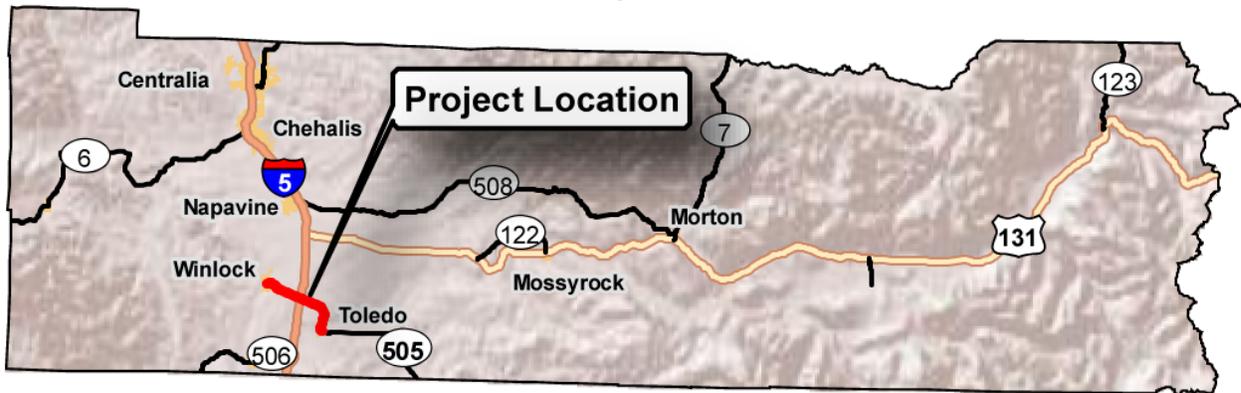


# South Lewis County SR 505 Transportation Infrastructure Strategic Plan

February 2010



Prepared for:



**Lewis County**

Lewis County, WA

With assistance of:

WSDOT - Southwest Region

City of Winlock

City of Toledo

Cowlitz Indian Tribal Housing

Cowlitz Wahkiakum Council of Governments

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## **PARTICIPATING AGENCIES AND INDIVIDUALS**

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The following agencies and individuals participated in creating this corridor plan. Many of those listed served on the project's stakeholders committee.

<b>Lewis County Public Works</b>	<b>Lewis County Planning and Development</b>
John Huestis, County Engineer	Barbara Kincaid, Long Range Planner
Michael Kroll, Transportation Planner	Phil Rupp, Planning Manager
Erik Martin, Traffic Engineer	
<b>City of Toledo</b>	<b>City of Winlock</b>
Mayor Jerry Pratt	Mayor Cy Meyers
<b>Cowlitz Indian Tribal Housing</b>	<b>Cowlitz Wahkiakum Council of Governments</b>
Larry Coyle - Director	Rosemary Siipola, Senior Planner
<b>Washington State Department of Transportation</b>	<b>Cowlitz Indian Tribe</b>
Sharon E. Zimmerman, SW Planning Manager	Kim Stube, Transportation Director
Karyn Anderson, Transportation Planner	
Dave Bellinger, Utilities and Agreements Engineer	<b>Consultants</b>
Yanming Yao, Transportation Planner	Mark Cook, PE - CEDS, Inc.
Chad Hancock, SW Region Traffic Engineer	Rishi Rao, AICP – Perteet
Kevin Miller, Area Engineer	Mike Horton, PE- Perteet
Collin Newell, Area Engineer	Michael Booth, AICP – Perteet
Brian Walsh, State Traffic Design and Operations Engineer	Jill Oliver – Perteet
Jeff Barsness, Development Reviewer	Wendy Nelson – Perteet

## **CONCURRENCE SIGNATORIES**

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The following agencies participated as stakeholders representing a variety of transportation interests. The conclusions and recommendations cited throughout the plan were endorsed during the course of the study. A copy of endorsed actions is provided in APPENDIX G of this report.

## EXECUTIVE SUMMARY

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### Background

During the fall of 2005, the City of Winlock, Washington located in southwest Lewis County; issued a final environmental impact statement (FEIS) for amending its related growth management policies, land uses actions, and future planning actions. The document was produced to support the City's Urban Growth Area (UGA) expansion east towards Interstate 5 (I-5) in Lewis County.

The transportation component of the FEIS forecasts significant increases in traffic demand over the 20-year period of evaluation. Lewis County, anticipating potential traffic impact in the area, worked with Washington State Department of Transportation (WSDOT) staff from the Southwest Region to secure a 2004 federal transportation earmark ("Widen I-5 in Lewis County"). The county included traffic studies in its Six-Year Transportation Plan and wrote a project prospectus with WSDOT to begin traffic analysis for the SR 505 corridor from the City of Winlock to the City of Toledo.

In 2007, several large potential land developers expressed interest in the newly designated industrial and commercial lands within Winlock's UGA. All of the developers expressed concerns regarding the lack of public right-of-way accessing key properties north of SR 505. The City of Winlock, working with an area property owner, contracted a local engineering firm to design a potential public roadway from SR 505 (extension of Knowles Road) through property formally known as "Mickelsen Dairy". The route provides future public access to lands currently zoned commercial and industrial within the City of Winlock comprehensive land use plan. The design allowed Lewis County to establish public right-of-way over the route for future roadway construction. Establishment of the right-of-way provides further evidence of the increasing urbanization of SR 505 corridor between the cities of Winlock (MP 0.0) and Toledo (MP 6.8).

As the likelihood for development in the area increases, deteriorating levels of service at intersections and segments along SR 505 is inevitable. Lewis County, working with the cities of Winlock and Toledo, WSDOT, the Cowlitz Indian Tribe, and the Cowlitz Wahkiakum Regional Transportation Planning Organization elected to pursue the South Lewis County SR 505 Transportation Infrastructure Strategic Planning effort. In a companion effort, Lewis County Community Development Department began a sub-area planning effort for a similar geographic area. This Corridor Plan forecasts impacts to existing transportation facilities within the subarea and proposes necessary mitigations to maintain Lewis County's adopted level of service (LOS) D at intersections and along roadway segments. These planning efforts compliment work that has been already completed within the study area (City of Winlock FEIS). This study adequately addresses anticipated congestion resulting from currently zoned commercial and industrial properties in the area and meets the needs of more intense land uses within the region well into the future (2035).

## Study Process

Key stakeholders along the SR 505 Corridor were identified to participate in a Stakeholder Committee to provide input to the development of the South Lewis County SR 505 Transportation Infrastructure Strategic Plan. The stakeholder group worked alongside the consultant project team in identifying project purposes and providing input on project elements including an outreach strategy.

Key components of the outreach strategy included a project Web site; outreach collateral materials such as a project fact sheet; an open house event; and a traveling project display with information at several locations.

In addition, presentations and updates were given at several key project milestones to the councils of the City of Winlock and the City of Toledo, as well as the Lewis County Board of County Commissioners.

Overall, the study examines existing conditions and documents indentified deficiencies. Future conditions are evaluated to a planning horizon considering local land uses and components such as operating conditions, environmental concerns, population, right-of-way, and other elements that affect the highway's development and the populations that it serves.

## Study Recommendations

Multiple intersections and safety segment improvements were identified; specifically, the following intersections on SR 505 and Lewis County arterials were analyzed:

Lewis County Arterials	SR 505 and Intersections
Highway 603 (North of Winlock)	Highway 603 Intersection (AKA Kerron Street / Walnut Street)
North Military Road	Nevil Road
Jackson Highway	Cemetery Road
Tucker Road	Kakela Road
	North Military Road
	South Military Road
	Knowles Road
	Southbound I-5 Ramps
	Northbound I-5 Ramps
	Camus Road
	Henriot Road
	Jackson Highway / Plomondon Road
	Ash Road /State Route 506
	Harkins Road*

\*This intersection was added to account for potential future development.

Congestion mitigation projects are necessary to maintain forecast land uses within the study area by 2035.

There were two possible mitigation strategies:

1. Signalization of key intersections
2. Roundabouts at key intersections

Based on screening of these two mitigation strategies through traffic forecasting, speed analyses, environmental screening, and the operations / maintenance cost, stakeholders agreed that each strategy has merit though the group did acknowledge a preference to pursue the roundabout alternative. The draft agreement (General Cooperative Agreement or GCA) of key stakeholders is located in Appendix G.

A 25-year comparative analysis suggests that the cost for roundabouts could be significantly reduced by crediting project life cost savings from collision reduction, maintenance savings, and fuel savings (\$7.5 million +/-).

Each strategy requires supporting actions by local jurisdictions. Each strategy ensures operating levels of service D or better at 2035. Currently, the identified funding vehicle for all forecast improvements is via developer mitigation. Transportation improvement plans for the intersections and mitigation strategy are provided for planning horizons 2014, 2020, and 2035. 2009 capital investment costs are approximately \$12.7 million (combined SR 505 and local) for signals and \$13.5 million (combined SR 505 intersections and local projects) for roundabouts. The range of transportation improvements that are planned by WSDOT and Lewis County are detailed in Appendix H.

### **Recommended Long Term Option**

Roundabouts are the preferred strategy for mitigating intersections under 2035 traffic conditions. Owing to site topography, current permitted access, and the number of existing legal lots of record; a divided highway segment from MP 2.88 (SB Ramps) to MP 2.22 (North Military Road) may provide minimal benefit. The addition of the truck-climbing lane on the north side of the highway from MP 2.88 to MP 2.52 (Knowles Road / Mickelsen Parkway) is anticipated to minimize access congestion (in-bound) on the hill segment. SR 505 roundabout costs are estimated at approximately \$8.2 million. The detailed cost benefit analysis is detailed in Appendix F.

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<b>Appendix F</b>	Cost Benefit Analysis
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<b>Appendix H</b>	CIP – WSDOT and Lewis County 2014, 2020, 2030

# CHAPTER 1: EXISTING ROUTE CHARACTERISTICS / CONDITIONS

## 1.1 Study Area

The study area<sup>1</sup> and land use that were studied in the Subarea and Transportation Analysis is illustrated in Exhibit 1. The existing study area includes local roadways within the South Lewis County subarea and along SR 505 from mile post 0.0 (downtown City of Winlock) to mile post 6.8 (downtown City of Toledo). In addition, one interchange to the south of the study area (Exit 60) and one to the north (Exit 68) are being evaluated for existing and future conditions. During initial traffic counting efforts, the consultant collected existing traffic volumes along three key local corridors (Highway 603 [North of Winlock], North Military Road, and Jackson Highway) and at seven key subarea intersections. The following intersections on State Route 505 and Lewis County arterials were analyzed:

Lewis County Arterials	SR 505 and Intersections
Highway 603 (North of Winlock)	Highway 603 Intersection (AKA Kerron Street / Walnut Street)
North Military Road	Nevil Road
Jackson Highway	Cemetery Road
Tucker Road	Kakela Road
	North Military Road
	South Military Road
	Knowles Road
	Southbound I-5 Ramps
	Northbound I-5 Ramps
	Camus Road
	Henriot Road
	Jackson Highway / Plomondon Road
	Ash Road /State Route 506
	Harkins Road*

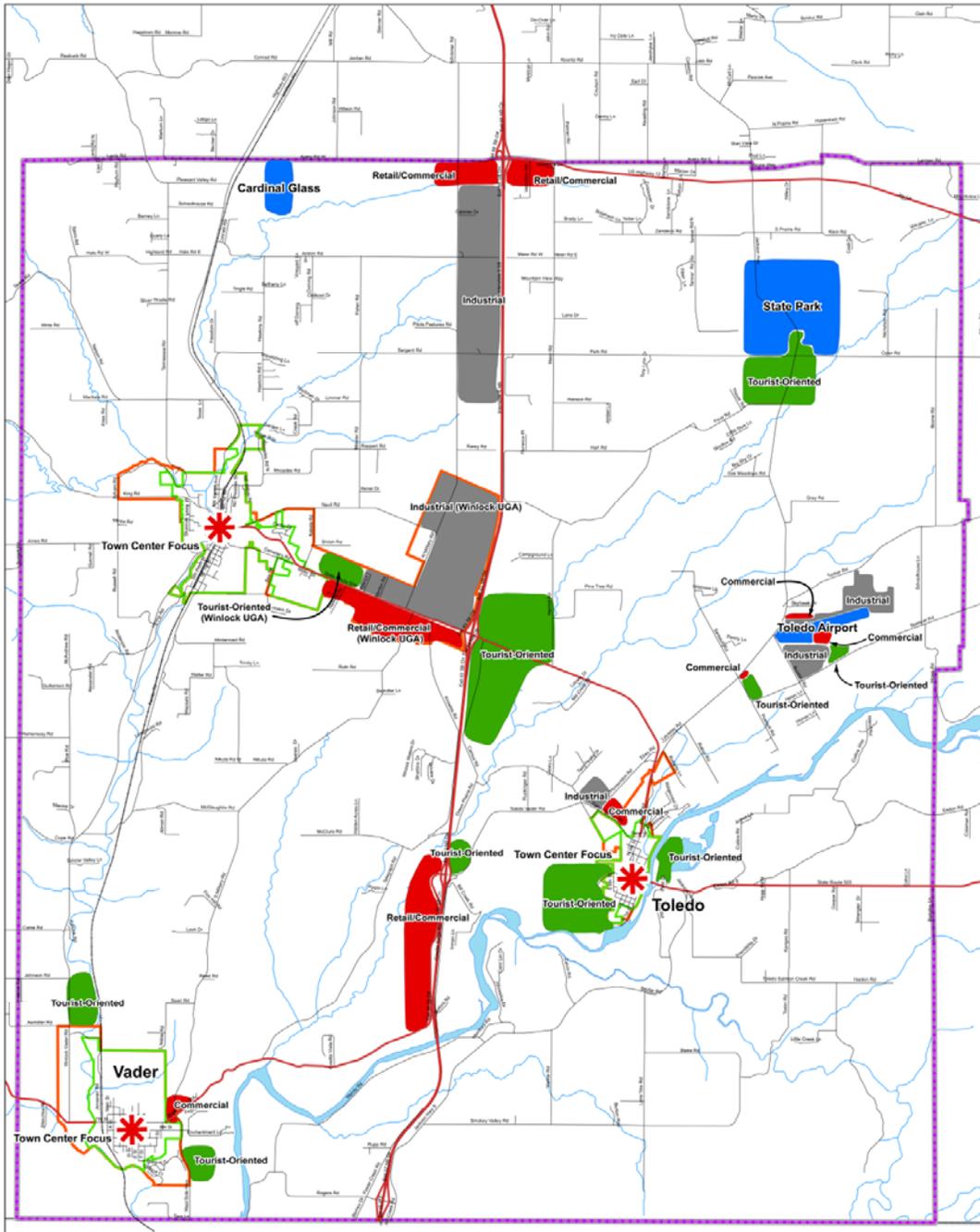
\*This intersection was added to account for potential future development.

## 1.2 Route Classification

Within the study area, SR 505 is designated as a rural collector on the state highway system. It is predominately Class 3 access control in the corridor with two exceptions: Limited Access (full control) between the ramps for I-5; and Class 5 at MP 5.25. Class 3 is described as being a balance between mobility and access in areas with less than maximum build out. Class 3 highways have a minimum intersection spacing of 0.5 miles and a minimum access spacing of 330'. More detail regarding access control classification appears in Section 2.3.

<sup>1</sup> Stakeholder meeting No. 1 – April 28, 2008 (Appendix C – Stakeholder Meetings)

**Exhibit 1  
STUDY AREA**



**South County SubArea  
Aggressive  
Development**

Industrial Land: 1,500 - 1,600 acres  
 Tourism Land: 1,500 - 1,600 acres  
 Retail Land: 750 - 850 acres

**Legend**

- Existing Development
- ✱ Town Center Focus
- Industrial Aggressive
- Retail Aggressive
- Tourism Aggressive
- SubArea
- Cities
- UGAs

**DRAFT**



Data sources supplied by Lewis County 2008 and may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.  
 MAP DATE: APRIL 2009

### **1.3 Access Classification and Densities**

In 1991, the Washington State legislature enacted statutes establishing rules in Chapter 47.50 of the Revised Code of Washington (RCW) to protect the safety and capacity of the state highway system through access management. Access control manages vehicle turning movements onto and off of state highways to improve system performance, minimize traffic conflicts, and increase traffic control flow. The Washington Administrative Code (WAC) 468-52 established five classification categories for non-limited access highways like SR 505. Exhibit 2 lists and defines the five classification categories.

**Exhibit 2  
Access Classifications**

<b>Class</b>	<b>Non-Conforming<sup>[1]</sup></b>	<b>Variance<sup>[2]</sup></b>	<b>Conforming<sup>[3]</sup></b>	<b>Access Point Spacing<sup>**</sup></b>	<b>Limitations<sup>[4]</sup></b>
<b>Class 1</b> Mobility is the primary function	Yes*	No	No	1320 ft	<ul style="list-style-type: none"> <li>• One access only to contiguous parcels under same ownership</li> <li>• Private access connection is not allowed unless no other reasonable access exists (must use local road/street system if possible)</li> </ul>
<b>Class 2</b> Mobility is favored over access	Yes*	Yes*	No	660 ft	<ul style="list-style-type: none"> <li>• One access connection only to contiguous parcels under same ownership unless frontage &gt;1320 ft</li> <li>• Private access connection is not allowed unless no other reasonable access exists; must use local road/street system if possible</li> </ul>
<b>Class 3</b> Balance between mobility and access in areas with less than maximum buildout	Yes	Yes	Yes	330 ft	<ul style="list-style-type: none"> <li>• One access connection only to contiguous parcels under same ownership</li> <li>• Joint access connection for subdivisions preferred; private connection allowed, with justification</li> </ul>
<b>Class 4</b> Balance between mobility and access in areas with less than maximum buildout	Yes	Yes	Yes	250 ft	One access connection only to contiguous parcels under same ownership; except with justification
<b>Class 5</b> Access needs may have priority over mobility	Yes	Yes	Yes	125 ft	More than one access connection per ownership, with justification

\*The access connection continues only until such time other reasonable access to a highway with a less restrictive class or acceptable access to the local road / street system becomes available and is allowed.

\*\*Minimum, on the same side of the highway.

[1] See 540.09(2)

[2] See 540.09(3)

[3] See 540.09(1)

[4] Unless grandfathered (see 540.08)

Source: WSDOT Design Manual (M 22-01.5, Page 540-18), June 2009

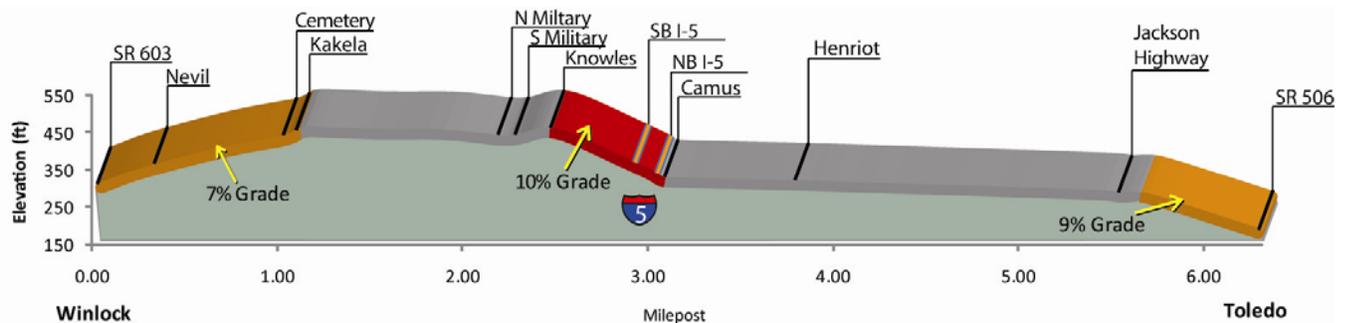
## 1.4 Access Densities

Access densities typical for urban areas are reflected in the rural segment along SR from MP 2.88 – MP 1.01. Right side densities are approximately 6.1 per mile and equal densities on the left (6.1 per mile). These densities are sufficient to raise concern regarding future forecast congestion in the corridor.

## 1.5 Terrain / Physical Elements

The area generally rises in elevation from the Cowlitz River (Toledo, MP 6.8; approximate elevation of 105 feet above Mean Sea Level) towards the City of Winlock (MP 0.0, approximate elevation of 300 feet above MSL). The approximate grade leaving the City of Toledo westbound is 9%. Rolling terrain best describes the landscape west of I-5 to the city limit of Winlock. The terrain then slopes gradually downward at an approximate grade of 7% into the City center. There are two sustained grades in the study area: an approximate grade of 10% west of Camus Road to Knowles Road and a grade of about 7% from the downtown core of Winlock to just east of Cemetery Road. The general topography is illustrated in Exhibit 3.

**Exhibit 3**  
**Study Area Topography Cross Section**



## 1.6 Geometric Elements

A complete “as constructed” centerline survey for SR 505 (MP 0.0 to MP 6.85) does not exist. A centerline profile was generated from Lewis County Light and Distance Ranging (LiDAR) data and plotted. The data provides two-foot contour intervals. The resulting centerline profile was plotted and correlated to collision data. Additional vertical information (survey control) is needed to complete a deficiency review of vertical alignments. No survey data has been collected or generated that will enable a deficiency review of horizontal alignments. Historic design files represent the intended design only and provide little insight as to the “as constructed” final geometrics.

It should be noted that while existing geometrics might fail today’s standards at 50 mph, speed reduction could easily migrate any current vertical and/or horizontal deficiencies to acceptable levels.

## 1.7 Parking Lanes / Surface and Shoulder

On-street parking on SR 505 is prohibited in the City of Winlock. The only exception is parallel parking on the north side of SR 505 approaching the intersection of First Street. Parallel parking is generally allowed on both sides of SR 505 in the City of Toledo. The exceptions to parking occur at North Fifth / Kellogg Way / St. Helens Street, Silver Street, and at the Cowlitz River Bridge.

SR 505 physical features are taken from WSDOT State Highway Log records. Asphalt concrete pavement width varies from a maximum width of 44 feet (MP 6.78) to a minimum width of 22 feet (MP 2.22 to MP 6.45). Shoulders throughout the study area are paved ranging from widths of 2 to 8 feet. A more detailed listing of physical features is provided in Appendix A, Existing Conditions.

The **State Highway Log** - includes road features such as bridges, intersections, and undercrossings; roadside features such as rest areas and side streets; jurisdictional information such as city and county boundaries as well as information about speed limits and number of lanes.

## 1.8 Crosswalks and Bike Paths

There are marked crosswalks at the intersection of Front Street in Winlock and at the intersection of Front Street in Toledo. There is a designated pathway plan in the City of Toledo along a short section of SR 505 in the study area.

## 1.9 Bridges and Intercrossing Structures

WSDOT Bridge Inspection Manual 2006 defines a bridge as: “A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous openings”.

There are eight bridges located on SR 505. Six of those bridges are located within the study area and are listed in the road log including the bridge (overpass) over I-5. The other five structures span the following:

- Olequa Creek
- Bear Creek
- Lacamas Creek
- Mill Creek
- Cowlitz River

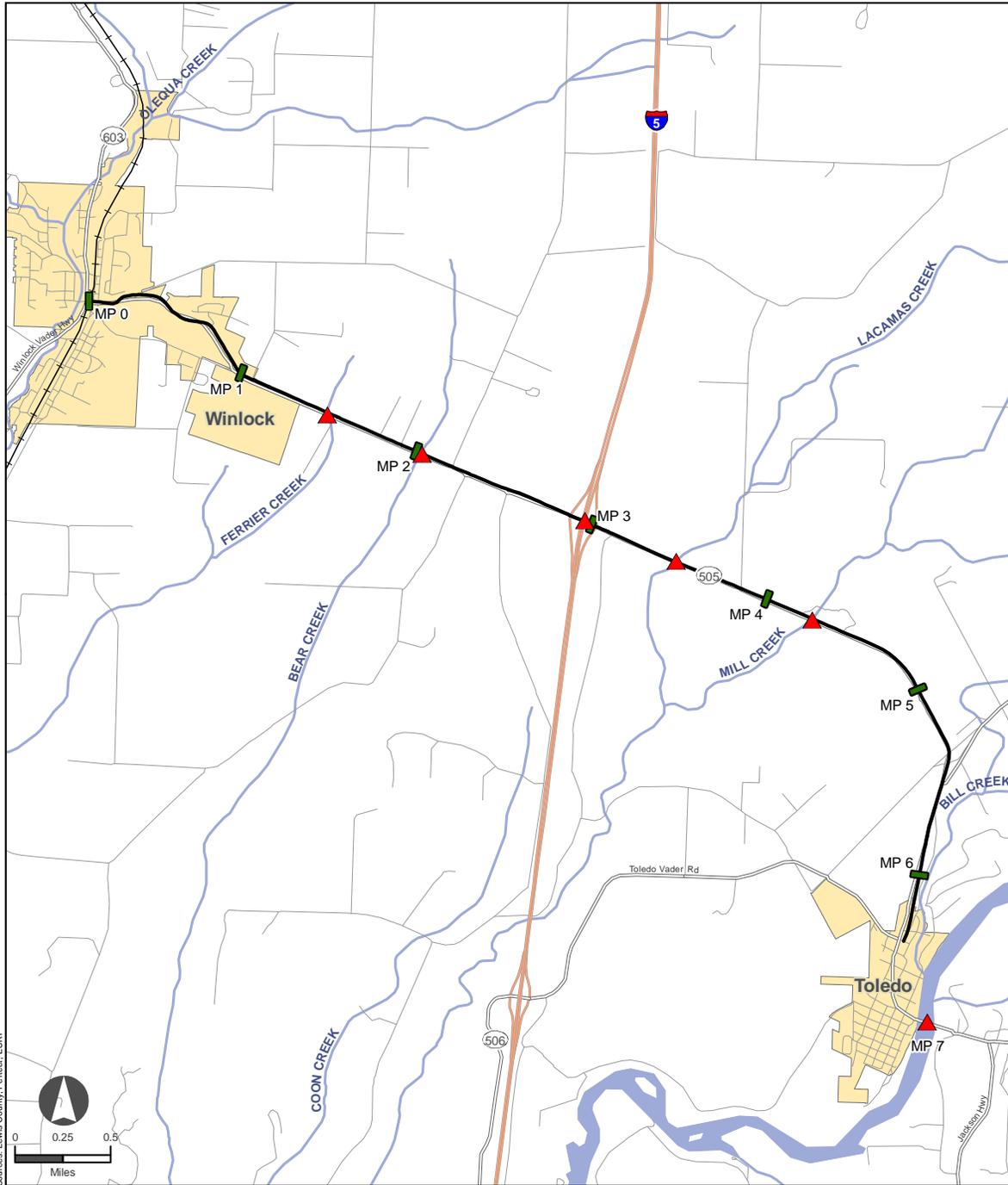
WSDOT’s Bridge and Structures Office provides the full engineering services, historic data. Bridge location, route, milepost and related files for bridge structures. Following is information listed in Exhibit 4 is abstracted from this website related to the six study SR 505 bridges.

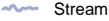
**Exhibit 4  
SR 505 Bridge Data**

<b>Bridge No. 505-</b>	<b>Bridge Name</b>	<b>County</b>	<b>Location</b>	<b>Milepost</b>
110	Cowlitz River Bridge	Lewis	3.9 E JCT I-5	6.79
115	Mill Creek	Lewis	1.3 E JCT I-5	4.26
120	Lacamas	Lewis	0.5 E JCT I-5	3.47
125	I-5 OC	Lewis	JCT I-5	2.94
130.25	Bear Creek Culvert 2.1	Lewis	E Beginning SR 505	2.10

The crossing at Bear Creek is listed as being a box culvert while all others are identified as bridges. WSDOT’s “2007 Annual Traffic Report” road log does not provide any details beyond identifying a box culvert at Bear Creek. This study does not provide field reconnaissance to verify elements reported within the road log. Exhibit 5 shows the bridge over I-5 at Exit 63.

**Exhibit 5  
Exit 63 Overpass at I-5**



 		<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Bridges</li> <li> Mileposts</li> <li> 505 Study</li> <li> Rail</li> <li> Stream</li> <li> City Limit</li> </ul>		<p><b>Bridges</b></p>
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## 1.10 Right-of-Way

Right-of-way width varies throughout the study area (MP 0.0 to MP 6.8). WSDOT provided plan and profile sheets for several projects from 1950's to 1990's within the study area. Widths vary from approximately 50 feet (downtown City of Winlock) to 117 feet at MP 4.89. There appears to be 60 feet through the downtown area of Toledo. Many of the documents provided date back into the 1940s and some date back to 1919. Significant research by a right-of-way specialist will be required to create a right-of-way for the study area.

## 1.11 Traffic Control

Within the study area, there are 14 non-signalized intersections. In addition, there are many local accesses, private, or dead-end streets present that have been considered on a cumulative and not individual basis.

Field observations were conducted to verify the characteristics of 13 study intersections (traffic controls, channelization, and approaches), traffic operations, and travel time for traffic model calibration. Exhibit 6 summarizes the characteristics of the SR 505 study corridor intersections. Exhibit 7 shows these locations on the map.

### **What is Right-of-Way?**

Right-of-way is the property the state owns.

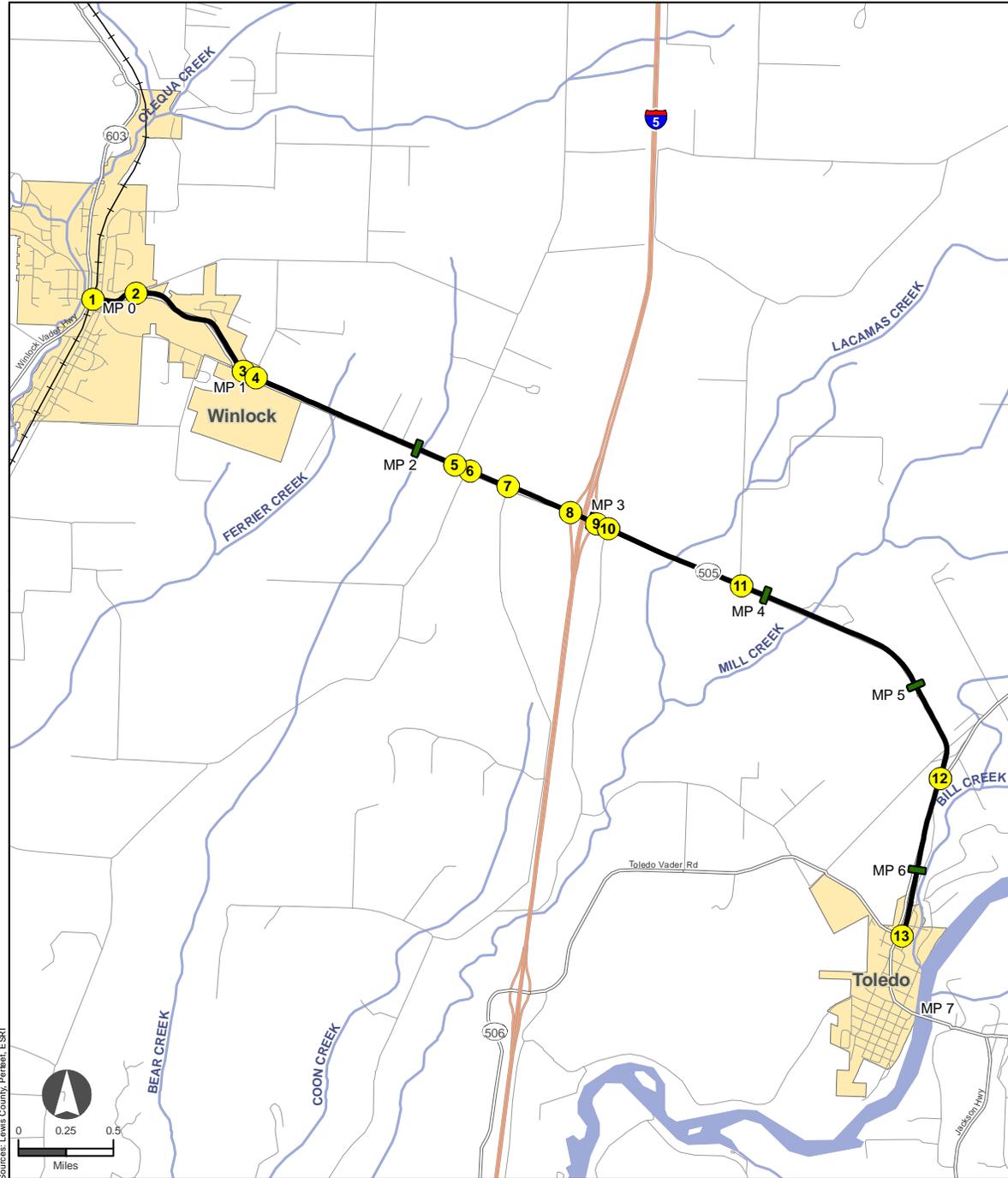
For this document it is the land for the highway corridor and all its facilities, including land for detention ponds, wetland mitigation, and other necessities to maintain the transportation system.

Exhibit 6  
**SR 505 Corridor – Intersection Characteristics**

MP	SR 505 Intersection	Intersection Type	Channelization	Traffic Control	Study ID Number
- 0.1*	Highway 603 (AKA Kerron Street / Walnut Street)	4-Leg	Single Lane Approaches	3-way stop (WB Free)	1
0.23	Nevil Road	T-intersection located northeast	Single Lane Approaches	1-way stop	2
1.01	Cemetery Road	T-intersection located west	Single Lane Approaches	1-way stop	3
1.08	Kakela Road	T-intersection located north	Single Lane Approaches	1-way stop	4
2.22	North Military Road	T-intersection located south	Single Lane Approaches	1-way stop	5
2.31	South Military Road	T-intersection located south	Single Lane Approaches	1-way stop	6
2.52	Knowles Road	T-intersection located south	Single Lane Approaches	1-way stop	7
2.88	Southbound I-5 Ramps	4-Leg (On-Off Ramps)	Single Lane Approaches	1-way stop	8
3.03	Northbound I-5 Ramps	4-Leg (On-Off Ramps)	Single Lane Approaches	1-way stop	9
3.09	Camus Road	T-intersection located south	Single Lane Approaches	1-way stop	10
3.85	Henriot Road	T-intersection located north	Single Lane Approaches	1-way stop	11
5.46	Jackson Highway / Plomondon Road	4-Leg	Single Lane Approaches additional NB RTL	2-way stop	12
6.32	Ash Road / Kellogg Way	4-Leg	Single Lane Approaches	2-way stop	13

\*Included owing to its proximity to MP 0.0.

**Exhibit 7  
Intersections Location Map**



Source: Lewis County, Pertteet, ESRI

 	<p><b>Legend</b></p> <table border="0" style="width: 100%;"> <tr> <td><span style="color: yellow;">●</span> Intersections</td> <td> Rail</td> </tr> <tr> <td> Milepost</td> <td> Stream</td> </tr> <tr> <td> 505 Study</td> <td> City Limit</td> </tr> </table>	<span style="color: yellow;">●</span> Intersections	 Rail	 Milepost	 Stream	 505 Study	 City Limit	<p><b>Intersections</b></p>
<span style="color: yellow;">●</span> Intersections	 Rail							
 Milepost	 Stream							
 505 Study	 City Limit							

## 1.12 Speed Limits

The posted speed limit for the rural areas along SR 505 east of I- 5 is 55 mph. 50 mph is the posted speed west of I-5. Speeds are reduced at the city limits for the cities of Toledo and Winlock. Progressive speed reduction occurs (40mph) to 25 mph as you approach the downtown core areas of both cities. Exhibit 8 lists the speed limits obtained from the WSDOT Highway Log (2007) and have been verified in the field.

**Exhibit 8**  
**Posted Speed Limits**

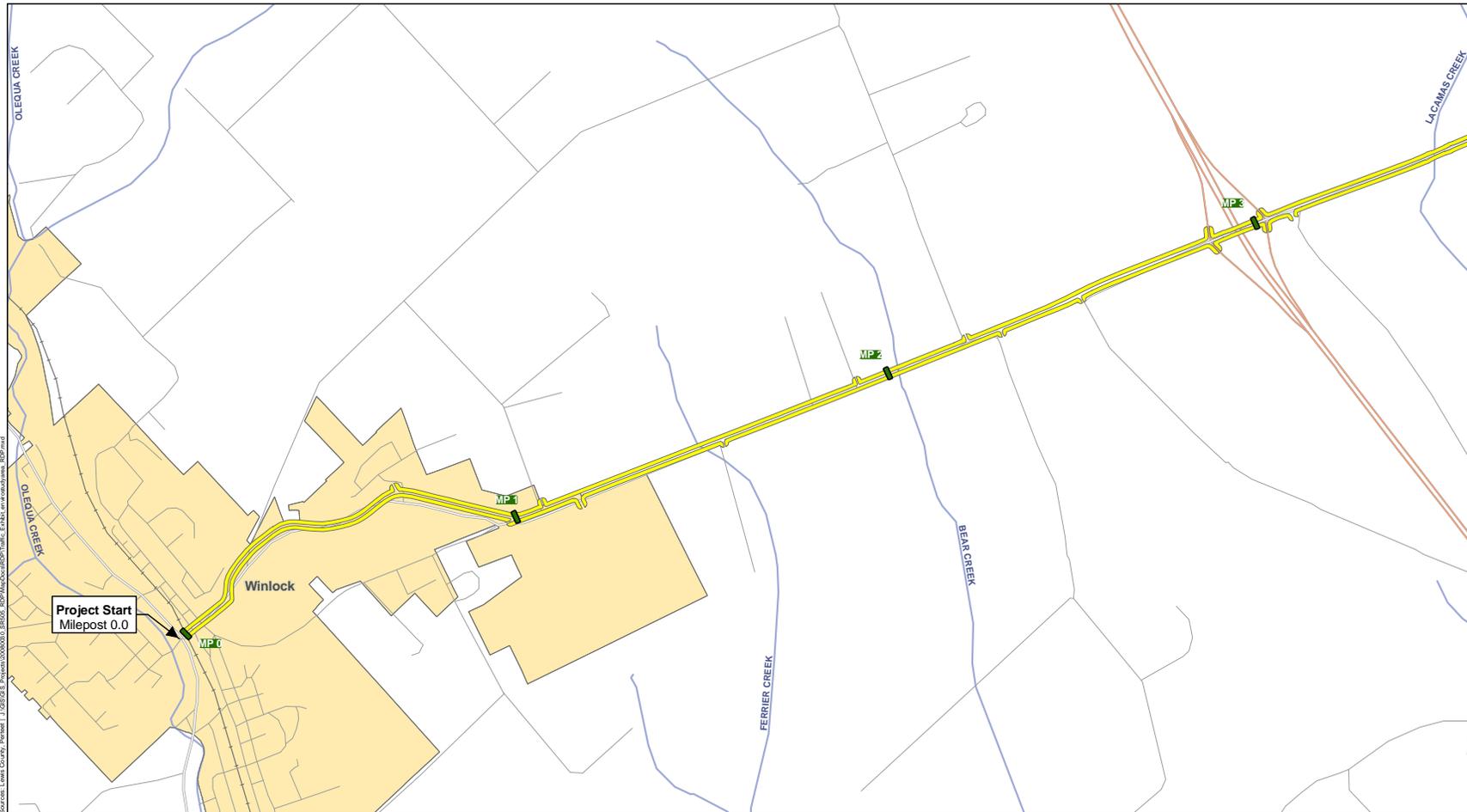
Milepost	Posted Speed Limit	West	East
0.00 – 0.74	25	Highway 603	Cedar Crest Drive
0.74 – 1.01	40	Cedar Crest Drive	Winlock City Limit
1.01 – 3.03	50	Winlock City Limit	Camus Road
3.03 – 5.00	55	Camus Road	Milepost 5
5.00 – 6.16	40	Milepost 5	Toledo City Limits
6.16 – 6.32	25	Toledo City Limits	SR 506 (Ash Road)

Source: WSDOT State Highway Road Log, 2007.

## 1.13 Environmental

Environmental screening was conducted on the 6.8 mile corridor by evaluating 50 feet beyond existing roadway edges, as illustrated in Exhibit 9. The overall area totals approximately 85 acres, with 28.3 acres of impervious surfaces (roadways) and was overlaid onto Lewis County Geographic Information Service environmental coverage layers to inventory environmental resources, environmental hazards, and the human environment. Some of the collected environmental screening data is summarized below. Additional information is available in Appendix A – Existing Conditions.

**Exhibit 9  
Environmental Screening Study Area**



	 	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: yellow; border: 1px solid black; margin-right: 5px;"></span> Standard Analysis Study Area</li> <li><span style="display: inline-block; width: 15px; border-bottom: 1px solid blue; margin-right: 5px;"></span> Stream</li> <li><span style="display: inline-block; width: 15px; border-bottom: 1px dashed orange; margin-right: 5px;"></span> City Limit</li> </ul>	<p>Environmental Screening Study Area</p> <p style="text-align: right;"><b>Sheet 1</b></p>
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For this study, environmental resources are divided into three categories:

1. Natural resources (critical areas typically regulated by local, state and federal law)
2. Natural hazards (areas/resources/natural systems that pose a potential hazard to people and property)
3. Built Environment (community, population and potential effects on community services)

## **1.14 Wetlands**

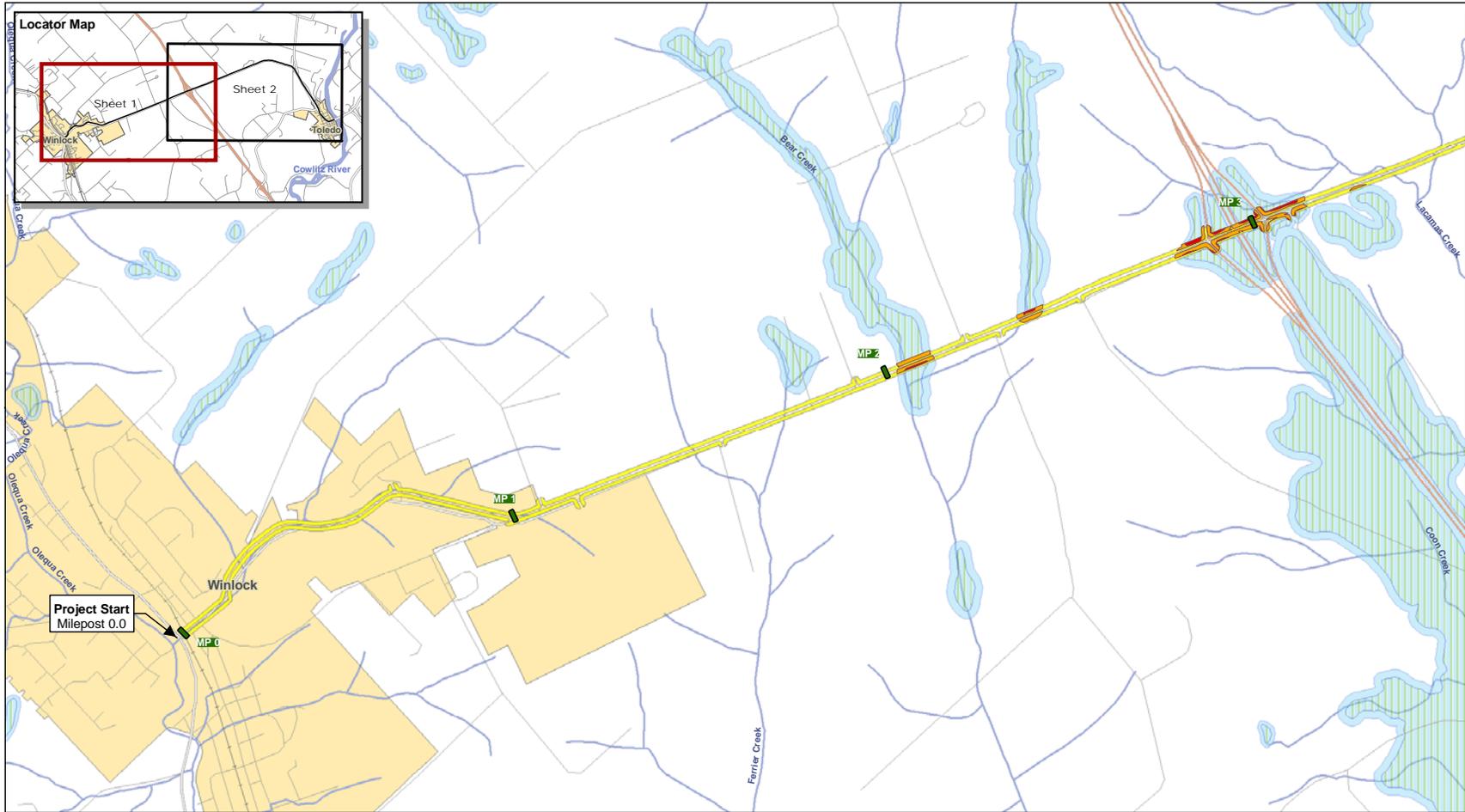
The primary data sources in the GIS screening was based on the National Wetlands Inventory (NWI) data sources which have general locations of wetlands. However, the data sources have some major limitations and should not be relied upon for final wetland determination. The NWI map data typically understates the amount of wetlands in an area. To supplement this data, Soil Survey reports of Lewis County were utilized (The Soil Survey report of Lewis County Area, issued May, 1987 [National Resource Conservation Service, 2008]).

### **1.14.1 Findings**

- A total of 69,670 square feet (or 1.6 acres) of wetlands are located in the study area
  - 48,040 square feet (or 1.10 acres) of wetlands are Type A wetlands
  - 21,630 square feet (or .50 acres) of wetlands are Type B wetlands
- A total of 387,250 square feet (or 8.9 acres) of wetland buffer are located in the study area
- A total of 1,115,760 square feet (or 25.6 acres) of hydric soils are located in the study area

The location of the wetlands and hydric soils are shown in relation to the standard analysis area are illustrated in Exhibit 10.

**Exhibit 10  
Wetlands**



Sources: Lewis County, Perteet, NJ | J:\GIS\GIS\_Projects\20080030\_SR505\_RDP\MapDocs\RDRPRDP\_Perteet\_Wetland.mxd

		<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Impacted Wetland</li> <li> Impacted Wetland Buffer</li> <li> Standard Analysis Study Area</li> <li> Wetland</li> <li> Wetland Buffer</li> <li> Stream</li> <li> City Limit</li> </ul>	<p>Wetlands</p> <p><b>Sheet 1</b></p>
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## 1.15 Streams

In Lewis County, streams are regulated by federal and state rules and regulations and the Lewis County Code (LCC 17.35). Staff calculated the location and number of stream crossings in the study area using the Lewis County Stream Data and the centerline of SR 505 and tallying the number of intersections.

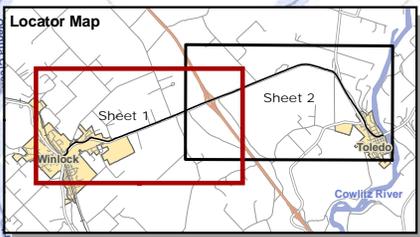
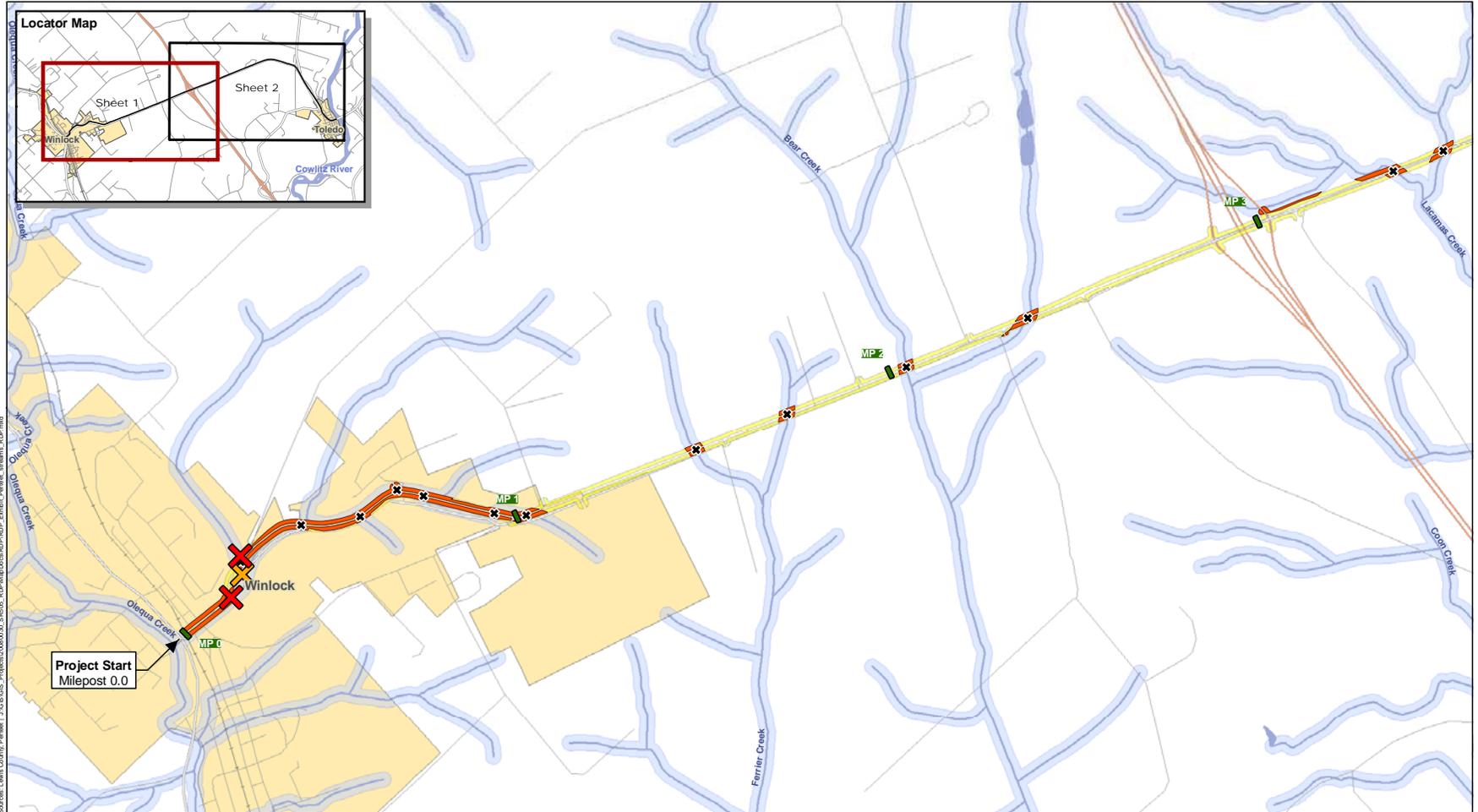
### 1.15.1 Stream Findings

There are a total of 5,295 linear feet of streams in the study area, a total of 765,120 square feet (or 17.6 acres) of stream buffers, and a total of 16 stream crossings in the project corridor.

The location of the streams crossings are listed in Exhibit 11 and illustrated in Exhibit 12.

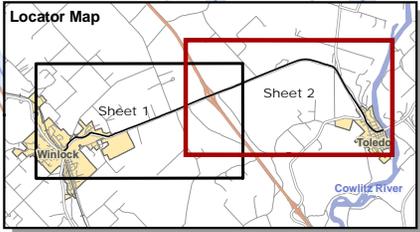
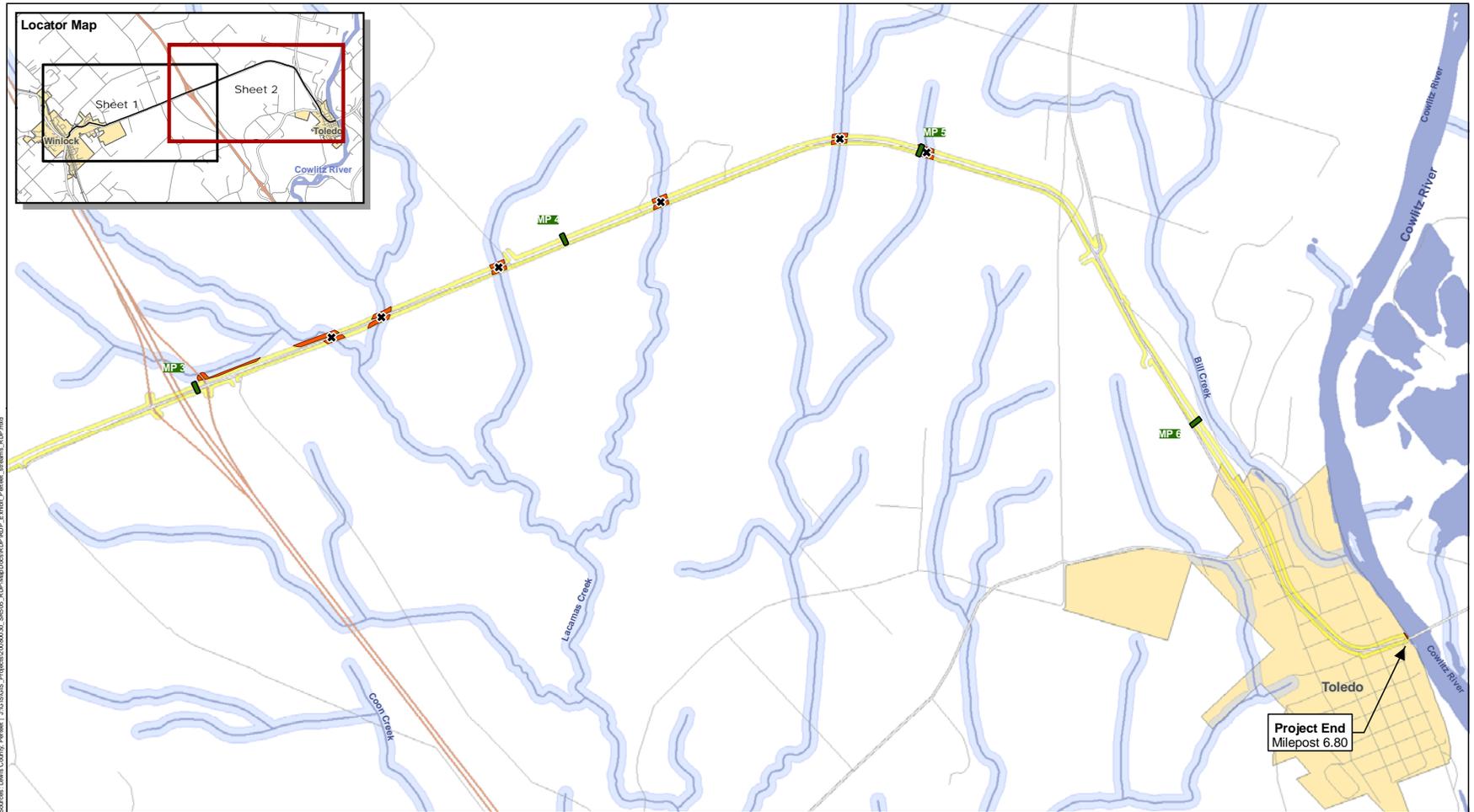
<b>Exhibit 11 Stream Crossings in Study Area</b>		
<b>Stream Crossing</b>	<b>Stream Name</b>	<b>Fish Status</b>
1	Tributary to Olequa Creek	Fish
2	Tributary to Lacamas Creek	Fish
3	Tributary to Lacamas Creek	Fish
4	Tributary to Lacamas Creek	Non-Fish
5	Tributary to Lacamas Creek	Fish
6	Tributary to Lacamas Creek	Unknown
7	Tributary to Olequa Creek	Non-Fish
8	Tributary to Bear Creek	Fish
9	Bear Creek	Fish
10	Lacamas Creek	Shoreline
11	Tributary to Ferrier Creek	Fish
12	Tributary to Olequa Creek	Fish
13	Tributary to Olequa Creek	Fish
14	Tributary to Olequa Creek	Fish
15	Tributary to Ferrier Creek	Fish
16	Tributary to Olequa Creek	Unknown

**Exhibit 12  
Streams**



Source: Lewis County Parcel | J:\GIS\GIS\_Progect\SR505\SR505\_RDP\MapDoc\SR505\_RDP\_Enhanced\_streams\_RDP.mxd

  	<p><b>Legend</b></p> <p>WSDW Culvert</p> <p>Partial Barrier</p> <p>Total Barrier</p>	<p>Stream Crossings</p> <p>Impacted Stream Buffer</p> <p>Stream Buffer</p>	<p>Stream</p> <p>Waterbody</p> <p>Standard Analysis Study Area</p>	<p>City Limit</p>	<p><b>Streams</b></p> <p><b>Sheet 1</b></p>
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Source: Lewis County, Parcel; J:\GIS\SR 505\_Series\SR505\_Series\MapDocs\SR505\_Pertect\Streams\_RDP.mxd

 Miles	 <b>Lewis County</b>	 <b>Pertect</b>	<b>Legend</b>		<b>Streams</b>	
			WSDW Culvert Partial Barrier Total Barrier	Stream Crossings Impacted Stream Buffer Stream Buffer	Stream Waterbody Standard Analysis Study Area	City Limit

**Sheet 2**

## 1.16 Fish and Aquatic Resources

Fish species protected under the Endangered Species Act (ESA) and determined to inhabit aquatic resources within the area of analysis must be considered during the design of the storm water system and in the permitting and environmental review process. Fish species that were screened for presence in the study area included endangered, threatened, and candidate species and state priority species found in Western Washington. Exhibit 13 lists the fish species potentially located within the study area, if they are found in the study area, and the regulatory status of each of these species.

Exhibit 13 List of Western Washington Fish Species and Their Regulatory Status					
Common Name	Found in Study Area	ESA Status		Habitat Status	Source
		Federal	State		
Chinook salmon (fall, spring) <i>Oncorhynchus tshawytscha</i>	✓	Federal threatened	State priority species or candidate species (food)	Federal - designated; State -any occurrence	WDFW, NOAA
Coho salmon, <i>O. kisutch</i>	✓	Federal species of concern	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Pink salmon, <i>O. gorbuscha</i>		Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Chum salmon (fall), <i>O. keta</i>	✓	Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Steelhead/ Rainbow trout (summer, winter), <i>O. mykiss</i>	✓	Federal Threatened	Food fish	Federal – TBD; State -any occurrence	WDFW, NOAA
Cutthroat trout, <i>O. clarki</i>	✓	Not warranted	Game Fish		WDFW, NOAA
Sockeye Salmon, <i>O. nerka</i>		Not warranted	Food fish	Federal - NA; State -any occurrence	WDFW, NOAA
Dolly Varden/ Bull Trout, <i>Salvelinus confluentus</i>		Federal threatened	Game Fish	Federal - NA; State - NA	USFW

There was a review of culverts (barrier or non-barrier status) in the study area using WDFW's Washington State Fish Passage Barrier Culvert Inventory when the culvert was recorded as passing under SR 505. That information is available in Appendix A – Existing Conditions Report.

## 1.17 Wildlife

Wildlife evaluated for this screening includes both state and federal endangered, threatened, sensitive, and candidate species; animal aggregations which are considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable and could be affected by project elements. The Priority Habitats and Species (PHS) List is a catalog of those species and habitat types identified by the Washington Department of Fish and Wildlife (WDFW) as priorities for management and preservation. Because information on fish, wildlife, and their habitats is dynamic, the PHS List is updated periodically. This data is not allowed to be displayed on map documents.

Several priority habitats intersect the study area including:

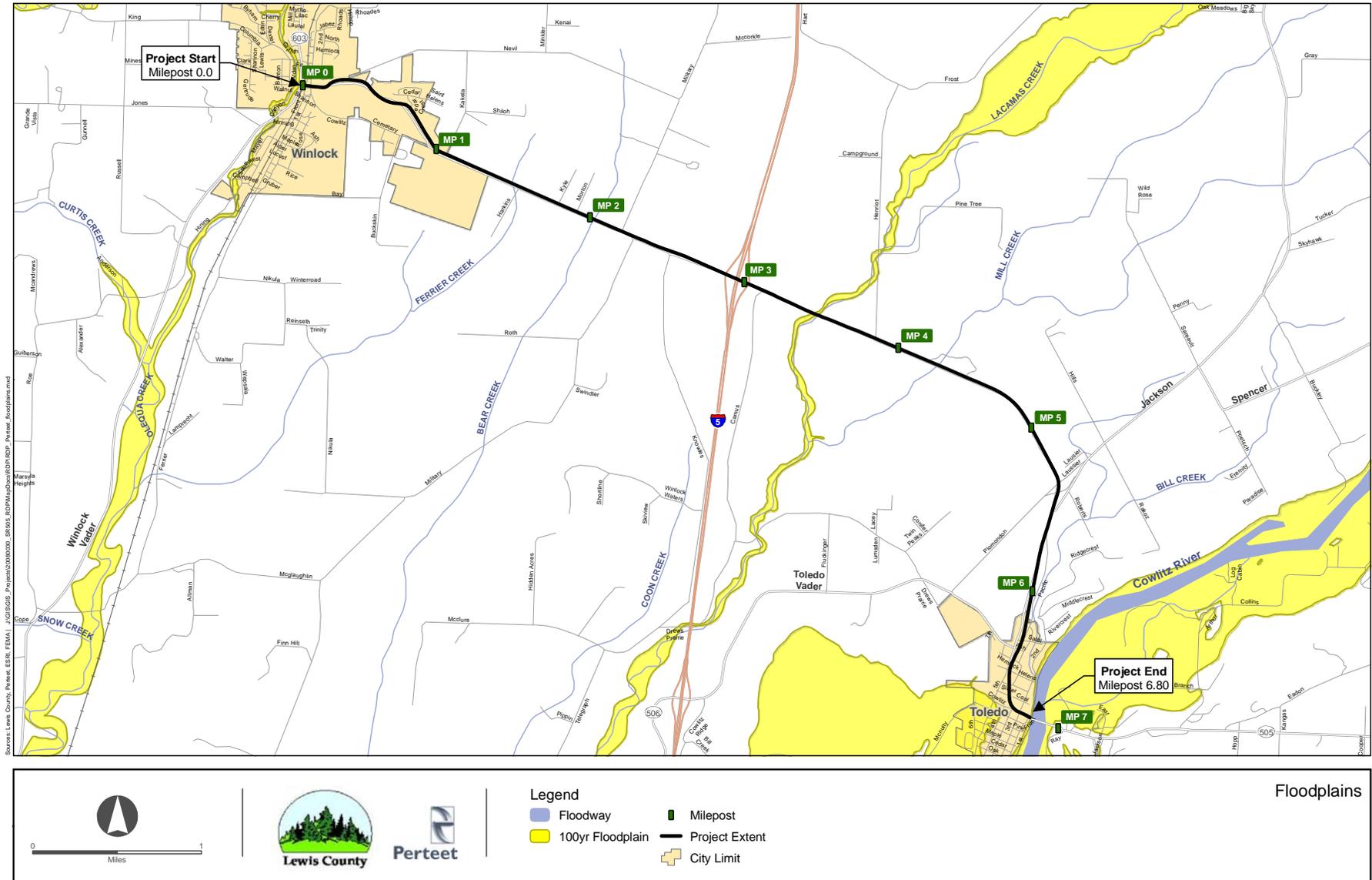
- PHS region of Rocky Mountain and Roosevelt Elk Winter Range, Mount Saint Helens and Mount Rainer Herds;
- Spotted Owl terrestrial buffer; and
- Pacific salmon and trout habitats.

Deer and Elk are known to cross SR 505 within the study area, WSDOT maintains data on car struck animals and this data is often used to identify possible wildlife crossing.

## 1.18 Floodplains

Floodplains in Lewis County are classified as the 100-year floodplain, and the floodway. The technical definition of the floodplain is that part of the valley that has a 1 percent chance of flooding in a given year (though recent and historical floods would contradict this conservative definition). A total of 196,901 square feet or 0.45 acres of floodplain are located in the project area. The location of the floodplains in relation to the SR 505 is illustrated in Exhibit 14.

**Exhibit 14  
Floodplains**

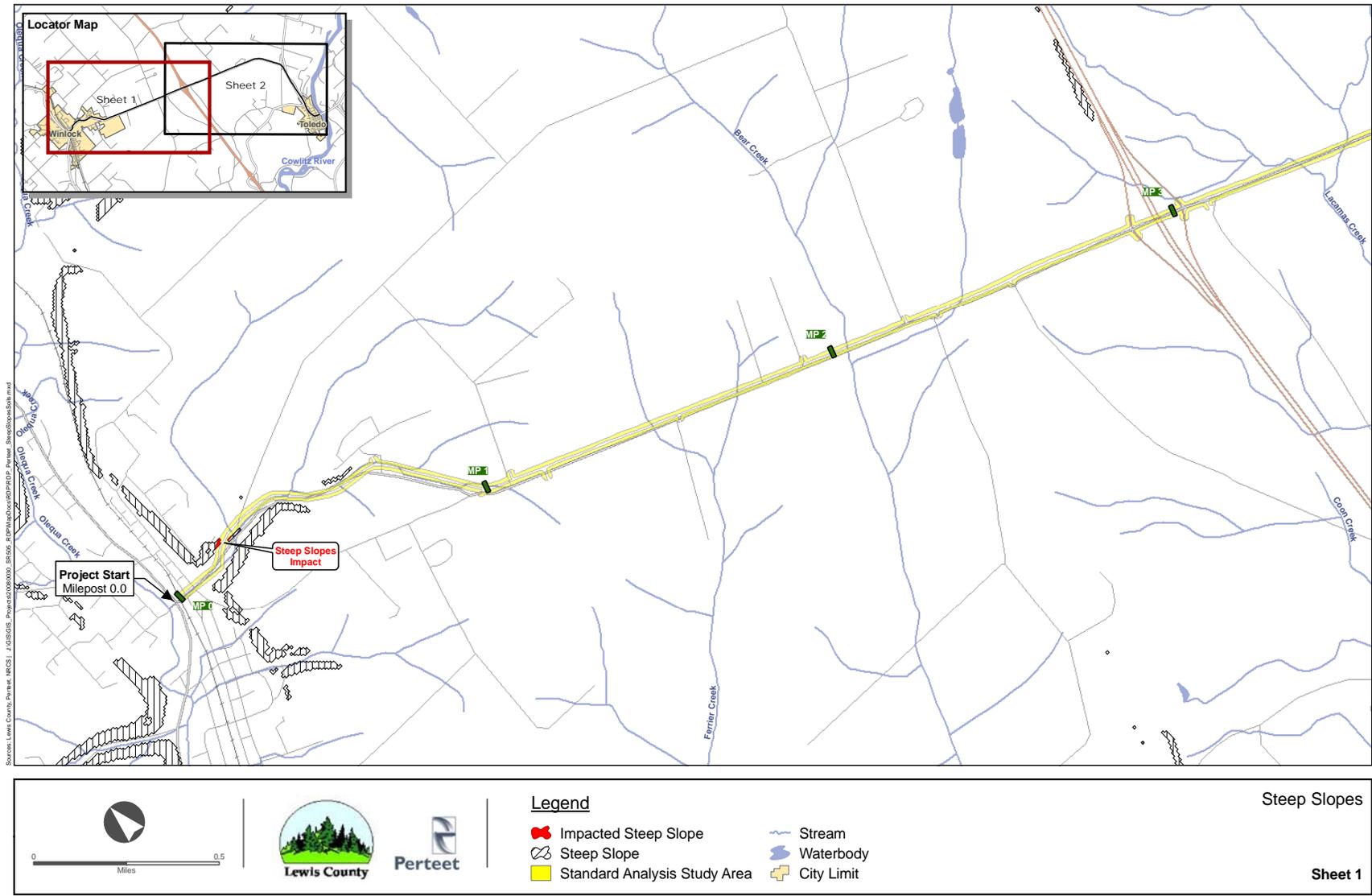


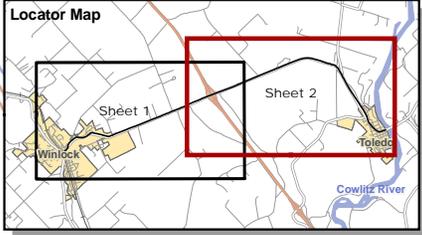
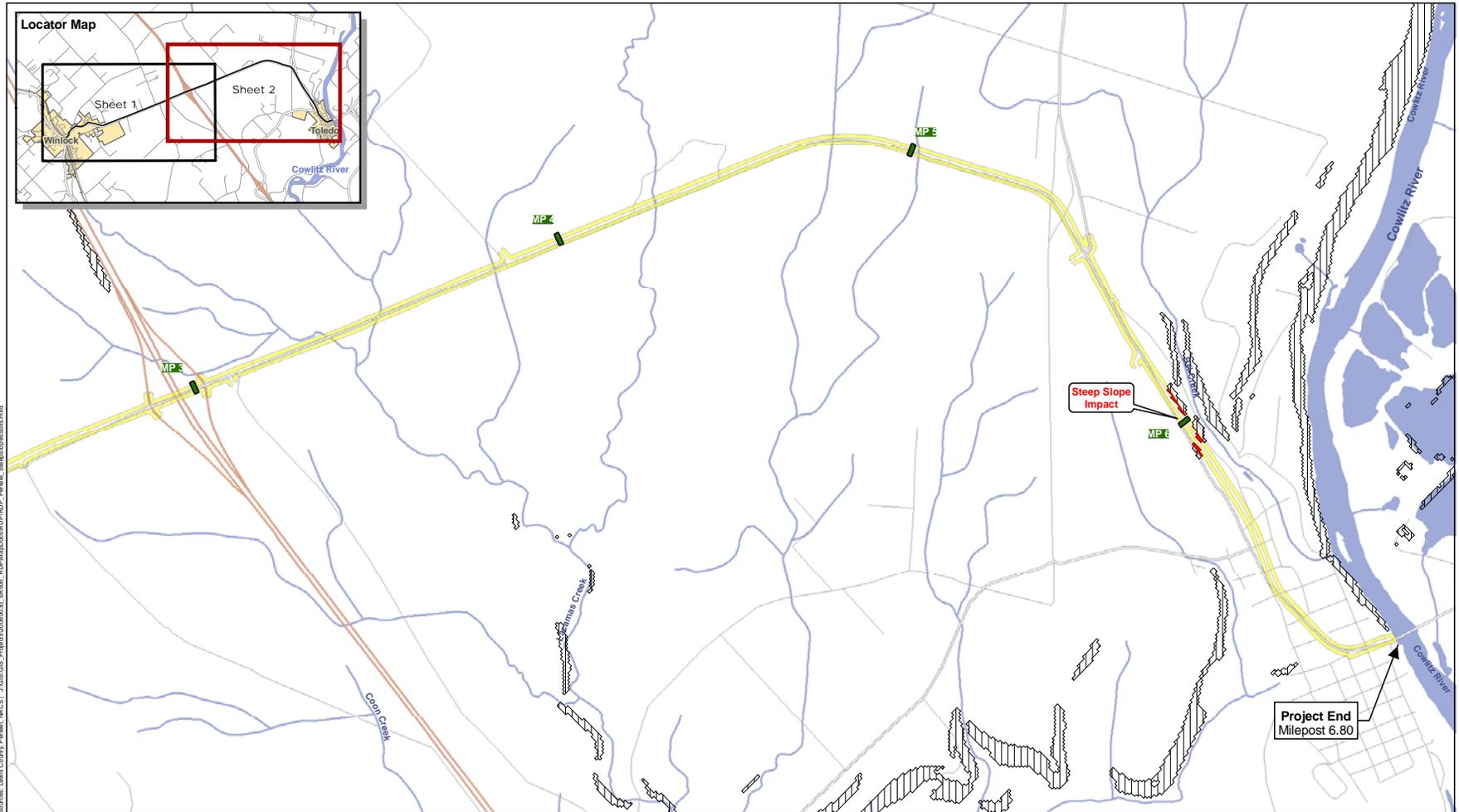
## **1.19 Steep Slopes**

Lewis County critical area code regulates Erosion and Landslide Hazard Areas (LCC 17.35.910) to minimize hazards to the public from development activities on or adjacent to areas of geological hazard. Steep slopes are an indicator of erosion and landslide hazard. Slopes over 15% with certain types of geology and hydrology are defined as landslide hazards (LCC 17.35.920). Steep Slopes (15% or greater) were therefore used to identify areas of potential landslide hazard. A total of 24,300 square feet or 0.56 acres of steep slopes are located in the study area.

The location of the steep slopes and soils in relation to the mile posts are illustrated in Exhibit 15.

**Exhibit 15  
Steep Slopes**





Source: Lewis County Permit, NCEC31\_1\GIS\GIS\_Project\02000000\_S0505\_RCP\MapDocs\RP\RD/P\_Permit\_Sheet2\MapData.mxd

		<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Impacted Steep Slope</li> <li> Steep Slope</li> <li> Standard Analysis Study Area</li> <li> Stream</li> <li> Waterbody</li> <li> City Limit</li> </ul>	<p>Steep Slopes</p> <p><b>Sheet 2</b></p>
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## **1.20 Human Environment**

The human environment refers to project effects that impact quality of life, social justice, historic places, and cultural resources. This environmental screening looks at the human environment typically regulated by local, state, and federal law and policies. The resources that fall under this section, as detailed in the Existing Conditions Report (Appendix A), are:

- Environmental Justice
- Parks and Recreation Resources
- Cultural and Historic Resources
- Air Quality

## **1.21 Noise**

There are noise sensitive receptors in the study area. The residential area, and some commercial areas are considered sensitive noise receptors when analyzing potential noise effects or impacts. The screening area included the proposed project footprint plus 500 feet around the project. The analysis area was overlaid on zoning maps. Residential zones were used as a surrogate for all sensitive receptors. These include residential dwellings, nursing homes, medical and health services, churches, libraries, cultural activities centers, and schools.

### **1.21.1 Findings**

The residential zones within 500 feet of the project are depicted on screening maps, which are provided in the Existing Conditions Report (Appendix A). Portions of the study area are considered sensitive noise receptors. It should be noted that these areas already experience highway noise. However, construction noise and potential increases in existing noise will need to be examined after a specific project is proposed.

## **1.22 Environmental Mitigation**

During the design phase of a future project, engineering staff will work closely with the staff of the WSDOT Southwest Region Environmental Services office to determine the extent of the environmental effects of projects. For example, unavoidable wetland impacts and to locate appropriate mitigation site locations.

Mitigation for increased stormwater runoff resulting from additional impervious area can often take place within existing or expanded highway right-of-way. Appropriate mitigation for storm water runoff quality and quantity is readily determined using the WSDOT Highway Runoff Manual.

### 1.23 Transit

Currently, there is no transit service provider in the study area. There is a park and ride lot located in the southeast corner of the Exit 63 interchange area, which is owned and maintained by WSDOT. Intercity Transit currently provides a daily vanpool service, Vanpool No. 26, from Winlock to Lacey between 8:00 AM and 4:30 PM.

### 1.24 Rail

The Burlington Northern Santa Fe (BNSF) mainline rail is located immediately west of MP 0.0 in downtown Winlock. The crossing is at grade and in fair to good condition.

### 1.25 Utilities

Power is provided along the study corridor via overhead transmission lines. Telephone appears to be the only underground utility between the cities of Winlock and Toledo. Current listings of franchises and franchise agreements along the study route are maintained at the WSDOT Southwest Region Utilities Office. Utilities located within the corporate limits of the City's of Winlock and Toledo are managed by these cities.

### 1.26 Land Use

Existing land use is defined by the Lewis County Comprehensive Plan Land Use Map, the City of Winlock Land Use Map, and the City of Toledo Land Use Map, all current as of March 2008. Land use maps are provided in Appendix A of this report.

### 1.27 Traffic Analysis Method

Operational analysis was performed on the study route using procedures described in the Highway Capacity Manual, HCM 2000. Operational analysis was conducted on key intersections and within identified segments using "SYNCHRO" traffic software. Level of service (LOS) was developed for each intersection (delay) and study segment (volume/capacity ratio). The adopted County LOS for this study area is LOS D. Once individual intersections and segments were defined, the corridors containing them were evaluated using "VISSIM" traffic analysis software. VISSIM allows for corridor performance evaluation beyond individual intersection and segment levels.

#### Level of Service (LOS)

Intersections are graded based on delay and assigned a level of service letter grade from "A" to "F". LOS "A" represents minimal delay (best) and LOS "F" represents maximum delay or congestion (worst).

### 1.28 Travel Demand / Traffic Volumes / Level of Service

Travel demand was generated from a traffic counting program conducted during spring and summer of 2008. Intersection turning movements were counted during the effort along with segment volumes. These volumes were then fed into the "SYNCHRO" software for operational analysis. This is summarized in Exhibit 16.

**Exhibit 16  
Intersection Level of Service Defined**

Level of Service (LOS)	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Un-signalized Intersections	Signalized Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delay	>35 and ≤50	>55 and ≤80
F	Extreme Waits	>50	>80

Existing and future condition LOS is discussed in detail in Chapter 4 of this corridor plan.

## 1.29 Safety

### 1.29.1 Data Sets Evaluated

All reported collisions in the SR 505 study corridor (MP 0.0 to MP 6.8) from January 1, 2003 to December 31, 2007 were collected and processed to determine collision frequencies. Data was provided by the Washington State Department of Transportation (WSDOT).

**Note: Federal law 23 USCS 409 governs the use of the data contained in this report. Under this law data utilized for purposes of evaluating potential highway safety enhancements "...Shall not be subject to discovery or admitted into evidence in a federal or state court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists or data."**

### 1.29.2 Safety Study Methodology

Four representative roadway segments were identified and evaluated for collision rate within the entire corridor. The segments listed below and illustrated in Exhibit 17 are:

#### Segment A, MP 0.0 to MP 1.18

Segment A is characterized by more urbanized land uses with curb and gutter sections transitioning to roadway shoulders and ditches as you move towards the easterly limit of the segment. The roadway slopes moderately from the downtown core of Winlock yielding to rolling topography in the easterly limit of the segment. Traffic speed increases from 25 to 50 mph as you leave the city limits.

Segment B, MP 1.19 to MP 3.03

Segment B has paved shoulders of varying widths and is drained by ditch sections. Travel lane widths are typically 11 feet with paved shoulders that are predominantly 2 feet wide. Speed in this segment is posted as being 50 mph. Land use is predominantly rural in this segment.

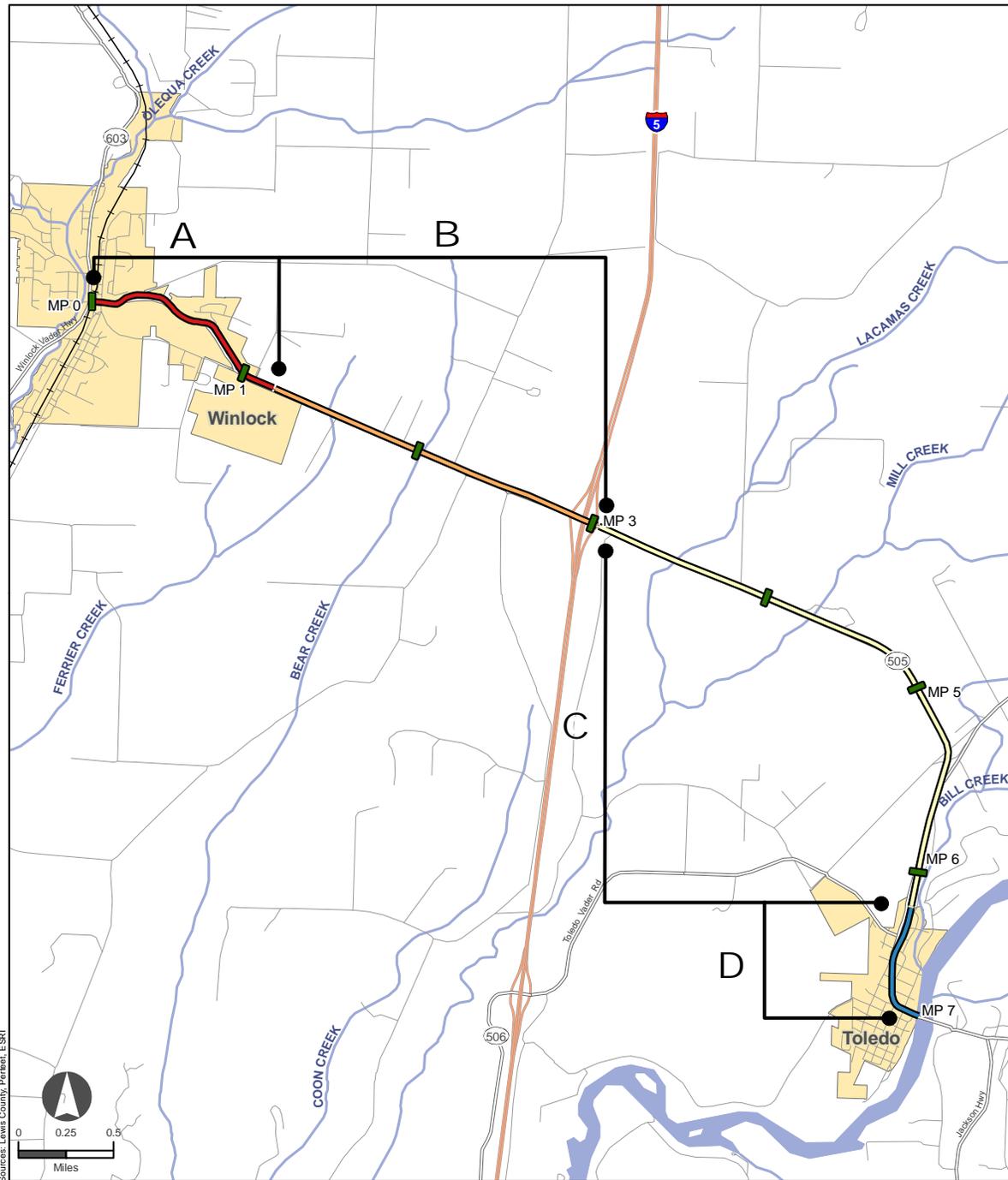
Segment C, MP 3.04 to MP 6.16

Segment C supports a posted speed of 55 mph, generally 11 foot travel lanes with paved shoulders varying from 2 to 6 feet. Land use is predominantly rural in this segment.

Segment D, MP 6.17 to MP 6.85

Segment D represents a transition from rural land use to those associated with more urban areas. As you approach the downtown core area of Toledo, travel lanes increase in width from 11 feet to 13 feet, paved shoulders are replaced by curb and gutter sections, and speeds are reduced to 25 mph.

**Exhibit 17  
Safety Segments**



Source: Lewis County, Pertee, ESRI

 	<b>Safety Segment</b>		 Milepost  mileposts  Rail  Stream  City Limit
		A	
		B	
		C	
	D		

**Safety Segments**

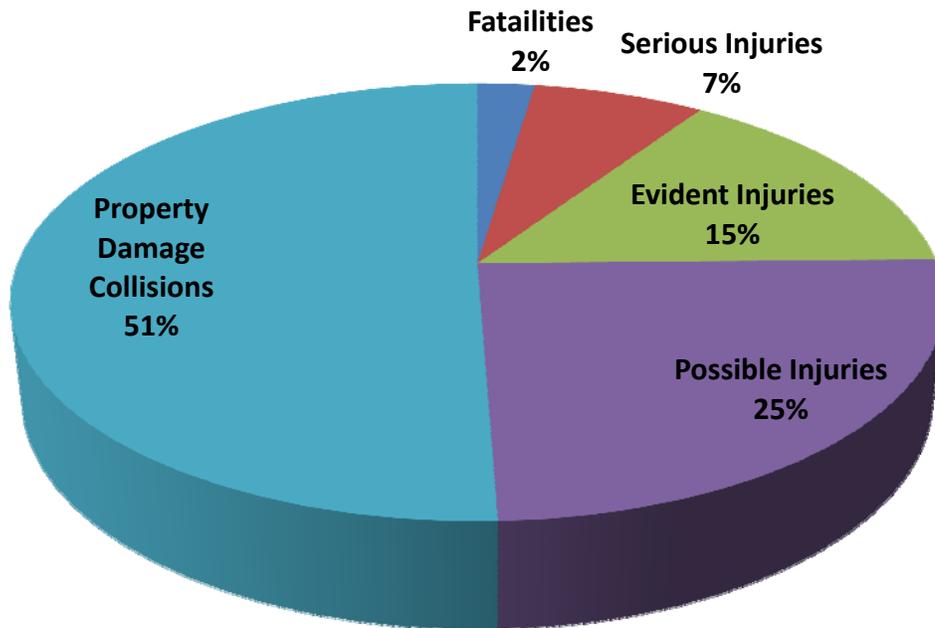
Four intersections of interest along the SR 505 corridor are also being evaluated for collision rate. They are: North Military Road at MP 2.22, I-5 Southbound Ramp at MP 2.88, I-5 Northbound Ramp at MP 3.03, and Jackson Highway / Plomondon Road at MP 5.46. The resulting rates are compared to state published collision rates for rural collector access Class 3 roadways in the various years of interest.

### 1.29.3 Summary of Collision Severity

During the analysis period (01/01/2003 to 12/31/2007) a total of 85 collisions were reported within the study area (mile post 0.0 to mile post 6.8). A breakout of collisions by severity is as follows:

- 2 fatalities
- 6 serious injuries
- 13 evident injuries
- 21 possible injuries
- 43 property damage collisions

Exhibit 18  
Summary Collision Severity

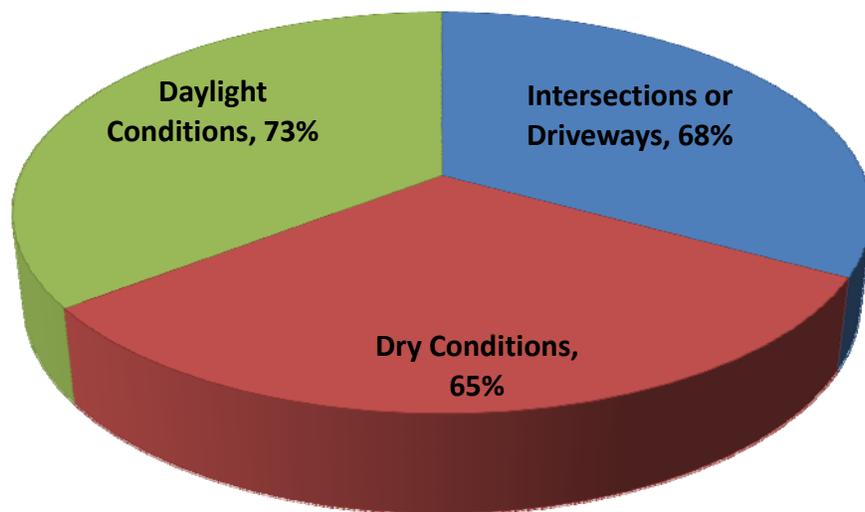


#### 1.29.4 Summary of First Collision Types

First collision type is described as being the first injury damage producing event in the series of events that constitute a motor vehicle traffic collision. The following is break down of the collision types:

- 58 occurred at intersections or at driveways (68%)
- 55 during dry conditions (65%)
- 62 during daylight conditions (73%)

Exhibit 19  
Summary of First Collision Types



#### 1.29.5 Intersections

The North Military Road intersection appears to exceed the state average intersection frequency for rural intersections in years 2003 and 2004. The north bound ramps at I-5 also appear to exceed the state average intersection collision frequency for rural highways for the years 2003 and 2006. The state average for a four-legged rural intersection is 0.589, and for a three-legged rural intersection it is 0.157.

#### 1.29.6 Segments

All of the study segments appear to exceed statewide average collision rates for at least one year out of the five-year study period as shown in Exhibit 20. Segments A and B appear to exceed statewide average collision frequencies (rural collector access Class 3) for several years within the study period. The collision frequencies for segments A and B suggest access control may be a significant contributor to total reported collisions in the corridor. The urbanizing segment within the City of Toledo reflects similar collision rates for concern. Nearly 70% of all

collisions (first collision type) list an intersection or driveway as related collision causation. Access control is expected to be a consideration in potential collision rate reduction strategies.

**Exhibit 20**  
**Collision Rate Summary by Roadway Segment**

<b>Study Segment</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
A	2.19	0.5	2.06	0.5	2.64
B	2.53	2.91	1.65	3.56	1.35
C	0.95	2.83	1.13	0.28	1.03
D	1.18	2.81	1.40	1.40	3.84
WSDOT rate*		1.48	1.66	1.55	

\*WSDOT Collision Rates for Rural Highway Class 3

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## CHAPTER 2: THE STUDY PROCESS

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### 2.1 Stakeholder Involvement

Key stakeholders along the SR 505 Corridor were identified to participate in a Stakeholder Committee to provide input to the development of the South Lewis County SR 505 Transportation Infrastructure Strategic Plan. The stakeholder group worked alongside the consultant project team in identifying project purposes and providing input on the key intersections, potential mitigation strategies, including an outreach strategy.

Key components of the outreach strategy included a project Web site; outreach collateral materials such as a project fact sheet; an open house event; and a traveling project display with project information at several locations. Details are provided in Appendices B, C, and D.

In addition, presentations and updates were given at several key project milestones to the councils of the City of Winlock and the City of Toledo, as well as the Lewis County Planning Commission.

### 2.2 Membership

Membership of the project's Stakeholder Committee included the following individuals representing local, regional, state, and tribal government:

Organization	Team member
Lewis County Public Works	Michael Kroll, Erik Martin
Lewis County Planning	Barbara Kincaid
WSDOT	Jeff Barsness
WSDOT	Karyn Anderson
WSDOT	Sharon Zimmerman
City of Toledo	Mayor Jerry Pratt
City of Winlock	Mayor Cy Meyers
Southwest Regional Transportation Planning Organization	Rosemary Siipola
Cowlitz Indian Tribe	Kim Stube

Others regularly attended meetings, including Michelle Whitten (City of Toledo), Tammy Hamilton (City of Winlock), and Matt Hyatt (Lewis County Public Works).

### 2.3 Tribal Coordination

The Cowlitz Indian Tribe was invited to participate in the study process. The Cowlitz tribal community has an interest in the SR 505 corridor due to its proximity to St. Mary's Center, home of the Cowlitz Indian Tribal offices as well as housing, programs, and events. Kim Stube, Transportation Director, represented the Cowlitz Indian Tribe at several stakeholder meetings.

## 2.4 Stakeholder Meetings

Eight meetings of the stakeholder committee were convened at critical milestones in order to provide informational updates and gather critical feedback for the development of project elements. Details are provided in Appendix C, with a summary of the agendas, discussions, and decisions for each of these meetings is as follows:

### Meeting #1—April 28, 2008

The first meeting of the stakeholder committee focused on a discussion of the project purpose, draft project schedule, group charter, and draft public outreach strategy. Consultant team members provided an overview of the project purpose and shared a draft project schedule outlining major project phases.

Group members participated in a chartering workshop and reviewed draft text for charter elements. Members agreed on a shared vision for the project that reads as follows in the final group charter:

*The project will create an Interchange/Corridor Plan (I/CP) (SR 505 from milepost 0.0 to milepost 6.80 that supports new land use development between the cities of Winlock and Toledo, WA). The SR 505 SR 505 I/CP) will be conducted in cooperation with Lewis County, Washington State Department of Transportation (WSDOT), the City of Toledo, the City of Winlock, the Southwest Washington Regional Transportation Planning Organization (SWRTPO), and the Cowlitz Indian Tribe. The SR 505 I/CP vision is to collaboratively develop a plan that:*

- *Will promote safety and efficiency;*
- *Provide transparency and predictability for corridor improvements;*
- *Will provide guidance for residential, commercial, and industrial development and usage; and*
- *Will connect infrastructure development with the potential for economic development.*

At this meeting, the group also discussed elements of a draft outreach strategy outlining planned public outreach and involvement activities for the project.

### Meeting #2—June 19, 2008

At their second meeting, the Stakeholder Committee discussed amendments to the scope and timeline of the project, project coordination and timing relative to the South Lewis County Subarea Plan, charter and outreach strategy review, and an update on existing conditions analysis.

The focus of the overall project shifted to coordinate with the development of the South Lewis County Subarea Plan, while still incorporating analysis of the SR 505 corridor. The analyses being undertaken by the subarea planning process were determined to be essential to modeling future conditions in the SR 505 study area and the project schedule was changed to reflect this coordination. In addition, the scope of the project was amended to respond to these changing

project conditions. Additional traffic counts for locations in South Lewis County were added to the scope, along with the development of transportation design standards.

The group also finalized their charter and discussed additions to finalize the draft outreach strategy, including identifying communications risks and opportunities, and key project messages to use in the public involvement process.

Finally, the group received its first update on existing conditions analysis, including accident screening and planned traffic counts along the SR 505 corridor.

#### Meeting #3—August 20, 2008

The third Stakeholder Committee meeting focused on a review of the Existing Conditions Report, coordination with the South Lewis County Subarea Plan, and planning for a public open house event.

The Stakeholder Committee discussed the results of existing conditions analysis and the draft Existing Conditions Report, including information related to overall system capacity, specific issues related to rights-of way/access control, and traffic count results.

The Committee also discussed a re-defined scope for the Consultant team, who would now be supporting the full transportation element of the South Lewis County Subarea Plan. Stakeholder Committee members discussed the importance of future land use information to the transportation future conditions analysis. The group also was also presented with the methodology for production of the Future Conditions Report.

A project open house and details of a project Web site were discussed by the group. The open house was anticipated to be held in fall of 2008. The Stakeholder Committee discussed the open house plan, including details of project informational materials.

#### Meeting #4—February 23, 2009

The Stakeholder Committee focused on an update on the existing conditions and future conditions analyses at their fourth meeting. The group discussed the results of the completed existing conditions work, including volume-capacity ratio results and observations from the accident screening.

The results of future conditions analyses was presented to the group and featured the details of traffic modeling using high, medium, and low 2035 projected land use scenarios.

The Stakeholder Committee began their discussion of the need for future mitigation to accommodate projected traffic on SR 505, as well as several options for funding these mitigation projects. Access management and access permits were also addressed by the group.

### Meeting #5—September 3, 2009

At their fifth meeting, the Stakeholder Committee met in a joint session with South Lewis County Subarea Plan stakeholders to discuss the results of future conditions analyses, potential mitigation requirements under various land use scenarios, and to coordinate their future land use assumptions.

The Stakeholder Committee also met separately and further discussed potential mitigation projects, specifically a comparison of the use of roundabouts versus signalization for intersections requiring mitigation.

## **2.5 Public Meetings**

Lewis County Public Works hosted an open house featuring the South Lewis Subarea Transportation Plan on a drop-in basis from 5:30 PM - 7:30 PM on September 17, 2008. Details are provided in Appendix D. The purpose of the open house was to inform the local community about the status of the Plan and provided an opportunity for the project team to solicit feedback from the public.

Attendees were able to learn about project goals, process, timeline, geographic area, and progress. Display boards presented the information graphically and project and agency representatives were available to receive questions, comments, and concerns. Lewis County Commissioner Lee Grose and Lewis County Planner Barb Kincaid spoke to attendees briefly about the project and its relationship to economic development within the county. A sign-up list was also made available for attendees to receive project updates via e-mail.

Attendees were asked to share their feedback in both written and verbal formats. Project and agency representatives noted themes in feedback they received as well as any significant concerns. Comment forms were also available for attendees to submit written comments in centrally located drop boxes. A project fact sheet was available for attendees to take with them.

Forty (40) people attended the open house and four (4) people filled out comment forms at the September 17th public meeting.

## **2.6 Traveling Public Displays**

Following the open house three “traveling displays” were placed at the Winlock City Hall, Toledo City Hall, and the Winlock Senior Center. These displays were condensed versions of the displays presented at the open house. They also included fact sheets, comment forms, and comment boxes. The traveling displays were placed at their respective sites for a period of three weeks. No comments were received from the traveling displays.

## **2.7 Comprehensive Plans, Regional Transportation Planning Organization and Consistency with Growth Management Act Growth Management Act Requirements**

The South Lewis County SR 505 Transportation Infrastructure Strategic Plan is consistent with land uses defined within the South Lewis County Subarea Plan and with the Transportation Element therein. The transportation element of the South Lewis County Subarea Plan is required by the Growth Management Act (GMA) to encourage multi-modal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans. This transportation element has to be consistent and supportive of land use as depicted in Lewis County's adopted comprehensive plan. Guidance is provided within the GMA on what components the transportation element should contain, including:

- Land use assumptions used in estimating travel demand
- Consistency with county-wide and regional transportation plans
- Internal consistency of county comprehensive plan elements
- Level of service (LOS) standards adopted for use and actions necessary to allow transportation facilities and services to function at adopted LOS on local roadways and along state highway routes (RCW 47.06.140)
- Multi-year financing strategy balancing needs against available funding
- Intergovernmental coordination of regional transportation facilities
- Any strategies for reducing travel demand.

The GMA mandates that new development cannot occur unless transportation infrastructure is in place to accommodate the increased demand or that the infrastructure will be built "concurrent" with the development.

This plan recognizes where existing or forecast deficiencies in the transportation network will likely occur and identify necessary solutions to meet capacity demands. The plan provides a capital improvement plan at several key planning horizon years supporting six year planning cycles associated with Lewis County Public Works Department.

## **2.8 Consistency with Adopted Comprehensive Plans**

The Corridor Plan is developed utilizing policies and objectives contained within the County's Transportation Element of its South Lewis County Subarea Plan. This Corridor Plan is also consistent with the City of Winlock Comprehensive Plan.

## **2.9 Coordination with the Regional Transportation Planning Organization**

The Cowlitz Wahkiakum Council of Governments governs the Southwest Region Transportation Planning Organization serving Lewis County. Lewis County participates in the SWRTPO providing a listing of regionally prioritized projects for inclusion within the RTPO transportation improvement plan. The recommended improvements set forth in this Corridor Plan are consistent with the SWRTPO regional transportation plan.



## **CHAPTER 3: TRAFFIC FORECASTS**

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### **3.1 Introduction**

During summer 2009, a traffic counting program was conducted to establish baseline conditions for the study area. Traffic tube counters were deployed in roadway segments and turning movements were hand collected at each study segment and intersection.

Once baseline conditions were defined (LOS), several land use planning horizons were evaluated for impact on baseline operational LOS. The years evaluated in the study are: 2008 (baseline), 2014, 2020, 2030 and 2035. While it is typical to evaluate a twenty year planning horizon (land use plans), this study extended to 2035 (twenty-five years) to manage possible implications to the structure and ramps located at Exit 63 (SR 505) along Interstate 5.

Land use was developed by a land use steering committee brought together by Lewis County. Final land use was provided to the traffic modeling consultant for operational evaluation and for defining necessary mitigation. Freeway traffic was built in collaboration with Southwest Region WSDOT staff to ensure consistency with other WSDOT I-5 corridor planning efforts.

### **3.2 Assumptions**

The following list of assumptions is used in developing travel demand at various planning horizons:

- I-5 is six lanes through 2020
- SR 505 vehicle capacity per hour per lane is 900
- Mickelsen Parkway is built in 2020
- Truck climbing lane is built in 2020
- Nevill Road is connected to Mickelsen Parkway in 2030
- Truck percentage is as follows: 5% in 2014, 6% in 2020 and 10% in 2035
- I-5 is eight lanes in 2030
- South Lewis County subarea stakeholder preferred land use defines land use in 2014, 2020 and 2030
- Volume/Capacity ratio better defines segment capacity in the study and is consistent with Lewis County's segment capacity methodology

### **3.3 Methodology**

EMME travel demand forecast model translates land use into jobs and housing for distribution into the study. 2005 EMME model transportation analysis zones (TAZ) were split to recognize more intense land use in the study area. Traffic generated within each TAZ was loaded onto the transportation network (SR 505 and local roadways). Operational analysis was conducted at each intersection for each planning horizon ("SYNCHRO" traffic modeling software). Level of Service (LOS) for all study intersections and segments was developed for each planning horizon.

Failing levels of service (below LOS D) were mitigated and mitigation designs evaluated for final operational LOS. Inter-action between intersections was evaluated using “VISSIM” traffic modeling software. The traffic analysis software “aaSIDRA” was used to evaluate roundabout operational performance. All SR 505 intersections were evaluated for intersection improvement using signalization and then using roundabouts.

Planning level schematic designs were developed for all mitigations and cost estimates (2009 dollars) developed based on current WSDOT bid tab history (“WSDOT bid analysis” website). Local roadway improvements necessary to compliment SR 505 improvements were developed and cost analysis performed to indentify total mitigation costs.

Intersection and roundabout total mitigation costs were then utilized to develop cost per PM peak hour trips and then cost per gross acre of land use in the following there categories: commercial, industrial and housing.

### **3.4 2008 Traffic Conditions**

The analysis of existing conditions data revealed a high level of capacity available throughout the SR 505 corridor and other arterials within the South Lewis County Subarea, with very few operational issues. Intersection and segment levels of service do not reflect any capacity deficiencies (levels of service are “high”). All volume-capacity ratios were lower than 0.8 and there were no segments or intersections with a level of service graded below ‘C’. With respect to accidents, higher than average accident rates occurred in the SR 505 corridor by the I-5 ramps and west of I-5 to Cemetery Road. Access records obtained from WSDOT reflect densities that exceed those for rural highways as reported in Highway Capacity Manual 2000. An analysis of access permits on record shows reasonable correlation to the number of accidents and access permits in the corridor west of I-5. However, several other factors may be contributing to the higher than normal accident rate, such as visibility and weather conditions.

The South Lewis County subarea traffic conditions were studied for three future year scenarios: 2014, 2020, and 2035. The 2008 Lewis County EMME travel demand model was used to develop traffic forecasts for the various future year land use scenarios.

### **3.5 2014 Traffic Forecasts**

The 2014 land use was evaluated for traffic conditions and mitigation to support the expected growth in the area. Traffic conditions were evaluated in terms of roadway segment and intersection traffic volumes, roadway segment volume-capacity ratios (V/C) and intersection level of service (LOS).

#### **3.5.1 2014 Land Use**

The 2014 land use data for the South Lewis County Subarea was developed by the County. In 2014, it is assumed that the subarea will have about 4,350 housing units and around 3,600 commercial and industrial jobs. In 2008, the subarea had about 4,200 housing units and 2,250 commercial and industrial jobs.

### **3.5.2 2014 Transportation Network**

It was assumed that there would be no additional transportation improvements to the existing 2008 transportation network in the subarea.

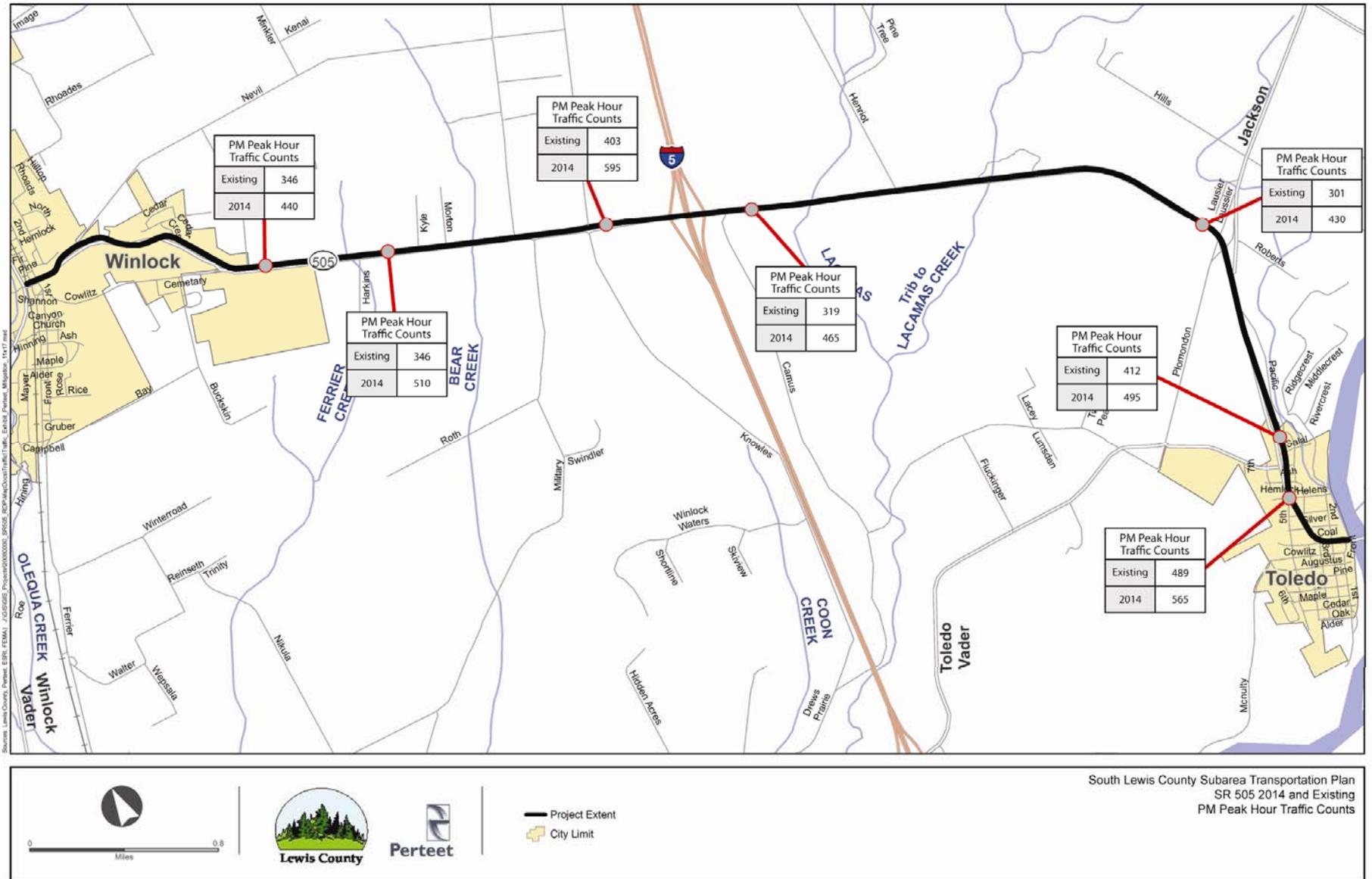
Travel demand from the EMME model was post-processed to account for the difference between the 2008 model estimates and 2008 traffic counts.

### **3.5.3 2014 Traffic Conditions**

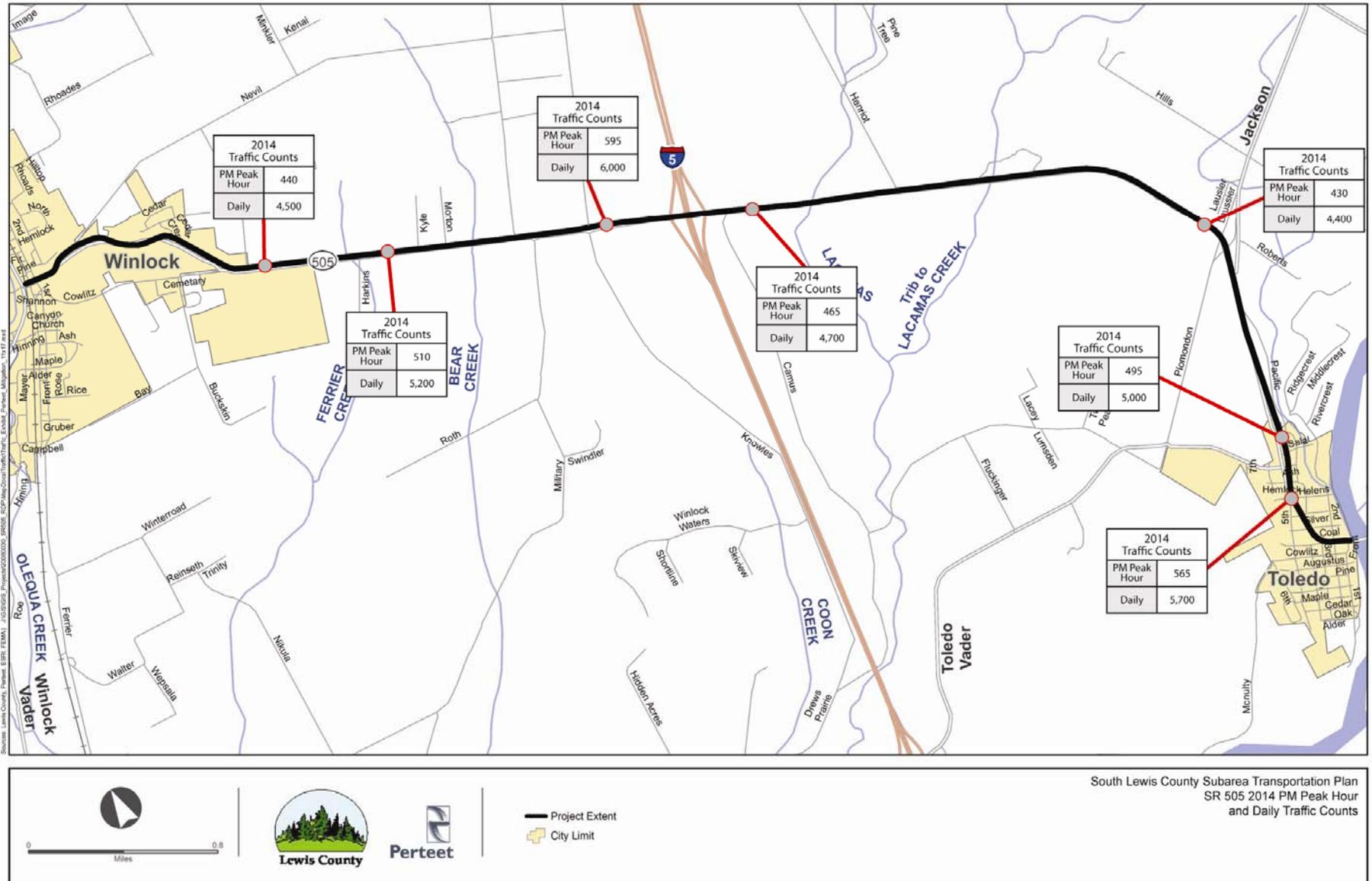
PM peak hour volumes were forecasted for the 2014 land use plan. Exhibit 21 shows the PM peak hour traffic volumes on SR 505 under the 2014 land use plan as well as in the existing year.

Once the land use scenario was forecasted for the PM peak hour, daily volumes were projected for the SR 505 corridor. This was done by taking the ratio of existing PM peak counts compared to existing daily counts and then applying it to the 2014 land use plan PM peak hour forecast. This was done for selected points along the SR 505 corridor. Exhibit 22 shows the PM peak hour and daily traffic volumes on SR 505 for the year 2014.

**Exhibit 21**  
**SR 505 Corridor – Existing and 2014 PM Peak Hour Traffic Volumes**

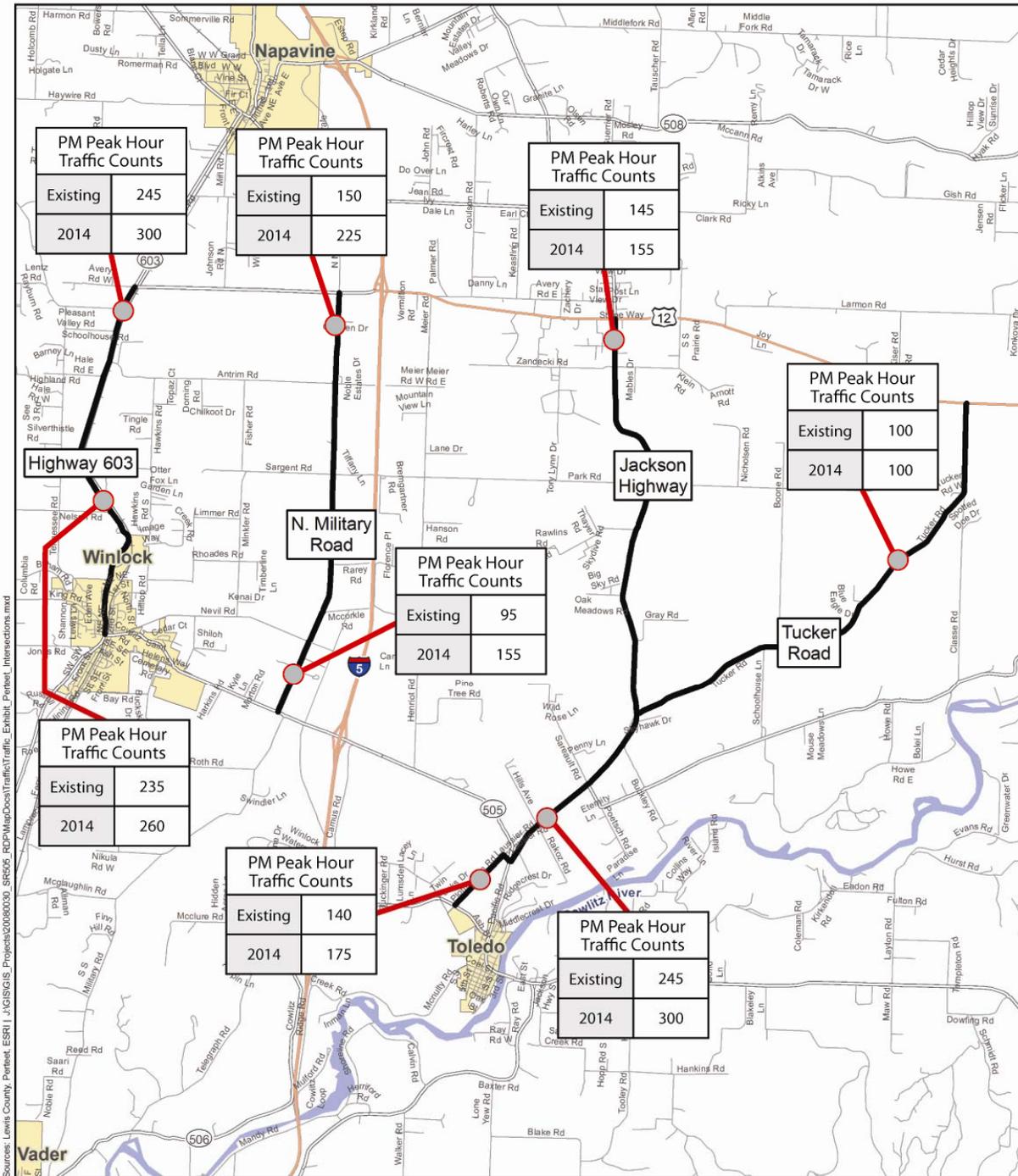


**Exhibit 22**  
**SR 505 Corridor – 2014 PM Peak Hour and Average Daily Traffic (ADT) Volumes**



Analysis was also conducted on selected arterials within the study area. Exhibit 23 shows the PM peak hour traffic volumes for South Lewis County arterials in 2014.

**Exhibit 23  
South Lewis County Arterial – Existing and 2014 PM Peak Hour Volumes**





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**Legend**

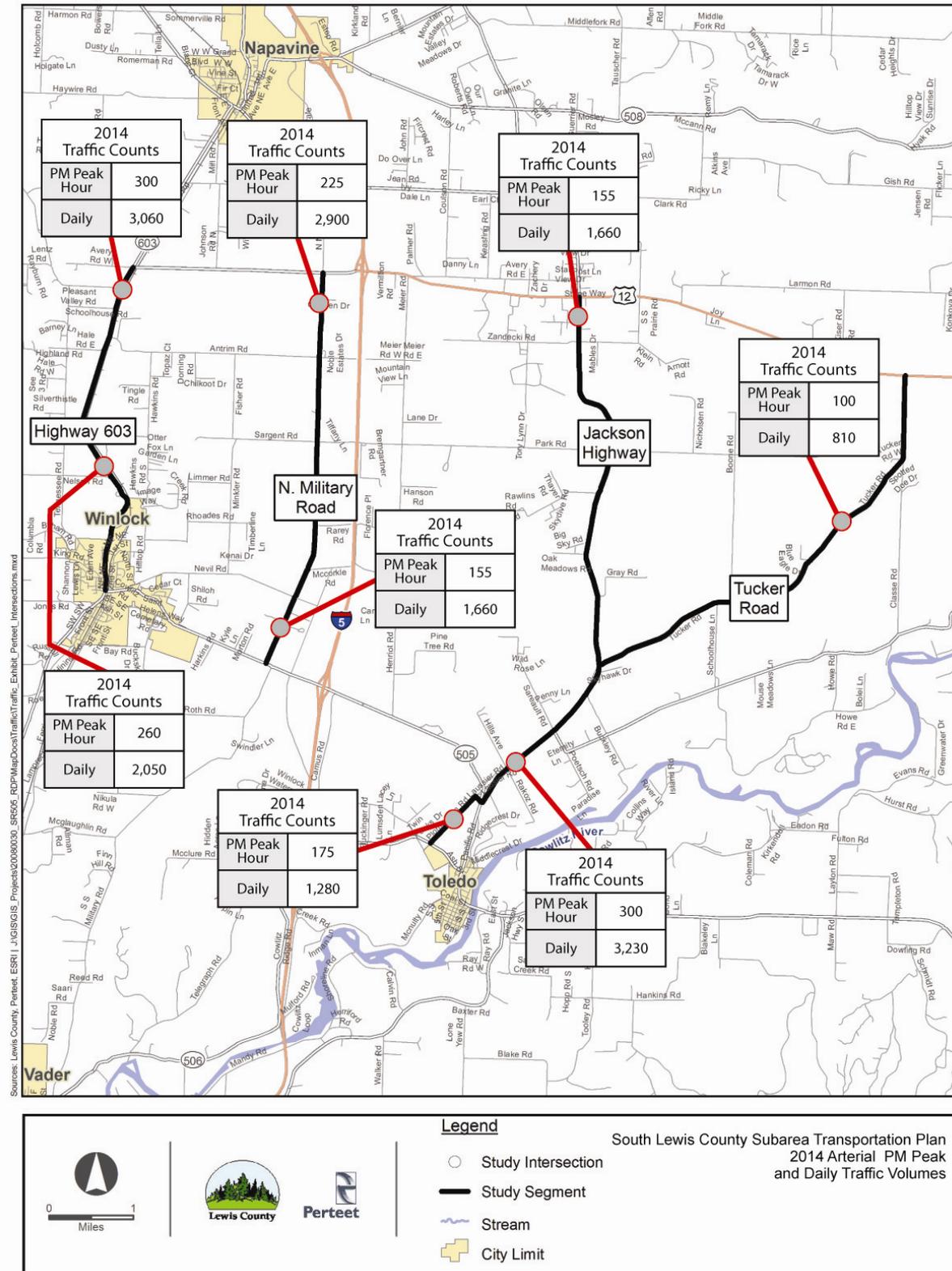
- Study Intersection
- Study Segment
- ~ Stream
- ⬜ City Limit

South Lewis County Subarea Transportation Plan  
Existing and 2014 Arterial  
PM Peak Traffic Counts

### **3.5.4 2014 Volume to Capacity Ratios**

Exhibit 24 shows the PM peak hour and average daily traffic volumes for South Lewis County arterials in 2014.

**Exhibit 24  
South Lewis County Arterial – 2014 PM Peak Hour and Average Daily Traffic (ADT) Volumes**



Corridor volume to capacity ratios (V/C Ratios) were calculated for segments along SR 505. This was done by dividing the PM peak hour volume by the capacity of the road (assumed to be 900 vehicles per hour per lane). The lowest V/C Ratio is .23 from Nevil Road to Cemetery Road and the highest V/C Ratio is .49 from Knowles Road to the southbound I-5 ramps. On the study arterials outside of SR 505, the lowest V/C Ratio will be .06 on Tucker Road from US 12 to Jackson Highway and the highest will be on .21 on Jackson Highway from Spencer Road to SR 505. Volume to capacity ratios are not a major concern for the year 2014. Exhibit 25 shows the PM peak hour roadway segment V/C ratios on SR 505 in 2014.

**Exhibit 25**  
**SR 505 Corridor - 2014 Volume to Capacity (V/C) Ratios**

Segments	2014 PM Peak Hour Volumes and V/C Ratios on SR 505	
	Volume	V/C Ratio
SR 603 to Nevil	445	0.25
Nevil to Cemetery Road	375	0.21
Cemetery Road to Kakela	440	0.24
Kakela to Harkins	440	0.24
Harkins to Military	510	0.28
Military to S. Military	525	0.29
S. Military to Knowles	570	0.32
Knowles to SB I5 Ramp	595	0.33
SB I5 Ramp to NB I5 Ramps	540	0.30
NB I5 Ramps to Camus	480	0.27
Camus to Henriot	465	0.26
Henriot to Jackson Highway	430	0.24
Jackson Highway to Ash	495	0.22

Similarly, V/C Ratios were calculated for the other major corridors within the study area. Exhibit 26 shows the PM peak hour roadway segment V/C ratios on other subarea arterials under the 2014 land use plan.

**South Lewis County Arterials - 2014 PM Peak Hour Volumes and Volume to Capacity (V/C) Ratios**

Segments	2014 PM Peak Hour Volumes and V/C Ratios on South Lewis County Arterials	
	Volume	V/C Ratio
<b>Highway 603 (North of Winlock)</b>		
Avery Rd to Antrim Rd	300	0.19
Antrim Rd to SR 505	260	0.16
<b>N. Military Road</b>		
Avery Rd to Nevil Rd	225	0.14
Nevil Rd to SR 505	155	0.10
<b>Jackson Highway</b>		
US 12 to Park Rd	155	0.10
Park Rd to Frost Rd	115	0.07
Frost Rd to Tucker Rd	110	0.07
Tucker Rd to Spencer Rd	275	0.11
Spencer Rd to SR 505	330	0.19
SR 505 to Toledo-Vader Rd	175	0.11
<b>Tucker Road</b>		
US 12 to Jackson Highway	90	0.06

**3.5.5 2014 Intersection LOS**

Fourteen intersections along the SR 505 corridor were evaluated for 2014 traffic operations. Only the PM peak hour was analyzed for Intersection level of service because it is assumed to be when the worst traffic conditions exist.

In the 2014 land use scenario, all of the study intersections will operate at LOS D or better. No mitigation is proposed for the year 2014. Exhibit 27 shows the PM peak hour intersection traffic volumes and LOS on SR 505 in 2014.

Exhibit 28 shows the PM peak hour intersection traffic volumes and LOS on other subarea arterials in 2014.

Exhibit 27

SR 505 Corridor - 2014 PM Peak Hour Intersection Volumes and Levels of Service (LOS)



Exhibit 28

South Lewis County Arterials - 2014 Intersection Volumes and Levels of Service (LOS) – PM Peak Hour

<p><b>20</b> Highway 603 @ Avery Road</p> <p><b>STOP</b> 2-Way</p>	<p><b>21</b> N Military Rd @ Avery Road</p> <p><b>STOP</b> 4-Way</p>	<p><b>22</b> SB I-5 Ramps @ Avery Road</p> <p><b>STOP</b> 1-Way</p>	<p><b>23</b> NB I-5 Ramps @ Avery Road</p> <p><b>STOP</b> 1-Way</p>	<p><b>24</b> Jackson Hwy @ US 12</p>																																																																																																																													
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Sources: Lewis County, Perteet, ESRI, J:\GIS\GIS\_Projects\20080303\_SR505\_RDP\MapDocs\TrafficTraffic\_ Exhibit\_Pereteet\_TurningTemplate.mxd



Lewis County



Pereteet

**Levels of Service (LOS)**

- A Little/No Delay
- B Short Delays
- C Average Delays
- D Long Delays
- E Very Long Delays
- F Extreme Delays

**South Lewis County Subarea Transportation Plan**

**South Lewis County Subarea Arterials**  
**2014 Baseline Intersection Levels of Service**  
**PM Peak Hour**

### **3.5.6 Truck Climbing Lane**

Additionally, we evaluated WSDOT warrants for a truck climbing lane on westbound SR 505 from the southbound ramps at I-5 to Knowles Road. The warrant contains two parts: speed reduction and truck volume during the peak hour. The first warrant is satisfied by the predicted speed reduction of 20 miles per hour owing to the gradient. The required speed reduction to meet the warrant is 10 miles per hour. Using 5% truck volume (derived from segment counts in 2008), 18 trucks per hour in the PM peak hour are predicted for 2014. The warrant is met at 20 trucks per hour. It appears that the warrant is NOT satisfied for 2014 traffic. The second part of the truck climbing land warrant is sufficiently close to being met that it calls for construction consideration in the event that Mickelson Parkway is built.

### **3.5.7 2014 Mitigations**

The 2014 land use plan within the south Lewis County subarea will not require any intersection or roadway segment mitigations in the subarea as well as on SR 505.

## **3.6 2020 Traffic Forecasts**

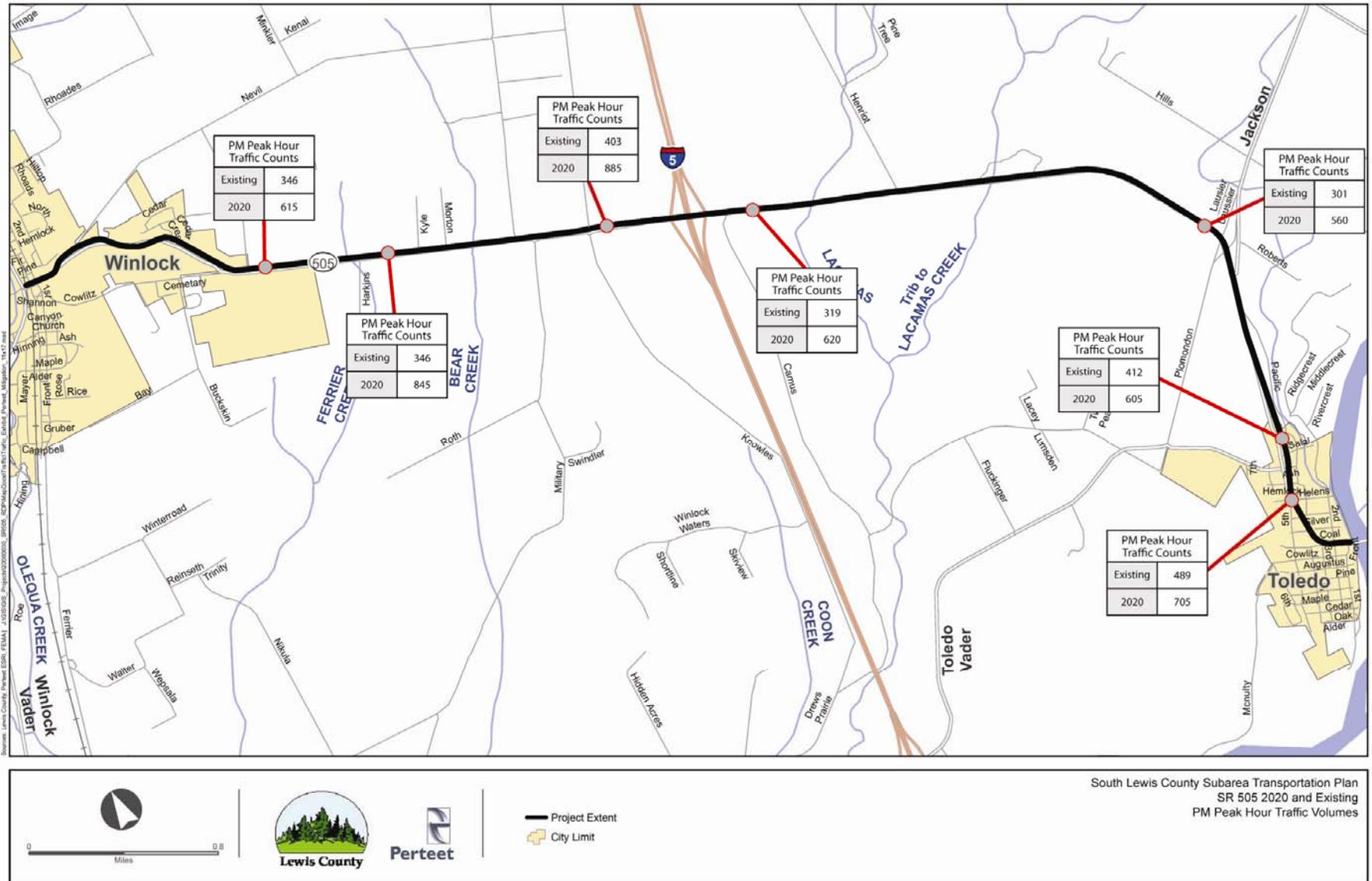
Traffic forecasts were developed for the South Lewis County Subarea using the County's 2020 housing and employment data along with the 2020 transportation network. The 2020 land use was evaluated for traffic conditions and appropriate mitigation was developed to support the expected growth in the area. Traffic conditions were evaluated in terms of roadway segment and intersection traffic volumes, roadway segment volume-capacity ratios (V/C) and intersection level of service (LOS).

PM peak hour volumes were forecasted for the 2020 land use plan. Exhibit 29 shows the PM peak hour traffic volumes on SR 505 under the 2020 land use plan as well as in the existing year.

### **3.6.1 2020 Land Use**

The 2020 land use data for the South Lewis County Subarea was developed by the County. In 2020, it is assumed that the subarea will have about 5800 housing units and just over 5000 commercial and industrial jobs. In 2008, the subarea had about 4,200 housing units and 2,250 commercial and industrial jobs.

**Exhibit 29**  
**SR 505 Corridor – Existing and 2020 PM Peak Hour Traffic Volumes**



### **3.6.2 2020 Transportation Network**

The following network assumptions were made for the year 2020 Land Use scenario:

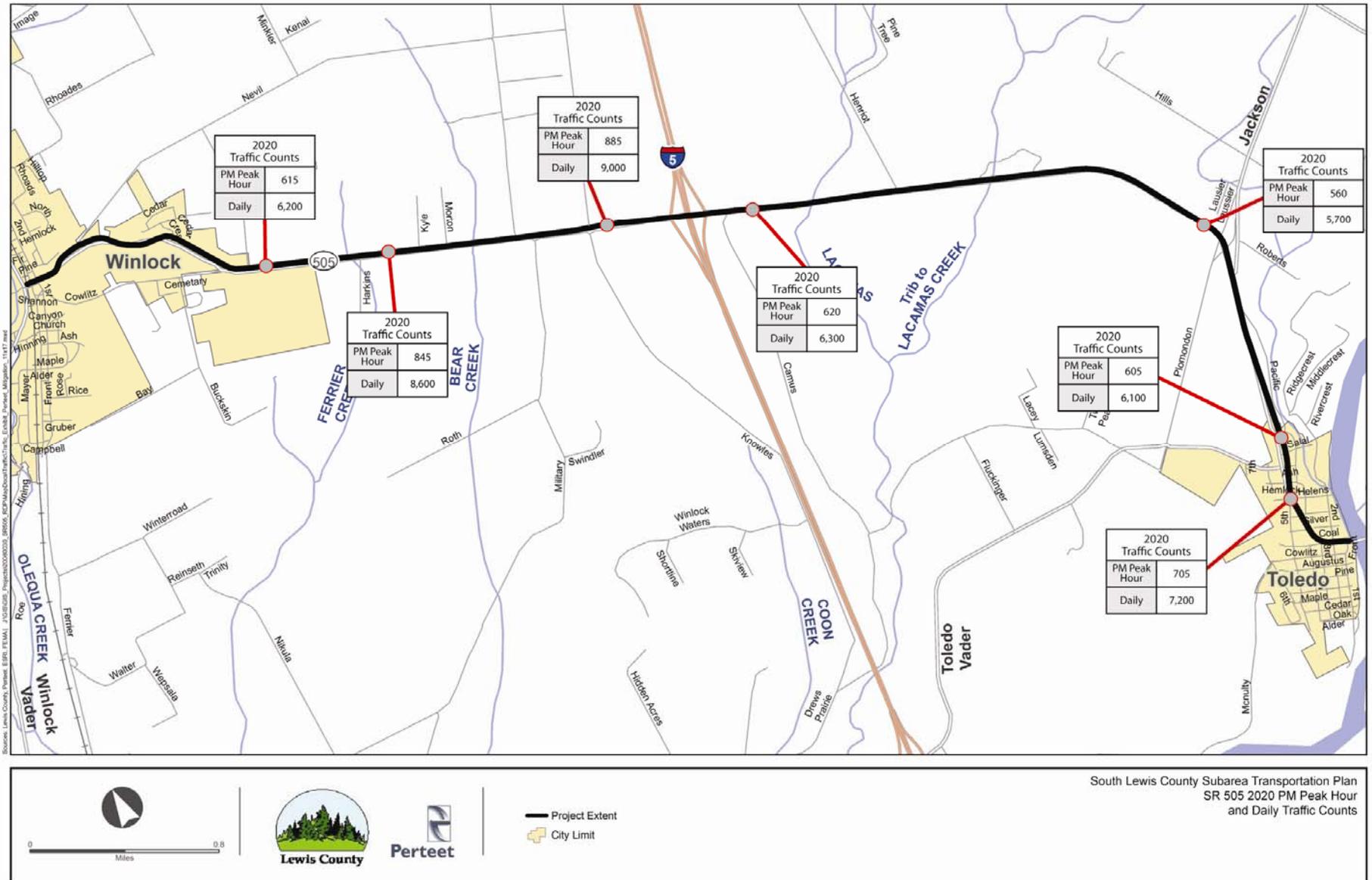
- Mickelson Parkway extension
- Nevil connection to Mickelson Parkway
- SR 505 - westbound Truck Climbing Lane from MP 2.82 to 2.52

Travel demand from the EMME model was post-processed to account for the difference between the 2008 model estimates and 2008 traffic counts.

### **3.6.3 2020 Traffic Conditions**

Once the land use scenario was forecasted for the PM peak hour, daily volumes were projected for the SR 505 corridor. This was done by taking the ratio of existing PM peak counts compared to existing daily counts and then applying it to the 2020 land use plan PM peak hour forecast. An example follows: 2008 SR 505 PM peak hour traffic at Kakela Road is 341 vehicles through the intersection. The segment average weekday traffic volume is 3,510. Kakela PM peak hour traffic is approximately 0.10 percent of the average daily traffic. 2020 predicted PM peak hour traffic for Kakela is approximately 615 vehicles. The average weekday traffic volume is forecast as being  $615/0.10 = 6,200$  vehicles +/- . This was done for selected points along the SR 505 corridor. Exhibit 30 shows the PM peak hour and daily traffic volumes on SR 505 for the year 2020.

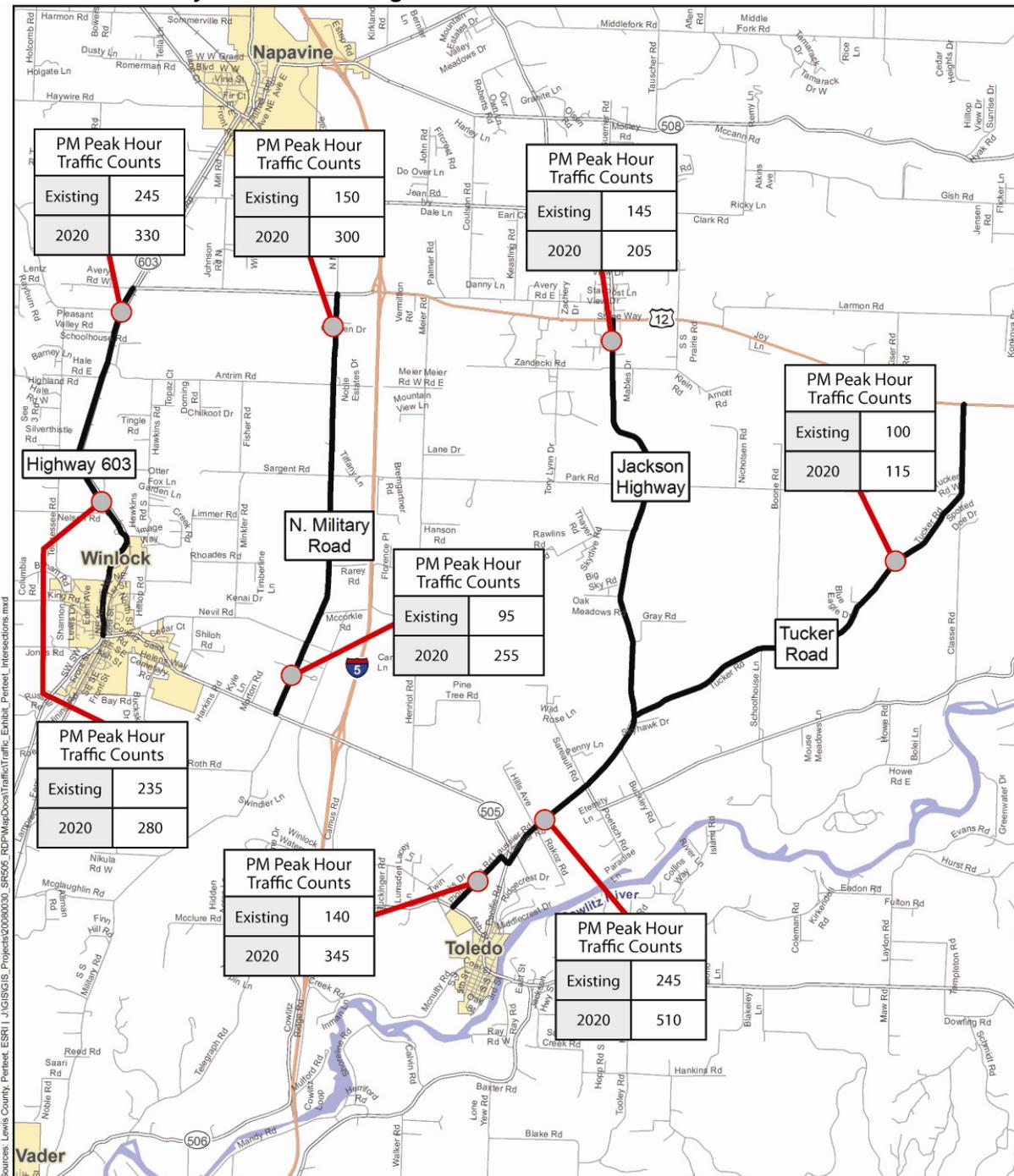
**Exhibit 30  
SR 505 Corridor – 2020 PM Peak Hour and Average Daily Traffic (ADT) Volumes for 2020**



South Lewis County Subarea Transportation Plan  
SR 505 2020 PM Peak Hour  
and Daily Traffic Counts

Analysis was also conducted on selected arterials within the study area. Exhibit 31 shows the PM peak hour traffic volumes for South Lewis County arterials in 2020.

**Exhibit 31  
South Lewis County Arterial – Existing and 2020 PM Peak Hour Volumes**





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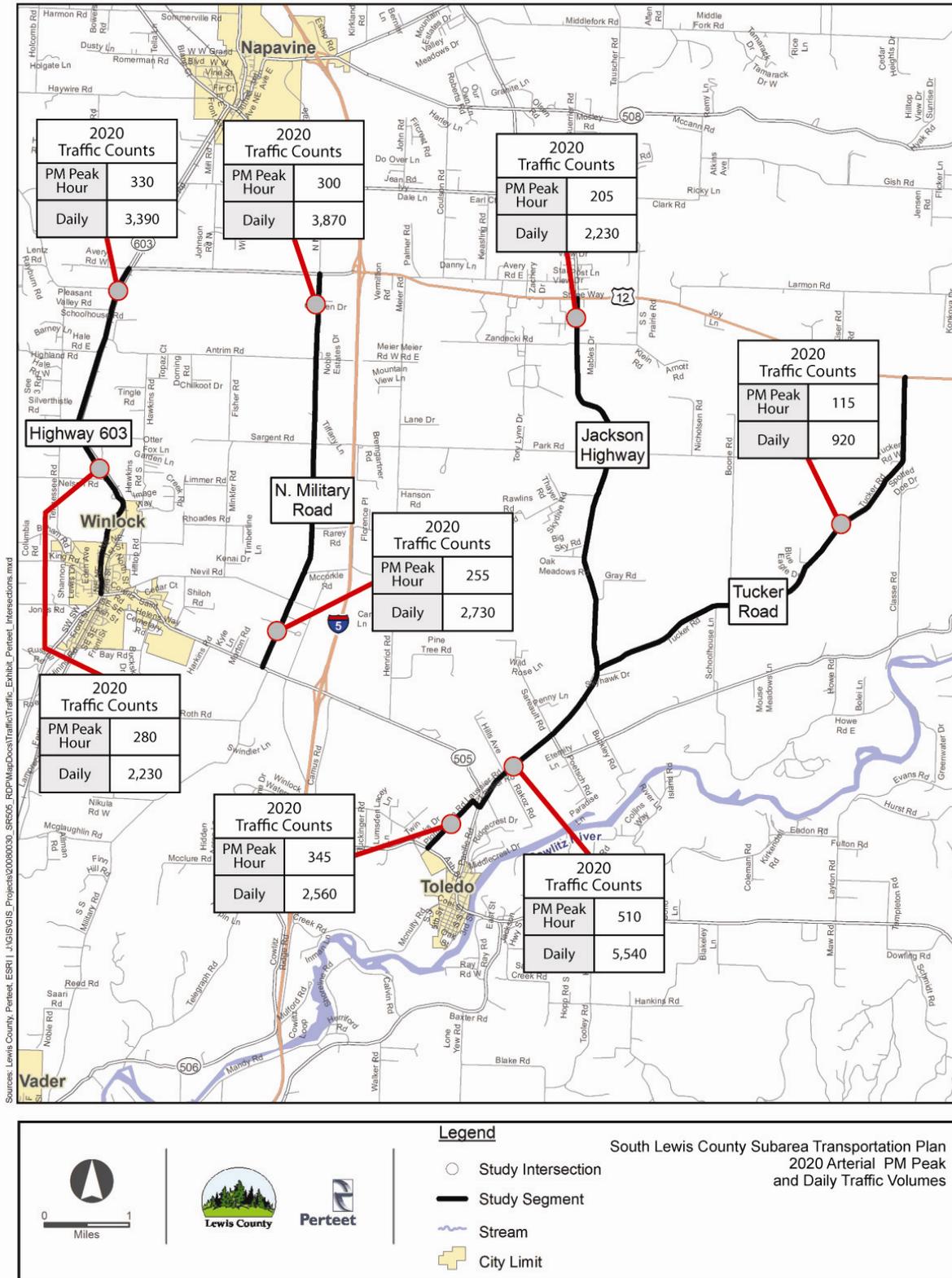

**Legend**

- Study Intersection
- Study Segment
- Stream
- City Limit

South Lewis County Subarea Transportation Plan  
Existing and 2020 Arterial  
PM Peak Traffic Counts

ADT was also projected for 2020 volumes on arterials outside the SR 505 corridor. Exhibit 32 shows the PM peak hour and daily traffic volumes on selected south Lewis County arterials under the 2020 land use scenario.

**Exhibit 32**  
**South Lewis County Arterial – 2020 PM Peak Hour and Daily Traffic**



### 3.6.4 2020 Volume to Capacity Ratios

Corridor volume to capacity ratios (V/C Ratios) were calculated for segments along SR 505. This was done by dividing the PM peak hour volume by the capacity of the road (assumed to be 900 vph per lane). Exhibit 33 shows the PM peak hour roadway segment V/C ratios on SR 505 in 2020.

Exhibit 33

#### SR 505 Corridor - 2020 PM Peak Hour Volumes and Volume to Capacity (V/C)

Segments	2020 PM Peak Hour Volumes and V/C Ratios on SR 505	
	Volume	V/C Ratio
SR 603 to Nevil	555	0.31
Nevil to Cemetery Road	490	0.27
Cemetery Road to Kakela	605	0.34
Kakela to Harkins	615	0.34
Harkins to Military	845	0.47
Military to S. Military	885	0.49
S. Military to Knowles	875	0.49
Knowles to SB I5 Ramp	885	0.33
SB I5 Ramp to NB I5 Ramps	770	0.43
NB I5 Ramps to Camus	685	0.38
Camus to Henriot	620	0.34
Henriot to Jackson Highway	560	0.31
Jackson Highway to Ash	605	0.27

Similarly, V/C Ratios were calculated for the other major corridors within the study area. Exhibit 34 shows the PM peak hour roadway segment V/C ratios on other subarea arterials under the 2020 land use plan.

**South Lewis County Arterials - 2020 PM Peak Hour Volumes and Volume to Capacity (V/C) Ratios**

Segments	2020 PM Peak Hour Volumes and V/C Ratios on South Lewis County Arterials	
	Volume	V/C Ratio
<b>Highway 603 (North of Winlock)</b>		
Avery Rd to Antrim Rd	330	0.21
Antrim Rd to SR 505	280	0.18
<b>N. Military Road</b>		
Avery Rd to Nevil Rd	300	0.19
Nevil Rd to SR 505	255	0.16
<b>Jackson Highway</b>		
US 12 to Park Rd	205	0.13
Park Rd to Frost Rd	160	0.10
Frost Rd to Tucker Rd	150	0.09
Tucker Rd to Spencer Rd	215	0.13
Spencer Rd to SR 505	510	0.32
SR 505 to Toledo-Vader Rd	345	0.22
<b>Tucker Road</b>		
US 12 to Jackson Highway	110	0.07

**3.6.5 2020 Intersection LOS**

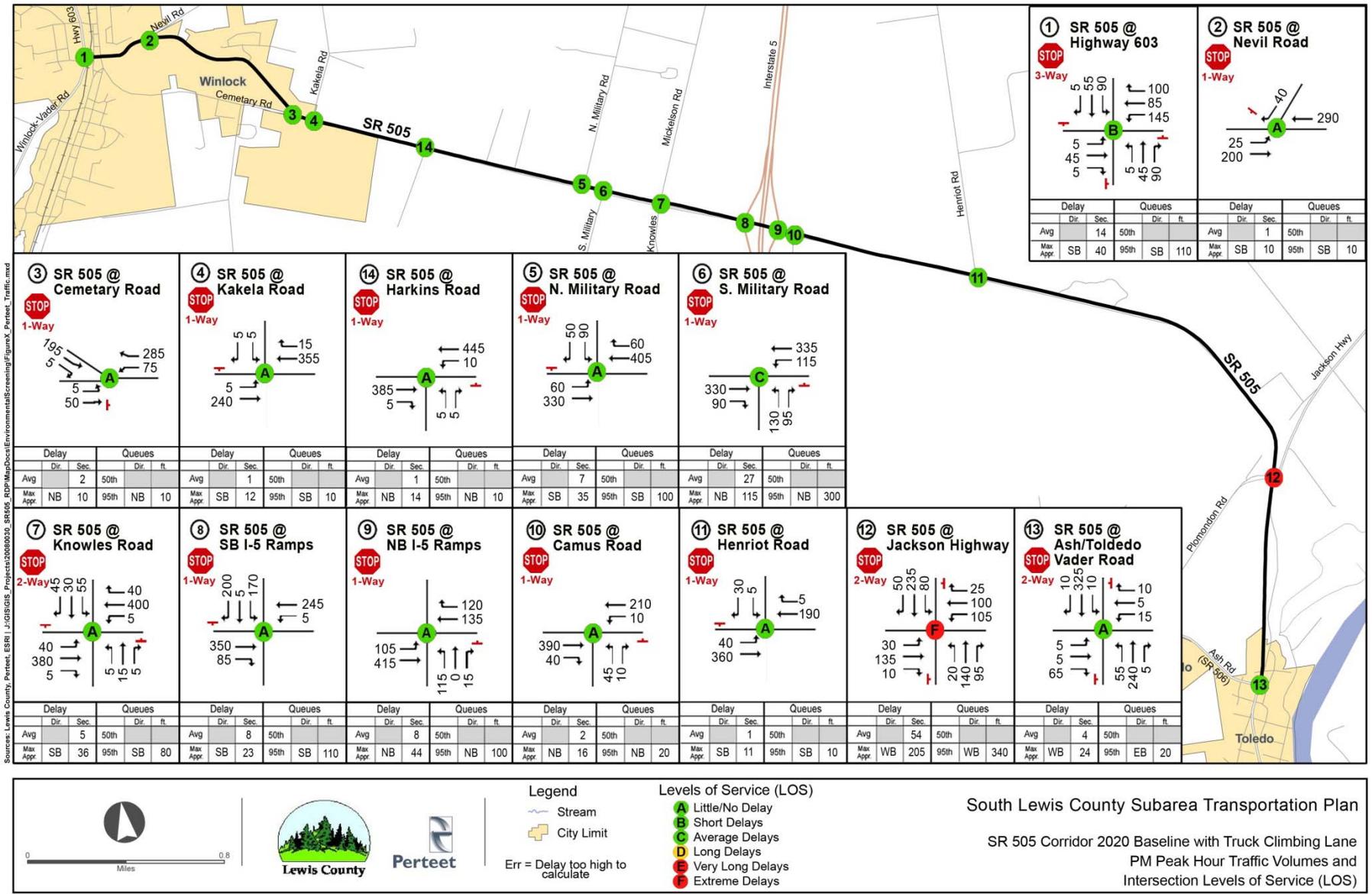
Fourteen intersections along the SR 505 corridor were evaluated for 2020 traffic operations. Only the PM peak hour was analyzed for Intersection level of service because it is assumed to be when the worst traffic conditions exist. Manual on Uniform Traffic Control Device signal warrants were evaluated for the necessity to signalize for maintaining operational LOS.

In the 2020 land use scenario, one intersection along SR 505 will operate below the County's adopted standard level of service D. The failing intersection is at Jackson Highway. Although the average delay at South Military Road will be at an acceptable level, the northbound approach will experience excessive delay. These intersections will require mitigation to bring them up to acceptable level of service under currently adopted County concurrency standards. Proposed mitigation measures are discussed in Section 3.3.6 of this report. The remainder of the study

intersections will operate at LOS D or better. Exhibit 35 shows the PM peak hour intersection traffic volumes and LOS on SR 505 in 2020.

Exhibit 35

SR 505 Corridor - 2020 PM Peak Hour Intersection Volumes and Levels of Service (LOS)



In addition to the 14 intersections along SR 505, 15 additional intersections were analyzed on the other subarea arterials within the study area.

In 2020 all of the study intersections along subarea arterials will operate at an acceptable level of service and require no mitigation. Exhibit 36 shows the PM peak hour intersection traffic volumes and LOS on other subarea arterials in 2020.

Exhibit 36

South Lewis County Arterials – 2020 PM Peak Hour Intersection Volumes and Levels of Service (LOS)

<p><b>20</b> Highway 603 @ Avery Road</p> <p><b>STOP</b> 2-Way</p>	<p><b>21</b> N Military Rd @ Avery Road</p> <p><b>STOP</b> 4-Way</p>	<p><b>22</b> SB I-5 Ramps @ Avery Road</p> <p><b>STOP</b> 1-Way</p>	<p><b>23</b> NB I-5 Ramps @ Avery Road</p> <p><b>STOP</b> 1-Way</p>	<p><b>24</b> Jackson Hwy @ US 12</p> <p><b>STOP</b> 2-Way</p>																																																																																																																													
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Sources: Lewis County, Perreet, ESRI, JGIS/GIS, Project2009030\_SR505\_RDP/MapDocs/Traffic/Exhibit\_Perreet\_Turning\_Template.mxd



Lewis County



Perreet

**Levels of Service (LOS)**

- A Little/No Delay
- B Short Delays
- C Average Delays
- D Long Delays
- E Very Long Delays
- F Extreme Delays

**South Lewis County Subarea Transportation Plan**

**South Lewis County Subarea Arterials**  
2020 Baseline Intersection Levels of Service  
PM Peak Hour

### **3.6.6 2020 Intersection Mitigation**

In the 2020 land use scenario, two intersections will receive mitigation to attain acceptable levels of service.

**SR 505 at South Military Road** – This intersection is currently a stop-controlled intersection with northbound traffic on South Military Road forced to stop before entering SR 505. SR 505 has no stop control on it at this intersection. In 2020, the northbound traffic will experience excessive delay due to having to wait for breaks in the traffic flow on SR 505. To allow them adequate time to merge on to SR 505 a westbound left turn pocket will be provided that will create a receiving lane for the northbound left turn movement. This improvement will allow the intersection to operate at LOS A.

**SR 505 at Jackson Highway** – This intersection currently allows traffic on SR 505 to travel freely and requires traffic on Jackson Highway to stop when approaching SR 505. In 2020 both the eastbound and westbound approaches will experience excessive delay and queuing. To mitigate this problem, a traffic signal will be necessary in 2020 to allow vehicles on Jackson Highway to cross traffic on SR 505. No turn pockets will be necessary to make this intersection operate at an acceptable level. The intersection will operate at LOS A.

Exhibit 37 shows the detailed intersection mitigation on SR 505 in 2020.

Exhibit 38 shows the intersection levels of service with mitigation on SR 505 in 2020.

**Exhibit 37**  
**SR 505 Corridor – Intersection Mitigation**

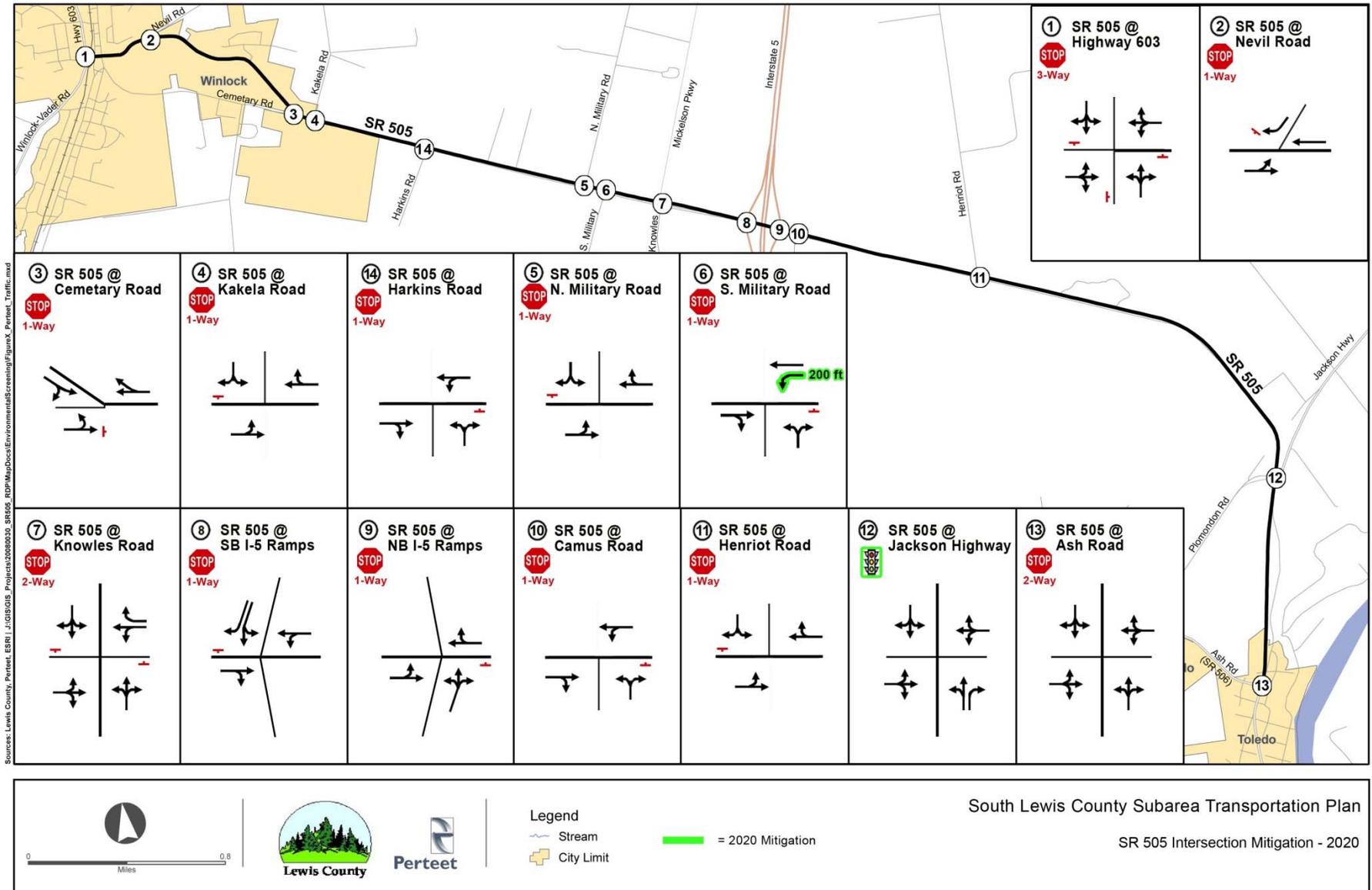
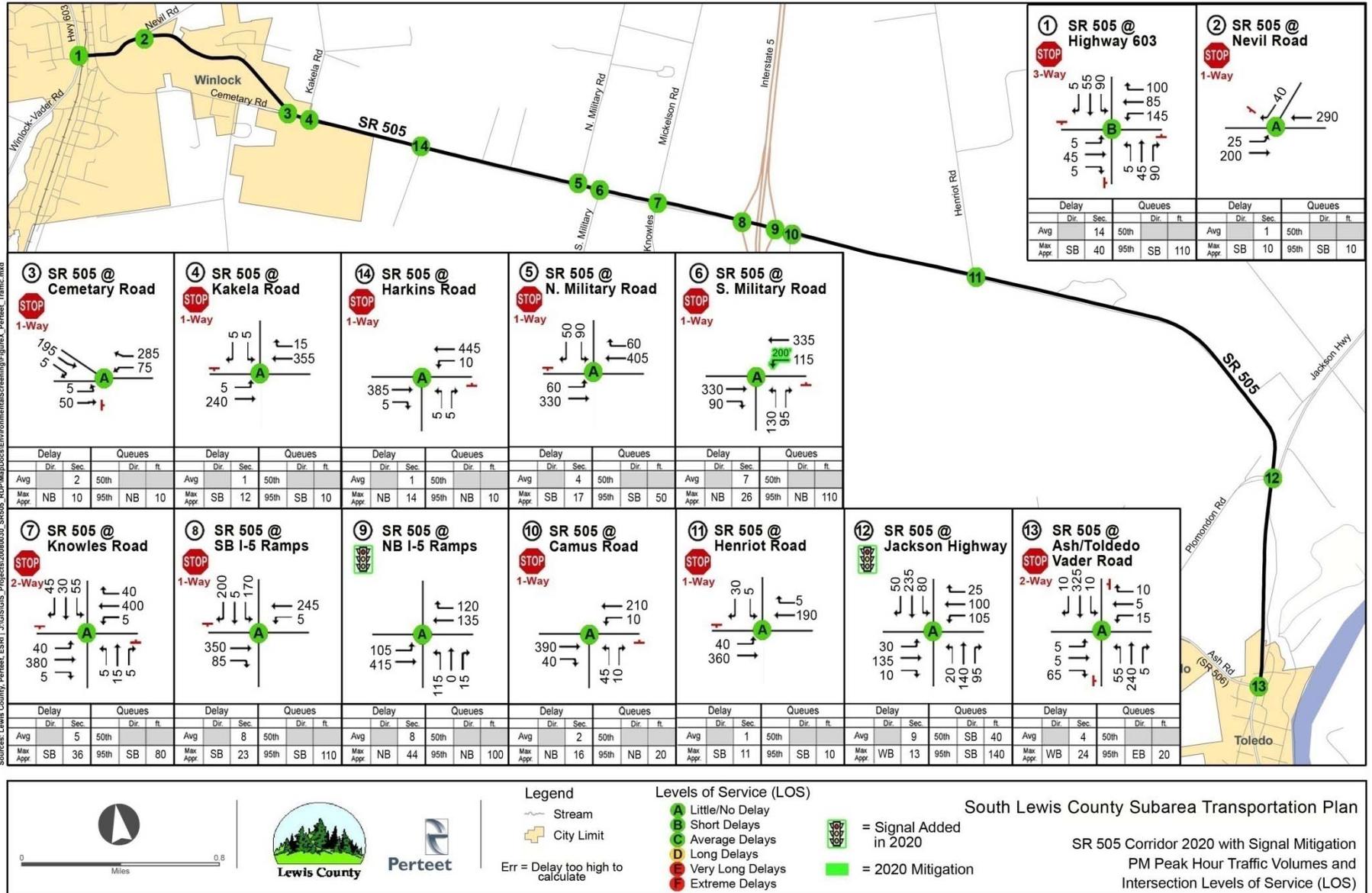


Exhibit 38

SR 505 Corridor – 2020 PM Peak Hour Intersection Volumes and Levels of Service (LOS) with Proposed Mitigation



Corridor volume to capacity ratios (V/C Ratios) were recalculated for segments along SR 505 with the proposed mitigation. This was done by dividing the PM peak hour volume by the capacity of the road (assumed to be 900 vehicles per hour per lane). In the non-mitigated scenario the lowest V/C Ratio is .28 from Nevil Road to Cemetery Road and the highest V/C Ratio is .64 from North Military Road to South Military Road. In the mitigated scenario, the minimum and maximum V/C Ratios do not change because no mitigation is required on those particular segments. In the mitigated scenario each segment V/C Ratio will be equal to or lower than it will be in the non-mitigated scenario. Exhibit 39 shows the roadway segment V/C ratios with and without mitigation on SR 505. The roadway segment on other subarea arterials in 2020 have not changed in V/C ratios.

**Exhibit 39**

**Roadway Segment V/C Ratios with and without Mitigation on SR 505 in 2020**

Segments	2020 PM Peak Hour Volumes and V/C Ratios on SR 505		With Mitigation
	Volume	V/C Ratio	V/C Ratio
SR 603 to Nevil	555	0.31	0.31
Nevil to Cemetery Road	490	0.27	0.27
Cemetery Road to Kakela	605	0.34	0.34
Kakela to Harkins	615	0.34	0.34
Harkins to Military	845	0.47	0.47
<b>Military to S. Military</b>	885	<b>0.49</b>	0.39
<b>S. Military to Knowles</b>	875	<b>0.49</b>	0.39
Knowles to SB I5 Ramp	885	0.33	0.33
SB I5 Ramp to NB I5 Ramps	770	0.43	0.43
NB I5 Ramps to Camus	685	0.38	0.38
Camus to Henriot	620	0.34	0.34
Henriot to Jackson Highway	560	0.31	0.31
Jackson Highway to Ash	605	0.27	0.27

## **3.7 2035 Traffic Forecasts**

Traffic forecasts were developed for the South Lewis County Subarea using the County's 2035 housing and employment data along with the 2035 transportation network. A discussion of this follows in the next several sections.

### **3.7.1 2035 Land Use**

Land use data was provided by participating jurisdictions. Employment data was developed by Lewis County and based on the "South Lewis County Regional Market Analysis", prepared by Hovee & Company, 2009. Additional assumptions for the 2035 land use plan are:

- 75 acres of commercial land (converted to jobs) at Knowles Road pursuant to the adopting action taken by Winlock City Council.
- Additional commercial and industrial lands east of I-5 are developed (north and south of SR 505 immediately east of I-5). Areas around the airport and lands north and west of Toldeo are also developed.

The resulting land use plan for the South Lewis County Subarea assumes that 8,200 housing units and 7,540 jobs will be developed by the year 2035. In 2008, the subarea had about 4,200 housing units and 2,250 commercial and industrial jobs.

### **3.7.2 2035 Transportation Network**

The following network assumptions were made for the year 2035 Land Use scenario:

- Widening of I-5 to 6 lanes in the South Lewis County by 2035
- Mickelson Parkway extension
- Nevil connection to Mickelson Parkway
- SR 505 - westbound Truck Climbing Lane from MP 2.82 to 2.52

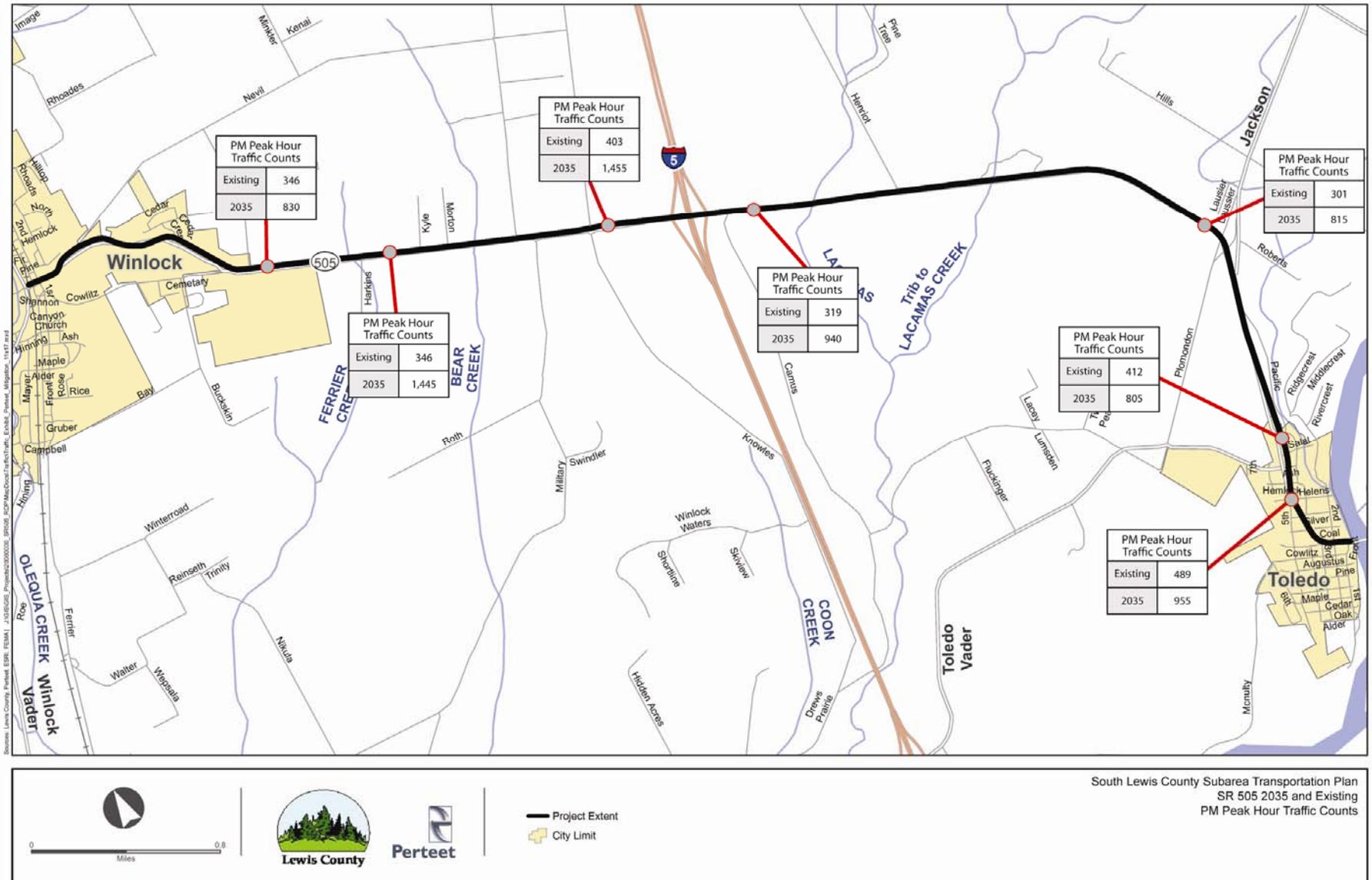
Travel demand from the EMME model was post-processed to account for the difference between the 2008 model estimates and 2008 traffic counts.

### **3.7.3 2035 Traffic Conditions**

The 2035 land use was evaluated for traffic conditions and mitigation to support the expected growth in the area. Traffic conditions were evaluated in terms of roadway segment and intersection traffic volumes, roadway segment volume-capacity ratios (V/C) and intersection level of service (LOS).

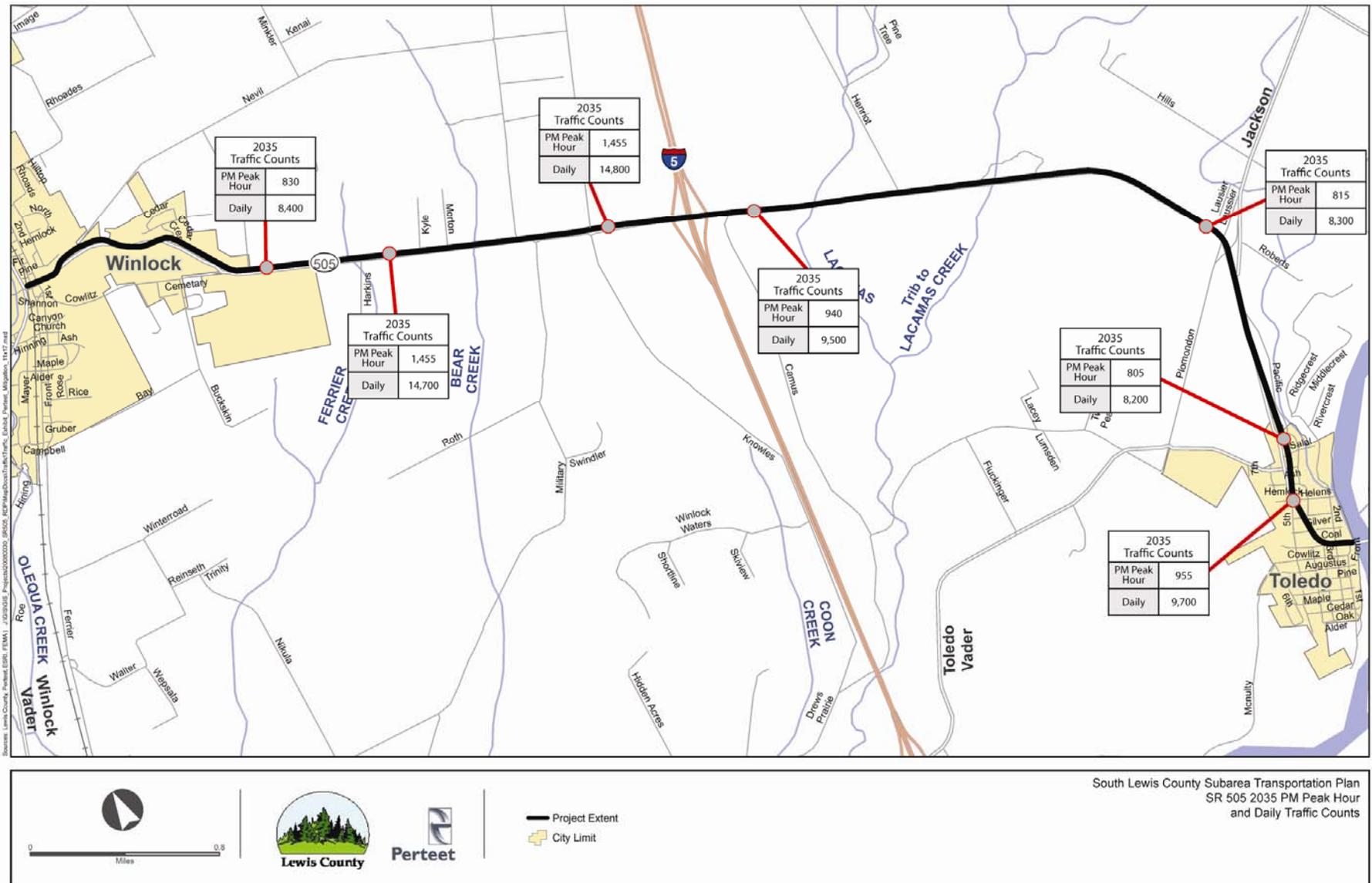
PM peak hour volumes were forecasted for the 2035 land use plan. Exhibit 40 shows the PM peak hour traffic volumes on SR 505 under the 2035 land use plan as well as in the existing year.

**Exhibit 40**  
**SR 505 Corridor – Existing and 2035 PM Peak Hour Volumes**



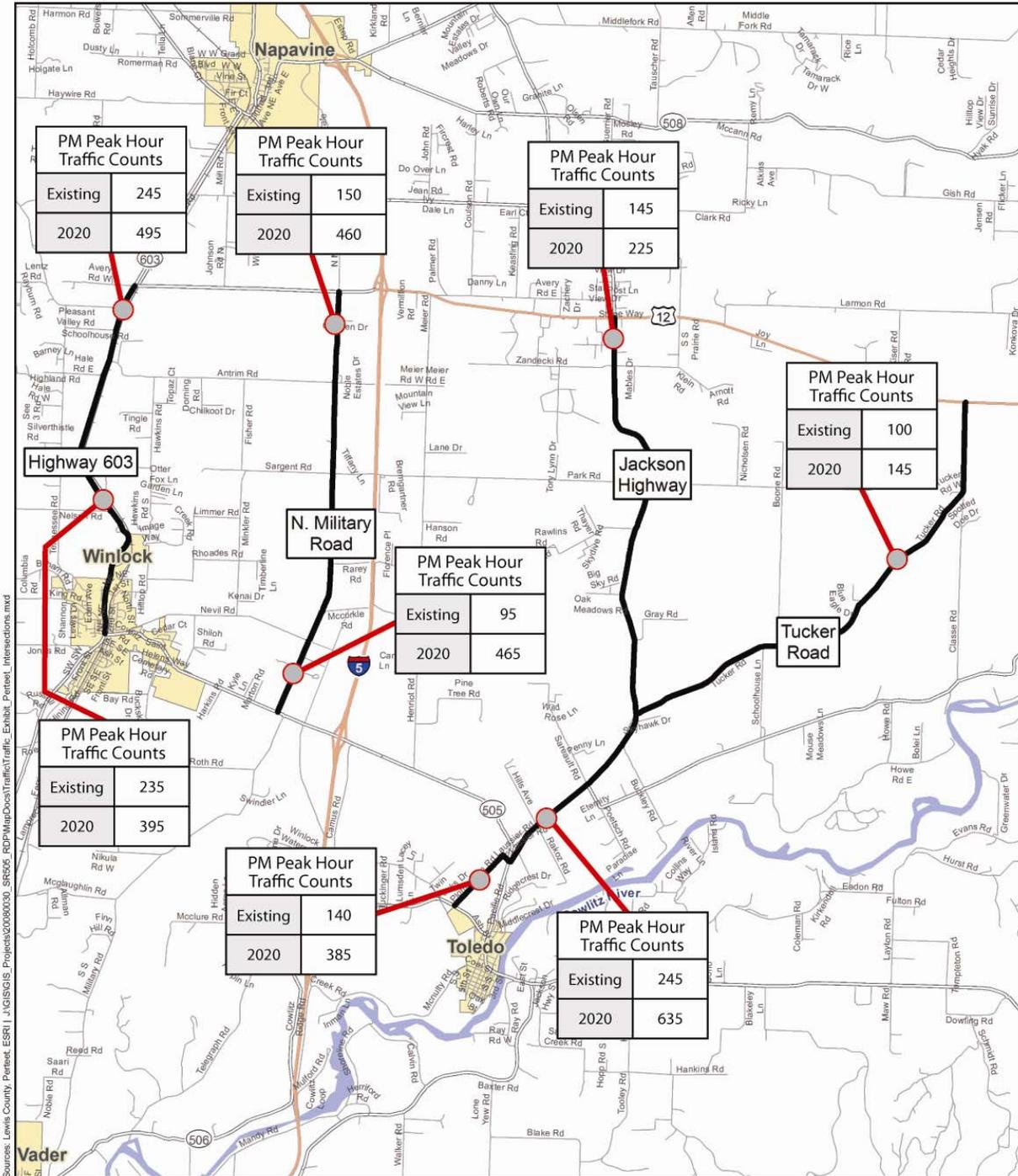
Once the land use scenario was forecasted for the PM peak hour, daily volumes were projected for the SR 505 corridor. This was done by taking the ratio of existing PM peak counts compared to existing daily counts and then applying it to the 2035 land use plan PM peak hour forecast. This was done for selected points along the SR 505 corridor. Exhibit 41 shows the PM peak hour and daily traffic volumes on SR 505 under the 2035 land use scenario.

**Exhibit 41  
SR 505 Corridor - 2035 PM Peak Hour and Average Daily Traffic (ADT) Volumes for the year 2035**



Analysis was also conducted on selected arterials within the study area. Exhibit 42 shows the PM peak hour traffic volumes for South Lewis County arterials for the 2035 land use plan scenario.

**Exhibit 42  
South Lewis County Arterial – Existing and 2035 PM Peak Hour Volumes**





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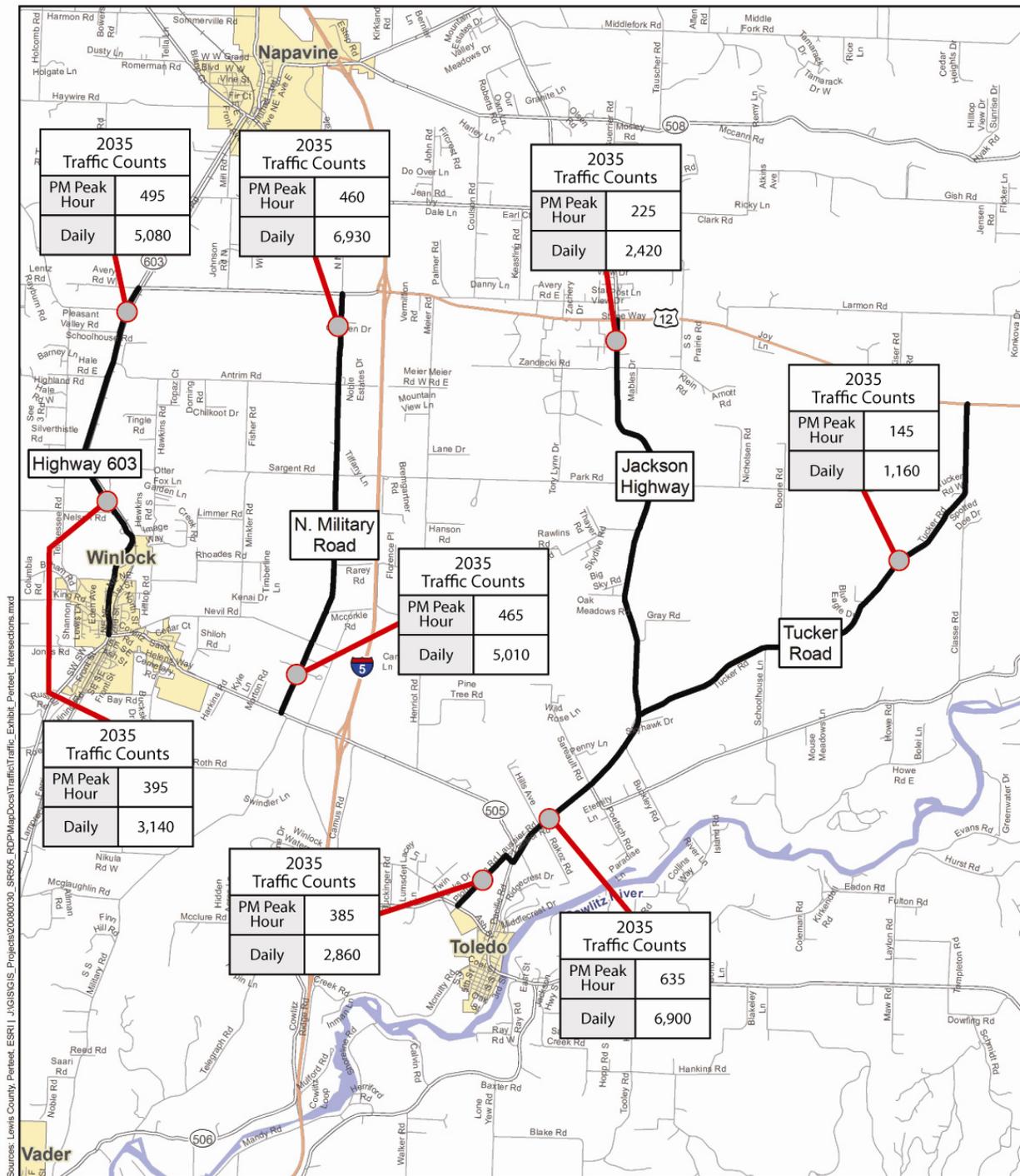

**Legend**

- Study Intersection
- Study Segment
- Stream
- City Limit

South Lewis County Subarea Transportation Plan  
Existing and 2035 Arterial  
PM Peak Traffic Counts

ADT was also projected for 2035 volumes on arterials outside the SR 505 corridor. Exhibit 43 shows the PM peak hour and daily traffic volumes on selected south Lewis County arterials under the 2035 land use scenario.

**Exhibit 43  
South Lewis County Arterial – 2035 PM Peak Hour and Daily Traffic**





0 1  
Miles




**Legend**

- Study Intersection
- Study Segment
- ~ Stream
- ⊕ City Limit

South Lewis County Subarea Transportation Plan  
2035 Arterial PM Peak  
and Daily Traffic Counts

**3.7.4 2035 Volume to Capacity Ratios**

Corridor volume to capacity ratios (V/C Ratios) were calculated for segments along SR 505. This was done by dividing the PM peak hour volume by the capacity of the road (assumed to be 900 vehicles per hour per lane). Exhibit 44 shows the PM peak hour roadway segment V/C ratios on SR 505 for the 2035 land use plan.

**Exhibit 44  
SR 505 Corridor - 2035 PM Peak Hour Volumes and Volume to Capacity (V/C) Ratios**

Segments	2035 PM Peak Hour Volumes and V/C Ratios on SR 505	
	Volume	V/C Ratio
SR 603 to Nevil	720	0.40
Nevil to Cemetery Road	650	0.36
Cemetery Road to Kakela	800	0.44
Kakela to Harkins	835	0.46
Harkins to Military	1,445	0.80
Military to S. Military	1,485	.83
S. Military to Knowles	1,510	0.84
Knowles to SB I5 Ramp	1,455	0.54
SB I5 Ramp to NB I5 Ramps	1,275	0.71
NB I5 Ramps to Camus	1,065	0.59
Camus to Henriot	940	0.52
Henriot to Jackson Highway	815	0.45
Jackson Highway to Ash	805	0.36

Similarly, V/C Ratios were calculated for the other major corridors within the study area. Exhibit 45 shows the PM peak hour roadway segment V/C ratios on other subarea arterials under the 2035 land use plan.

## South Lewis County Arterials - 2035 PM Peak Hour Volumes and Volume to Capacity (V/C) Ratios

Segments	2035 PM Peak Hour Volumes and V/C Ratios on South Lewis County Arterials	
	Volume	V/C Ratio
<b>Highway 603 (North of Winlock)</b>		
Avery Rd to Antrim Rd	495	0.31
Antrim Rd to SR 505	395	0.25
<b>N. Military Road</b>		
Avery Rd to Nevil Rd	460	0.29
Nevil Rd to SR 505	470	0.29
<b>Jackson Highway</b>		
US 12 to Park Rd	225	0.14
Park Rd to Frost Rd	210	0.13
Frost Rd to Tucker Rd	175	0.11
Tucker Rd to Spencer Rd	240	0.15
Spencer Rd to SR 505	635	0.40
SR 505 to Toledo-Vader Rd	385	0.24
<b>Tucker Road</b>		
US 12 to Jackson Highway	145	0.09

**3.7.5 2035 Intersection LOS**

Fourteen intersections along the SR 505 corridor were evaluated for 2035 land use plan traffic operations. Only the PM peak hour was analyzed for Intersection level of service because it is assumed to be when the worst traffic conditions exist.

In the 2035 land use scenario, seven intersections along SR 505 will operate below the County's adopted standard level of service D. These include the intersections at Highway 603, North Military Road, South Military Road, Knowles Road, SB I-5 ramps, NB I-5 ramps, and Jackson Highway. These intersections will require mitigation to bring them up to acceptable level of service under currently adopted County concurrency standards. Proposed mitigation measures will be discussed later in this report. The remainder of the study intersections will operate at

LOS D or better. Exhibit 46 shows the PM peak hour intersection traffic volumes and LOS on SR 505 in 2035.

Exhibit 46

SR 505 Corridor - 2035 PM Peak Hour Intersection Volumes and Levels of Service (LOS)

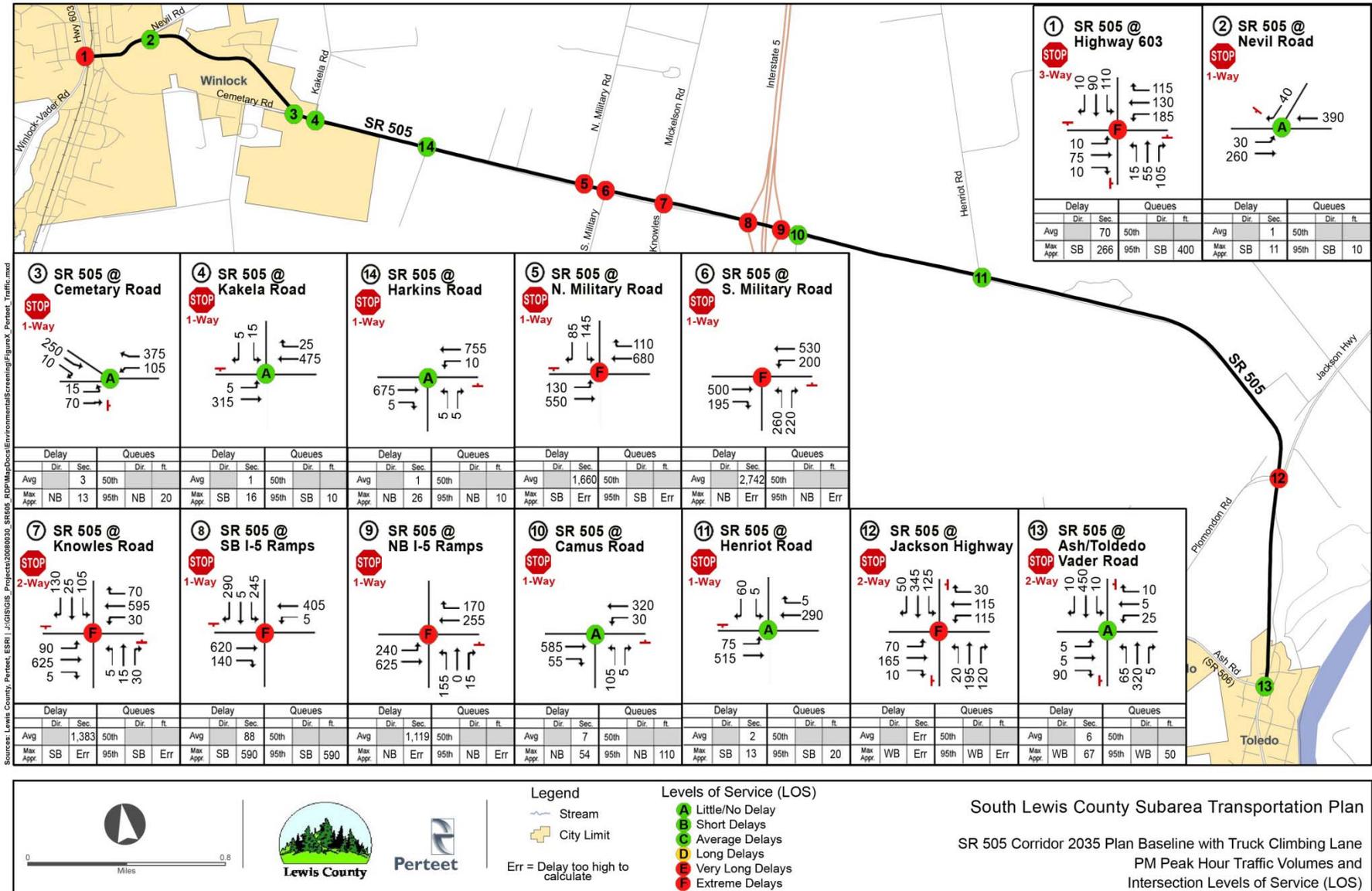


Exhibit 47 shows the PM peak hour travel speeds on SR 505 in 2008 and 2035 (as predicted by VISSIM traffic modeling software)

**Exhibit 47**  
**SR 505 Corridor - 2008 and 2035 PM Peak Hour Travel Speeds**

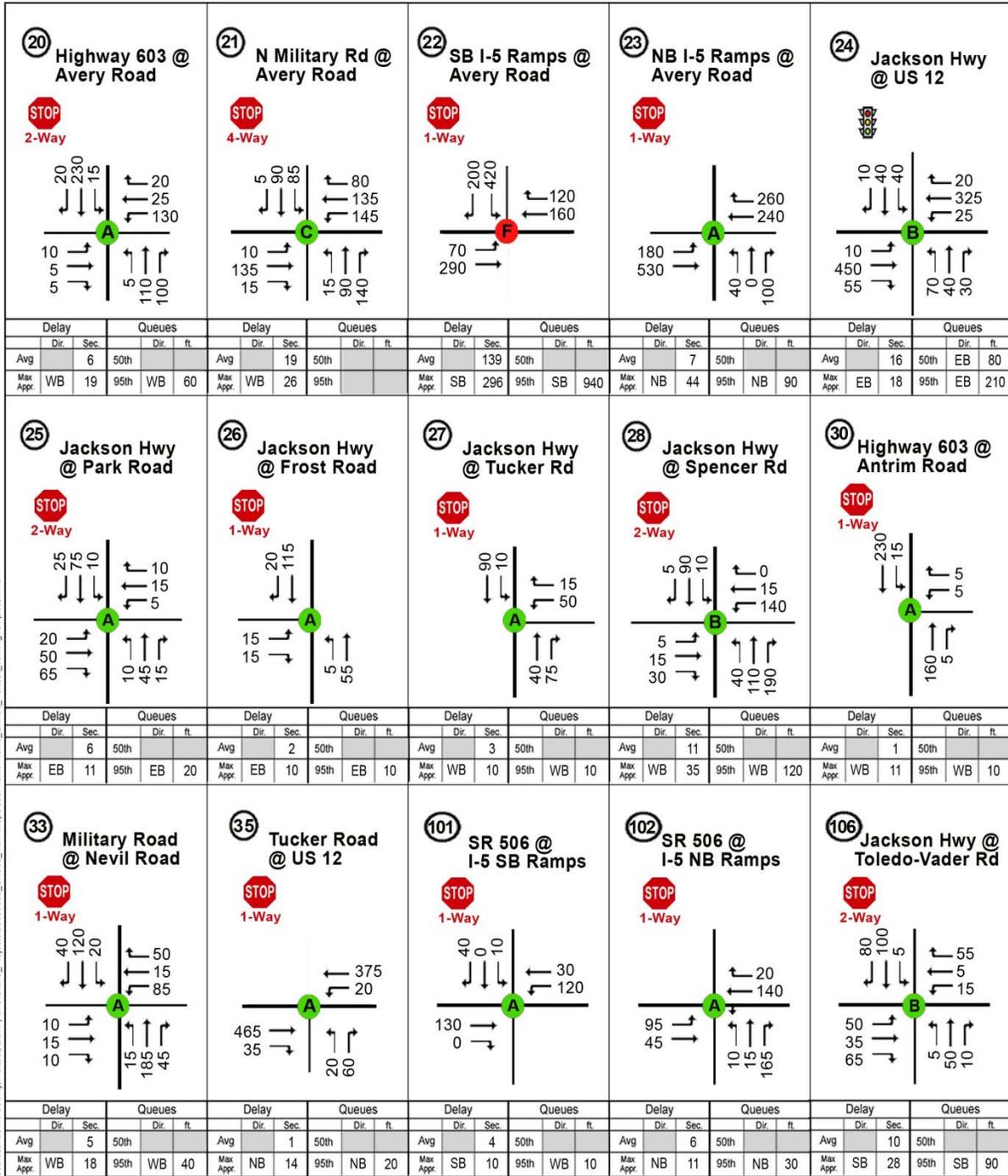
<b>PM Peak Hour Travel Speeds on SR 505</b>				
	<b>2008 Existing</b>		<b>2035 Plan Baseline Network</b>	
	<i>Eastbound</i>	<i>Westbound</i>	<i>Eastbound</i>	<i>Westbound</i>
SR 603 to Cemetery Road	26.6	26.8	26.6	27.1
Cemetery Road to N. Military	48.2	48.1	45.9	46.0
N. Military to SB I-5 Ramp	44.6	44.8	34.3	35.3
SB I5 Ramp to Henriot	48.6	50.6	43.4	48.6
Henriot to Jackson Highway	48.2	47.8	42.6	46.7
Jackson Highway to Ash	34.1	34.6	34.2	32.5
<b>Average Speed</b>	<b>40.4</b>	<b>40.7</b>	<b>37.4</b>	<b>38.7</b>

In addition to the 14 intersections along SR 505, 15 additional intersections were analyzed on the other subarea arterials within the study area.

The only intersection to fall below the county’s adopted level of service standard is the intersection at US 12 (Avery Road) and the southbound I-5 ramps. This intersection will require mitigation under the currently adopted County concurrency standards. Proposed mitigation measures will be discussed later in this report. The remainder of the study intersections along subarea arterials will operate at an acceptable level of service. Exhibit 48 shows the PM peak hour intersection traffic volumes and LOS on other subarea arterials in 2035.

Exhibit 48

South Lewis County Arterials – 2035 PM Peak Hour Intersection Volumes and Levels of Service (LOS)



Sources: Lewis County, Perteeet, ESRI | J:\GIS\GIS\_P\Projects\20080030\_SR505\_R0P\MapDocs\Traffic\Traffic\_Embell\_Perteeet\_Turning\_Template.mxd

**Levels of Service (LOS)**

- A Little/No Delay
- B Short Delays
- C Average Delays
- D Long Delays
- E Very Long Delays
- F Extreme Delays

**South Lewis County Subarea Transportation Plan**

**South Lewis County Subarea Arterials**  
**2035 Plan Baseline**  
**Intersection Levels of Service**  
**PM Peak Hour**

**3.7.6 2035 Intersection Mitigation**

In the 2035 land use plan scenario, eight intersections will receive mitigation, either in 2020 or by 2035, to attain acceptable levels of service.

**1. SR 505 at Highway 603** – This intersection is currently a three way stop at a four-legged intersection with traffic moving westbound on SR 505 not required to stop. In the 2035 land use scenario, maintaining a free westbound movement will cause excessive delay for the other approaches, particularly the southbound left turn movement. Turning this intersection into an all-way stop will give the other approaches a chance to get through the intersection, thus improving the average delay to acceptable standards. However, because the railroad crosses SR 505 just to the east of this intersection, having the east leg stop-controlled will be unsafe. To safely mitigate this intersection a signal will be required so that vehicles will not stop on the railroad tracks. The mitigated intersection will operate at LOS B. It will necessary to deploy intelligent transportation system elements coordinated with rail traffic to ensure that no vehicles are stranded on the tracks during red signal phase west for eastbound on 505.

**2. SR 505 at North Military Road** – This intersection is currently a stop-controlled intersection with southbound traffic on North Military Road forced to stop before entering SR 505. SR 505 has no stop control on it. In 2035, the southbound traffic will experience excessive delay due to waiting for breaks in the traffic flow on SR 505. To mitigate this intersection, an eastbound left turn pocket will be provided to store vehicles waiting to turn left. Also, this intersection will require a signal to allow adequate time for eastbound vehicles to turn left on to North Military. The mitigated intersection will operate at LOS B. A south bound left turn lane is not necessary at SR 505 and North Military Road. This is due to the addition of the signal which results in a LOS of D and a queue of 144 feet.

**3. SR 505 at South Military Road** – This intersection is currently a stop-controlled intersection with northbound traffic on South Military Road forced to stop before entering SR 505. SR 505 has no stop control on it at this intersection. In 2035, the northbound traffic will experience excessive delay due to having to wait for breaks in the traffic flow on SR 505. The westbound left pocket that will be phased into this intersection in 2020 will not be sufficient for this intersection to operate at a sufficient level in 2035. To further mitigate this problem, an additional northbound right turn pocket should be added. The mitigated intersection will operate at LOS B in 2035.

**4. SR 505 at Knowles Road** – This intersection is currently a three legged intersection with northbound traffic having to stop before entering SR 505. By 2035 the County plans to add Mickelson Parkway which will make it a 4-legged intersection. It is assumed that this intersection will continue to be stop-controlled both northbound and southbound. As part of the truck climbing lane mitigation that will occur by 2020 the westbound approach will have one shared left-through lane and the truck climbing lane will drop at the intersection as a right turn only. With this configuration, in 2035 both northbound and southbound vehicles will experience excessive delay. To mitigate this problem, a signal should be installed to allow northbound and southbound vehicles adequate time to cross SR 505. This mitigation is proposed to be installed by the year 2020. The mitigated intersection will operate at LOS C.

**5. SR 505 at Southbound I-5 Ramps** – Currently, this intersection is stop-controlled for the one-way southbound approach with free movement for vehicles on SR 505. As part of the truck climbing lane mitigation that will occur by 2020, the southbound approach will have a free right turn into the additional westbound truck climbing lane. Even with this free turn lane in 2035 the southbound approach will experience excessive delay. Mitigation for this intersection includes installing a signal to allow southbound traffic adequate time to turn on to SR 505. The intersection will operate at LOS B.

**6. SR 505 at Northbound I-5 Ramps** – This intersection currently allows traffic to travel on SR 505 freely and northbound traffic from I-5 is required to stop. In 2035 the northbound approach will experience excessive delay and will require mitigation. A signal will allow northbound traffic adequate time to merge on to SR 505. However, with the addition of a signal, eastbound traffic will experience excessive delay unless a left turn pocket is added to keep vehicles turning left from blocking vehicles that are traveling straight. The mitigated intersection will operate at LOS A.

**7. SR 505 at Camus Road** – This intersection currently allows traffic to flow freely on SR 505 and requires northbound traffic to stop when approaching SR 505. In 2035, this intersection will operate at an acceptable level, however, there will be enough traffic on SR 505 to cause significant delay to northbound traffic, particularly those wishing to turn left onto SR 505. To alleviate some of the cross traffic a westbound left turn pocket is proposed which will provide a two way left turn lane west of the intersection. The mitigated intersection will operate at LOS A.

**8. SR 505 at Jackson Highway** – This intersection currently allows traffic on SR 505 to travel freely and requires traffic on Jackson Highway to stop when approaching SR 505. In 2020 and 2035 both the eastbound and westbound approaches will experience excessive delay and queuing. To mitigate this problem, a traffic signal will be necessary in 2020 to allow vehicles on Jackson Highway to cross traffic on SR 505. No turn pockets will be necessary to make this intersection operate at an acceptable level. In 2035 the intersection will operate at LOS B with no further mitigation.

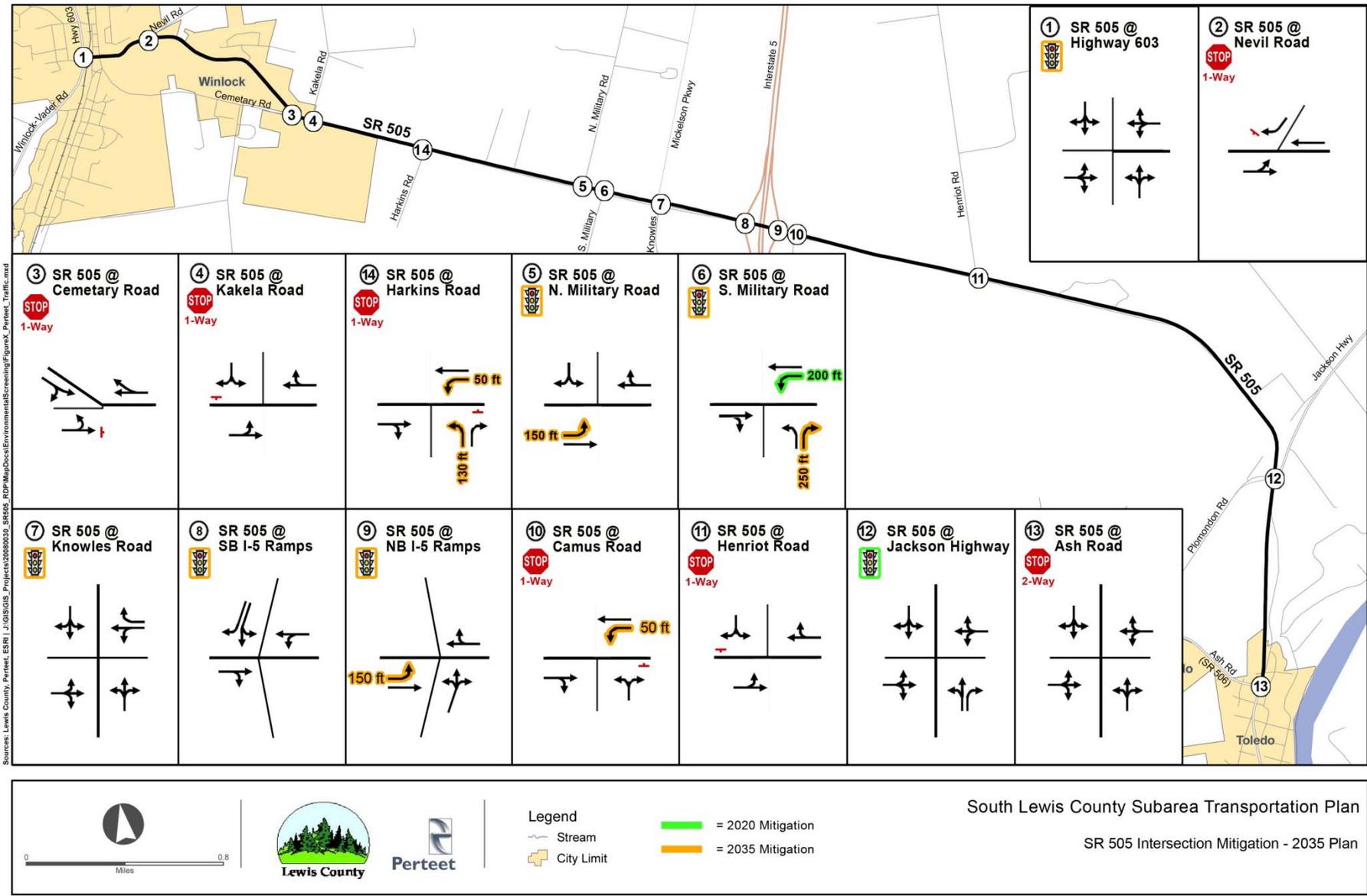
Exhibit 49 shows the detailed intersection mitigation on SR 505 in 2035.

Exhibit 50 shows the overall mitigation on other subarea arterials in 2035.

Exhibit 51 shows the intersection levels of service with mitigation on SR 505 in 2035.

Exhibit 52 shows the intersection levels of service with mitigation on other subarea arterials in 2035

**Exhibit 49**  
**SR 505 Corridor – Intersection Mitigation – 2035 Plan**



**Exhibit 50  
South Lewis County Arterials – 2035 Intersection Mitigation**

<p>20 Highway 603 @ Avery Road</p> <p> 2-Way</p>	<p>21 N Military Rd @ Avery Road</p> <p> 4-Way</p>	<p>22 SB I-5 Ramps @ US 12 (Avery Rd)</p> <p></p>	<p>23 NB I-5 Ramps @ US 12</p> <p> 1-Way</p>	<p>24 Jackson Hwy @ US 12</p> <p></p>
<p>25 Jackson Hwy @ Park Road</p> <p> 2-Way</p>	<p>26 Jackson Hwy @ Frost Road</p> <p> 1-Way</p>	<p>27 Jackson Hwy @ Tucker Road</p> <p> 1-Way</p>	<p>28 Jackson Hwy @ Spencer Rd</p> <p> 2-Way</p>	<p>30 Highway 603 @ Atrim Road</p> <p> 1-Way</p>
<p>33 N Military Road @ Nevil Road</p> <p> 1-Way</p>	<p>35 Tucker Road @ US 12</p> <p> 1-Way</p>	<p>101 NB I-5 Ramps @ US 12</p> <p> 1-Way</p>	<p>102 NB I-5 Ramps @ US 12</p> <p> 1-Way</p>	<p>106 Jackson Hwy @ Toledo-Vader Rd</p> <p> 2-Way</p>

Sources: Lewis County, Permit, EBRI, J:\GIS\GIS\_Projects\20080303\_SR505\_RDP\MapDocs\Traffic\Traffic\_Exhibit\_Permit\_Turning\_Template.mxd

	= Mitigation implemented in 2035	<p><b>South Lewis County Subarea Transportation Plan</b></p> <p><b>South Lewis County Subarea Arterials 2035 Plan Mitigation Intersection Channelization</b></p>
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Exhibit 51

SR 505 Corridor – 2035 PM Peak Hour Intersection Volumes and Levels of Service (LOS) with Proposed Mitigation

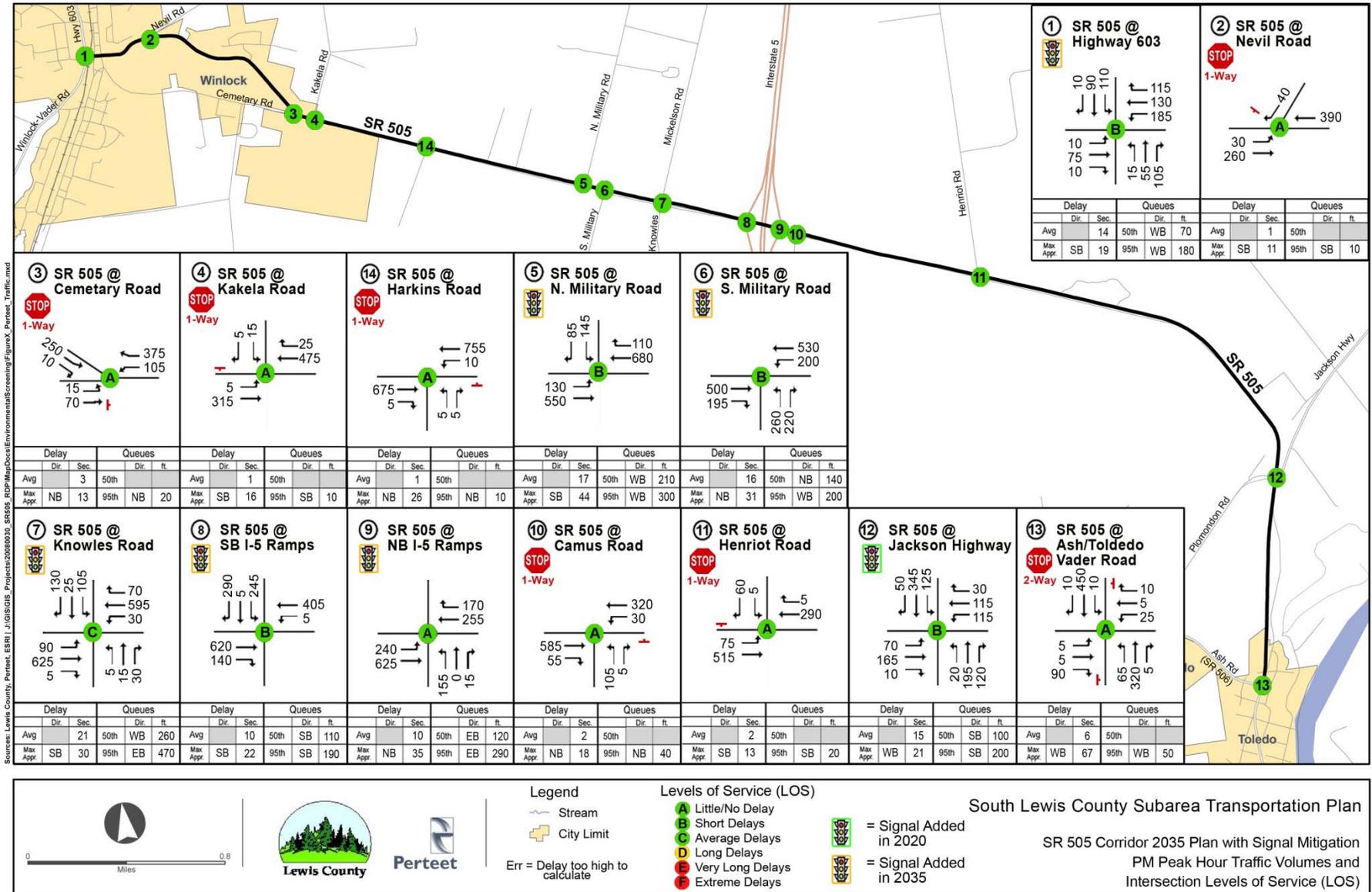


Exhibit 52

South Lewis County Arterials – 2035 PM Peak Hour Intersection Volumes and Levels of Service (LOS) with Proposed Mitigation

<p><b>20</b> Highway 603 @ Avery Road</p> <p><b>STOP</b> 2-Way</p>	<p><b>21</b> N Military Rd @ Avery Road</p> <p><b>STOP</b> 4-Way</p>	<p><b>22</b> SB I-5 Ramps @ Avery Road</p>	<p><b>23</b> NB I-5 Ramps @ Avery Road</p> <p><b>STOP</b> 1-Way</p>	<p><b>24</b> Jackson Hwy @ US 12</p>																																																																																																																								
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**Levels of Service (LOS)**

- A Little/No Delay
- B Short Delays
- C Average Delays
- D Long Delays
- E Very Long Delays
- F Extreme Delays

**South Lewis County Subarea Transportation Plan**

**South Lewis County Subarea Arterials**  
**2035 Plan Mitigation**  
**Intersection Levels of Service**  
**PM Peak Hour**

Corridor volume to capacity ratios (V/C Ratios) were recalculated for segments along SR 505 with the proposed mitigation. This was done by dividing the PM peak hour volume by the capacity of the road (assumed to be 900 vph per lane). In the non-mitigated scenario the lowest V/C Ratio is .39 from Nevil Road to Cemetery Road and the highest V/C Ratio is 1.01 from North Military Road to South Military Road. In the mitigated scenario, the V/C Ratios range from a low of .36 from Camus Road to Henriot Road to a high of .67 from North Military Road to South Military Road. In the mitigated scenario each segment V/C Ratio will be equal to or lower than it will be in the non-mitigated scenario.

Exhibit 53 shows the roadway segment V/C ratios with and without mitigation on SR 505 in 2035.

**Exhibit 53  
Roadway Segment V/C Ratios with and without Mitigation on SR 505 in 2035**

Segments	Mile posting (mi)	2035 PM Peak Hour Volumes and V/C Ratios on SR 505		With Mitigation
		Volume	V/C Ratio	V/C Ratio
Hwy 603 to Nevil	0.00 – 0.23	720	0.40	0.40
Nevil to Cemetery Road	0.23 – 1.01	650	0.36	0.36
Cemetery Road to Kakela	1.01 – 1.08	800	0.44	0.44
Kakela to Harkins	1.08 – 1.56	835	0.46	0.46
<b>Harkins to N. Military</b>	1.56 – 2.22	1,445	0.80	0.64
Military to S. Military	2.22 – 2.31	1,485	0.83	0.83
<b>S. Military to Knowles</b>	2.31 – 2.52	1,510	0.84	0.67
Knowles to SB I-5 Ramp	2.52 – 2.88	1,455	0.54	0.54
<b>SB* I-5 Ramp to NB** I-5 Ramps</b>	2.88 – 3.03	1,275	0.71	0.57
<b>NB I-5 Ramps to Camus</b>	3.03 – 3.09	1,065	0.59	0.47
<b>Camus to Henriot</b>	3.09 – 3.85	940	0.52	0.42
Henriot to Jackson Highway	3.85 – 5.46	815	0.45	0.45
Jackson Highway to Ash	5.46 – 6.32	805	0.36	0.36

\*South Bound (SB)

\*\* North Bound (NB)

Exhibit 54 shows the roadway segment V/C ratios with and without mitigation on other subarea arterials in 2035.

**Exhibit 54  
Roadway Segment V/C Ratios with and without Mitigation (2035)**

Segments	2035 PM Peak Hour Volumes and V/C Ratios on South Lewis County Arterials		With Mitigation
	Volume	V/C Ratio	V/C Ratio
<b>Highway 603 (North of Winlock)</b>			
Avery Rd to Antrim Rd	495	0.31	0.31
Antrim Rd to SR 505	395	0.25	0.25
<b>N. Military Road</b>			
Avery Rd to Nevil Rd	460	0.29	0.29
Nevil Rd to SR 505	470	0.29	0.29
<b>Jackson Highway</b>			
US 12 to Park Rd	225	0.14	0.14
Park Rd to Frost Rd	210	0.13	0.13
Frost Rd to Tucker Rd	175	0.11	0.11
Tucker Rd to Spencer Rd	240	0.15	0.15
Spencer Rd to SR 505	635	0.40	0.40
SR 505 to Toledo-Vader Rd	385	0.24	0.24
<b>Tucker Road</b>			
US 12 to Jackson Highway	145	0.09	0.09

### **3.7.7 2035 Intersection Mitigation with Roundabouts**

Roundabout analysis was completed for six intersections where signals are proposed to mitigate intersection level of service deficiencies in 2035. This work was required to satisfy policy regarding analysis of all options when considering installation of a signal on a WSDOT highway. WSDOT’s design manual, Chapter 915, was used to estimate the minimum configuration for the roundabout design parameters. SIDRA analysis software was used to evaluate the configuration,

calculate LOS, define size and lane deficiencies and develop the baseline design needed for acceptable operation. This network was then modeled in VISSIM to provide a quality control on proper channelization and queues, interaction between roundabouts and refinements were added to create the final proposed roundabout network.

### **3.7.8 Roundabout Designs**

To easily accommodate trucks expected by the planned land use of the area, a 100 foot diameter central island was used as a base size for all roundabouts. Exit speeds were set at 25 mph, circulating speeds at 15 mph, with an 18 foot circulating travel lane. Even with the generous diameter of the roundabouts, appropriate sized truck aprons will be needed with the final design. Several simulation roundabout models were constructed, run and evaluated to arrive at the proposed configuration for the roundabout network.

Over ten roundabout model runs were analyzed in both Sidra and Vissim during the process of finalizing the land uses and volumes predicted in the future demand model network. During those runs the operations model received minor modifications to better replicate true traffic operations. When the operations model was updated with the volumes from the final demand model, the model with the proposed network operated smoothly with no changes necessary. Through the process of correcting errors through multiple iterations, the results posted are expected to accurately replicate traffic with the forecasted volumes.

Due to the short distance between the intersections of N. Military Road and S. Military Road, it is recommended that S. Military Road be re-aligned to form a single two-lane roundabout at N. Military Road. All approaches would have two-lane approaches and exits out of the two circulating lane roundabout.

The Knowles Road (Mickelson Pkwy) roundabout would have two lanes eastbound continuing through the roundabout with two lanes exiting eastbound. One lane would approach and depart from the south leg. Two lanes would approach from the east with the right lane (originally the westbound truck climbing lane) channelized into a dedicated right turn slip lane onto Mickelson Parkway. Only one lane would circulate past the SR 505 eastbound exit and continue past Mickelson Parkway with one lane departing westbound on SR 505.

The southbound I-5 ramps roundabout would be a teardrop roundabout which would not have a circling lane from westbound to eastbound on the west side of the circle. It would have a dedicated right turn slip lane from eastbound to the southbound on-ramp and a dedicated right turn.

The northbound I-5 ramps roundabout would also be a teardrop roundabout and may need to be shifted east to allow for needed tapers from the I-5 overcrossing bridge. Two lanes would approach from the west, two lanes would approach from the off-ramp and two lanes approach from the east with the eastbound right lane a dedicated slip lane to the northbound on-ramp. Two lanes would exit to the east and two lanes exit north, but only one circulating lane would continue past the northbound on-ramp with one-lane traveling westbound and no circulating lane

connecting to eastbound along the west side of the center circle. The Jackson Highway / Plomondon Road roundabout would be a standard one-lane roundabout.

Levels of Service (LOS) analysis shows that all the roundabouts would operate at a LOS A with the 2035 Plan, the LOS results are summarized in Exhibit 55.

Exhibit 55

**SR 505 2035 PM Peak Hour Levels of Service, Queue Lengths, and V/C Proposed Mitigation with Roundabouts Network (SYDRA Model)**

<b>SR 505 Intersection</b>	<b>Overall LOS</b>	<b>Overall Delay</b>	<b>Approach</b>	<b>LOS</b>	<b>Delay (seconds)</b>	<b>Queue (feet)</b>	<b>V/C</b>
N. Military Road / S. Military Road	A	8.3	EB	B	10.4	75'	0.420
			WB	B	11.6	<b>109'</b>	0.493
			NB	B	11.9	84'	0.458
			SB	B	12.8	50'	0.280
Knowles Road (Mickelson Pkwy)	A	5.6	EB	A	9.3	72'	0.333
			WB	A	9.3	<b>160'</b>	0.579
			NB	B	15.9	22'	0.116
			SB	B	15.9	113'	0.477
I-5 Southbound Ramps	A	6.1	EB	A	7.2	<b>246'</b>	0.705
			WB	A	8.1	0'	0.278
			SB	B	10.9	50'	0.359
I-5 Northbound Ramps	A	5.3	EB	A	8.0	0'	0.286
			WB	A	6.2	<b>49'</b>	0.297
			NB	B	11.4	26'	0.202
Jackson Highway	A	7.4	EB	B	11.6	<b>170'</b>	0.603
			WB	B	11.7	100'	0.458
			NB	B	14.5	97'	0.440
			SB	A	8.5	65'	0.328

SIDRA roundabout analysis software results.

To verify the analysis results and provide a secondary check of the operations with the proposed network the corridor was modeled in VISSIM traffic analysis software. The VISSIM results for the roundabout intersections are shown below in Exhibit 56. The VISSIM model shows queues and LOS results that are a little different from those of the SIDRA analysis. But do show a network of roundabouts would work for the SR 505 corridor.

**Exhibit 56**  
**Results for SR 505 Corridor – LOS and Queues for 2035 (VISSIM Model)**

SR 505 Intersection	Overall LOS	Overall Delay	Approach	LOS	Delay (seconds)	Queue (feet)
N. Military Road / S. Military Road	A	6.4	EB	A	7.2	0'
			WB	B	10.2	0'
			NB	A	9.0	0'
			SB	B	11.8	0'
Knowles Road (Mickelson Pkwy)	B	14.9	EB	B	11.3	83'
			WB	B	19.5	<b>443'</b>
			NB	A	5.0	0'
			SB	C	26.4	180'
I-5 Southbound Ramps	A	7.0	EB	A	7.6	199'
			WB	A	2.6	0'
			SB	B	14.9	<b>444'</b>
I-5 Northbound Ramps	A	5.9	EB	A	2.8	23'
			WB	B	10.7	<b>51'</b>
			NB	B	14.5	10'
Jackson Highway	A	6.1	EB	A	7.4	138'
			WB	A	3.7	83'
			NB	A	6.4	98'
			SB	A	7.2	186'

VISSIM analysis results.

Exhibit 57 shows the PM peak hour travel speeds on SR 505 in 2008 and 2035.

**Exhibit 57**

**SR 505 Corridor - 2008 and 2035 PM Peak Hour Travel Speeds**

<b>PM Peak Hour Travel Speeds on SR 505</b>				
	<b>2035 PLAN With Signals Mitigation</b>		<b>2035 PLAN with Roundabouts Mitigation</b>	
	<i>Eastbound</i>	<i>Westbound</i>	<i>Eastbound</i>	<i>Westbound</i>
SR 603 to Cemetery Road	26.5	23.8	26.5	24.8
Cemetery Road to N. Military	45.7	44.7	40.0	38.4
N. Military to SB I-5 Ramp	35.4	30.2	29.6	25.0
SB I-5 Ramp to Henriot	42.0	47.4	33.2	31.3
Henriot to Jackson Highway	42.3	46.9	47.3	51.5
Jackson Highway to Ash	34.2	34.0	31.0	29.6
<b>Average Speed</b>	<b>37.3</b>	<b>36.8</b>	<b>34.8</b>	<b>33.3</b>

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**APPENDIX A**  
**Existing Conditions**

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## **APPENDIX B**

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### **Press Releases, News Coverage, and Public Outreach**

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**APPENDIX C**  
**Stakeholder Meetings**

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**APPENDIX D**  
**Public Meetings**

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**APPENDIX E**  
**Traffic Data Summaries**

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**APPENDIX F**  
**Cost Benefit Analysis**

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# **APPENDIX G**

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## **Draft General Cooperative Agreement**

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## **APPENDIX H**

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