US 97 North Interchange Study

Bend, Oregon

US 97 Final Report

February 5, 2021

Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

30 HV	30th highest annual hour traffic volumes
ACS	American Community Survey
AADT	Annual Average Daily Traffic
APM	Analysis Procedures Manual
BNSF	Burlington North Santa Fe
CG	Commercial General
CL	Commercial Limited
City	City of Bend
DDI	Diverging Diamond Interchange
DRAB	Dual Roundabout
FEIS	Final Environmental Impact Study
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HOLPP	Highway Over-dimension Load Pinch Points
IL	Industrial Light
ILUTP	Integrated Land Use and Transportation Plan
LOS	Levels of Service
LTS	Level of Traffic Stress
ME	Mixed Employment
MPH	Miles Per Hour
MTP	Metropolitan Transportation Plan
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
OS&C	Open Space and Conservation
RL	Residential Urban Low Density
ROW	Right of Way
RS	Residential Urban Standard Density
SPIS	Safety Priority Index System
TSP	Bend Transportation System Plan
TUDI	Tight Diamond Urban Interchange
UA	Urbanizable Area
UGB	Urban Growth Boundary
V/C	Volume-To-Capacity

Executive Summary

US 97 is the primary north-south highway east of the Cascades running through the state and Central Oregon. US 97 serves as the main thoroughfare in the City of Bend (City), providing access to commercial, residential and community properties. Deschutes County and the City have experienced continued population growth resulting in additional demands on the transportation infrastructure. Deschutes County is one of the fastest-growing counties in the state and the population has grown by 25 percent in the last ten years. Oregon Department of Transportation and the City are currently developing the US 97 North Corridor project near US 97 and Cooley Road that will provide benefits to the transportation system, however, with further planned growth additional improvements will likely be needed to secure a safe and efficient transportation system.

The City, Deschutes County, Bend Metropolitan Planning Organization and ODOT have partnered to address this growth in population and traffic in this US 97 North Interchange Study. The project team developed goals, objectives and evaluation criteria to develop, refine and screen project alternatives in the context of concurrent planning or design efforts and future growth needs for Juniper Ridge, the Boyd Acres neighborhood and the Hunnell neighborhood. A Stakeholder Advisory Committee and Technical Advisory Committee were empowered to help guide decision-making. The US 97 North Interchange Study which has resulted in this final report, identifies interchange options, an approximate location, active transportation components, access road concepts, conceptual cost estimates and next steps.

The preferred option selected was the tight diamond urban interchange (TUDI), although both the dual roundabout (DRAB) and diverging diamond interchange (DDI) options also showed promise in the evaluation scoring. A wishbone style grade-separated access connection with a right in right out approach along 18th Street) is recommended to serve properties whose approaches are modified by the proposed project on the east side of US 97. The benefits of the improvement include:

- Enhanced Juniper Ridge access to/from the north, the highest projected volumes in the future going in and out of Juniper Ridge's residential and employment growth.
- Improved traffic performance at US 97 and Cooley Road.
- Improved traffic operations performance on US 97 in the project study area.
- Additional flexibility to respond to future growth or land use changes beyond the planning horizon.
- Reduced collisions on US 97 in the project study area.
- Safer, grade-separated crossings for bikes and pedestrians.

  Completing the Parkway concept to the north boundary of the Bend urban growth boundary (UGB).

Figure 1. North Bend Future Interchange

1 Introduction

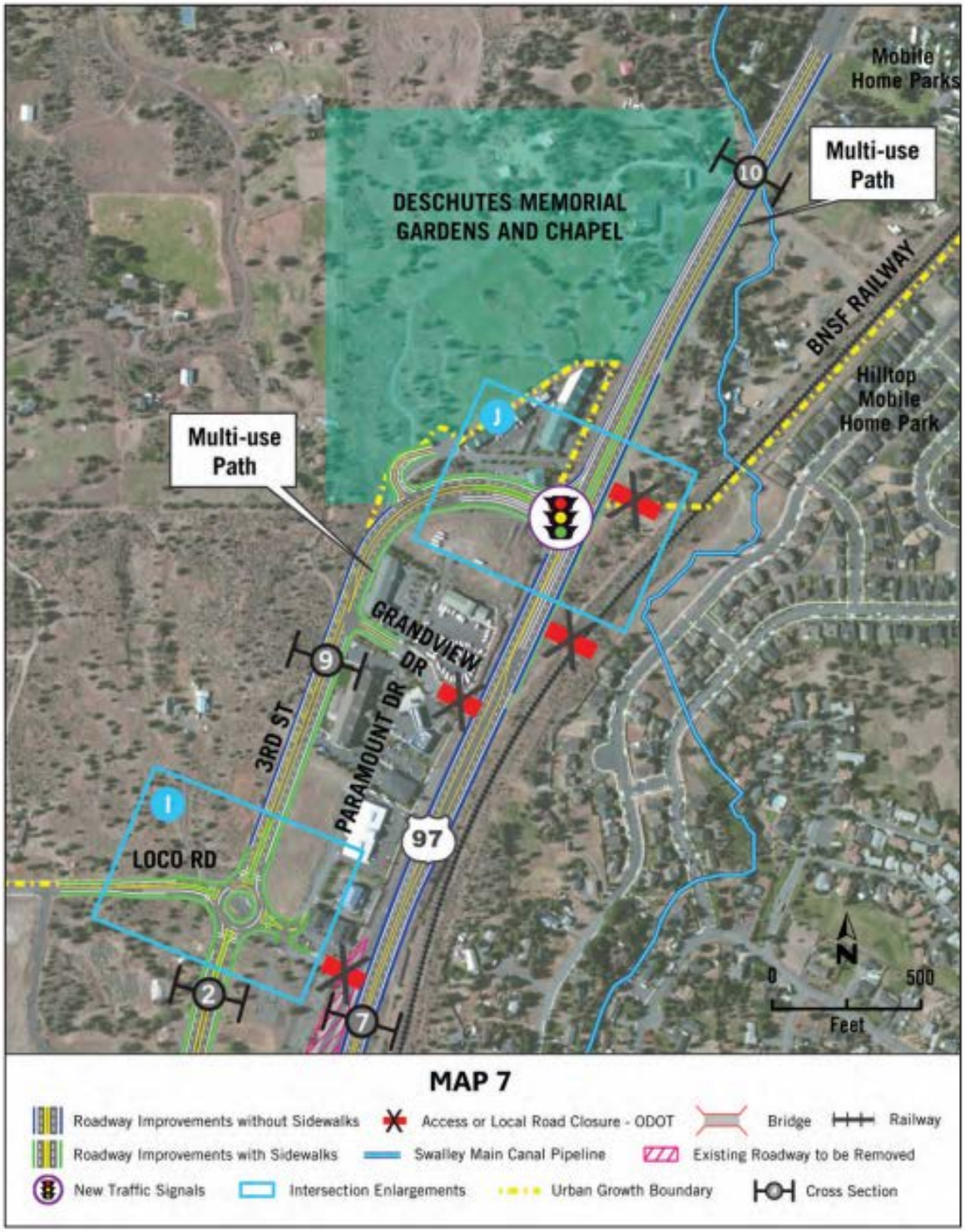
The section of US 97 in the study area has a posted speed limit of between 40 miles per hour (mph) on the south end and 65 mph on the north end. US 97 is classified as a Statewide Highway and Freight Route in the Oregon Highway Plan. US 97 is considered an Expressway and Reduction Review Route [1]designations for US 97, which will be taken into account when making design and management decisions.

Deschutes County and the City have experienced continued population growth resulting in additional demands on the transportation infrastructure. Deschutes County is one of the fastest-growing counties in the state and the population has grown by 25 percent in the last 10 years. Substantial additional growth is anticipated in the northern edge of the City within the planned developments north of Cooley Road both east and west of US 97.

The North Corridor Final Environmental Impact Study (FEIS) was completed in 2014 and identified long-term solutions to maintain a safe and efficient corridor along US 97 in northern Bend. The preferred alternative includes a new alignment of US 97 to the east of the existing US 97 alignment and converting existing US 97 into an extension of the current 3rd Street. This alternative would improve safety at the Cooley Road intersection and provide more throughput traffic on the corridor as is displayed in Figure 2. The preferred alternative from the FEIS would reroute US 97 from Empire Avenue to north of Grandview Drive leading to a traffic signal on US 97 at Grandview Drive.

[1] Reduction Review Routes (ORS 366.215) are ODOT facilities that require review by the Mobility Advisory Committee during planning, project development, development review, and maintenance to examine any “hole in the air” capacity.

Figure 2. Preferred Alternative US 97 North Corridor FEIS Project



Note: The design shown in this exhibit is conceptual in nature. Further refinements may be made during the final design process. Where roadway improvements shown in this exhibit end, the improvements will transition to the existing roadway cross section.

Source: https://www.bendoregon.gov/home/showdocument?id=39795 page ES-25

1.1 Purpose

The purpose of the US 97 Study is to determine a future interchange improvement to address the projected growth and further development along US 97 and future 18th Street located in the City.

Analysis based on the traffic and safety data supports the recommendation of grade-separating the US 97 North Interchange. Three grade-separated alternatives are recommended for further consideration and include a TUDI, DRAB, and a DDI. Two alternative access road concepts are identified in the study, frontage road along US 97 and a back road running along the railroad tracks.

The US 97 North Bend Interchange project provides an opportunity to unite the North Corridor FEIS, Juniper Ridge Master Plan, US 97 Parkway Plan, and Bend Transportation System Plan (TSP) into a common vision. A successful concept will continue the long-term strategy of access control on US 97, provide access into the growing areas along Juniper Ridge, and provide access to businesses along the west side of US 97 north of Cooley.

1.1.1 Policy Review

Appendix A summarizes the plans, policies, targets, and standards that are applicable to the US 97 Bend North Interchange Study. There are a number of state, regional, and local planning documents that contain policies and regulations relevant to developing a plan for transportation improvements in the project study area. Relevant policies, projects, and design elements will be considered in the development of the preferred concept and, where appropriate, identify where adopted plans may need to be amended to reflect study recommendations to ensure consistencies between plans.

Appendix A also provides a list of the planning documents and policies that were reviewed and indicates how each is relevant to planning for transportation improvements and the US 97 Bend North Interchange Study, using three general categories:

- *Policies*: Indicates that the document contains policies which will need to be reflected and informed the Study.
- *Design Standards*: Indicates that the document includes design standards for transportation facilities (e.g. street cross sections and classifications).
- *Project List*: Documentation of a list of specific planned projects which may be located in the vicinity area or study and is incorporated in the future no-build scenario and development of the interchange study.

1.2 Project Study Area

The project study area is approximately 1.5 miles in length along U.S. 97 from north of Fort Thompson Lane to south of Grandview Drive. It runs approximately 200 feet east of the railroad and west of Harris Way as shown in Figure 3. The future interchange must connect US 97 to the planned extension of 18th Street and will serve Juniper Ridge and areas on the northeast side of US 97.

Figure 3 displays the larger project vicinity area that may be affected by the proposed interchange. The project vicinity area captures study area intersections, transportation facilities and land uses to be considered when evaluating alternatives.

Figure 3. Project Study and Vicinity Area

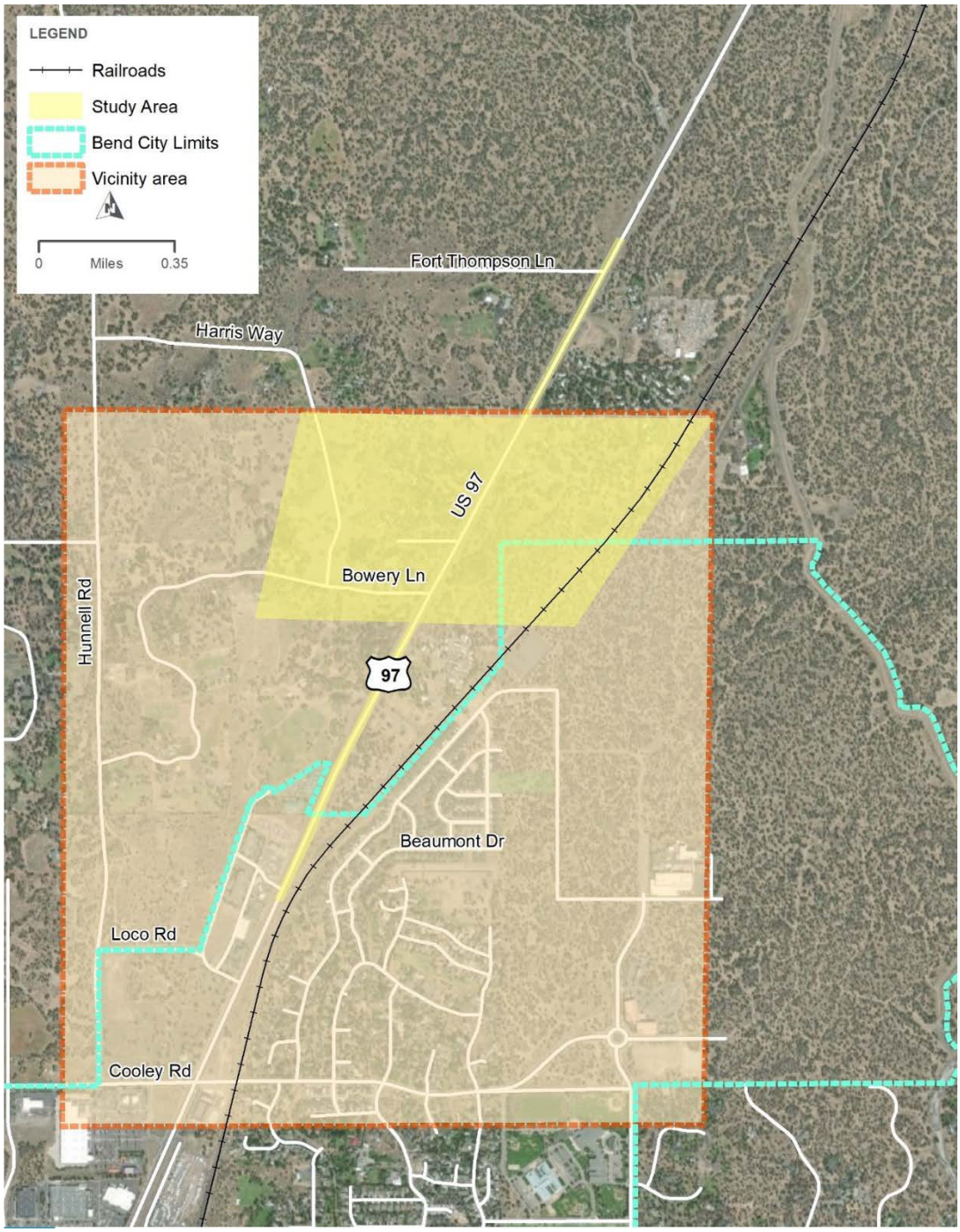
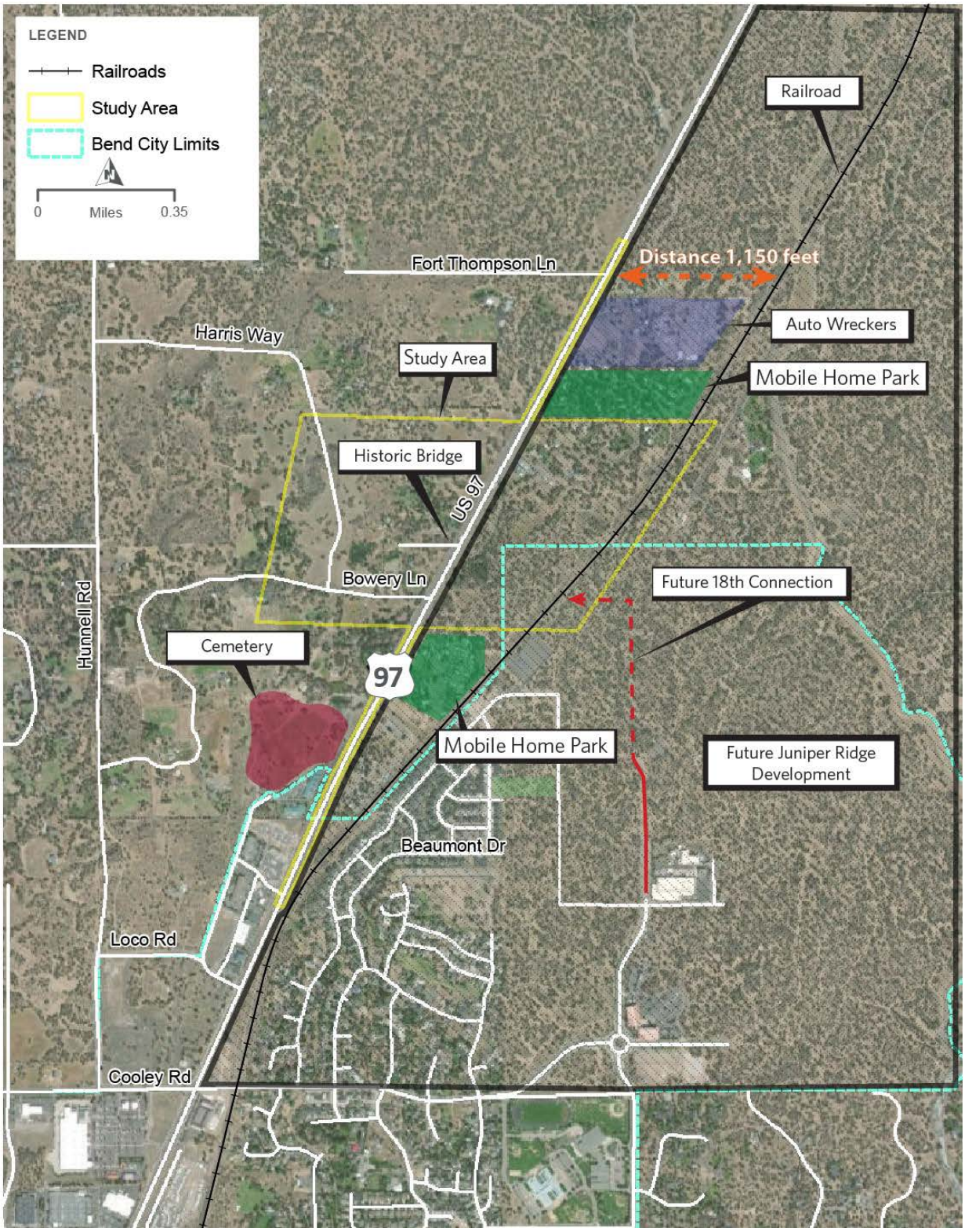


Figure 4 displays the opportunities and constraints in the study area. Constraints include of the BNSF railroad approximately 1,150 feet to the east of US 97 with. Additional constraints include the historic bridge on Bowery Lane and Deschutes Memorial Chapel and Gardens Cemetery immediately west of US 97 and mobile home facilities to the east of US 97 both north and south of the future 18th Street connection. These constraints and opportunities will be considered in the evaluation of future interchange concepts. The map illustrates the most conducive general location to a future connection to US 97 to avoid potential impacts, streamline the future environmental process and maximize

overall benefit to the transportation system and surrounding land uses. Concepts will be developed inside the yellow study area shown in Figure 4.

Figure 4. Opportunities and Constraints Map



2 Goals and Objectives

Table 1 below summarizes the study goals and organized in four categories:

- Develop an interchange design that meets the long-term growth needs for residences and businesses near the northern boundary of Bend.
- Develop an interchange connection based on the established corridor vision with significant public and stakeholder involvement and support.
- Develop an interchange design that improves safety for all modes on US 97 and local streets.
- Develop an interchange design that improves local access to businesses and residences.

Table 1 also introduces goals and objectives to support and implement the US 97 Bend North Interchange Study purpose. The project goals, objectives and evaluation criteria were used to develop, screen, evaluate and refine project concepts as defined below.

Table 1. Goal and Objectives for the US 97 Bend North Interchange Study

Project Goals	Objectives
Develop an interchange design that meets the long-term needs of Juniper Ridge and the Golden Triangle.	Consider long-term growth needs of Juniper Ridge to the east of US 97 north of Cooley Road.
	Address long-term growth needs of Juniper Ridge to the east of US 97 north of Cooley Road.
	Preserve and enhance business access and vitality by improving conditions for existing businesses or by maximizing values for property owners.
	Improve livability for adjacent neighborhoods
	Accommodate future development or redevelopment.
	Consider the visual sequence of project elements as an entry/exit node to the City.
Develop an interchange connection based on the established shared corridor vision with significant public and stakeholder involvement in order to utilize public funds effectively and efficiently.	Avoid and minimize impacts to resources in the project study area to streamline environmental process.
	Involve stakeholders and public in a meaningful manner in the decision making process throughout the project.
	Develop a prioritized implementation strategy/action plan.
	Create a US 97 corridor that aligns with the extension of the parkway vision.
	Ensure public funds are invested efficiently and effectively.

Project Goals	Objectives
Develop an interchange design that improves safety by reducing fatalities and serious injuries and provides for all modes.	Improve safety for drivers, bicyclists and pedestrians.
	Evaluate safety through analysis of crash data and identification of risk factors.
	Maintain or enhance efficient travel for regional traffic along US 97.
	Maintain or enhance efficient travel for local trips.
	Improve the comfort of or add facilities for people walking or bicycling along the corridor and crossing the corridor, including the multiuse path along US 97.
	Accommodate transit operations in facility designs.
Develop an interchange design that improves local access and east-west connectivity for all modes of travel.	Add or enhance opportunities to cross US 97 for all modes of travel specifically, bicyclist and pedestrians
	Improve connectivity between the US 97 corridor and the business district between US 97 and US 20 at the northern end of Bend.
	Provide adequate access to businesses along the US 97 corridor for both customers and freight/delivery.
	Reduce the number of local trips on US 97.
	Design to accommodate freight movement
	Minimize out-of-direction travel.
Develop a project that supports ODOT's value of equity.	Providing an equitable process to serve all.

3 Evaluation Framework

The evaluation framework is fundamentally the application of goals, objectives and evaluation criteria in two stages. The first stage is concept development and screening, the second stage is concept evaluation and refinement. The purpose of the first stage of evaluation was to develop design concepts that achieve the project goals and objectives and screen out the least performing concepts. For the first stage of evaluation, each concept was compared against the no-build scenario using the goals and objectives noted above. The second stage of evaluation featured more detailed analysis using evaluation criteria and weighted scoring, followed by concept refinement to maximize the performance of the remaining concepts.

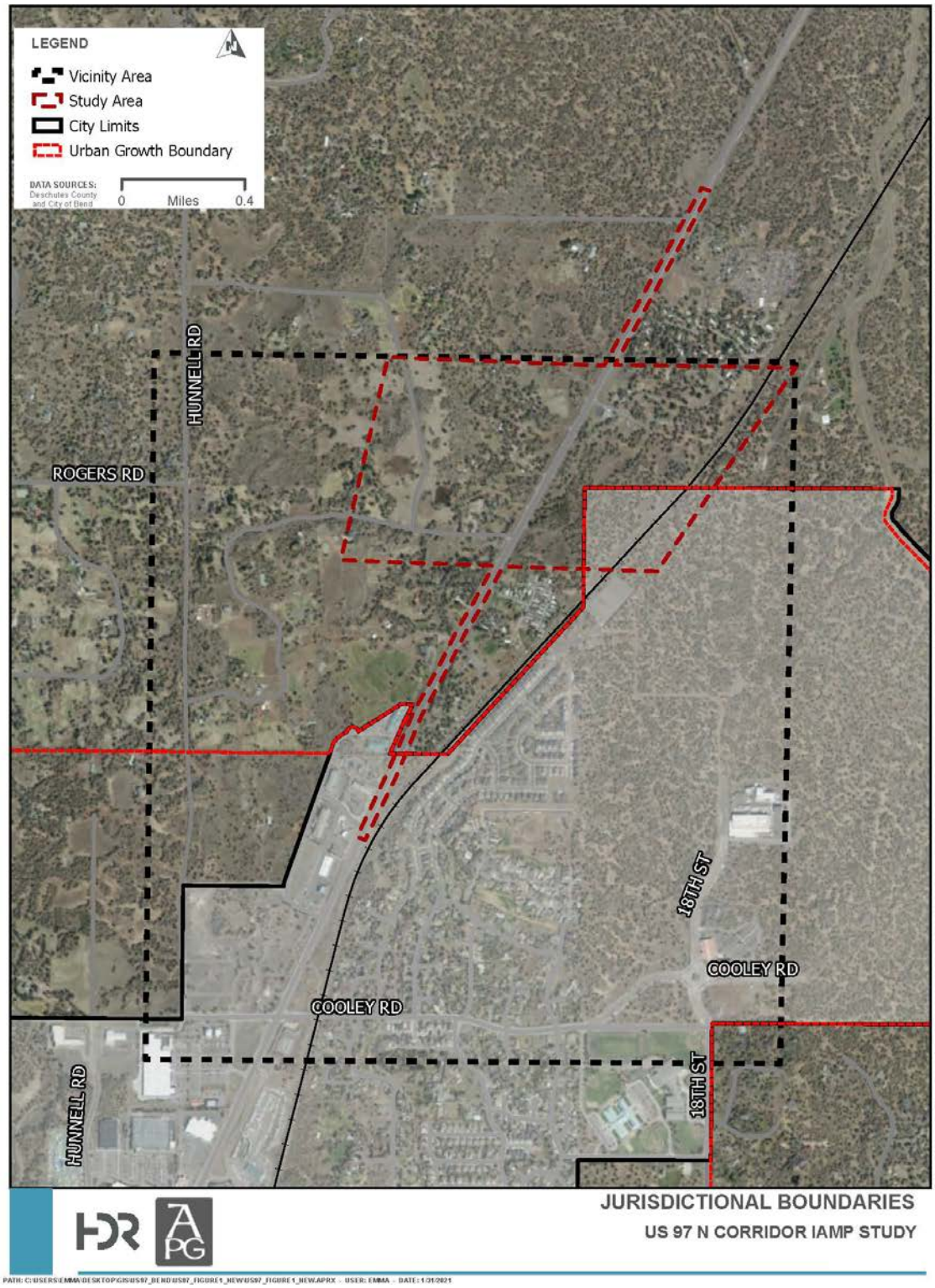
This two-step process allowed a consistent evaluation and a focused design effort. The end result was a preferred alternative that responds to the goals, objectives and evaluation criteria developed and applied by the Technical Advisory Committee, Stakeholder Advisory Committee and public interests in the fall of 2020. The manner in which the preferred alternative responded to evaluation criteria was documented in the evaluation scoring matrix to help build a defensible, robust record for why project decisions were made to help inform future design efforts during final design.

4 Existing Land Uses

The vicinity area and study area boundaries are described in Appendix A. Land use datum includes a description of existing land use designations and uses in the vicinity area. This review is intended to inform existing and future transportation needs for the area surrounding the interchange.

The vicinity area is located along the border of the City and Deschutes County and includes areas within the city limits and the UGB. The City expanded the UGB in 2016. The City jurisdictional boundaries – UGB and city limits – are shown in Figure 5 and in Appendix B.

Figure 5. Bend City Limits and UGB



4.1 Land Use

Land within the Bend UGB is subject to the City's land use and development regulations; land outside the UGB is subject to Deschutes County land use and development regulations. The Bend Comprehensive Plan provides the basis for the City's zoning and associated land use policies which influence the County's development code. Similarly, the County's Comprehensive Plan designations inform land use regulations in the Deschutes County Code. City and County land use designations depicts current zoning on parcels within the vicinity area. Parcels within the UGB that are currently located in Deschutes County and have County zoning likely will be rezoned to City of Bend zoning on annexation.

A summary of permitted land uses and the associated requirements that govern development and redevelopment in the Vicinity and Study Areas is provided in the following sections. This overview provides an indication of the type and intensity of land uses that can be expected within the 20-year planning horizon, which in turn will affect future traffic generation. The number of trips that specific uses generate, and where those uses are located within the community, will have a bearing on planning for appropriate types of transportation solutions.

4.1.1 Comprehensive Plan Designations

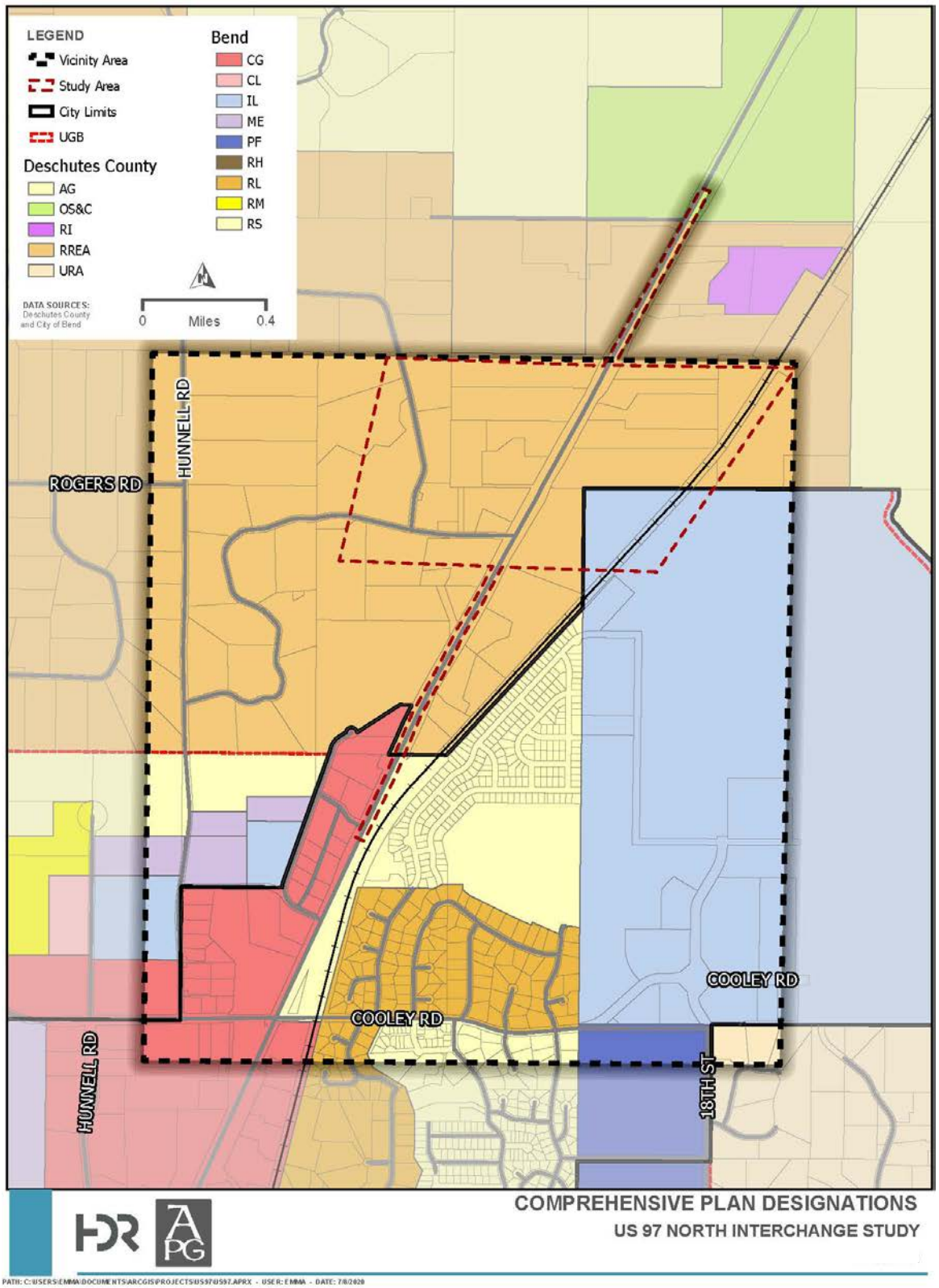
4.1.1.1 Deschutes County

The Deschutes County Comprehensive Plan map shows the range of land uses for lands outside the UGB. The northwestern portion of the vicinity area is designated as a Rural Residential Exceptions Area. This is a special designation for land that does not warrant farm or forest zoning, as determined through a Statewide Goal 2 exceptions process. The major determinant in designating land Rural Residential Exceptions Area was that many of these areas were platted for residential use before Statewide Planning was adopted.

4.1.1.2 City of Bend

The Bend City limits bisect the vicinity area from east to west. The eastern section of the vicinity area has an Industrial Light (IL) Comprehensive Plan designation, which provides for light industrial, limited heavy commercial, and corporate office uses in areas with easy access to collector and arterial streets. Between this IL area and the highway is an area designated for Residential Urban Standard Density (RS), which provides for a variety of residential housing types at a scale compatible with single-family homes, and Residential Urban Low Density (RL), for low-density residential development with a maximum of approximately four dwellings per acre. West of the highway to the current City limits is designated Commercial General (CG), which provides for a broad mix of commercial uses with large site requirements. Just outside the vicinity area, north of Cooley Road and west of Hunnell Road, lies a small area designated Commercial Limited (CL), which provides for a wide range of retail, service, and tourist commercial areas. The North Triangle Expansion area, outside City limits, includes three designations – IL, Mixed Employment (ME), and RS. The ME designation provides a broad mix of employment and residential uses and is a buffer between the residential and IL designations.

Figure 6. US 97 North Interchange Study Comprehensive Plan Designations



4.1.2 Zoning and Special Districts

The Bend Development Code and Deschutes County Zoning Ordinance (Deschutes County Code Title 18) implement policies established in their respective comprehensive plans. The codes regulate development through zoning designations and provisions that generally apply to all development and specifically to land divisions within the City. The zoning requirements establish allowed uses and associated development regulations, permitted uses, and lot standards.

4.1.3 Current Land Uses and Developable Land

An inventory of existing land uses, and vacant and developable land was produced using Deschutes County's tax assessor data for tax lots located within or partially within the vicinity area. Each tax lot was classified in accordance with Oregon Revised Statute 308.215[2] and, except for specially assessed properties, the classification was based on the highest and best use of the property. Tax assessor information for tax lots provided a basic inventory of existing land uses and vacant and developable land.

The vicinity area is comprised of residential, commercial, and industrial uses. Current uses are shown in Figure 7. The most prevalent uses are residential and commercial land use. Properties shown as vacant were based on county property class codes. Properties eligible for redevelopment were given the designation by using a basic land to improvement value ratio based on the most recent County assessment of property values.[3]

There are pockets of vacant parcels in residential areas in the southern portion of the vicinity area, west of US 97. There also is a large cluster of vacant parcels west of US 97 and north of Harris Way, where most of the County vacant and parcels eligible for redevelopment in the vicinity area are located. County parcels are zoned agricultural (MUA10), which allows more than Exclusive Farm Use lands with a minimum lot size of 10 acres and provides a much lower density of development compared with parcels in the City.

East of US 97, most of Juniper Ridge is comprised of vacant parcels that will be developed pursuant to the provisions of its special overlay. The acreage for the future roadway system in the Juniper Ridge area is included in the acreage of vacant land.

Also, there are several properties in the vicinity area that are considered eligible for redevelopment, most of which are found along US 97; however, few are located in the UGB. The most land qualified for redevelopment within the UGB is located in the North Triangle Expansion Area, which is zoned Urbanized Area (UA). The UA zone suggests use-specific zoning will be determined through a master or area planning process for the area, which is required by the City prior to annexation. The Comprehensive Plan designations can provide insight into future zones for the area including ME, IL, and RS.

As shown in Table 2, residential is the most prevalent land use type for parcels considered suitable for redevelopment. Most developed parcels are also residential

[2] https://www.oregonlaws.org/ors/308.215

[3] Properties shown as eligible for redevelopment are based on a land value to improvement value ratio of 2:1.

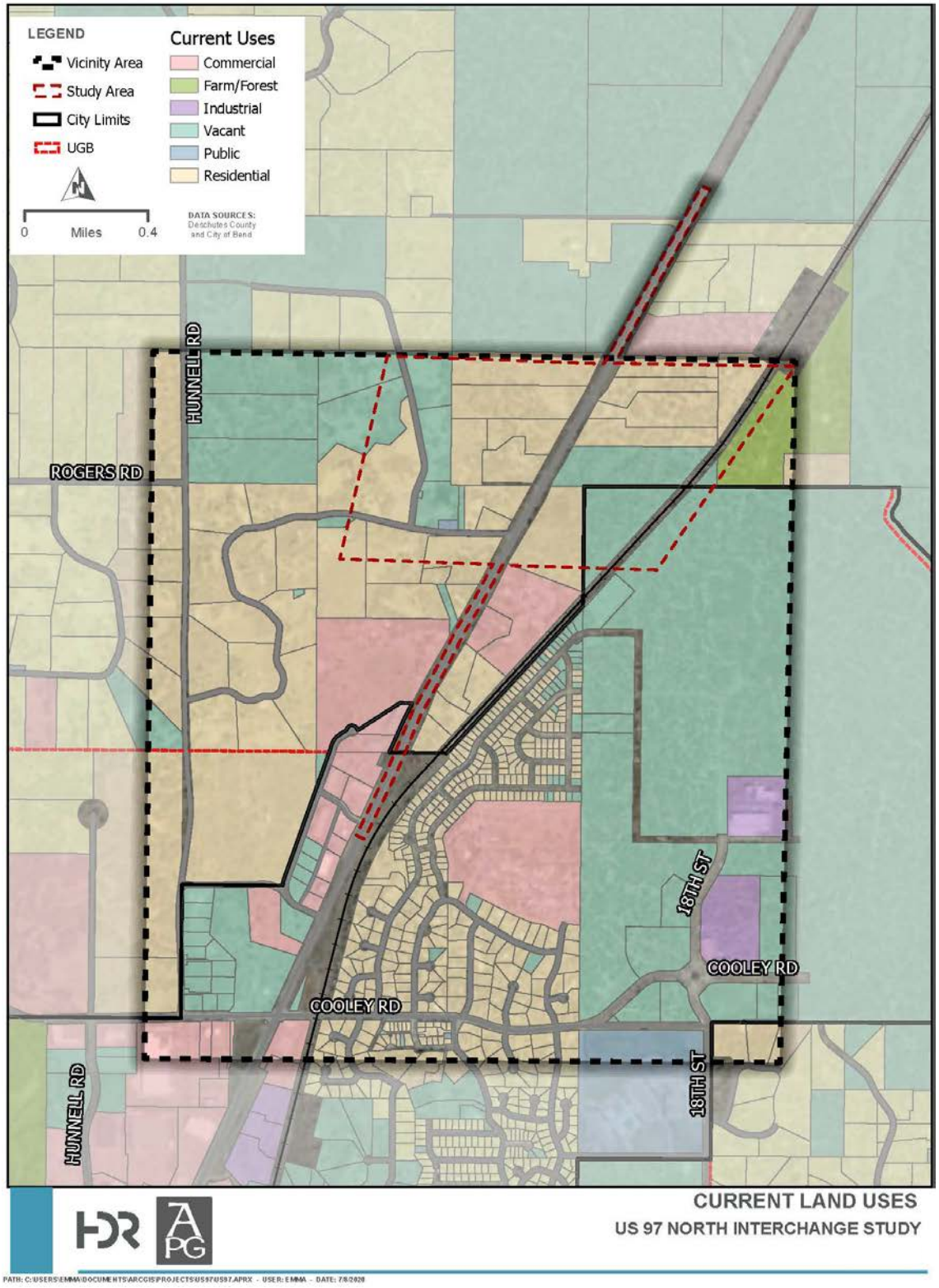
properties, followed by commercial uses. Additionally, there are 95 vacant parcels with various zoning designations.

Table 2. Vacant and Land Eligible for Redevelopment in Vicinity Area[4]

Current Use	Developed Parcels	Parcels Eligible for Redevelopment	Vacant Parcels	Total Parcels
Residential	389	22	0	411
Commercial	18	2	2	22
Industrial	2	0	0	2
Exempt	2	0	0	2

[4] Table 2 includes tax lots that are only partially within the vicinity area, as well as those that lie entirely within the vicinity area boundaries.

Figure 7. Current Land Uses



5 Natural Resources and Environmental Barriers

A FEIS was completed for the US 97 Bend North Corridor Project to evaluate a new alignment of US 97. The study area for the FEIS included US 97 from Butler Market Road in Bend, north to Fort Thompson Road just outside of the Bend UGB and included several local streets between US 20 and US 97. The study area for the US 97 North Bend Interchange Project partially overlaps with the FEIS study area, but includes some additional areas not evaluated for the FEIS (Figure 8). A review of readily available information from the FEIS and online resources was completed to identify natural resources and environmental barriers present in the study area and/or may be affected by the project. The results are summarized in the following sections.

5.1 Section 4(f) Resources

Section 4(f) resources are recreation areas, parks, and wildlife refuges that are publicly owned or open to the public. The FEIS evaluated a planned Section 4(f) resource that also overlaps with the study area: a future multiuse trail that would span the Burlington North Santa Fe (BNSF) Railway ("Rails with Trails Corridor") and be developed by the Bend Park and Recreation District. The trail facility would extend from north of the City UGB near Fort Thompson Lane through the City to the southern limits of the UGB, located within the active BNSF Railway right-of-way east of US 97. There are no existing Section 4(f) resources in the study area.

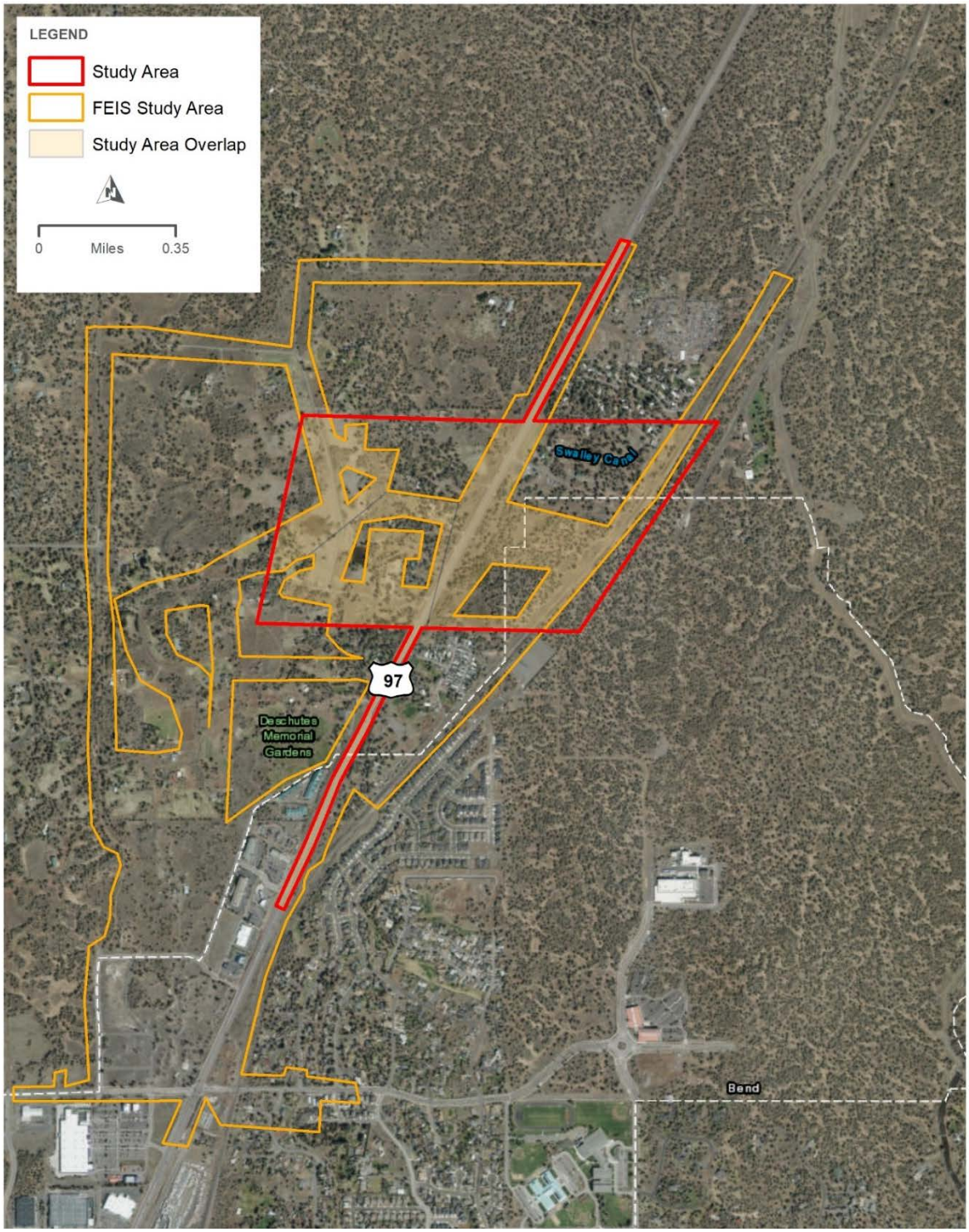
5.2 Section 6(f) Resources

Section 6(f) resources are those properties that were acquired or developed with grants from the Land and Water Conservation Fund and are prohibited from conversion to a non-recreational purpose. No Section 6(f) resources are present in the study area.

5.3 Historic Resources

Historic (built) resources include districts, sites, buildings, structures, and objects that are significant in American history, architecture, engineering, and culture. According to the Oregon Historic Sites Database, one historic resource is present in the study area: The Rock O' the Range Bridge. The covered bridge is located on Bowery Lane and spans the Swalley Canal and has been determined to be eligible for listing on the National Register of Historic Places (Figure 9). While the Section 106 Finding of Effect for the FEIS determined there would be no adverse effect on the Rock O' the Range Bridge, the project would be required to evaluate the effects of the action to determine validity of the previous finding. Because the study area in the FEIS does not include the entire study area for the Project, there may be unidentified resources that could require additional field work to determine eligibility.

Figure 8. Project Study Area and FEIS Study Area



5.4 Socioeconomic

Several businesses and residences within the study area may have their accesses affected (closure, relocated, modified) either temporarily or permanently by the construction of the proposed interchange and/or frontage road. construction and permanently with the proposed interchange and potential frontage road. Two mobile home parks are located just outside the study area, but the entrance to these parks is along US 97 and access could be modified. Maintaining viable connectivity to the church, cemetery, and businesses located along Clausen Road will be important for the project to avoid adverse socioeconomic impact to the surrounding area.

5.5 Threatened and Endangered Species

Species that are threatened, endangered, proposed to be listed as threatened or endangered, or that have designated critical habitat are protected federally by Section 7 of the Endangered Species Act or by the State of Oregon. If these protected species and habitats could occur, impacts need to be formally assessed. The U.S. Fish and Wildlife Service Information for Planning and Consultation lists the following threatened and endangered species that may occur in Deschutes County: fisher, gray wolf, northern spotted owl, yellow-billed cuckoo, Oregon spotted frog, bull trout, and whitebark pine. The FEIS included a No-Effect Memo for the following species: bull trout, northern spotted owl, bald eagle, Howell's thelypody, Peck's milkvetch, and pumice grape fern. The FEIS indicated marginal habitat for Peck's milkvetch was identified in the northeastern portion of the study area. Since publication of the FEIS, the Oregon spotted frog and designated critical habitat were listed as threatened under the Endangered Species Act. Designated critical habitat for Oregon spotted frog, bull trout, and northern spotted owl is present in Deschutes County, however, it does not overlap with the study area. Fieldwork may be required to survey for suitable habitat and species presence of Oregon spotted frog and Peck's milkvetch within the study area. Suitable habitat for the Oregon spotted frog includes perennial bodies of water with zones of shallow water and abundant emergent or floating aquatic plants. Peck's milkvetch suitable habitat includes open habitat, possibly associated with pine, juniper, or bitterbrush communities, in sandy soils between 3,000 and 5,000 feet in elevation.

5.6 Environmental Justice

The study area is made up of two census block groups: 410170012003 and 41017001102. Block group 410170012003 is 9 percent minority, 26 percent low income, and 29 percent over age 64, while block group 41017001102 is 7 percent minority, 10 percent low income, and 9 percent over age 64. Deschutes County is 12 percent minority, 29 percent low income, and 19 percent over age 64. While the percentages of environmental justice populations within the study area is not substantially greater than the County percentages, additional effort should be made to identify if smaller pockets of environmental justice populations may be present within the study area, specifically evaluating the populations within the mobile home park. Additional research to determine if disabled or transit-dependent populations are present in the study area also may be required.

5.7 Goal 5 Resources

Deschutes County has an inventory of the following Goal 5 resources: water; wildlife; open space and scenic views and sites; energy; wilderness, natural areas, and recreation trails; surface mining; and cultural and historic. One listed resource occurs within the study area: Landscape management roadways to protect scenic views, including one located on US 97 from the Redmond UGB to the Bend UGB (12-mile stretch). The City also has a Goal 5 Inventory that includes riparian resources, wetlands, wildlife habitat, and state scenic waterways as part of their General Plan but does not list any specific resources located within the study area.

5.7.1 Wetlands and Waters

The U.S. Fish and Wildlife Service National Wetlands Inventory Mapper shows the Swalley Main Canal and six freshwater ponds are located within the study area. All ponds are characterized as human-excavated (Figure 9). Many of these ponds may have been evaluated in the FEIS and determined not jurisdictional due to being artificial, less than 1 acre in size, and isolated. One of the ponds in the study area is located outside of the FEIS study area, and approximately 1.2 acres in size. Fieldwork may be required to delineate this pond and determine its jurisdiction.

The Deschutes County Local Wetlands Inventory does not show any wetlands located in the study area. The Swalley Main Canal crosses through the study area at two separate locations. In the southern location, the portion of the canal that passes through the study area is contained within a culvert under US 97. The canal spans diagonally across most of the study area and crosses under US 97 again. It is unclear whether the portions of the canal within the study area are entirely within a culvert or if there are open segments, so additional fieldwork may be needed.

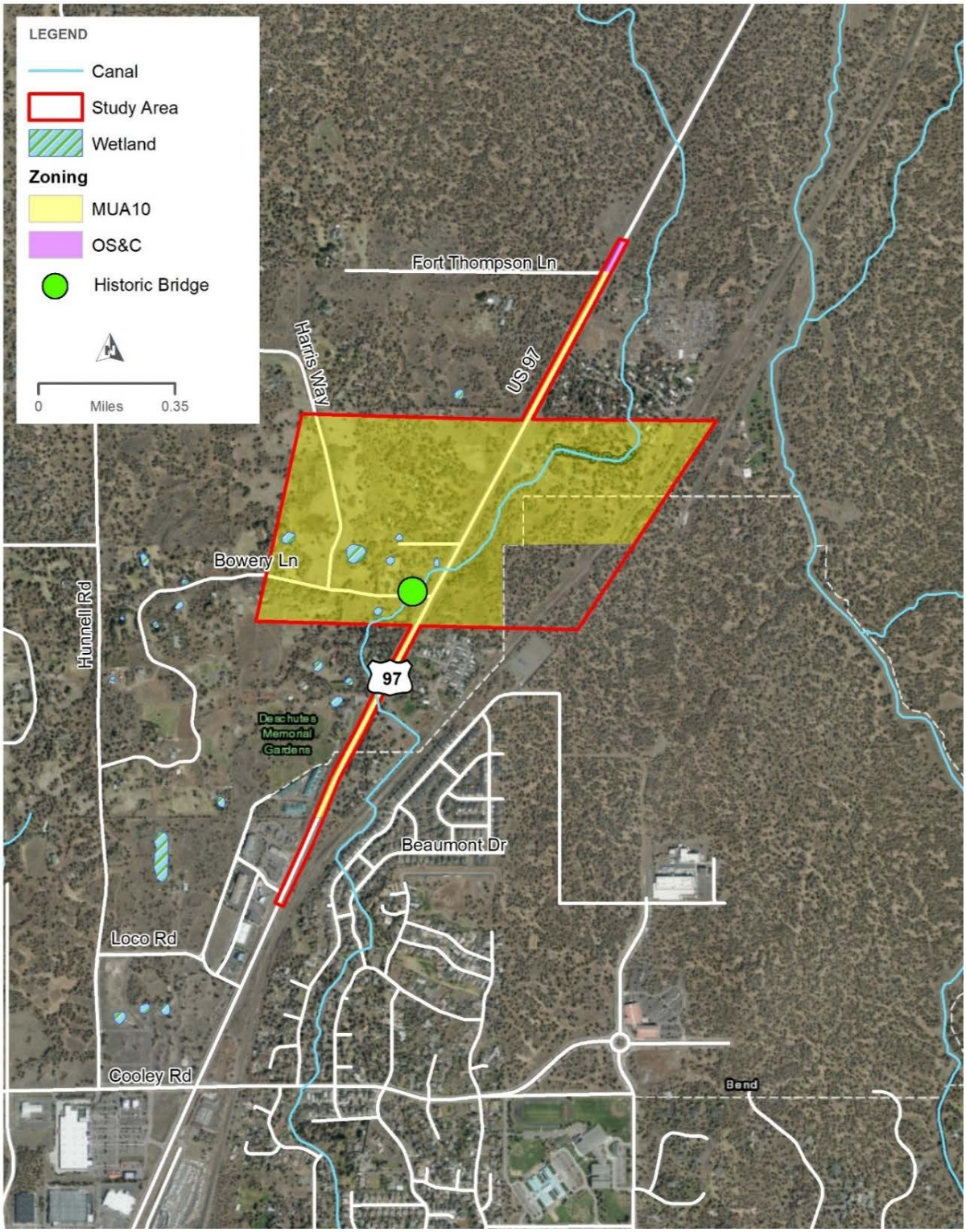
5.7.2 Open Spaces

One small area of the northernmost portion of the study area is zoned as Open Space and Conservation by Deschutes County (OS&C; Figure 9). This zone protects designated areas of scenic and natural resources, restricts development in areas with fragile or unique qualities, and protects air, water, and land quality.

5.8 Goal 3 Resources

The Oregon Statewide Planning Goal 3 requires counties to identify farmland and designate it as Exclusive Farm Use or Agricultural Lands on the comprehensive map. These lands restrict development to minimize uses that conflict with farming. Most of the study area is designated as Deschutes County Multiple Use Agricultural Zone (MUA10; Figure 9), which is meant to preserve the rural character of the County. There is a large portion designated as farmland of statewide importance also within the study area.

Figure 9. Environmental Resources in the Study Area



5.9 Economic Summary

The Project area features approximately 990 jobs with mostly retail jobs followed by office, industrial, and finally government jobs. The population sampled in Census Block Groups 1100.2, 1100.3, and 1200.3 was estimated to have an unemployment rate of approximately 3.6 percent in 2018. According to the American Community Survey (ACS) estimates, approximately 8 percent of households are below the poverty line, 6.6 percent have a member of the household with a disability, and 5.8 percent qualify for SNAP or food stamps.

6 Existing Transportation System Operations

Figure 10 shows the study intersections being evaluated for traffic operations. The study intersections are focused along US 97 and along Cooley Road. An elementary school and middle school are located by 18th Street and Cooley Road. There is also a large commercial development south of Cooley Road between US 20 and US 97 (also known as the regional Cascade Village shopping mall).

A BNSF railroad line runs north-south through the study area to the east of US 97. BSNF and Union Pacific operate manifest trains (which carry a variety of boxcars, tanker cars, lumber, etc.) through the study area. The rail track is regulated under the Federal Railroad Administrations Class 1, 2, 3 and 4 track standards with no weight or dimensional restrictions for freight movement.[5] Both US 97 and the railroad pose a barrier for east-west connectivity in the vicinity of the study area, with Cooley Road providing the first opportunity for southbound vehicles entering the City to cross US 97 and the railroad (both are at-grade crossings).

[5] City of Bend Draft Transportation System Plan, Volume 2, Existing Conditions and Needs Memorandum, July 2018.

Figure 10. Study Intersections for Traffic Operations

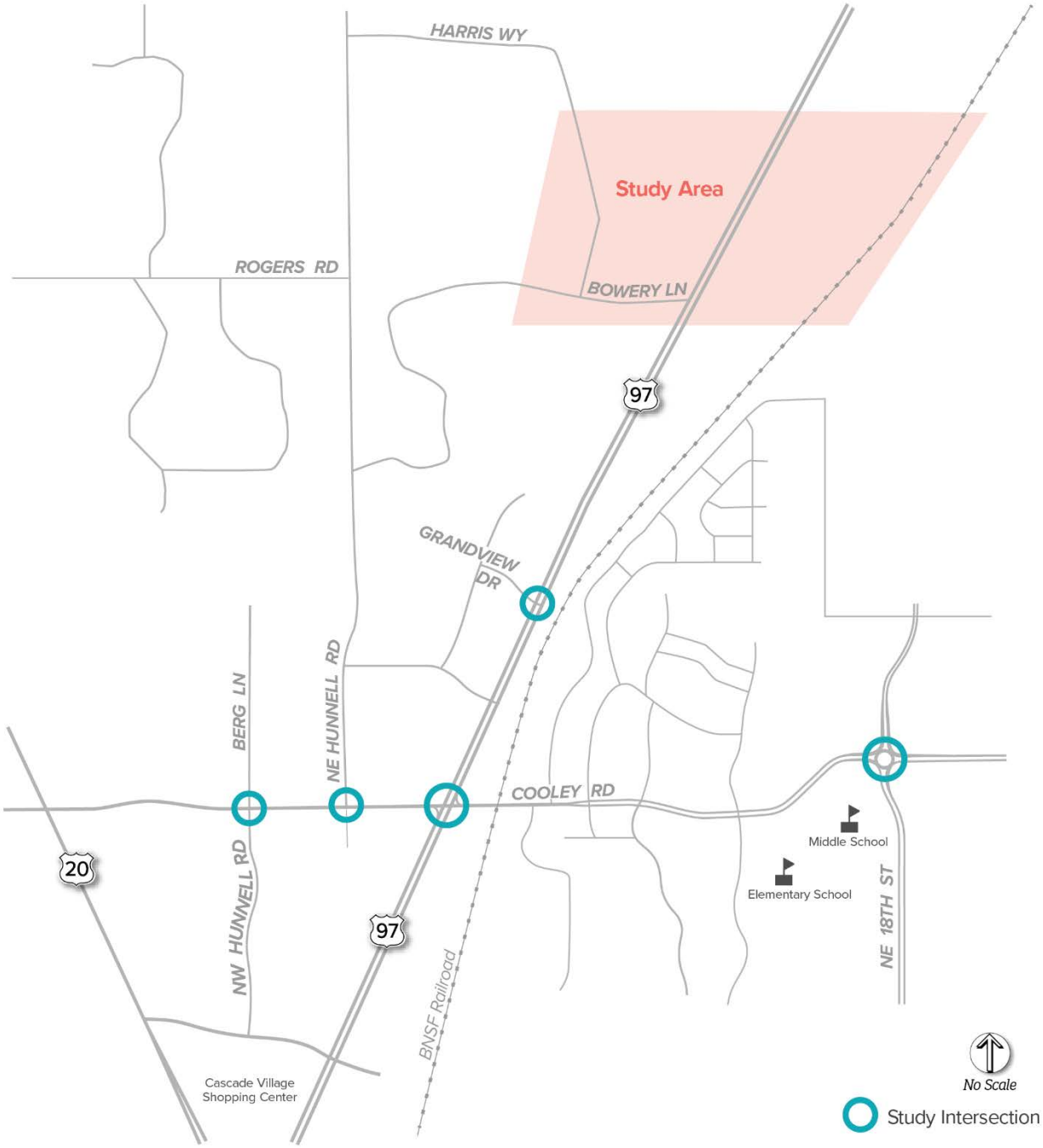


Table 3 lists characteristics of significant roadways in the study area. US 97 is classified as a Statewide Highway and Expressway and has a posted speed ranging from 65 mph near Bowery Lane, 55 mph approaching the Bend city limits and 45 mph south of the city limits. US 97 is also designated as part of the National Highway System, is a Federally Designated Truck Route, a State Freight Route and Reduction Review Route. The remaining roadways are City facilities with posted speeds ranging from 25 to 40 mph.

Table 3. Roadway Characteristics

Roadway	Jurisdiction	Functional Classification	AADT[a] Vehicles per day)	Posted Speed
US 97	ODOT	Statewide Highway/ Expressway	39,600	45 – 65 MPH
Cooley Road	City	Minor Arterial	6,000-6,600	35 MPH
NE Hunnell Road	City	Collector	1,200	25 MPH
NW Hunnell Road	City	Minor Arterial	3,200	35 MPH
18th Street	City	Minor Arterial	3,250	40 MPH
Grandview Drive	City	Local	NA	25 MPH

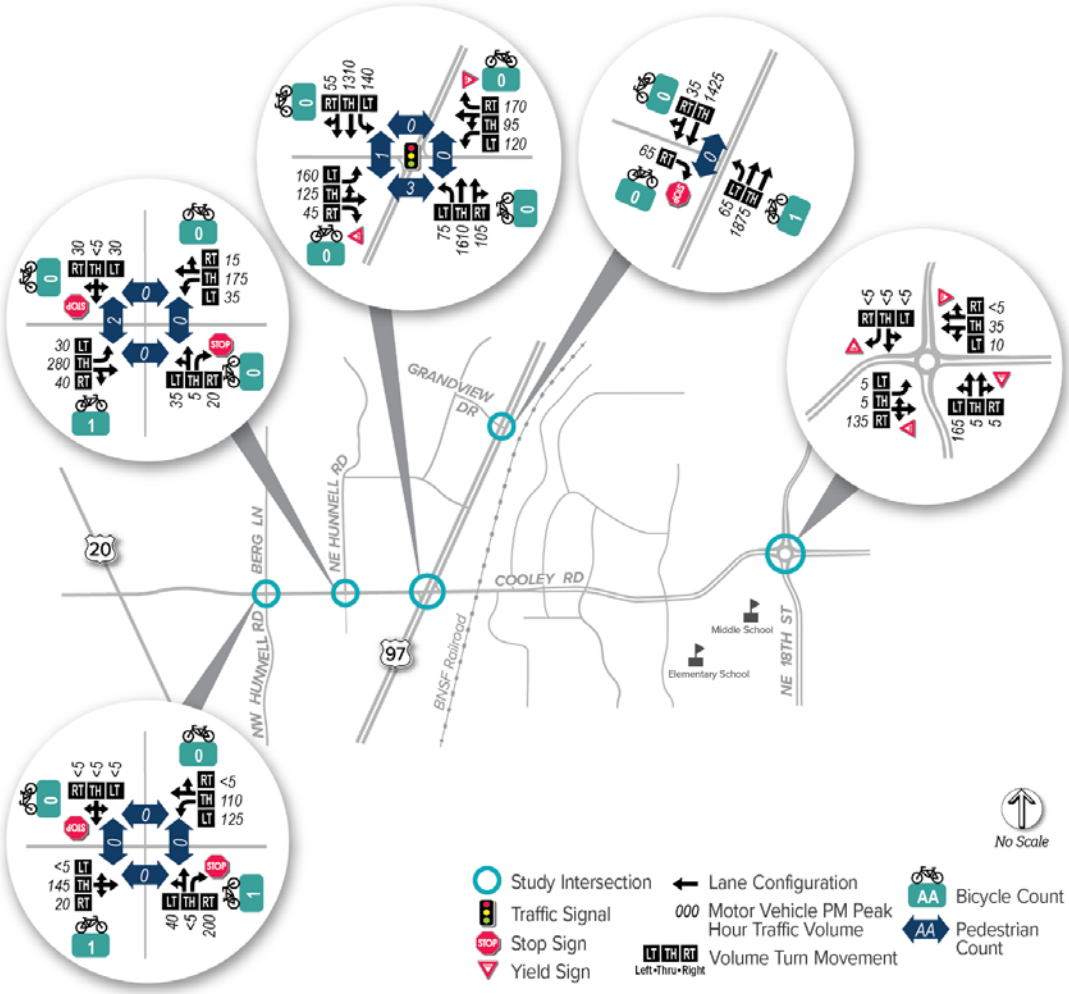
[a] Annual Average Daily Traffic (AADT) accessed from ODOT Transgis (https://gis.odot.state.or.us/transgis/), except 18th Street which is based on an 18-hour bi-directional tube count.

6.1 Traffic Volumes

Traffic volumes were counted in July and August of 2019.[6] These counts represent 30th highest annual hour traffic volumes (30 HV), which are equivalent to typical summer weekday pm peak hour volumes. Figure 11 shows the balanced motor vehicle, pedestrian and bicycle volumes at each study intersection, as well as lane configurations and the type of traffic control present. Traffic counts are included in Appendix C.

[6] Except for the intersection of Cooley Road/18th Street, where intersection turning movement volumes were based on bi-directional tube counts from 2016 and Cooley Road/NE Hunnell Road, where a 2014 count was balanced to the newer counts at Cooley Road/NW Hunnell Road and US 97/Cooley Road.

Figure 11. Existing (2019) 30th Highest Annual Hour Traffic Volumes



6.2 Existing Operations Analysis

Intersection operations were analyzed using Synchro software and the Highway Capacity Manual (HCM) methodologies (HCM 2000 at signalized intersections, HCM 6th edition at unsignalized intersections). The analysis was conducted at all study intersections using the 30 HV traffic volumes representing the year 2019 conditions shown in Figure 11. Performance measures used for this analysis include volume-to-capacity (V/C) ratios, seconds of control delay and levels of service (LOS). Table 4 summarizes the results of this analysis, with each intersection's performance compared to the adopted mobility target.[7] HCM reports are included in Appendix C. All study intersections currently meet the V/C ratio mobility targets during the weekday pm peak hour, with US 97/Cooley Road as the only intersection operating right at the target.

[7] Mobility targets for ODOT facilities obtained from the 1999 Oregon Highway Plan. Mobility standards for City facilities based on City of Bend Development Code 4.7.500.

Table 4. Existing (2019) 30th Highest Annual Hour Traffic Operations at Study Intersections

Study Intersection	Control	Jurisdiction	Mobility Target	V/C [A]	LOS	Delay (sec)
US 97 / Grandview Dr	Two-way stop control	ODOT	v/c ≤ 0.80 (major) v /c ≤ 0.95 (minor)	0.16 / 0.19	B / C	15 / 18
US 97 / Cooley Rd	Signalized	ODOT	v/c ≤ 0.85	0.85	D	52
Cooley Rd / NE Hunnell Rd	Two-way stop control	City	v/c ≤ 1.0	0.03 / 0.19	A / C	8 / 17
Cooley Rd / NW Hunnell Rd	Two-way stop control	City	v/c ≤ 1.0	0.10 / 0.38	A / B	8 / 13
Cooley Rd / 18th St	Roundabout	City	v/c ≤ 1.0	0.14	A	4

[a] V/C ratio, LOS and delay are reported as overall intersection at signalized intersections, major street/minor street at two-way stop-controlled intersections and worst approach lane at roundabouts.

6.3 Safety Analysis

Methods from the ODOT Analysis Procedures Manual (APM),[8] were used to identify the crash frequency, severity, type, and contributing factors at the study locations. The state Safety Priority Index System (SPIS)[9] was also consulted and documented.

The most recent 5-year crash data available (2014 to 2018) were obtained from ODOT.[10] The safety analysis considered US 97 between Fort Thompson Lane in the north to Robal Road in the south and Cooley Road from NW Hunnell Road to E 18th Street. The study intersections are:

- US 97/Fort Thompson Lane
- US 97/Bowery Lane
- US 97/Grandview Drive
- US 97/Cooley Road
- Cooley Road/NE Hunnell Road
- Cooley Road/NW Hunnell Road, and
- Cooley Road/18th Street

The study segments are the segments of US 97 and Cooley Road split between the study intersections as shown in Figure 12. According to ODOT's 2018 Motor Vehicle Traffic Crash Analysis and Code Manual,[11] legally reportable motor vehicle traffic crashes are those involving loss of $2,500 effective 1st January 2018 and prior the limit was $1,500. The following summarizes the results of the intersection and segment safety analysis.

[8] Analysis Procedure Manual (APM Version 2), Chapter 4-Safety, Oregon Department of Transportation

[9] 2018 Safety Priority Index System (SPIS)

[10] ODOT TransGIS

[11] 2018 Motor Vehicle Traffic Crash Analysis and Code Manual

Figure 12. Study Intersections and Segments for Safety Analysis

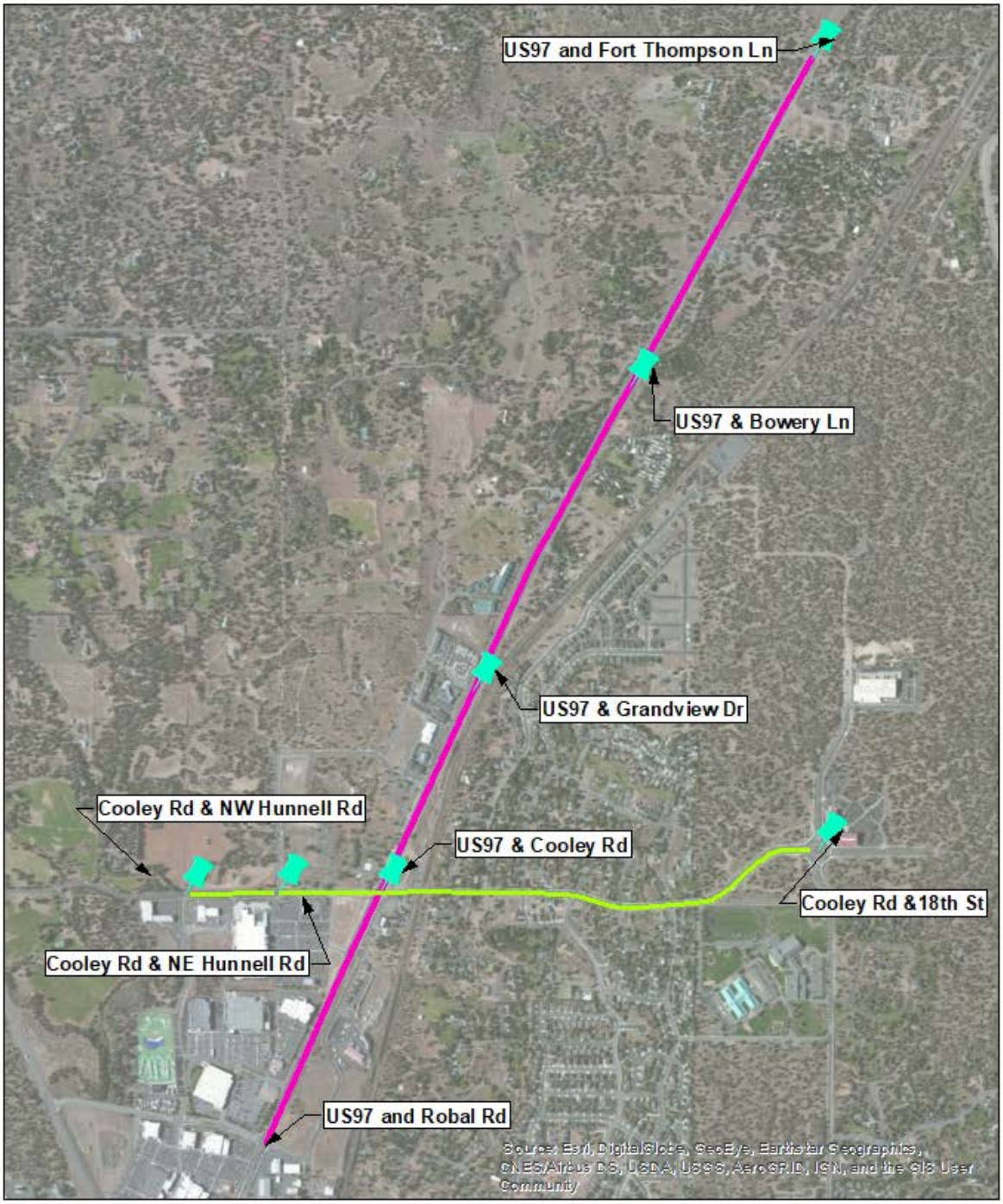
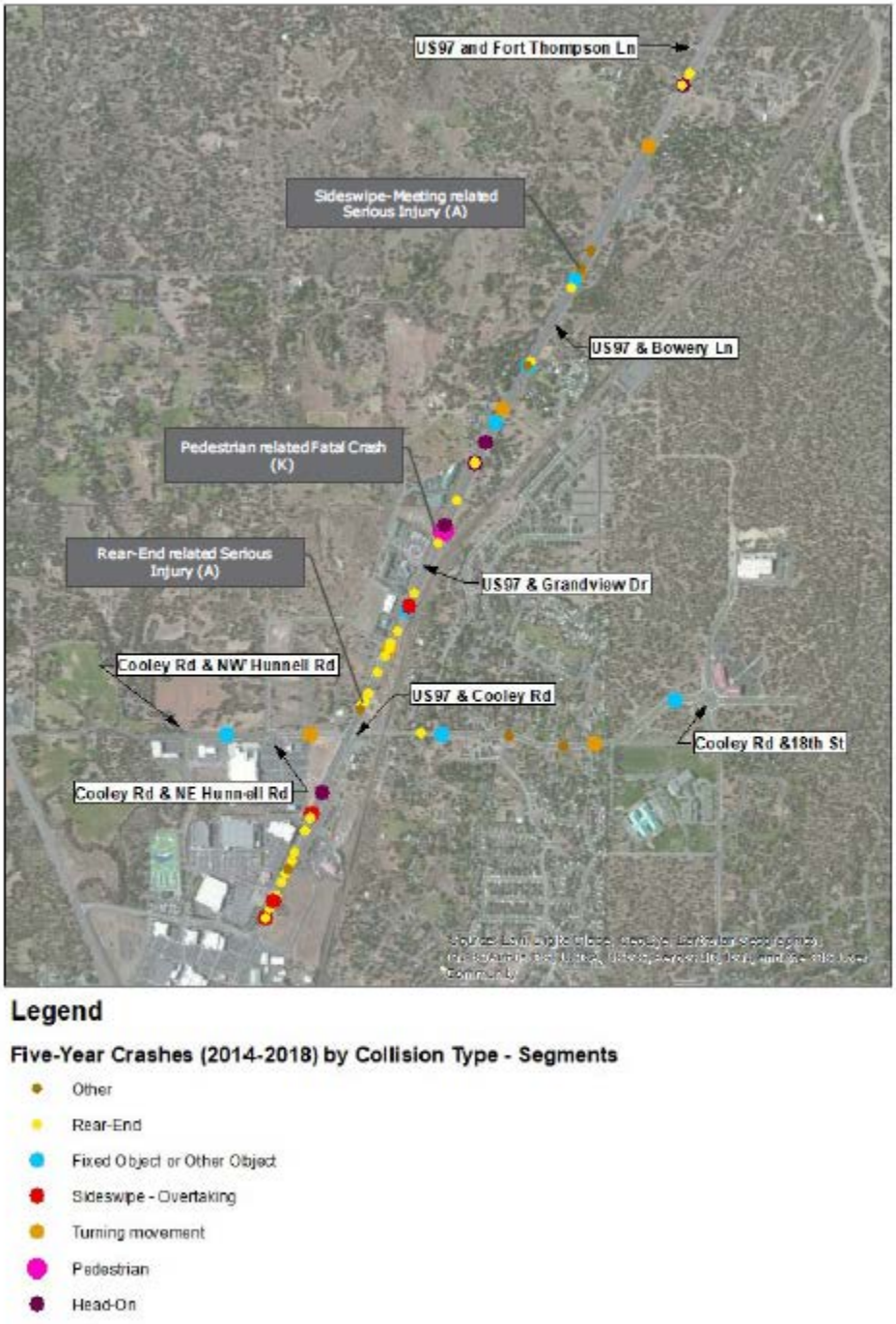


Figure 13 presents the distribution of crashes by collision type at the study segments. rear-end crashes were the most frequent crash type observed to be in the vicinity of driveways – particularly between Grandview Drive and Robal Road. Appendix C, Table 8 provides a summary of crash frequency by collision type at the study segments.

Figure 13. Crashes (2014-2018) by collision type at study segments



6.3.1 Safety Summary

There were no high-severity (fatal or serious injury) crashes at the study intersections. Overall, the most common crash type was a rear-end crash. There were three high-severity crashes on the study segments in the area: a pedestrian fatality on US 97 between Bowery Lane and Grandview Drive (fatal pedestrian crash); a serious injury crash on US 97 between Fort Thompson Lane and Bowery Lane (serious injury motor vehicle crash); and between Grandview Drive to Cooley Road (serious injury motor vehicle crash). The crash rate of the study intersections was lower than the statewide 90th percentile crash rate for comparable intersections.[12] Overall, the most common crash type was rear-end crashes.

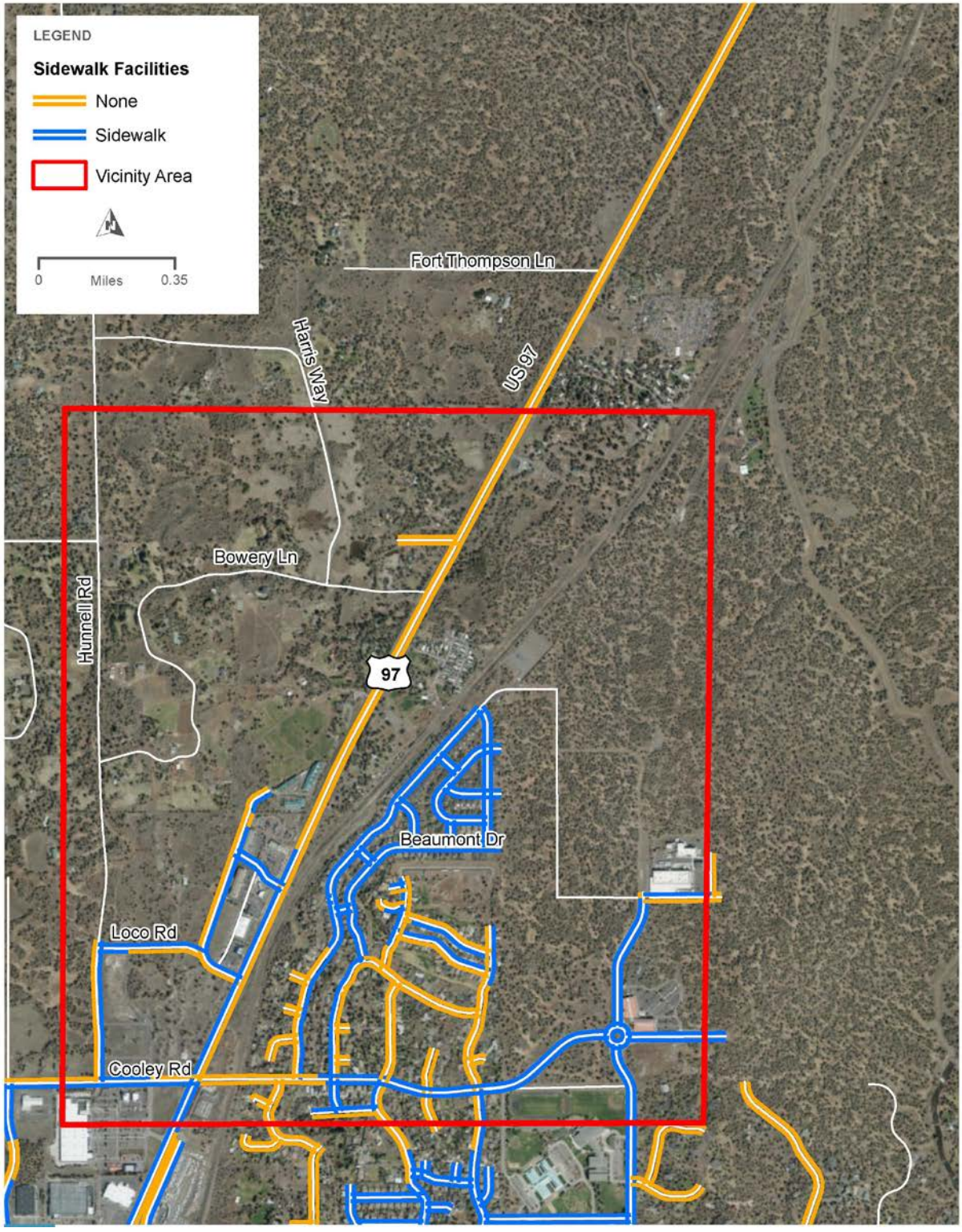
6.3.2 Inventory of Existing Pedestrian and Bicycle Facilities

6.3.2.1 Pedestrian Facilities

Sidewalks accommodate pedestrian travel on many of the roadways in the vicinity area, though sidewalks are not consistently provided on all streets. There are significant gaps in the network, which include both local streets and arterial streets. Most notably, access to the only signalized intersection in the vicinity area along Cooley Road is limited, with missing connections to the east. Cooley Road east of Hunters Circle provides a combination of curb-tight and curb-separated sidewalks, providing pedestrian routes to and from the roundabout at 18th Street, which accommodates pedestrians traveling north and south. Existing sidewalks along local streets are generally curb-tight and often only present on one side, though local streets developed more recently typically include sidewalks on both sides with planted buffers (Figure 14). A number of local streets in the area lack curb and gutter, along with any formalized pedestrian facilities.

[12] Analysis Procedure Manual (APM Version 2), Chapter 4-Safety, Oregon Department of Transportation

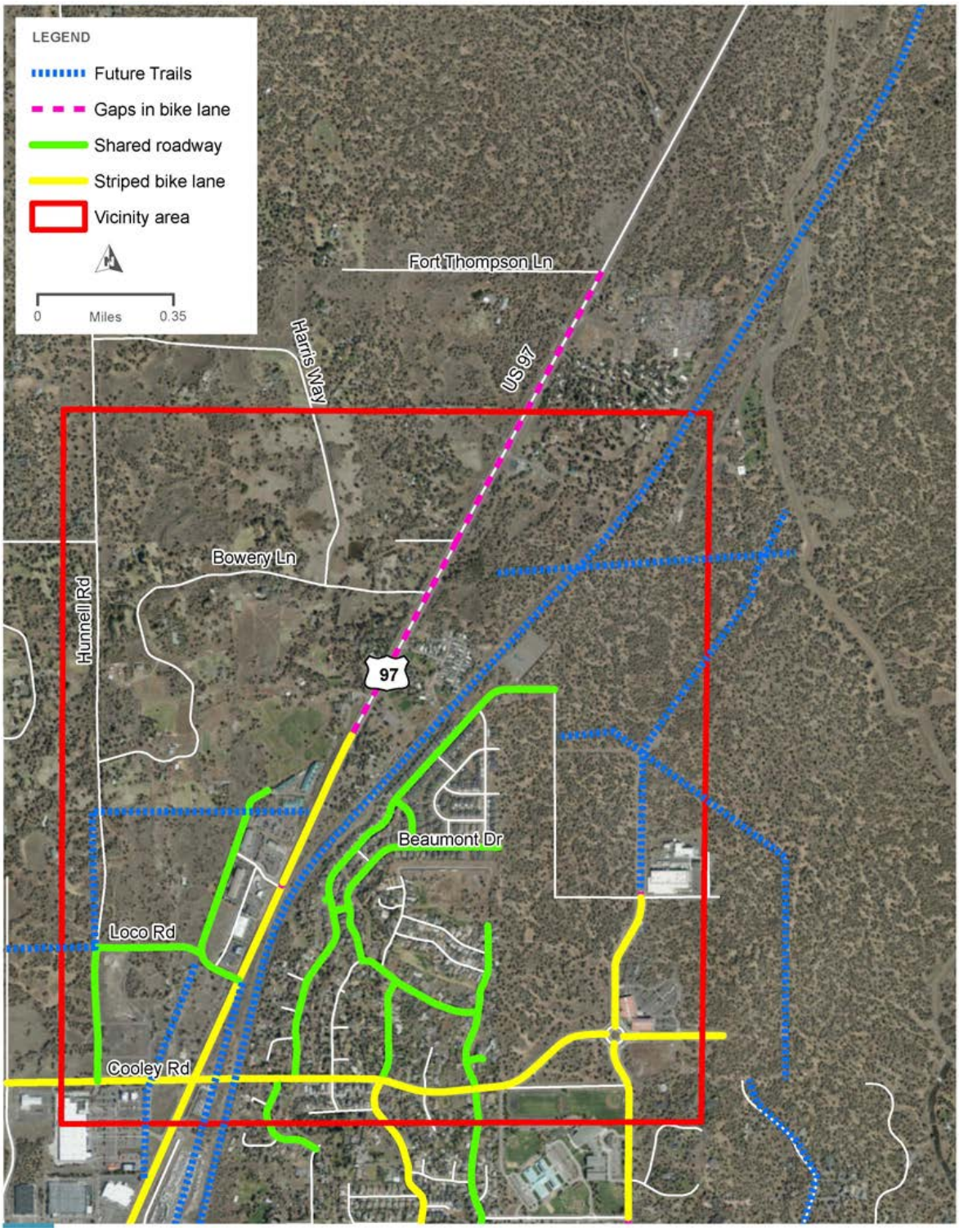
Figure 14. Pedestrian Facilities Map



6.3.2.2 Bicycle Facilities

Bicycle traffic in the vicinity area is generally accommodated utilizing two types of facilities: striped bike lanes on arterial streets and along US 97, and shared roadway designations on lower-volume collector streets and select local streets. There is severely limited network connectivity, with designated bike routes forming a dendritic system that funnels most trips to arterial streets. Bike trips rely on the US 97/Cooley Road intersection as the only signalized crossing opportunity within the vicinity area, and the only east-west connection across US 97 (Figure 15). While a number of additional north-south connections exist along Cooley Road, none is signalized, and some are offset, requiring bicyclists to ride along Cooley Road for a distance. The City's TSP identifies additional future bike facilities that would improve network connectivity through additional streets with bike lanes or shared roadway designations. The TSP also identifies a north-south multiuse path that would provide off-street connections to the larger trail system.

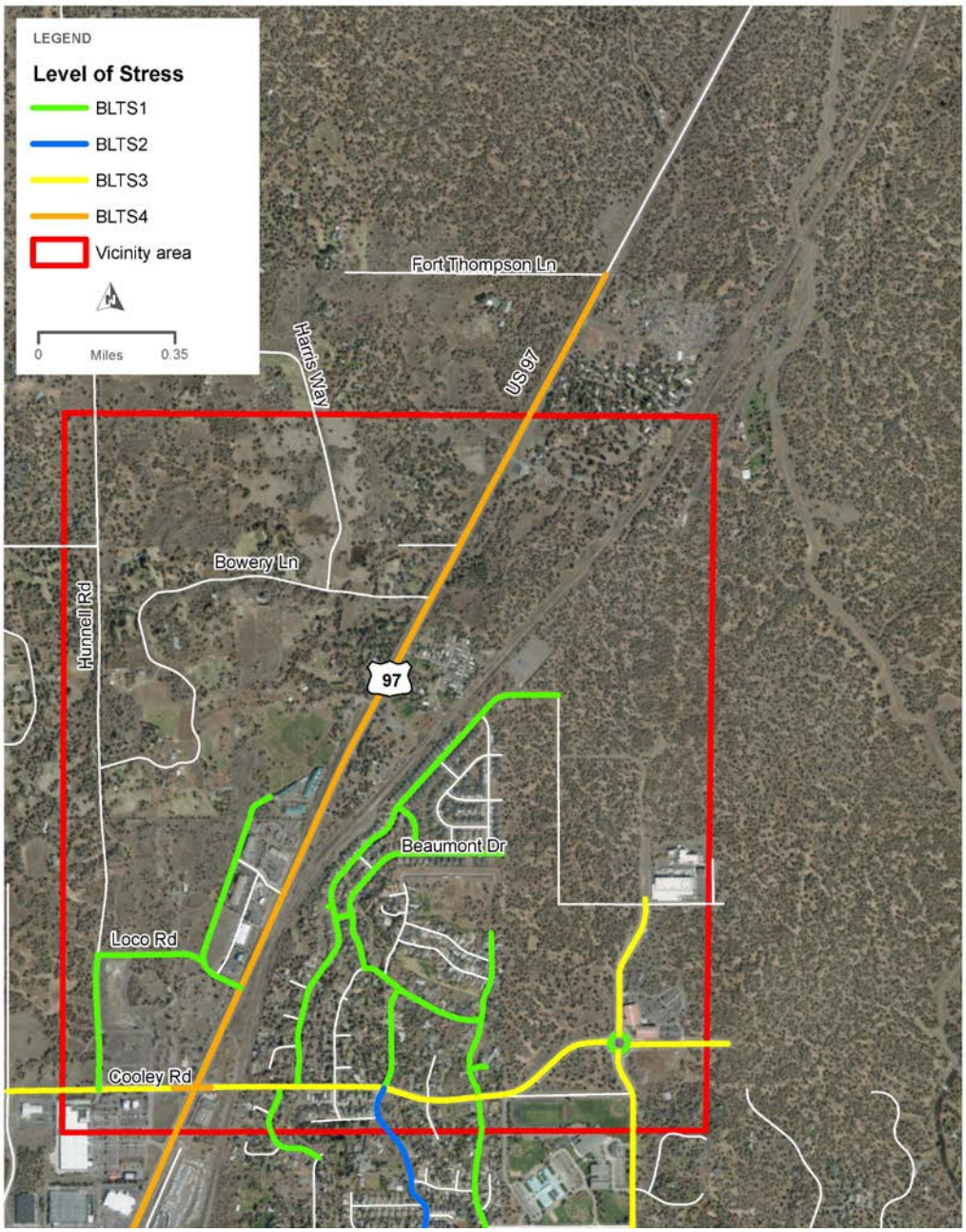
Figure 15. Bike Facilities



6.3.3 Level of Traffic Stress Results

The bicycle level of traffic stress (LTS) throughout the vicinity area is dominated by US 97 and Cooley Road subdividing the area into four relatively disconnected islands (Figure 16). The northeast quadrant presents the largest low stress network, including a variety of low speed and low volume local streets. While Cooley Road provides bike lanes, crossing the arterial at numerous unsignalized crossings is fairly high stress. As stated above, the only signalized crossing in the vicinity area is at US 97 and Cooley Road.

Figure 16. LTS Analysis



6.3.4 Gaps Analysis

6.3.4.1 Pedestrian Gaps

The following is a summary of the key identified gaps in the pedestrian network, consisting of lacking or substandard facilities along stretches of the roadway network. Shortcomings in crossing opportunities are discussed in the following section. Figure 15 above shows both the existing sidewalks and identifies stretches without.

- Cooley Road: There is a significant gap in the sidewalk network between just east of US 97 and just east of Hunters Circle, exceeding 800 feet in length. This gap includes access to and from the only signalized intersection in the vicinity area, thus severely limiting safe east/west pedestrian travel. West of US 97 there is a sidewalk gap along the north side extending about 400 feet.
- US 97: There is no pedestrian accommodation along the east side north of Cooley Road. The sidewalk on the west side is curb tight between Cooley Road and Clausen Road, providing little comfort for pedestrians along this high speed and high-volume roadway.
- Hunnell Road/Loco Road/Clausen Road: Sidewalks are generally provided on one side only, often curb-tight.
- Local streets: Several of the local streets in the quadrant east of US 97 lack sidewalks on one or both sides. Where present, sidewalks are often curb-tight.

6.3.4.2 Bicycle gaps

While the existing network provides continuous bicycle facilities along arterials and US 97 and shared roadways on most local and collectors streets, the level of protection provided on Cooley Road and particularly along US 97 does not adequately accommodate bicyclists except for the most experienced and fearless riders. The limited network permeability also heavily relies on cyclists utilizing the high stress facilities – Cooley Road and US 97 – to ride from one quadrant of the vicinity area to another. Crossing challenges are discussed in the following section.

As stated above, only one signalized intersection in the vicinity area provides north/south and east/west connectivity for pedestrians and bicyclists attempting to cross US 97 or Cooley Road. A roundabout at Cooley Road and 18th Street includes marked crosswalks on all four legs and provides slip lanes for bicyclists to navigate the roundabout off-street. Other intersections along US 97 or the Cooley Road corridor do not provide any marked crossings, except a marked crosswalk with median refuge across Cooley Road at the Lava Ridge Elementary School access drive.

7 Future Operations Analysis

7.1 Future Traffic Volumes

Future traffic volumes were forecast for the year 2040 using the Bend-Redmond Regional Travel Demand Model. The Bend-Redmond Regional Travel Demand Model

transportation network included projects from the Bend Metropolitan Transportation Plan (MTP) including UGB expansion projects in North Bend and Deschutes County Transportation System Plan. These projects included:

- North Corridor Project INFRA Grant improvements, which realigns US 97 between Cooley Road and Empire Avenue (Figure 17, MTP Project 13)
- Empire Avenue Extension (MTP Project 9)
- Yeoman Road Extension (MTP Project 17)
- Britta Extension (MTP Projects 20 and 21)
- Robal Road Extension between US 20 and O.B. Riley (MTP Project 204)
- Hunnell Road Extension (MTP Project 205, Deschutes County Transportation Plan)
- Loco Road Extension (MTP Project 248)
- New collector in expansion area (MTP Project 206a)

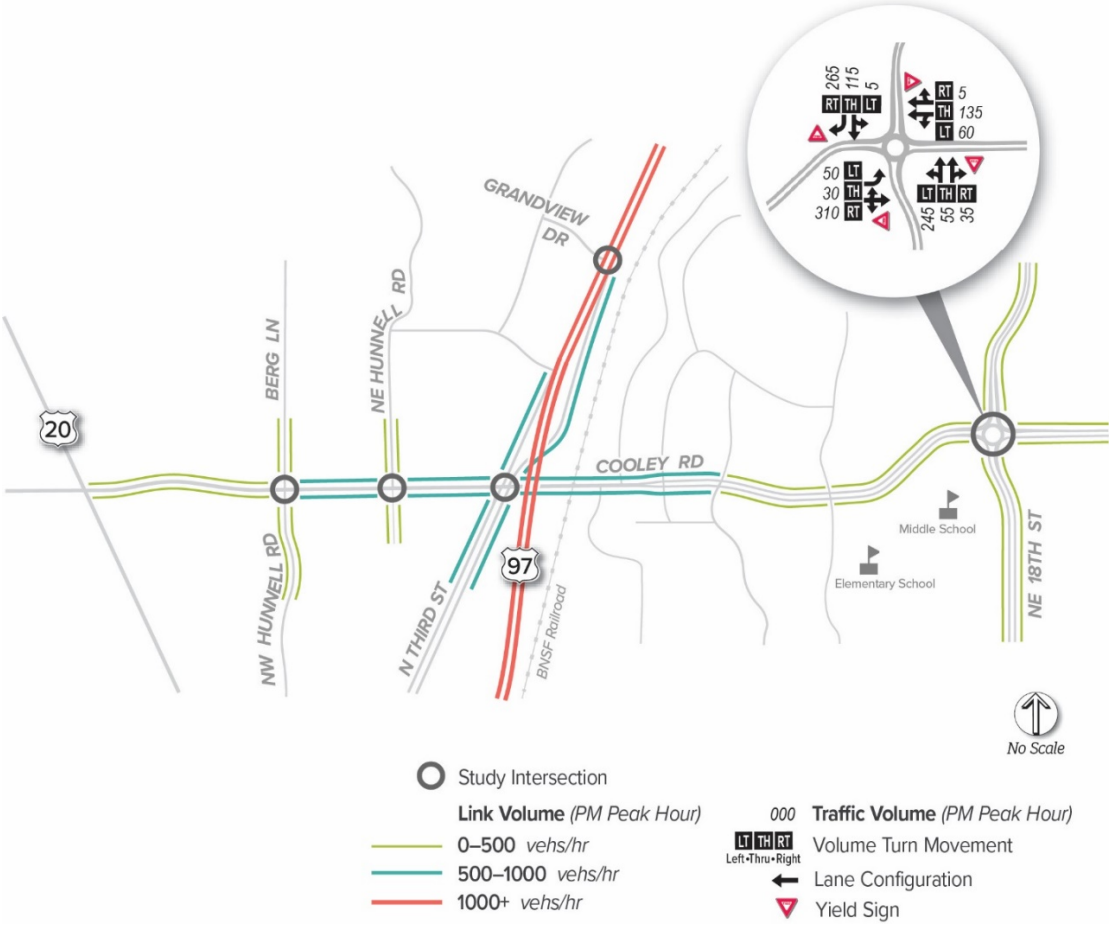
Figure 17. North Corridor Project Concept

Source: *https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=21229*

Figure 18 shows the approximate 2040 traffic volumes on the study area roadways during the design hour (future equivalent of the 30th highest annual hour). Peak hour traffic volumes grow by approximately 45 percent on US 97 near Grandview Drive (approximately two percent annual growth). Traffic volumes are expected to significantly decrease on North 3rd Street as the new US 97 alignment pulls through movements off of North 3rd Street.

Analysis for the North Corridor project is currently ongoing to determine appropriate lane configurations and access near the study area, which could impact future traffic volumes. Therefore, intersection turning movement volumes were only forecast for the future baseline conditions at Cooley Road and 18th Street (using NCHRP Report 765[13] procedures).

Figure 18. Future (2040) Design Hour Traffic Volumes



[13] National Cooperative Highway Research Program (NCHRP) Report 765: *Analytical Forecasting Approaches for Project-Level Planning and Design*

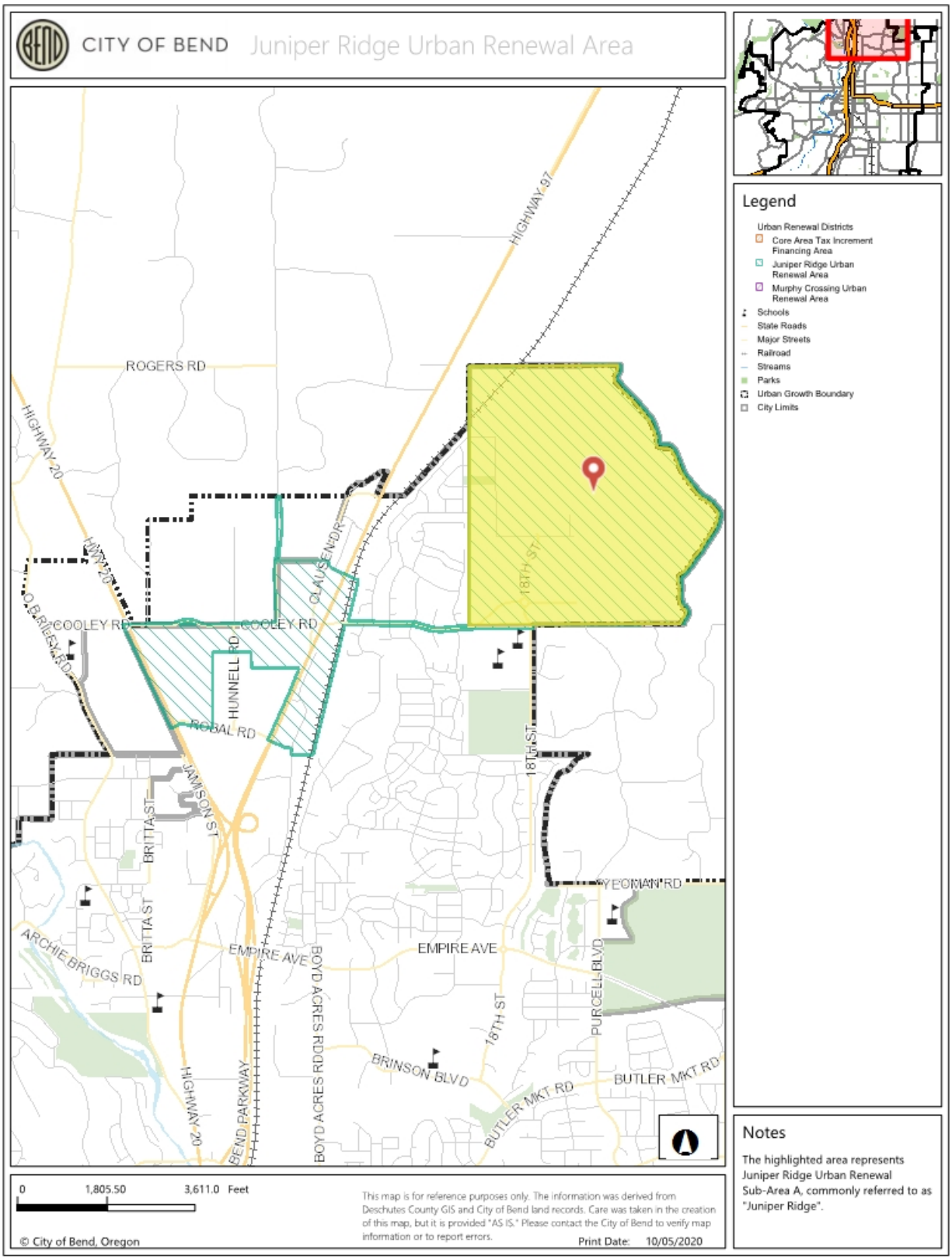
7.2 Potential Future Traffic Generators

In the future as development continues to occur in Bend, traffic is anticipated to increase on US 97 and nearby roadways. In particular, Juniper Ridge is anticipated to be a heavy traffic generator in the vicinity area. Juniper Ridge (highlighted in Figure 19, below) is a 500-acre industrial and business park that encompasses land to the north of Cooley Road. Juniper Ridge is zoned as IL and is anticipated to generate additional passenger vehicle and freight traffic.

Under future baseline conditions, nearly 30 percent of eastbound traffic on Cooley Road east of US 97 would be destined for Juniper Ridge and nearly 60 percent of westbound traffic on Cooley Road would be traveling from Juniper Ridge. This increase in traffic on Cooley Road would pass by Sky View Middle School and contend with an at-grade rail crossing at Cooley Road. In addition, as build out of Juniper Ridge continues to occur (beyond the 20-year planning horizon), more traffic will be funneled to Cooley Road for vehicles to access North 3rd Street, US 97 and land uses east of US 97.

There are limited routes for people to cross US 97 to access potential future traffic generators. In particular, as noted in Appendix C, there are limited routes for people walking and biking to cross US 97 and key bike facility and sidewalk gaps exist. Under future baseline conditions, Cooley Road would be the northernmost crossing of US 97 near Bend to connect residential land uses east of US 97 with the Juniper Ridge area, with the next closest crossing to the north at Deschutes Market Road.

Figure 19. Juniper Ridge Urban Renewal Area Boundary



Source: Bend Oregon Online Mapper (BOOM) https://maps.ci.bend.or.us/html5viewer/?viewer=publicviewer#

7.3 Freight Operations

US 97 through the study area is classified as a Statewide Highway and has been designated as a part of the National Highway System, a Federally Designated Truck Route, a State Freight Route and Reduction Review Route, and an Expressway.

Today, nearly 10 percent of the Annual Average Daily Traffic (AADT) is truck traffic (approximately 2,700 trucks per day)[14]. A little over three percent of all US 97 daily traffic is multi-unit truck traffic. The value of freight traveling on US 97 through the study area is approximately $6.5 billion annually, with the highest value commodities being food or kindred products or machinery, instruments, transportation equipment or metals.[15] The largest tonnage of commodities on US 97 include clay, minerals or stone and food or kindred products, followed closely by forest or wood products.

By 2040, daily traffic on US 97 in the proximity of the proposed interchange is expected to increase by 75 percent from 27,700 to 48,500 vehicles per day.[3] About two-thirds of this growth is related to "through" travel with origins/destinations south of US 20. The remaining one-third of the growth accesses City streets in the vicinity area with much of it related to surrounding land uses. Commodities traveling by freight trucks are also expected to increase in both value and tonnage on US 97, as it serves a crucial north-south route through Oregon. As general traffic and freight traffic increases, it will be critical to address any potential freight issues to ensure the efficient and reliable delivery of goods on US 97.

7.3.1 Reliability and Congestion

Reliable transportation is critically important to the freight sector to ensure on-time delivery of the billions of dollars' worth of goods. Less reliable freight transportation can reduce the productivity of freight trucks, increase the number of trucks on the road and increase costs associated with warehousing inventory that would otherwise be on the road.[16]

Congestion and crash incidents play a key role in reliability on US 97, particularly in urban areas such as near Bend. US 97 in northern Bend between Cooley Road and the US 20 interchange to Sisters is estimated to have some of the highest levels of unreliability and delay on all of US 97 through Oregon.[5] US 97 intersects at-grade with several key arterials in Bend and provides access to commercial land uses in the Golden Triangle (area between US 97 and US 20), which generates a substantial amount of cross street traffic. The delay and unreliability at Cooley Road can spillback to the north, affecting the proposed interchange area. While this congestion and unreliability likely have a significant impact on freight delay, the North Corridor Project realigns US 97 through this section to limit at-grade access. The North Corridor Project should significantly improve congestion and reliability for freight on US 97.

---

[14] ODOT Transgis: https://gis.odot.state.or.us/transgis/

[15] *Technical Memorandum 2: Existing and Future Conditions Addendum*, US 97 Freight Plan Phase 2, Oregon Department of Transportation Dec 2018

[16] *Reliability: Critical to Freight Transportation*, Federal Highway Administration https://www.fhwa.dot.gov/publications/publicroads/04nov/09.cfm

However, the North Corridor Project is currently not likely to address unreliability tied to the at-grade railroad crossing along Cooley Road. Freight traffic accessing Juniper Ridge could still be delayed by an at-grade rail crossing along Cooley Road. In 2019, there were an estimated six train crossings daily (three between 6 a.m. and 6 p.m.).[17]

7.3.2 Geometric Constraints

North of Cooley Road, there are limited geometric constraints for freight vehicles. The US 97 Freight Plan noted that there is limited grade on US 97 north of Bend (2.4 percent or less) and no significant horizontal curvature.[4]

ODOT's Freight Planning Unit conducted the Highway Over-dimension Load Pinch Points study, which identified over-dimension pinch points on US 97. The pinch point nearest the study area is at mile point 134.93 (near Exit 135A, just south of the Golden Triangle). The structure connecting northbound US 97 traffic to US 20 has a vertical constraint of 15'-10", shorter than the standard 17'-4" for a High Route. While this could limit the ability of over-dimension loads on US 97 and was identified by the US 97 Freight Plan as a High Priority Pinch Point, this pinch point is being addressed by the North Corridor Project, as the new US 97 alignment will not travel under the existing structure.

7.4 Operations Analysis

Intersection operations were analyzed using Sidra software and the HCM 6th edition methodologies. Analysis for the North Corridor project is currently on-going to determine appropriate lane configurations and access near the study area. Therefore, intersection operations were only analyzed for the future baseline conditions at Cooley Road and 18th Street. The analysis was conducted using the future (2040) design hour traffic volumes shown in Table 5.

Performance measures used for this analysis include V/C ratios, seconds of control delay and LOS. Table 5 summarizes the intersection operations results at Cooley Road and 18th Street, which meets the adopted mobility target.[18] HCM reports are included in Appendix D.

Table 5. Future (2040) Design Hour Traffic Operations at Cooley Road and 18th Street

Study Intersection	Control	Jurisdiction	Mobility Target	V/C[a]	LOS	Delay (sec)
Cooley Rd / 18th St	Roundabout	City	v/c ≤ 1.0	0.33	A	7

[a] V/C ratio, LOS and delay are reported for the worst approach lane.

8 Alternative Analysis

Three grade separated interchange alternatives were geometrically laid out and assessed for benefits and impacts. All three alternatives elevate the eastbound and

[17] U.S. DOT Crossing Inventory Form, *Federal Railroad Administration*, Revised 09/03/2020.

[18] Mobility standards for City facilities based on City of Bend Development Code 4.7.500.

westbound through movements along 18th Street over US 97. The three grade separated interchanges evaluated were a traditional TUDI, a TUDI with roundabouts at the terminals (DRAB), and a DDI.

8.1 Tight Urban Diamond Interchange

A TUDI alternative was geometrically laid out with a design speed of 45 mph along 18th Street. The TUDI alternative (Figure 20) provides on and off ramps to and from 18th Street, with a traditional four-legged intersection at the ramp terminals.

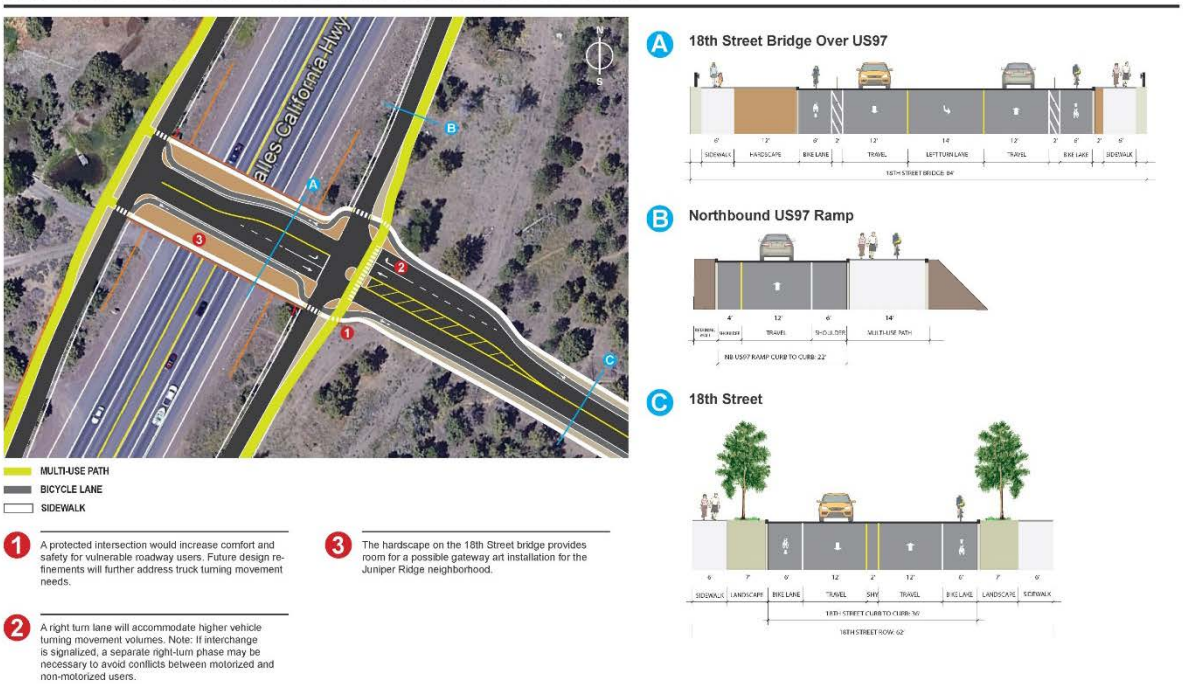
A TUDI alternative minimizes right of way (ROW) impacts along US 97. The traditional four-legged intersections at the ramp terminals are consistent with drivers' expectations and therefore, do not require extensive signing for driver compliance.

A two-way, stop-controlled intersection at the US 97 northbound ramps and all-way stop-controlled intersection at the US 97 southbound ramps, with a westbound right turn lane.

The TUDI integrates bicycle and pedestrian facilities into the interchange with the smallest footprint of the three design options (Figure 21). The multiuse paths running on either side of US 97 would parallel the on- and off-ramps, providing active transportation access to 18th Street. The interchange itself features a protected intersection design providing both bicyclists and pedestrians a greater sense of comfort, while enhancing visibility to motorists. Ramp terminal crosswalks are placed immediately upstream from the intersection to facilitate crossings at the narrowest point, while providing sufficient turning radii from trucks and other large vehicles.

Figure 20. Tight Urban Diamond Interchange

Figure 21. Tight Diamond Interchange Alternative Concept – Bike and Pedestrian



8.2 Tight Diamond with Dual Roundabouts

A Tight Diamond with Dual Roundabouts Interchange Alternative (DRI) at the ramp terminals was geometrically laid out with a design speed of 45 mph along 18th Street. This alternative replaces the traditional four-legged unsignalized/signalized intersections at the ramp terminals with single-lane roundabouts.

A roundabout intersection has fewer conflict points compared to traditional intersections and therefore significantly reduces the occurrence of crashes at the intersection. The roundabout also decreases vehicular travel speed at the intersections, which may help reduce severity of injury crashes.

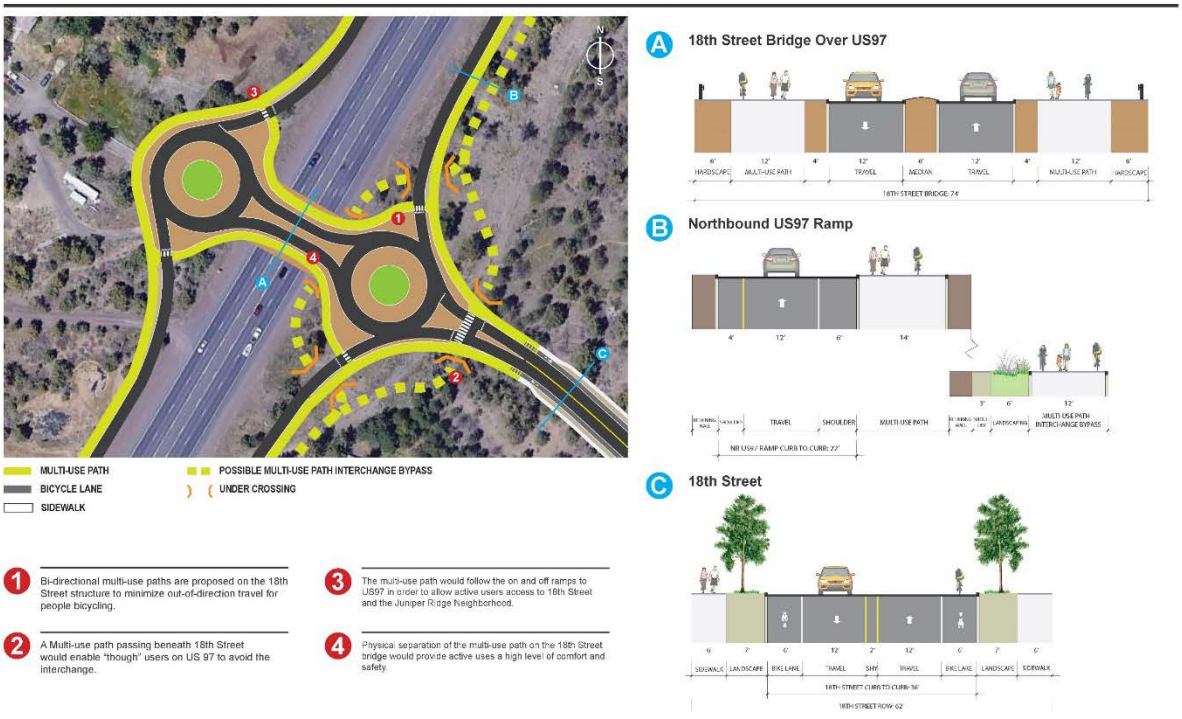
The design of the two roundabouts require additional right-of-way when compared to the TUDI alternative. When compared to a traditional intersection, a roundabout is expected to have higher construction costs; however, a roundabout is also expected to have reduced maintenance costs in the future due to the lack of signal equipment.

The DRI features multiuse paths on both the north and south sides of the 18th Street bridge (Figure 23). This allows all possible movements (including direct connections between the 18th Street and US 97 pathways). The multiuse paths running on either side of US 97 would parallel the on- and off-ramps, providing active transportation access to 18th Street. Multiple undercrossing options would enable north-south “through” users on the eastern US 97 path to bypass the interchange altogether.

As 18th Street approaches the roundabouts, the on-street bicycle lanes and the landscape separated sidewalks transition to physically separated multiuse paths. The crossings of 18th Street and the on-/off-ramps are marked and pulled back from the roundabout’s circular roadway. This allows active users to move through the interchange while having minimal impacts on the flow of traffic through the roundabouts.

Figure 22. Tight Diamond with Dual Roundabouts – Plan View

Figure 23. Dual Roundabout Interchange Alternative Concept – Bike and Pedestrian Elements



8.3 Diverging Diamond Interchange

The DDI alternative was geometrically laid out with a design speed of 45 mph along 18th Street and 30 mph through the interchange area. The DDI (Figure 24) is an alternative interchange that crosses the minor approaches of the through movements at the terminal intersections, or crossover intersections, safely allowing the vehicular traffic to drive on the left side of the roadway within the core of the interchange. By crossing the minor approaches, this alternative allows the left turn traffic to operate freely at the entrance ramp, eliminating several conflicts points left turns have at a typical interchange.

The crossover intersections at a DDI operate on a two-phase signal, pairing the left and right turns at the exit ramps with their minor approach through movements that they do not conflict with each other. Additionally, the DDI eliminates the need for dedicated left turn lanes to the entrance ramp compared to the TUDI.

This allows the DDI to meet or exceed the operations of the TUDI while reducing the overall footprint required to serve the design year traffic volumes. The two-phase signal operations allows for more green time to the heavy movements while reducing the overall delay of the terminal intersections which improves the overall intersection LOS.

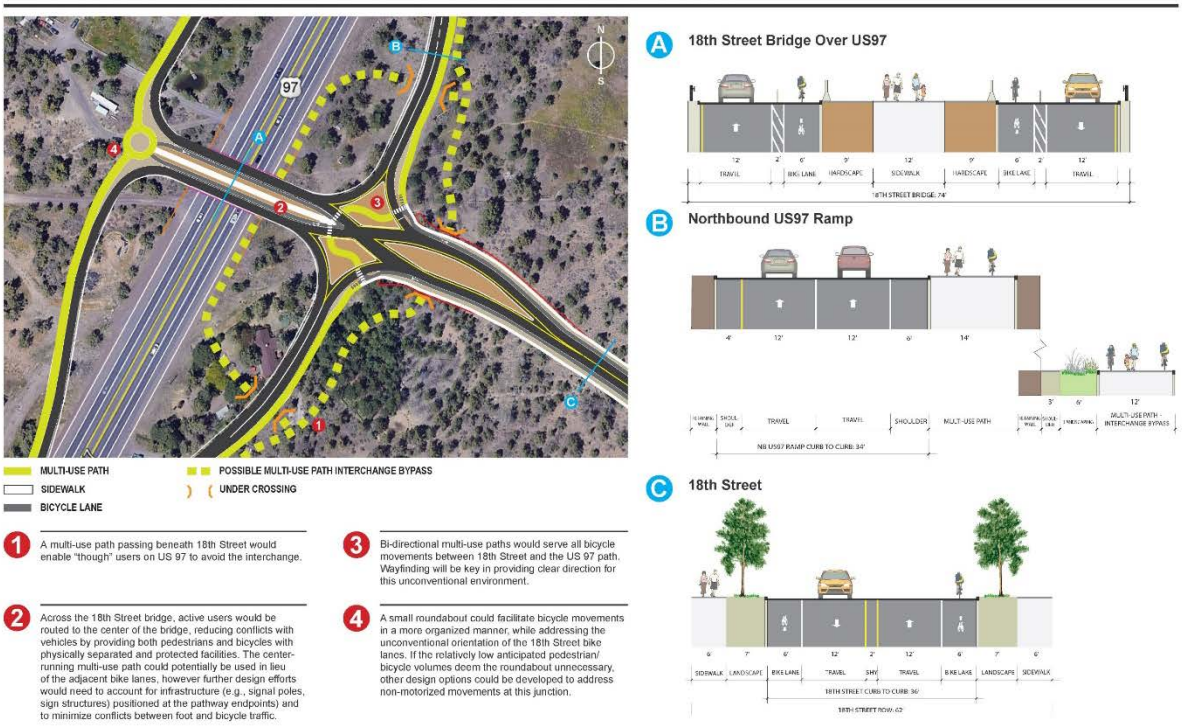
While less conventional compared with traditional interchange designs, the DDI offers several benefits to active transportation users. The reduced number of ramp terminal signal phases and turning movements would streamline travel through the interchange area. Additionally, the removal of left-turn pockets potentially frees up additional space that could be allocated for more robust walking and cycling infrastructure.

As in the other interchange alternatives, the multiuse paths running on either side of US 97 would parallel the on- and off-ramps, providing active transportation access to 18th Street. Multiple undercrossing options would enable north-south “through” users on the eastern US 97 path to by-pass the interchange altogether (Figure 25).

The 18th Street structure would include protected bike lanes and a center-running sidewalk. A series of protected crossings and pathway connections links the 18th Street structure with the more conventionally arranged bicycle/pedestrian facilities east of the interchange. Key to this design are bi-directional multiuse path connections within the eastern ramp terminal. The bi-directional nature facilitates streamlined bicycle movements between US 97 and 18th Street. For example, this allows a bicyclist traveling south on the eastern US 97 path to pass directly through the interchange and connect with the bicycle lane on 18th Street heading east.

Figure 24. Diverging Diamond Interchange - Plan View

Figure 25. Half Diverging Diamond Interchange Alternative Concept – Bike and Pedestrian Elements



8.4 Access Road – Recommendation

8.4.1 Option 1 Roundabout Connection

This option includes an access road that runs along and parallel to US 97 on the east side, which then connects to a roundabout on 18th Street on the east side of US 97 as shown in Figure 26. This road will allow access to properties that front US 97. A benefit of the frontage road is it follows US 97 and provides less of a footprint to existing properties.

Figure 26. Option 1 - Frontage Road Roundabout Connection Plan View

8.4.2 Option 2 -Wishbone Connection

Option 2 provides a back road that follows the railroad tracks and provides access to abutting properties. This option includes a right in right out along 18th Street and shown in Figure 27. This design allows easier access to the mobile homes turning on/off US 97.

Figure 27. Option 2 - Wishbone Connection

8.5 Preferred Alternative Recommendation

Based on the goals and objectives, the recommended grade-separated interchange is the TUDI (Figure 20). The DRAB and DDI scored well based on the evaluation criteria and with further study should be considered as acceptable alternative options. Additionally, the preferred access road concept was the wishbone and shown in Figure 27.

Table 6 list the evaluation criteria and final scoring from the workshop.

Table 6. Evaluation Criteria - Final Concepts

Objectives	Preliminary Evaluation Criteria	Tight Diamond (TUDI)	DDI	DRAB
Consider long term growth needs of Juniper Ridge to the east of US 97 north of Cooley. Address long term growth needs for the area west of US 97 north of Cooley Road.	Future transportation system performance	2	2	2
Preserve and provide adequate business access and vitality by improving conditions for existing businesses or by maximizing values for property owners.	Modifications to access	0	0	0
Improve livability for adjacent neighborhoods.	Potential for diversion on Boyd Acres and Hunnell	0	0	0
Avoid and minimize impacts to resources in the project study area to streamline environmental process.	Potential impacted resources	2	-0.5	1
Develop a prioritized implementation strategy/action plan.	Ability to phase project, forward compatibility	0	0	0
Ensure public funds are invested efficiently and effectively.	Effectiveness of project concept to address goals and objectives per $	2	1	1
Create a US 97 corridor that aligns with the extension of the parkway vision.	Previous planning statement of alternative vision	2	2	2
Statewide goal exception		-1	-1.5	-1.5
Improve safety for drivers, bicyclists and pedestrians.	Safety for all modes	1	1.5	1.5
Maintain or enhance efficient travel for regional traffic along US 97.	Operations and delay at key intersections	2	2	2
Maintain or enhance efficient travel for local trips.	Serve local trips, enhance ability for local trips to avoid US 97	1	1	1
Improve the comfort and connectivity of or add facilities for people walking or bicycling along the corridor and crossing the corridor, including the multiuse path along US 97.	Comparison of future no-build and project for relative comfort of facilities and connections. Ability to attract "interested-but-concerned" riders.	2	0.5	2
Accommodate transit operations in facility designs.	Provide locations consistent with transit plans to accommodate transit connections	0	0	0
Provide adequate access to businesses along the US 97 corridor for both customers and freight/delivery	Business access opportunities that accommodate freight turning movements	0	0	0
Reduce the number of local trips on US 97	Serve local trips, enhance ability for local trips to avoid US 97	0	0	0
Design to accommodate freight movement	Business access opportunities that accommodate freight turning movements	1	1	-0.5
Minimize out-of-direction travel	Out-of-direction travel	1	1	1

Objectives	Preliminary Evaluation Criteria	Tight Diamond (TUDI)	DDI	DRAB
Avoid disproportionate impacts to EJ populations	Impacts to properties owned, used by or accessed by EJ populations	1	1	1
Comparison against average project and other options (not comparing to no-build)	# of potential design exceptions	1	1	1
	Constructability and ability to maintain traffic	1	0.5	1
	Consideration of maintenance Challenges/opportunities (e.g. plowing)	1	1	1.5
	Total	19	13.5	16

8.6 Future Traffic Performance of Preferred Options

8.6.1 Future 2040 Traffic Volumes

Future traffic volumes were forecast for the year 2040 using the Bend-Redmond Regional Travel Demand Model (BRM). The BRM transportation network included the No Build network assumptions (see Technical Memorandum #4) and a new North Interchange connected to an extension to 18th Street. Figure 28 shows the estimated shift in future daily traffic volumes on the area street network resulting from the construction of the North Interchange and 18th Street extension. The traffic volume forecasts described below would be the same for any of the interchange alternatives.

With the proposed North Interchange, traffic volumes are expected to decrease on US 97 to the south, North 3rd Street, and Cooley Road but increase on 18th Street compared to the No Build condition. At the 3rd Street/Cooley Road intersection, traffic volumes are expected to decrease, particularly on the critical southbound left and westbound left movements. The decrease is pronounced along Cooley Road, with an expected reduction in daily traffic of approximately 30 percent (approximately 2,500-3,500 vehicles per day). Instead of using Cooley Road to access US 97 or 3rd Street, vehicles can utilize the new North Interchange. This includes freight vehicles needing to access existing and future proposed industrial land uses in the Juniper Ridge area, which may be preferable to having them route down Cooley Road through a residential area and past schools.

While not shown in Figure 28, there would also be a significant decrease in the volume of traffic on Deschutes Market Road, particularly during the p.m. peak hour when volumes decrease by over 25 percent. This reflects the ease of access the new interchange would provide for the Juniper Ridge area to and from destinations to the north, such as the City of Redmond.

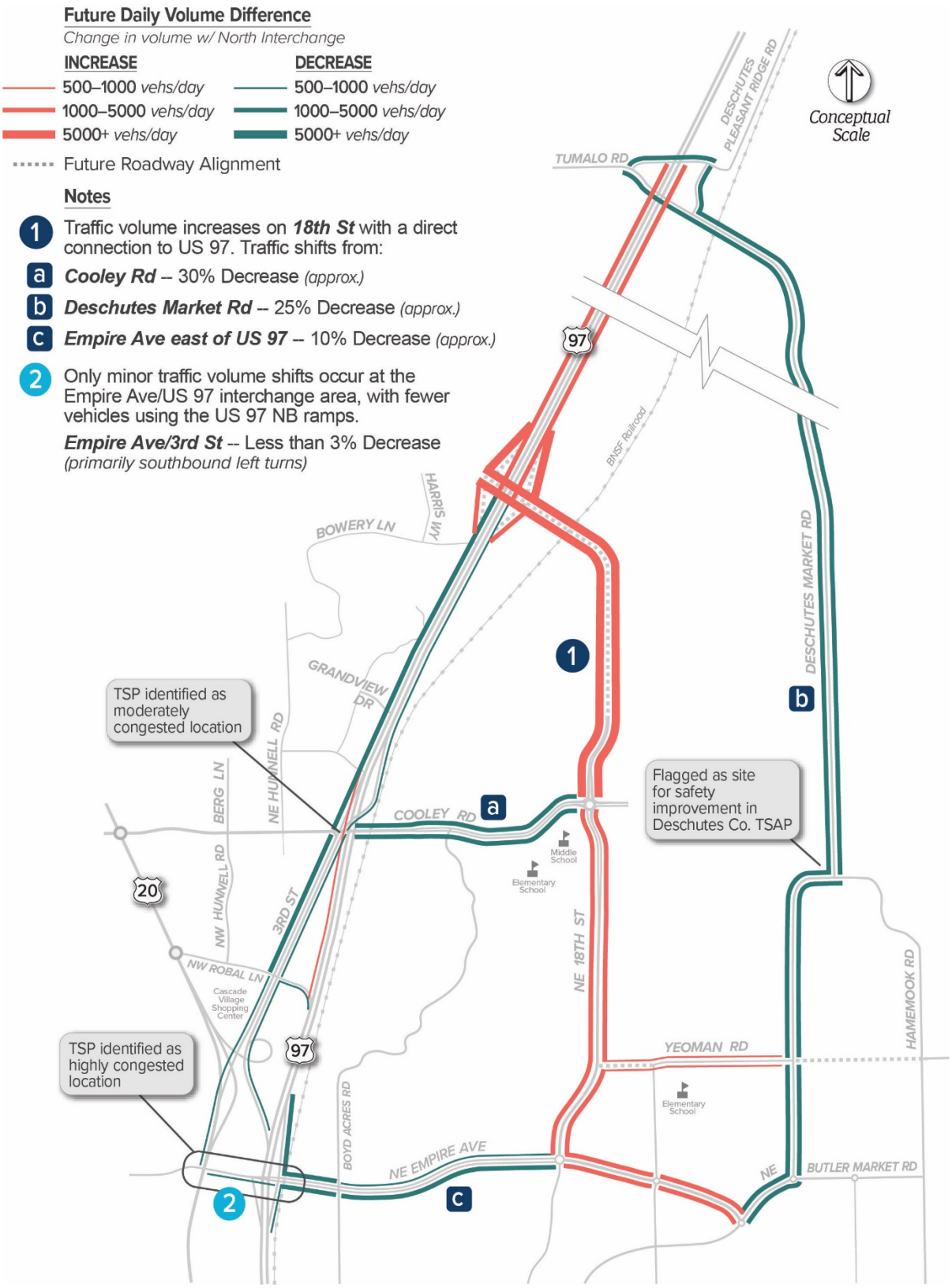
The North Interchange also shifts traffic from the US 97 northbound ramps at Empire Avenue, leading to less than a 10 percent decrease in traffic on Empire Avenue east of the US 97 interchange. There would be limited change in traffic volumes at the US 97 southbound ramps at Empire Avenue or the intersection of 3rd Street/Empire Avenue

with less than three percent shift in traffic (mostly related to a decrease in vehicles making a southbound left turn at 3rd Street/Empire Avenue).

The largest increase in traffic is on 18th Street, which sees an increase of more than 5,000 vehicles per day with a direct connection to US 97. P.M. peak hour volumes on 18th Street (south of Cooley Road) are expected to increase by approximately 40 to 50 percent. 18th Street is classified as a minor arterial in the City of Bend's Transportation System Plan (TSP). With the increase in traffic volumes on 18th Street, average daily traffic is expected to be approximately 15,000 to 20,000 vehicles per day. This is anticipated to fit within the minor arterial classification. With the implementation of the North Interchange, there are no roadways expected to require a change in functional classification from what is shown in the TSP.

The North Interchange also provides important connectivity/accessibility from US 97 to land uses to the east, particularly for vehicles traveling northbound. The North Corridor improvements are anticipated to remove the ability to access Cooley Road from northbound US 97. Therefore, without the North Interchange, northbound vehicles on US 97 destined for areas east in the vicinity of Cooley Road must exit early at either Empire Avenue or 3rd Street. If drivers miss those exits, they would need to drive over four miles to turn around at the Tumalo Road/Deschutes Market Road interchange. The North Interchange and 18th Street extension provide a more reasonable option for those situations.

Figure 28. Future (2040) Daily Traffic Volume Changes with North Interchange and 18th Street Extension



8.7 Traffic Operations

8.7.1 Intersection Operations

To assess the adequacy of future performance for State facilities, ODOT's mobility standards from the Highway Design Manual were used, which rely on V/C ratios. These standards differ whether a roadway is located within a UGB or not. The North Interchange is located just north of the existing City of Bend UGB. By 2040, it is possible that the UGB will have further expanded to the north to incorporate the North Interchange. City of Bend mobility standards were used to assess performance of the 18th Street and Cooley Road intersection.

The DDI serves future traffic with the least amount of congestion, with free movements for the southbound ramp terminal and operation well below even the rural mobility standard at the northbound ramp terminal. The DRI also performs very well with similar delay at the northbound ramp terminal compared to the DDI and operation that just meets the rural mobility standard at the southbound ramp terminal. With the TUDI design, the northbound ramp terminal experiences the least delay of any alternative, but the southbound ramp terminal experiences the most delay. In fact, the southbound ramp terminal would not comply with ODOT's rural mobility standard[19], but it would comply with the urban mobility standard.

[19] While a traffic signal could be installed at the ramp terminals to meet the rural mobility standard, it is unlikely that traffic volumes would warrant traffic signals during the 20-year planning horizon with just an east side connection (see the Forward Compatibility section below for more discussion around potential TUDI signalization).

Figure 29. Future (2040) Weekday PM Peak Hour (Design Hour) Traffic Volumes

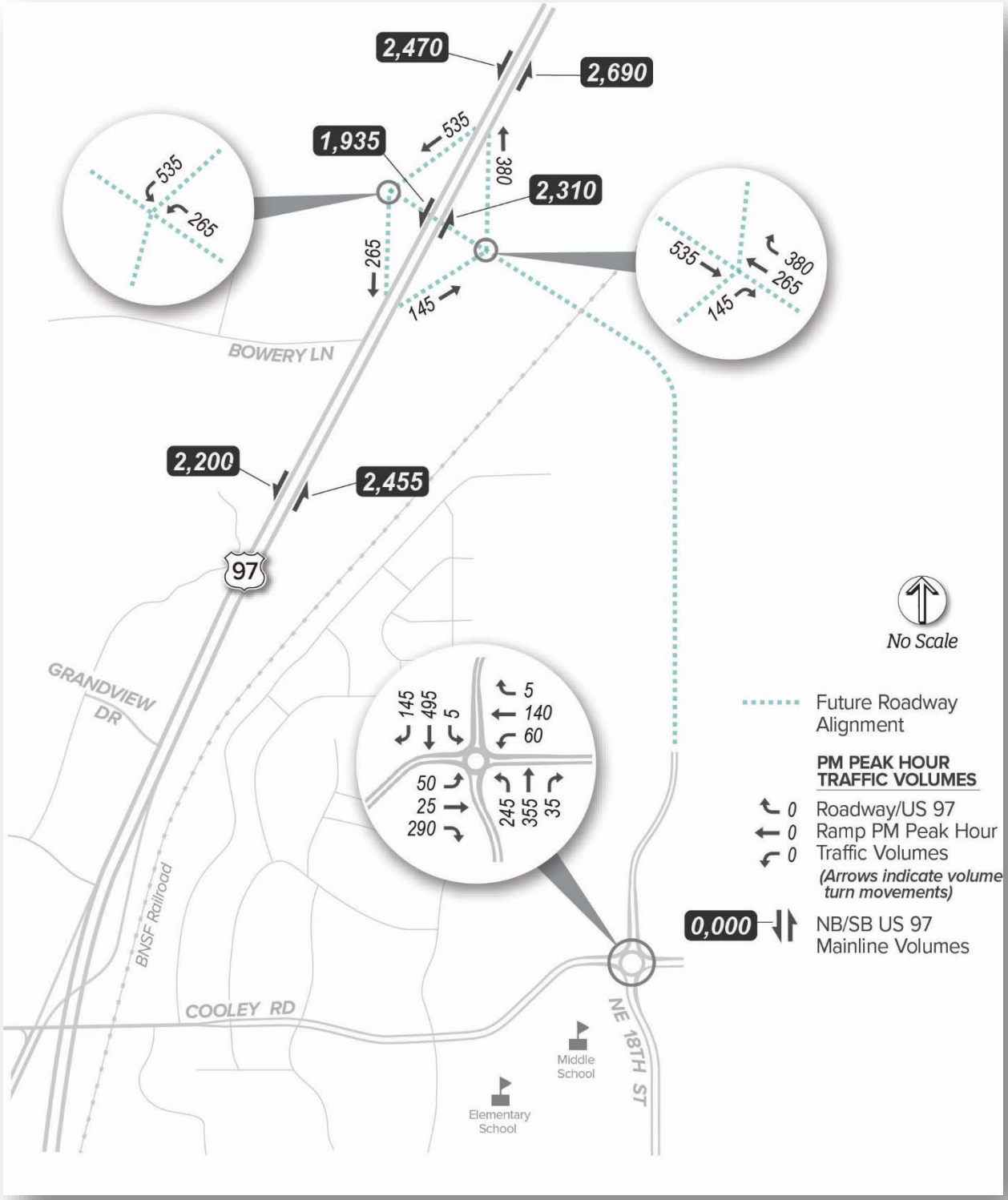


Table 7 summarizes the intersection operations results for each of the alternatives. HCM reports are included in Appendix A. Note that no changes are expected between the three different interchange alternatives at 18th Street/Cooley Road. Overall, the DDI serves future traffic with the least amount of congestion, with free movements for the southbound ramp

terminal and operation well below even the rural mobility. However, at the time the impacts of future development are being evaluated, ODOT's mobilty targets from the Oregon Highway Plan (OHP) would be applied to determine if facilities are adequate, rather that the HDM mobility standards, which are only used for design purposes. The OHP mobility targets would allow a v/c ratio of 0.70 in a rural area and 0.85 in an urban area. Therefore, all interchange alterantives considered would have sufficient caapcity to serve future demands to 2040 or well beyond if the UGB is expanded..[20].

Table 7. 2040 PM Peak Hour Intersection Operations with the North Interchange

Intersection	Alternative Scenario	Intersection Control	V/C Mobility Standard		V/C	LOS	DELAY (SEC)
			(No UGB Expansion)	(UGB Expansion)			
N. Interchange Southbound Ramps	TUDI	All-Way Stop Controlled	0.60	0.75	**0.71**	C	18
	DRI	Roundabout	0.60	0.75	0.60	A	10
	DDI	Free	0.60	0.75	NA	NA	NA
N. Interchange Northbound Ramps	TUDI	Two-Way Stop Controlled	0.60	0.75	NA/ 0.25	NA/B	NA/ 13
	DRI	Roundabout	0.60	0.75	0.53	A	8
	DDI	Signal	0.60	0.75	0.55	A	9
18th Street / Cooley Road	Baseline (No Build)	Roundabout	1.0	1.0	0.33	A	7
	All Alternatives	Roundabout	1.0	1.0	0.60	B	13

Bold and Gold indicates failure to meet standard if an UGB expansion is not assumed.

Two-way stop-controlled results reported for the worst major/minor approach lane; All-way stop-controlled V/C ratio reported for worst approach lane, LOS and delay reported for overall intersection; Roundabout results are reported for the worst approach lane; Signal results are reported for the overall intersection.

8.7.2 US 97 Mainline Operations

Table 8 lists the US 97 mainline operations results. During the p.m. peak hour (i.e., design hour), all highway segments meet the urban standard if a UGB expansion is assumed. However, segments on both northbound and southbound US 97 would fail to meet the stricter rural standard.

In the northbound direction, the weaving movements between the Cooley Road on-ramp (proposed with North Corridor Project) and the 18th Street off-ramp would operate relatively well, meeting ODOT's mobility standard for urban areas, but not for rural areas. If better operation is desired, construction of an auxiliary lane on US 97 northbound connecting these ramps would significantly improve conditions. Similarly, the merge on US 97 northbound with the 18th Street on-ramp would also operate relatively well, meeting ODOT's mobility standard for urban areas, but not for rural areas.

In the southbound direction, there are downstream exits at Grandview Drive and 3rd Street. The weaving movements between the 18th Street on-ramp and Grandview Drive would meet the mobility standard under both urban and rural conditions. The weaving movements between the 18th Street on-ramp and 3rd Street would also operate well but

[20] While a traffic signal could be installed at the ramp terminals to meet the rural mobility standard, it is unlikely that traffic volumes would warrant traffic signals during the 20-year planning horizon with just an east side connection (see the Forward Compatibility section below for more discussion around potential TUDI signalization).

would just miss meeting the standard for rural areas. If the rural area standard is applied, a design exception may be required.

Table 8. 2040 PM Peak Hour US 97 Mainline Operations with the North Interchange

Segment	Segment Type	V/C Mobility Standard		V/C	LOS
		(No UGB Expansion)	(UGB Expansion)		
US 97 Northbound					
3rd Street On-ramp to 18th Street Off-ramp	Weave (No Aux. Lane)	0.60	0.75	0.65	C
	Weave (With Aux. Lane)	0.60	0.75	0.39	B
18th Street on-ramp	Merge	0.60	0.75	0.63	C
US 97 Southbound					
18th Street Off-ramp	Diverge	0.60	0.75	0.58	C
18th Street On-ramp to Grandview Drive/3rd Street	Weave (to Grandview Dr)	0.60	0.75	0.56	C
	Weave (to 3rd Street)	0.60	0.75	0.61	C

Bold and Gold indicates failure to meet standard if an UGB expansion is not assumed.
LOS is based on density of traffic.

8.8 Access Management

8.8.1 Access Spacing Along US 97

The proposed interchange location would be approximately 2.60 miles from the crossroad of the Deschutes Market Road/Tumalo Road interchange to the north and approximately 1.13 miles from the assumed location of the crossroad of the future Cooley Road interchange to the south. By comparison, ODOT's adopted spacing standard for interchange crossroads on Statewide Highways and Expressways in rural areas is 3 miles. In urban areas the standard is 1.9 miles. Therefore, a design exception would likely be required to construct an interchange in this location.

In addition, any direct access points to US 97 in the vicinity of the proposed interchange may be removed for safety, with access re-established to other existing public roads or a new frontage or back road to provide alternate access to properties in the interchange influence area. At a minimum, it is recommended that all access points be removed between the proposed interchange and the Cooley Road interchange due to the short separation and presence of vehicle weaving between interchanges. To the north, it is recommended that all access points be removed from US 97 for at least 1,500 feet from the end of the ramp tapers, which would be the approximate location of Fort Thompson Lane.

8.8.2 Access Spacing along 18th Street

ODOT's access spacing standard for the distance between an interchange ramp terminal on a two-lane crossroad and the first approach or intersection is 1,320 feet. This is the same for freeway and non-freeway interchanges, urban and rural areas, and whether all turn movements are allowed at the first intersection or they are restricted to right-in and right-out only. The presence of the railroad to the east and the need to re-establish safe access to properties in the interchange area east of the highway makes meeting this

standard impractical. The current concept drawings of the interchange alternatives and the first intersection on 18th Street to the east, which would be a roundabout or right-in/right-out connection with a new frontage road, show a separation of approximately 650 feet. To meet the standard, this intersection would need to be approximately 350 feet east of the railroad. Therefore, a design exception would be required.

8.9 Safety

8.9.1 Safety Results

Results of the safety analysis are presented below for the interchange alternatives, including recommendations for improving active transportation safety and for the access road alternatives.

8.9.1.1 Interchange Alternatives

Table 9 presents a summary of the CMFs used in this safety analysis. Note, the CMF Clearinghouse does not have a CMF for a TUDI; however, the prior condition is not included. CMFs less than 1.0 indicate that crashes would be reduced. As an example, a CMF of 0.75 means crashes are expected to be reduced by 25 percent.

Table 9. Summary of Crash Modification Factors

Interchange Type	CMF IDA[a] (Star Rating)	Prior Condition	CMF
DRI	9445 (***)	Conventional Signalized Diamond Interchange	0.756
DDI	10135 (****)	Conventional Signalized Diamond Interchange	0.633

[a] Source: Crash Modification Factors Clearinghouse - http://www.cmfclearinghouse.org/index.cfm

Table 10 summarizes the predicted crashes from the ISATe models for the TUDI, conventional stop-controlled diamond interchange, and conventional signalized diamond interchange. The table also shows estimated crashes for the DDI and DRI interchanges as compared to the base condition. For example, the CMF for converting a stop-controlled diamond interchange to a DRI is 0.756. The hypothetical stop-controlled diamond interchange would have 2.5 crashes; multiplying 2.5 by 0.756 is 1.9 crashes.

Table 10. Summary of HSM (ISATE) Predicted Future (2040) Crashes by Ramp Terminal Types

Ramp Terminal Type	Terminal Spacing	CMF	Prior Condition	Crashes
TUDI	200 ft	NA	NA	2.3
Conventional Stop-Control Diamond Interchange	1000 ft	NA	NA	2.5
Conventional Signalized Diamond Interchange	1000 ft	NA	NA	3.0
CMF Results (Applied to Predicted Crashes)				
DRI	NA	0.756	Conventional Stop-Control Diamond Interchange	1.9 [a]
DDI	NA	0.633	Conventional Signalized Diamond Interchange	1.9 [a]

[a] CMFs were applied based on the "Prior Condition" interchange type, Table 3.

The direct access driveways to US 97 will be closed in the vicinity of the project, thus eliminating the existing conflicts between vehicles, pedestrians, and bicyclists and reducing the potential for driveway related crashes. However, without a divided median, there will still be potential for median cross-over crashes. A divided median should be installed within the interchange influence area to eliminate the potential for median cross-over crashes, which is consistent with recommendations from the US 97 Safety Assessment[21]

8.10 Summary of Findings

In consideration of the evaluation described above, the key findings related to traffic operations and safety for the three US 97 North Bend Interchange alternatives include the following.

8.10.1 Traffic Volume Shifts

- Traffic volumes would decrease significantly along Cooley Road, with an expected decrease in daily traffic of approximately 30 percent. This includes freight vehicles needing to access the industrial land uses in the Juniper Ridge area, which may be preferable to having them route down Cooley Road through a residential area and past schools.
- Traffic volumes through the Cooley Road/3rd Street intersection would also decrease significantly, with the volume of traffic on critical turning movements dropping 30 to 50 percent. This would complement the planned North Corridor improvements in that area and extend the life of that substantial investment.
- The new interchange and 18th Street extension would facilitate access to and from the north for future Juniper Ridge development, which could include destinations such as the City of Redmond.

[21] US 97 Safety Assessment: Highway Safety Analysis for Potential Safety Improvements, June 2015, Oregon Department of Transportation

- The North Interchange has a limited impact on Empire Boulevard and destinations further south. There would be no significant change in traffic volumes in the Empire Boulevard interchange area or at the intersection of 3rd Street and Empire Boulevard.
- Traffic volumes on 18th Street would increase significantly, though the resulting level of traffic would still be consistent with its minor arterial classification.

8.10.2 Traffic Operations and Forward Compatibility

- The intersection on Cooley Road at 18th Street is expected to operate with little delay even with an 18th Street extension to a new US 97 interchange.
- All interchange alternatives considered are projected to operate well below capacity, indicating they could serve future demands beyond 2040 as Bend continues to grow.
- It is anticipated that the North Interchange would improve operations at the Cooley Road/3rd Street intersection by reducing traffic volumes on the critical southbound left turn movement by nearly half and on the critical westbound left turn movement by approximately 30 percent.
- The half diverging diamond interchange serves future traffic with the least amount of congestion, with free movements for the southbound ramp terminal and operation well below even the rural mobility standard at the northbound ramp terminal.
    - While the half diverging diamond interchange design may be able to accommodate a west side connection without requiring widening of the structure for more lanes, the southbound ramp terminal would need to be reconstructed to provide the signalized crossover movements.
- The dual roundabout interchange also performs very well with similar delay at the northbound ramp terminal compared to the DDI and operation that just meets the rural mobility standard at the southbound ramp terminal.
    - The dual roundabout interchange would require significant upgrades to accommodate a future west connection. Similar to the Tight Urban Diamond Interchange, these may include the addition of a right turn lane and second left turn lane on the southbound off-ramp and widening of the structure to accommodate a second eastbound lane.
- With the tight urban diamond interchange design, the northbound ramp terminal experiences the least delay of any alternative, but the southbound ramp terminal experiences the most delay. In fact, the southbound ramp terminal would not comply with ODOT's rural mobility standard, but it would comply with the urban mobility standard.
    - The tight urban diamond interchange design would also require substantial upgrades to accommodate a west connection if desired in the future. This would likely need to include signalization of both ramp terminals, the addition of a right turn lane and second left turn lane on the southbound off-ramp and

widening of the structure to accommodate a second eastbound lane and potentially side-by-side left turn lanes.

- US 97 mainline traffic movements will continue to operate well with the proposed interchange in place. All merging, diverging, and weaving movements will meet ODOT's mobility standards for urban areas. They will also come very close to meeting the mobility standards for rural areas, but some design exceptions may be required if those standards will apply.
- The construction of auxiliary lanes on US 97 between the closely spaced 18th Street and Cooley Road interchanges does not appear to be necessary to safely and efficiently serve traffic through 2040. However, the need for such improvements could arise beyond 2040 if Bend continues to grow to the north.

8.10.3 Access Management and Safety

- The proposed location of the US 97 North Bend Interchange would not comply with ODOT's access spacing standards for interchanges and interchange ramps because it would be too close to the future Cooley Road interchange. Therefore, a design exception would be required to construct an interchange in this location.
- Any direct access points to US 97 in the vicinity of the proposed interchange should be removed for safety, with access re-established to other existing public roads or a new frontage road. Ideally this would include all access points to US 97 between the Deschutes Market Road/ Tumalo Road interchange to the north and the future interchange with Cooley Road to the south. At a minimum, it is recommended that all access points be removed between the proposed interchange and the Cooley Road interchange to the south and to Fort Thompson Lane to the north.
- Re-establishing access to properties on the east side of US 97 to a new frontage road would improve safety, but the presence of the railroad to the east limits the ability to connect a frontage road back to the 18th Street extension far enough from the interchange to meet ODOT's access spacing standards for interchange areas. Therefore, even though this intersection is currently proposed to allow only right-in and right-out turning movements, a design exception would be required.
- The direct access driveways to US 97 will be closed in the vicinity of the project, thus eliminating existing conflicts between vehicles, pedestrians, and bicyclists and reducing the potential of driveway related crashes. A divided median should be installed within the interchange influence area to eliminate the potential for median cross-over crashes.

9 Next Steps

9.1 Step 1: Conceptual Design Refinement:

- Refine exact alignment of 18th Street relative to future development of Juniper Ridge to best serve the area and optimize cost and function of the new facility
- Further refine active transportation treatments along 18th Street through the interchange area consistent with any future changes to the City Road Design Standards. Confirm the proposed design speed of 35 MPH.
- Conduct type, size and location study of the structure for the interchange –
    - This should include a geotechnical investigation to determine the optimal location and potential scope or cost risks to the structures.
    - Research rock outcropping locations to optimize alignment of 18th Street coming into the interchange
    - Determine the feasibility of a separate or combined structure for active transportation with the interchange
- Refine exact location of access road serving properties, conceptual design of the intersection and refined connections to surrounding properties.
- Continued coordination with local, regional and federal governments to coordinate on-going efforts with the project moving ahead including key considerations to streamline implementation. This coordination should include involvement from the City, Bend Metropolitan Planning Organization, Deschutes County, FHWA and Department of Land Conservation.
- Continued public engagement with members of the Hunnell United Neighbors, Boyd Acres Neighborhood Association, Golden Triangle Area Consortium, residents and businesses in the context of the development of the US 97 North Corridor project.
- Refine cost estimates and align the project with potential funding sources. Current cost estimates in this plan have assumed the project to begin construction in 2027.
- Develop sequence of entry to Bend from the north involving landscaping appropriate to the context and visual cues providing a pleasant entry to the area. This could also include gateway treatments on the overcrossing and in the surrounding study area to provide a distinctive entrance to the northern part of the Bend metropolitan area.
- Develop concepts to enhance roadside development consistent with local development codes and overlays that create a positive experience for travelers on 18th Street between the new interchange and Juniper Ridge.

9.2 Step 2: Long Term Planning Consistency Refinement:

- Conduct circulation study on the west side of US 97 to identify potential network improvements to serve any planned future growth and current development north of Grandview Drive.
- Address the need for a land use goal exception in the context of the refined conceptual design. ODOT would be responsible to apply to Deschutes County for any potential goal exception.
- Update preferred concept in the context of future land use changes, build-out of current planned growth and changes to properties in the study area at the time the project becomes funded for design and construction.
- ODOT, the City, Deschutes County, and the Bend MPO will work collaboratively on developing any amendments to local comprehensive plans and transportation system plans necessary to support the proposed improvements and to ensure that the recommendations of this study are consistent with local plans and requirements.

9.3 Step 3: NEPA process and compliance:

- Upon refinement of the conceptual design of a preferred alternative, conduct FHWA coordination on potential NEPA classification to determine next procedural steps.
- Identify strategies to avoid and minimize impacts to adjacent properties and natural or cultural features in the project study area.
- Legislative amendments to the Bend Transportation System Plan, as well as the Metropolitan Transportation Plan, will be necessary to secure future funding and ensure that interchange US 97 North Corridor recommendations are planned improvements pursuant to OAR 660-012-0060. The adopted Deschutes County TSP, currently undergoing an update, may also include a description of the needed improvements at US 97 to ensure coordination with the City.
- Consistent with OAR 734-051-0155, the Oregon Transportation Commission will adopt the future US 97 North Interchange IAMP as a facility plan amending the Oregon Highway Plan.

Appendix A. Study Definition, Goals and Objectives

Appendix B. Existing Lane Use, Natural Resources, and Demographic Data

Appendix C. Current Transportation System Operations

Appendix D. Future Baseline System Operations

Appendix E. Alternatives Evaluation – Traffic Operations

Appendix F. Comment Log