the time by westbound traffic on East Vilas Road and 34% of the time by the eastbound traffic. The northbound ramps are blocked 12% of the time by westbound

traffic. Ramp terminal blockage would impact Vilas Interchange operation and reduce efficiency.

Table 14: Scenario 2 Significant Turn Bay and Intersection Blockages

Intersection	Approach	Blocked Turn Bay	Blocked Intersection	Average % Time Blocked
Hamrick Rd & Biddle Rd	EB	EBL		22
Lear Way & E Vilas Rd	WB		Crater Lake Hwy	9
		WBL		35
Crater Lake Hwy & E Vilas Rd	EB	EBR		9
	NB	NBL		48
	SB	SBR		26
		SBL		12
E Vilas Rd & Peace Ln/Airway Dr	EB		Table Rock Rd	16
		EBL		35
		EBR		52
	WB		SB Ramps	18
		WBL		45
		WBR		47
	NB	NBR		6
Table Rock Rd & E Vilas Rd	EB	EBL		9
		EBR		47
	WB		Peace Ln/Airway Dr	22
		WBL		39
		WBR		13
	NB	NBL		11
		NBR		19
	SB	SBL		65
Table Rock Rd & Biddle Rd	WB	WBL		59
		WBR		37
	SB	SBL		45
		SBR		27
	NB	NBL		36
		NBR		27
SB Ramps & E Vilas Rd	EB		Peace Ln / Airway Dr	10
		EBR		8
	WB		NB Ramps	12
NB Ramps & E Vilas Rd	EB		SB Ramps	34
	WB		Lear Way	23
		WBR		80

	Total Blocked Turn Bays	26	Total Blocked Intersections	8

Crash Analysis Summary

The purpose of the crash analysis is to determine the relative predicted crash frequency amongst the scenarios. The following tables depict the total crashes for each scenario. The total is a sum of the Fatal and Injury (FI) and the Property Damage Only (PDO) crashes. The Highway Safety Manual (HSM) predictive spreadsheet tool for urban / suburban arterials is used for intersections and segments outside of the Vilas Interchange. The Enhanced Interchange Safety Analysis Tool (ISATe) is used for the JTA Expressway mainline segments, the ramps, and ramp terminals. The HSM and ISATe tables are in Appendix O. The arterial and Vilas Interchange predicted crashes were summed and are reported in Table 15 below. The construction of the Vilas Interchange increases the crash frequency by about 13%.

Table 15: Total Predicted Crash Frequency (crashes/year)

Scenario	Source	Total	FI[4]	PDO[3]
Scenario 0	HSM[1]	82	26	56
	Total	82	26	56
Scenario 1	HSM	107	34	73
	Total	107	34	73
Scenario 2	ISATe[2]	33	12	21
	HSM	88	28	60
	Total	121	40	81

[1]HSM is the Highway Safety Manual predictive spreadsheet tool for urban / suburban arterials and is used for intersections and segments outside of the Vilas Interchange.
[2]ISATe is the Enhanced Interchange Safety Analysis Tool used for the OR62 mainline segments, the ramps, and ramp terminals.
[3]PDO is Property Damage Only
[4]FI is Fatal and Injury in the HSM tool and the sum of fatal, incapacitating injury, non-incapacitating injury, and possibly injury fields in the ISATe tool.

Multimodal Level of Service Analysis

For this analysis the APM v2 Chapter 14 Simplified Multimodal Level of Service (MMLOS) was applied. This is based on the HCM 2010 MMLOS methodologies. The Simplified MMLOS Calculator spreadsheet tool available on the ODOT Planning and Technical Guidance webpage was used. The directional characteristics of each segment within the study area were entered to reflect the current conditions using Google Earth, including parameters such as number of lanes, sidewalk width, speed limit, and directional volume. A directional Pedestrian, Bicycle, and Transit LOS or LOS range was output for each segment. When the LOS was below D (E or F) potential multimodal mitigations were considered. The v/c or queue length mitigation recommended for

several facilities is to widen the roadway. With widening, a sidewalk will likely be added. Scenario 0 will be analyzed without a sidewalk while the two primary scenarios will be assumed to include the needed six-foot wide sidewalk. The existing bike lane will be included.

In summation, if a segment is recommended to be widened, then bike/ped facilities will be assumed to be included. If no widening occurs, Google Earth will be used to document "as-is" conditions.

Along Airway Drive, a five feet wide sidewalk is present along both the east and west sides of the developed section. The north and south ends of the segment are undeveloped and a sidewalk is not present. This will be reported as no sidewalk because that would be the most restrictive characteristic along the entire roadway. Peace Lane was realigned with Airway Drive. Currently there are no sidewalks, but here it will also be assumed that they will be included. The construction of Lear Way both north and south of East Vilas Road is assumed to include sidewalks.

To mitigate Scenario 0, adding a sidewalk generally improves the pedestrian LOS to C or better, except for along Pine Street/Biddle Road, Table Rock Road, Crater Lake Highway (and also East Vilas Road with the presence of the Vilas Interchange). This is because the LOS is driven by two-lanes of traffic in each direction with higher posted speeds and volumes. As noted in the Background Information Section, the stretch of East Vilas Road located roughly between the Upton Slough and Rainbow Drive is in an RPZ and will need a "Notice of Proposed Construction" permit from the FAA in order to add the recommended, as well as 2018 Medford TSP Standard required (Figure 3), pedestrian facilities. The details of the specific mitigations are in Appendix P.

To improve the bicycle LOS, first a bike lane or paved shoulder was added. While this did help on some roadway sections, a shoulder is only appropriate for rural areas and a bike lane is a minimal accommodation, not very acceptable by most users; facilities with greater separation are preferred. When this did not improve the LOS, a separated shared use path is suggested. The Shared Path Calculator spreadsheet tool was used to evaluate the resulting LOS. The following assumptions were made in the use of this calculator:

- Literature suggests a 20% factor to cover the peak period. The study area has a low bike and ped volume which does not have a large variance between intersections. For this reason, it is assumed that adding a separated multi-use path will have the same effect on the LOS on all segments. The bike and pedestrian LOS becomes an A wherever this mitigation is implemented.
- Directional Split = 0.52 based on actual counts as well as APM guidance to use 0.50 – 0.55.
- PHF=1
- 12' path width
- No marked centerline

A separated multi-use path is the recommended mitigation along Pine Street / Biddle Road from the west project limit to the east project limit on the north side of the roadway. It creates a useful eastward extension from the existing north-south Bear Creek Greenway. A separated path is also needed along Table Rock Road from Biddle Road to the North Project Limit; however, this is probably not feasible because the roadway is completely developed by commercial and industrial use. CLH is similarly developed, but a City of Medford Tier 1 project proposes a re-alignment of CLA 1,000 feet to the east of its current location running parallel to CLH. This would provide an ideal spot to locate the recommended separated multi-use path.

The Rogue Valley Transportation District (RVTD) route schedules were used to populate the transit tab to calculate the transit schedule speed and frequency inputs. See Appendix Q for route schedules and methodology documentation. The transit LOS is poor throughout the study area because it is determined by limited frequencies. Service every hour or so will always have a low LOS. CLH has a higher LOS because service is offered twice per hour. Frequencies are partly determined by funding and land use density, so this reflects the best available service and does not imply that the service is "bad". None of the scenarios evaluated modify the transit service, so it remains poor.

As can be seen in Table 16, segments in Scenario 0 are primarily at an unacceptable LOS level. With the mitigation strategy described in the preceding paragraphs, it is possible to improve every segment to an acceptable LOS, with the exception of Table Rock Road from Biddle Road north to the North Project Limit (Table 16). The recommended mitigation by segment and the MMLOS output tables are in Appendix P.

Table 16: Scenario 0 Simplified MMLOS Segment LOS Output Summary[1]

Roadway	Dir	From-To	Pedestrian LOS	Bicycle LOS	Transit LOS
E Vilas Rd	W	E Project Limit-Crater Lake Ave	C-E	**F**	n/a
E Vilas Rd	E	Crater Lake Ave-E Project Limit	C-E	**F**	n/a
E Vilas Rd	W	Crater Lake Ave-Crater Lake Hwy	**E**	**F**	n/a
E Vilas Rd	E	Crater Lake Hwy-Crater Lake Ave	**E**	**F**	n/a
E Vilas Rd	W	Crater Lake Hwy-Industry Dr	C	C-D	n/a
E Vilas Rd	E	Industry Dr-Crater Lake Hwy	**E**	C-D	n/a
E Vilas Rd	W	Industry Dr-Peace Ln	C	C-D	n/a
E Vilas Rd	E	Peace Ln-Industry Dr	**E**	C-D	n/a
E Vilas Rd	W	Peace Ln-Airway Dr	C	C	n/a
E Vilas Rd	E	Airway Dr-Peace Ln	**E**	C	n/a
E Vilas Rd	W	Airway Dr-Table Rock Rd	C	C-D	n/a
E Vilas Rd	E	Table Rock Rd-Airway Dr	**E**	C-D	n/a
E Vilas Rd	W	Table Rock Rd-W Project Limit	C	C-D	n/a

Roadway	Dir	From-To	Pedestrian LOS	Bicycle LOS	Transit LOS
E Vilas Rd	E	W Project Limit-Table Rock Rd	C-E	C-D	n/a
Pine St/Biddle Rd	W	E Project Limit-Table Rock Rd	**E**	**F**	**F**
Pine St/Biddle Rd	E	Table Rock Rd-E Project Limit	**E**	**F**	**F**
Pine St/Biddle Rd	W	Table Rock Rd-Hamrick Rd	**E**	**E-F**	n/a
Pine St/Biddle Rd	E	Hamrick Rd-Table Rock Rd	**E**	**E-F**	n/a
Pine St/Biddle Rd	W	Hamrick Rd-W Project Limit	**F**	C-E	n/a
Pine St/Biddle Rd	E	W Project Limit-Hamrick Rd	**E**	**E-F**	n/a
Hamrick Rd	N	S Project Limit-Pine St/Biddle Rd	B	C	n/a
Hamrick Rd	S	Pine St/Biddle Rd-S Project Limit	B-C	B	n/a
Hamrick Rd	N	Pine St/Biddle Rd-Beebe Rd	**E**	C-D	n/a
Hamrick Rd	S	Beebe Rd-Pine St/Biddle Rd	**E**	C-D	n/a
Table Rock Rd	N	S Project Limit-Biddle Rd	**E**	C-D	n/a
Table Rock Rd	S	Biddle Rd-S Project Limit	**E**	C-D	n/a
Table Rock Rd	N	Biddle Rd-E Vilas Rd	**E**	**E-F**	**F**
Table Rock Rd	S	E Vilas Rd-Biddle Rd	**E**	**E-F**	**F**
Table Rock Rd	N	E Vilas Rd-N Project Limit	**E**	**E-F**	**F**
Table Rock Rd	S	N Project Limit-E Vilas Rd	**E**	**E-F**	**F**
Airway Dr	N	S Project Limit-E Vilas Rd	B-C	**F**	n/a
Airway Dr	S	E Vilas Rd-S Project Limit	B-C	**F**	n/a
Peace Ln	N	E Vilas Rd-N Project Limit	C-E	**F**	n/a
Peace Ln	S	N Project Limit-E Vilas Rd	C-E	**F**	n/a
Industry Dr	N	S Project Limit-E Vilas Rd	B-C	C-D	n/a
Industry Dr	S	E Vilas Rd-S Project Limit	B-C	C-D	n/a
Crater Lake Hwy	N	S Project Limit-E Vilas Rd	**F**	C-E	D
Crater Lake Hwy	S	E Vilas Rd-S Project Limit	**F**	C-E	D
Crater Lake Hwy	N	E Vilas Rd-N Project Limit	**F**	C-E	C
Crater Lake Hwy	S	N Project Limit-E Vilas Rd	**F**	**E-F**	C
Crater Lake Ave	N	S Project Limit-E Vilas Rd	**E**	**F**	n/a
Crater Lake Ave	S	E Vilas Rd-S Project Limit	**E**	**F**	n/a
Crater Lake Ave	N	E Vilas Rd-N Project Limit	C-E	**F**	n/a
Crater Lake Ave	S	N Project Limit-E Vilas Rd	C-E	**F**	n/a

[1]Black-shaded cells indicate that the LOS is E or worse.

The MMLOS analysis was performed for all of the scenarios and those tables are shown in Appendix P. The MMLOS improvements beyond those already stated are:

Scenario 1 requires a separated multi-use path on East Vilas Road from Crater Lake Avenue to the west project limits.

The construction of the Vilas Interchange (Scenario 2) will require the separated multi-use path on East Vilas Road across the entire study area from the east project limit all the way to the west which is identified as a project in the City Of Medford Leisure Services Plan.

Other Operational Performance Measures

The overall simulation measures of effectiveness (MOE) are a network level assessment of the functionality of each scenario. Lower values for travel time, delay, and number of stops indicate higher efficiency while a higher value for speed indicates a more efficient scenario. As can be seen in Table 17, the Tier 1 and Tier 2 projects and proposed mitigations improve the efficiency of Scenario 0 for every MOE except for the number of stops. Scenario 1 has a 9% increase in stops from Scenario 0 and the Vilas Interchange further increases this. This is expected because the number of stops increases as more roadways are added and also volume increases at certain locations, and more control is added such as AWSC or new signals, which stop traffic flows which previously did not stop.

The addition of the Vilas Interchange in Scenario 2 increases the overall travel time and delay by about 35% and the number of stops by 23%. These are measures of efficiency of the network which can be seen to deteriorate in the Vilas Interchange Build scenario (Scenario 2).

Table 17: Year 2040 Overall Simulation Measures of Effectiveness[1]

Scenario	Travel Time (vehicle-hours)	Speed (mph)	Delay (vehicle-hours)	Number of Stops
No-Build				
Scenario 0	2,200	11	1,600	28,600
Scenario 1	1,500	19	800	31,200
JTA Build				
Scenario 2	2,000	20	1,100	38,300

[1]A stop is recorded every time a vehicle drops below 7 mph (crawl speed). A vehicle might have multiple stops on a single intersection approach.

In addition, the state version of the Highway Economic Requirements System (HERS-ST) was used to develop a delay analysis for the larger OR62 corridor area. HERS-ST is a modeling tool developed for the Federal Highway Administration (FHWA) to evaluate long-range system needs and performance. A dataset was developed for the project analysis, consisting of forty-one data sections covering the two basic alternatives. Scenario 1 (No Vilas Interchange) and Scenario 2 (With Vilas Interchange) were modeled with separate datasets. The OR 62 study area was divided into four homogenous analysis segments:

- MP 1.22 – 3.90; CLH from southern cut-and-cover interchange terminus with OR 62 to E Vilas Road
- MP 3.90 – 5.68; CLH from E Vilas Road to northern terminus of OR62
- MP 1.22 – 3.73; OR62 Expressway from southern terminus with CLH to E Vilas Road
- MP 3.73 – 5.82; OR62 Expressway from E Vilas Road to northern terminus at CLH

There are three elements of delay associated with the HERS-ST analysis: intersection delay, incident delay and congestion delay which are summed to define the total delay. Tables 18 and 19 show the average total delay for the corridor area by individual segment and totals for each scenario also grouped into two tables by direction (northbound and southbound). As can be seen, the interchange almost doubles the delay on the expressway. In fact, the presence of the interchange effectively splits the delay between CLH and OR62. Without the interchange, most of the total delay is on CLH; 69% NB and 75% SB. Without the interchange the expressway is able to most effectively remain efficient with less delay. With the presence of the interchange, the total delay is approximately split in half between OR62 and CLH. The interchange undermines the delay benefit a bypass was intended to create (See Figure 10).

Table 18: Average Total Delay (Hours per 1000 Vehicle Miles Traveled) Northbound

Scenario	CLH South of E Vilas Rd	CLH North of E Vilas Rd	OR62 South of E Vilas Rd	OR62 North of E Vilas Rd	Scenario Total	% Total on CLH	% Total on OR62
No-Interchange	49.55	5.05	5.65	19.37	79.62	69%	31%
With-Interchange	38.5	3.25	10.72	35.02	87.49	48%	52%

Table 19: Average Total Delay (Hours per 1000 Vehicle Miles Traveled) Southbound

Scenario	CLH South of E Vilas Rd	CLH North of E Vilas Rd	OR62 South of E Vilas Rd	OR62 North of E Vilas Rd	Scenario Total	% Total on CLH	% Total on OR62
No-Interchange	36.7	33.05	19.27	3.72	92.74	75%	25%
With-Interchange	30.57	17.93	24.25	9.58	82.33	59%	41%

Cost Effectiveness Assessment

A high level annual cost estimate is created for each scenario (in 2017 dollars). This captures the savings (or deficit) in annual cost with mitigations to the current network and also with the inclusion of the Vilas Interchange.

The annual cost generated by delay, fuel use, emissions, and crash with associated costs (added delay, fuel, and CO_2) is estimated. This net "year of construction" cost is compared for each scenario to the baseline conditions – i.e., the additional savings (or cost) created when the current network is mitigated with the Tier 1 and the Tier 2 projects, or when the Vilas Interchange is added in addition to the Tier 1 and Tier 2 projects. The results of this analysis can be seen in Table 20. Mitigating the current network creates a savings of about $45 million as the improvements reduce delay, fuel usage and emissions. Crashes still increase as the roadway network is expanded creating additional conflict points. The addition of the Vilas Interchange (Scenario 2) to the baseline conditions only precipitates an annual savings of about $25 million which is $20 million less savings to the community than Scenario 1. As seen in Table 20, the annual cost is primarily driven by delay. Further details are in Appendix R.

Table 20: Change in Net Cost between Progressive Scenarios

	Scenario Step	
Parameter	Baseline to Scenario 1	Baseline to Scenario 2
Delay	$46,000,000	$28,800,000
Fuel	$270,000	-$2,300,000
Emissions	$18,700	-$157,000
Crash[1]	-$920,000	-$1,700,000
Annual Savings with Mitigations:	$45,400,000	$24,600,000

[1]The Crash category includes the cost of the crash as well as the added delay, fuel, and CO_2 caused by the crash. These conversions were gleaned from the National Highway Traffic Safety Administration and The Economic and Social Impact of Motor Vehicle Crashes.

Another pertinent economic measure to evaluate is to quantify the cost of TSP projects and required intersection mitigations required to support a Vilas Interchange, broken out by jurisdiction. Although all of the city and county Tier 2 TSP projects in the study area were included in the analysis, some of the Tier 2 projects proved to be more critical than others. For that reason, the total cost is expressed as a range to capture this variation (Table 21). These are high level estimates (in 2019 dollars) and actual costs may vary. Note that widening East Vilas Road from two through lanes to four is City of Medford Project 632 and Jackson County Project R91 and is projected to cost about $16.4 million. Because it falls under two jurisdictions, the cost is split equally between the City and the County. Even with the lower cost range, this represents a significant required local investment that will need to be weighed against current goals and project priorities.

Table 21: Cost Range of Necessary Projects and Mitigations to Support Vilas Interchange

Jurisdiction	Low Total Cost	High Total Cost
Central Point	$4,100,000	$5,500,000
Medford	$30,800,000	$55,300,000
Jackson County	$10,700,000	$10,700,000

SCENARIO SUMMARY & COMPARISON

The performance of the No-Build/No-mitigation (Scenario 0) scenario is improved with appropriate mitigations as well as the addition of the Tier 1 and Tier 2 projects (Scenario 1), as can be seen in Table 22.

Scenario 1 performed better than Scenario 2 in almost every measure. Table 22 ranks the scenarios based on the performance measures analyzed. The overall network travel time of Scenario 1 is better than Scenario 2 by 500 hours and similarly the overall delay is lower than Scenario 2 by 300 hours. These measures of effectiveness indicate that the network is more efficient without the Vilas Interchange. Having the Vilas Interchange in place does result in no intersections to be over capacity, while without the Vilas Interchange, one location (Crater Lake Highway and East Vilas Road) exceeds capacity.

Without the Tier 1 and Tier 2 projects and intersection mitigations, there is extensive queuing on East Vilas Road across the entire study area causing frequent occurrences of intersection and turn bay blockages. One issue that concentrates the congestion on East Vilas Road is that only two east – west connectors exist in the area: OR140 and Vilas Road. The increased travel routes provided by the Tier 2 projects distribute the volume throughout the network thereby reducing the queuing. These projects also cause more locations to meet standards. The realignment of Peace Lane with Airway Drive triggered by the Tier 2 City of Medford Project (#632) / Jackson County Project (#R91) widening of East Vilas Road and Project (#629) extension of Coker Butte to Airway Drive/Industry Drive also contribute to improved performance in the two mitigated scenarios.

The JTA Expressway No-Build Vilas Interchange with Tier 2 projects (Scenario 1) has the overall best results in all measures except for the number of locations over capacity and the overall average network speed (Table 22). Especially noteworthy is that there are eight intersections blocked by queues in Scenario 2 which is 75% higher than Scenario 1 and 50% higher than the baseline conditions scenario. Both of the scenarios have a higher overall number of stops than the "do nothing" scenario with the Vilas Interchange Build having the highest number of stops. This would be expected with the inclusion of additional intersections.

The No-Build/No-mitigation scenario (Scenario 0) is improved in a number of ways by the inclusion of the Tier 1 and 2 projects (Scenario 1). The number of locations over capacity is reduced 85% due to the mitigations as well as the increased network

distributing the overall volume. The number of turn storage bays blocked more than 50% of the peak hour is reduced 70% and the number of intersections blocked by queues is cut in half. The overall average network speed is increased by 8 mph, the overall network travel time is decreased by 700 hours, and the overall network delay is decreased by 50%.

Table 22: Scenario Comparison for 2040 Results[1]

Measure	Scenario 0	Scenario 1	Scenario 2
Number of locations over standards[2]	7	1	**2**
Number of locations over capacity[3]	7	**1**	0
Number of turn storage bays blocked more than 50% of the peak hour	15	4	4
Number of intersections blocked by queues	4	2	**8**
Overall average network speed (mph)	11	**19**	20
Overall network travel time (hr)	2,200	1,500	**2,000**
Overall delay (vehicle-hours)	1,600	800	**1,100**
Overall number of stops	28,600	31,200	**38,300**
Number of predicted crashes	82	107	**121**
Number of segments with MMLOS worse than D	34	6	**8**
Economic Value[4]	N/A	1	**2**
Measure		**Scenario 1**	**Scenario 2**
Total number of Worst		1	9
Total number of Best		10	2

[1]The dark to light gray shading depicts the best and the worst performing scenario. The darker shaded cell is the worst and the lightest shade of gray is the best.
[2]Determined by OHP, HDM, City, or County Standards and Targets
[3]Defined as v/c > 1.0 or LOS E or F
[4]Change in total value between each scenario and baseline conditions

Crash frequency is another important parameter to consider. The presence of the Vilas Interchange creates a higher predicted crash frequency increasing from 107 to 121; however, the JTA Expressway mainline is not included in the No-Build values. Table 15 lists all of the scenarios' predicted crash frequencies from least crashes per year to the most.

The intersection of CLH with East Vilas Road is over standard in both scenarios. This intersection is a standalone issue with or without the Vilas Interchange and additional improvements. It is likely that jurisdiction of CLH will be transferred to the City of Medford. The City only requires an LOS D which is less stringent than the v/c of 0.85 (OHP) or 0.75 (HDM). Upon jurisdiction transfer, the standard would be met in the Build scenario (Scenario 2).

The construction of the Vilas Interchange does little to improve the intersection performance measures (v/c and LOS's) and even worsens a couple of locations in the study area. When mitigations do reduce the v/c or LOS, the standard is met only by a small margin. This indicates that the network has very little reserve capacity available. Given that the analysis is based on the existing comprehensive plans, the assumed land use and employment rates must be maintained. The existing land use is industrial. It is likely that a Vilas Interchange will attract commercial entities over time which typically create much higher traffic volumes. The network does not have the reserve capacity for additional demand. A land use or employment change along East Vilas Road would potentially require a study for intersection grade separation at major intersections. Furthermore, access restrictions would need to be implemented on East Vilas Road to prevent further exacerbation of long queues.

FINDINGS

With no-mitigation, the entire study area will have extensive queuing and congestion.

Generally the network functions better without the Vilas Interchange (Scenario 1). With mitigations and no Vilas Interchange, the IMSA has only one location over standard, the shortest overall network travel time, the least amount of delay, and the lowest number of intersections blocked by queues.

The presence of the interchange causes some traffic pattern shifts which have a significant impact and are contrary to the purpose of an expressway. The interchange causes more short, local trips to utilize the expressway thereby displacing the longer distance trips onto local roadways. This traffic flow pattern change undermines the reason that the expressway was originally built by putting longer distance trips on local roadways and shorter local trips on the highway system. Furthermore, the interchange almost doubles the delay on the expressway due to the additional local trips. In fact, the presence of the interchange effectively splits the delay between CLH and OR62. Without the interchange, most of the total delay is on CLH and the expressway is able to most effectively remain efficient with less delay.

The Vilas Interchange (Scenario 2) allows Crater Lake Highway to meet the City of Medford LOS standard (assuming future jurisdictional transfer from ODOT) and also increases the overall average network speed by 1 mph; however, extensive queuing causes intersection blockage across East Vilas Road and the annual savings precipitated by additional delay, fuel consumption, emissions, and crashes compared to the baseline conditions is $20 million less than the savings created by Scenario 1 (even excluding the cost of the Vilas Interchange itself). Also, the Tier 1 and 2 projects and necessary intersection mitigations required to support the interchange require a substantial financial investment of future funds that will have to be weighed against other local priorities. The JTA Expressway No-Build Vilas Interchange scenario (Scenario 1) is the best overall scenario that allows the most efficient and cost-effective transportation network.