Section 12 of Ordinance 2271

Exhibit L

Amendments to the Bend Transportation System Plan and Maps, Appendix C to the Bend Comprehensive Plan

New Transportation System Plan Chapter 9: 2016 Amendments to the Transportation System Plan

Integrated Land Use and Transportation Plan, Appendix F to the Transportation System Plan

9.0 2016 AMENDMENTS TO THE TRANSPORTATION SYSTEM PLAN

NOTE: This chapter of the Bend Transportation Systems Plan (TSP) includes the amendments necessary to address the requirements of Oregon Administrative Rule 660-12, known as the Transportation Planning Rule (TPR), for the 2016 expansion of the Urban Growth Boundary (UGB). In Chapters 1-8, there may be outdated or inaccurate information. **Where there is a conflict between Chapters 1-8 and this one, the information and policies in this Chapter prevail**.

In addition, the Bend General Plan (now called Comprehensive Plan) Transportation Chapter 7 has been updated as part of the 2016 UGB expansion. **Where Objectives and Policies in Chapter 7 of the Comprehensive Plan differ from those found in Chapters 1-8 of the TSP, the Objectives and Policies in Chapter 7 of the Comprehensive Plan prevail**.

The City plans to begin an update of the TSP after the UGB is approved by Council, at which time the entire document will be revised.

9.1 Background

9.1.1. History and Changes Since 2000

On October 11, 2000, the Bend City Council adopted the Bend Urban Area Transportation System Plan (TSP) by Ordinance No. NS-1756. In 2001, the Oregon Department of Land Conservation and Development (DLCD) remanded the TSP back to the City to correct certain deficiencies, which were addressed through subsequent work between 2002 and 2012. The final remanded section of the TSP, a transportation system financing plan, was acknowledged by DLCD in 2013. The acknowledged TSP is found in the preceding Chapters 1-8.

Since 2000, the City's population has grown from 52,000 to 81,000 and there have been a number of significant changes to the City's transportation system. These include:

- Inclusion of the City into a Metropolitan Planning Organization (MPO) in 2002;
- Creation of a Public Transportation System (Bend MPO Public Transit Plan, 2013);
- Update to the MPO's 2040 Metropolitan Transportation Plan (MTP) in 2014; and
- A number of large capital improvement projects were constructed, including:
  - Bend Parkway (Highway 97),
  - Healy Bridge (Southern Bridge Crossing), and
  - A series of roundabouts and improvements to Mt. Washington Drive funded by a public/private Westside Consortium
- The City completed Transportation General Obligation Bond Projects:
  - Roundabouts at 18th and Empire, Powers and Brookswood, and Simpson and Mt Washington;
  - Reed Market from 3rd to 27th improved to City standards, with a new bridge and signal at American Lane,
  - Railroad upgrades at the crossing,
  - A new multi lane roundabout at 15th and Reed Market,

- Murphy Road Overcrossing project with an extension of Murphy Road across the Parkway with a new bridge and a new multi lane roundabout at 3rd and Murphy Road, new roundabout at Brookswood and Murphy; and new roundabout at Parrell and Murphy intersections.

9.1.2. 2010 Remand Order

In 2008, the City attempted to expand the Urban Growth Boundary (UGB). This effort was remanded back to the City by DLCD in 2010. The Remand included a number of transportation-specific requirements relating to compliance with the Transportation Planning Rule (TPR), which is the Oregon Administrative Rule (OAR) that implements Statewide Planning Goal 12 – Transportation. In particular, the Remand required the City to comply with OAR 660-012-0035, which is the section of the TPR that addresses the transportation planning requirements that apply to cities that are located within MPOs.

In 2016, the City completed its work to address the issues raised in the Remand, resulting in an approximately 2,380-acre expansion of the UGB. As part of this work, the City has applied land use tools such as increasing residential densities and mixing uses to demonstrate that redevelopment and infill is likely to occur along transit corridors and centers (Opportunity Areas[1])) throughout the City (Figure 9.1)

The UGB expansion triggered the need for specific amendments to this TSP. These include:

- An Integrated Land Use and Transportation Plan (ILUTP[2]);
- New policies to implement the Bend Central District Plan[3].
- Projects needed to serve the UGB Opportunity Areas and expansion areas;
- New projects and/or changes to roadway standards needed to serve the Opportunity Areas and expansion areas; and
- An updated financial plan.

[1] "Opportunity Areas" are areas within the City boundary that were identified as having a strong potential for redevelopment because of proximity to transit, employment, and commercial areas. These areas received new mixed use Comprehensive Plan land use designations (and in some cases zoning) as part of the 2016 UGB expansion. See (Chapter 11, Growth Management) of the Bend Comprehensive Plan for details.

[2] Appendix F.

[3] Bend Central District Multimodal Mixed Use Area Plan, July 2014

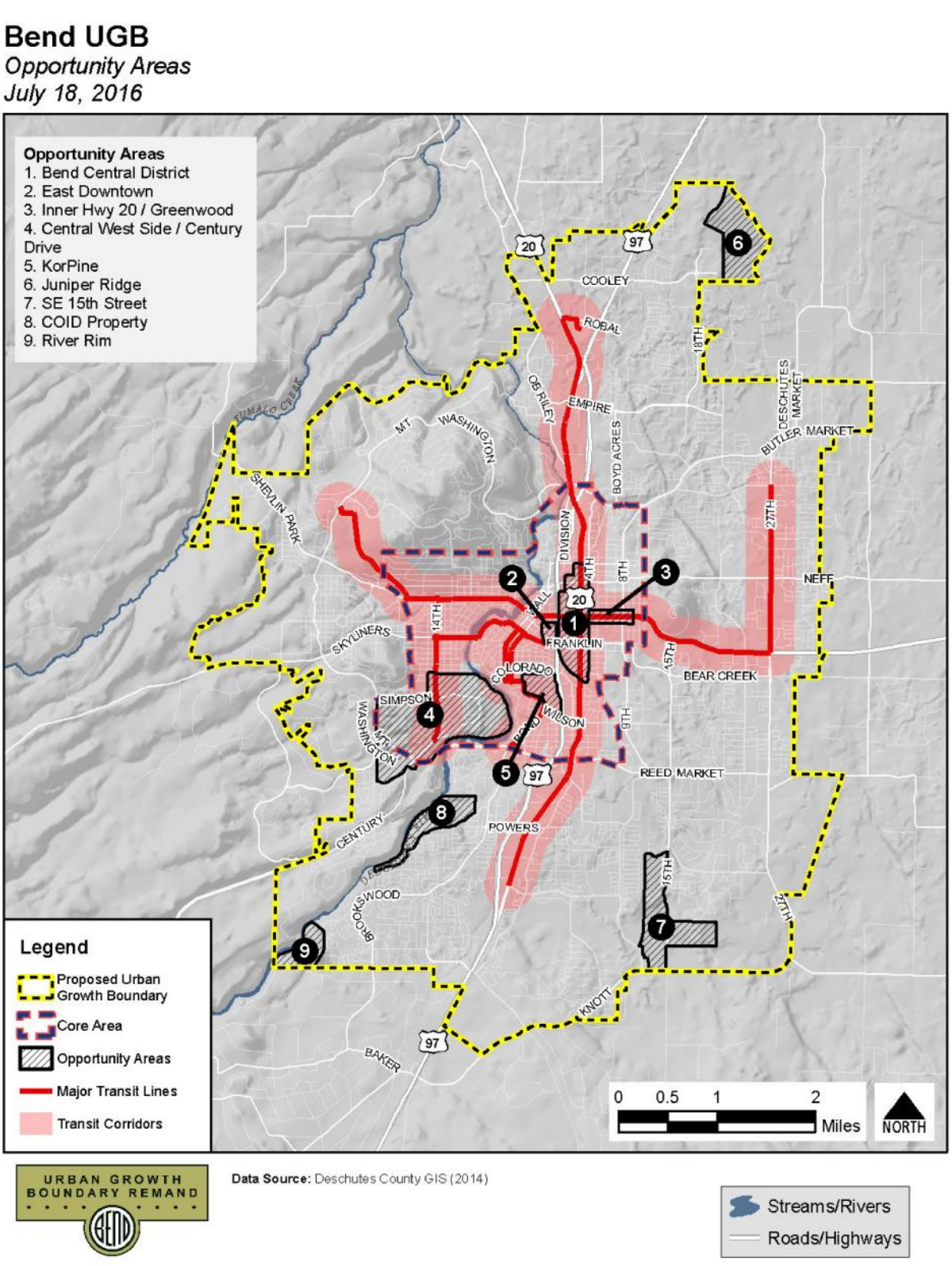
Bend UGB
Opportunity Areas
July 18, 2016
Opportunity Areas
1. Bend Central District
2. East Downtown
3. Inner Hwy 20 / Greenwood
4. Central West Side / Century Drive
5. KorPine
6. Juniper Ridge
7. SE 15th Street
8. COID Property
9. River Rim
Legend
Proposed Urban Growth Boundary
Core Area
Opportunity Areas
Major Transit Lines
Transit Corridors
Streams/Rivers
Roads/Highways
0 0.5 1 2 Miles
NORTH
Data Source: Deschutes County GIS (2014)
URBAN GROWTH BOUNDARY REMAND
COOLEY
ROBAL
OB RILEY
EMPIRE
BOYD ACRES
DESCHUTES MARKET
BUTLER MARKET
MT WASHINGTON
SHEVLIN PARK
DIVISION
NEFF
FRANKLIN
SKYLINERS
COLORADO
BEAR CREEK
SIMPSON
WILSON
REED MARKET
CENTURY
POWERS
BROOKSWOOD
KNOTT
BAKER
20
97
6
1
2
3
4
5
7
8
9

Figure 9.1

9.2 Coordination with the Bend Metropolitan Planning Organization

The Remand directed the City to comply with the TPR (OAR 660-012-0016) planning requirements for cities within metropolitan planning areas (MPOs). At the time of the adoption of the acknowledged 2000 Bend TSP, the City of Bend was not yet part of a designated Metropolitan Planning Organization (MPO) area. The Bend MPO was established in December 2002. A federally-compliant regional transportation plan, the Bend MTP, was adopted in June 2007.

The MTP was updated in 2014 (Bend 2040 MTP[4]) to ensure compliance with federal requirements. The 2014 MTP included the full list of projects that were developed for the City's acknowledged TSP Financial Plan (see Chapter 7 and Appendices A-E)..

The travel demand model network modeling for the UGB analysis was based on the Bend 2040 MTP, inclusive of motor vehicle facilities and transit service that are included in the financially constrained system, adjusted to 2028. The amendments to the Bend TSP (Chapter 9 of the TSP) required for the Bend UGB expansion were coordinated with the 2014 MTP. The 2040 MTP transportation demand model was utilized to determine the transportation effects of the UGB expansion proposal, and a coordinated list of projects was created.

In addition, the TPR also requires cities and MPOs to coordinate efforts to reduce reliance on the automobile (OAR 660-12-035). The City has coordinated with the Bend MPO to create an Integrated Land Use and Transportation Plan (ILUTP), as described below (9.3).

9.3 Integrated Land Use and Transportation Plan

9.3.1 Overview

The TPR requires Oregon's larger communities, including Bend, to plan transportation systems and land use patterns that increase transportation choices and reduce reliance on the automobile. How much people are driving, measured as vehicle miles traveled (VMT) per capita (the average distance driven in a day per person) is a key measure of reliance on the automobile. Specifically, the Remand Order required the City to demonstrate that it had included measures and policies to increase transportation choices and reduce reliance on the automobile.

The Remand specified that the City prepare analyses of baseline VMT per capita and then demonstrate the change in VMT that would result from that the proposed UGB expansion, along with land use and transportation measures. If the analysis showed a decline of 5% or more per capita, then the City would have demonstrated compliance with this aspect of the TPR under OAR 660-12-0035(6). If the results showed a decline of between 0% and 4.99%, then the City could prepare a work program to achieve a reduction of 5% or more over the planning period. Finally, if the results of the VMT analysis were to show an increase in VMT

[4] Bend 2040 MTP's planning period was 2010 to 2040.

per capita, then the City would be required to prepare an integrated land use and transportation plan as described in OAR 660-12-0035(5). The purpose of the ILUTP is to describe what can be done to lessen that increase in VMT and "demonstrate progress towards increasing transportation choices and reducing automobile reliance."

9.3.2 VMT Analysis and Key Findings

As is true with most U.S. cities of Bend's age, urban form, and rapid growth, Bend's VMT per capita has been increasing in recent decades. Bend measured growth in VMT per capita against baseline years of 2003 (as specified in the Remand) and 2010 (which the City believes is a better indicator of conditions in 2008 – the beginning of the 20-year planning horizon for the UGB work). In order to evaluate the impact of various VMT reduction strategies, a series of land use and transportation packages, or scenarios, were created and tested. The scenarios tested and the results are included in the ILUTP, Appendix F.

The results of the VMT analysis (using the regional travel demand model) for the preferred UGB expansion scenario showed that there would be an increase in VMT using either baseline. However, the modeling also demonstrated that the increase can be limited to less than 5% under the proposed UGB expansion scenario, with the implementation of certain strategies (Table 9.1). The ILUTP (Appendix F) details the strategies and outlines standards by which the effectiveness of those strategies can be measured.

9.3.3 ILUTP Strategies

The ILUTP identified strategies to be adopted with the UGB expansion, summarized below:

- Designate and ultimately rezone mixed use opportunity areas identified in UGB project.
- Adopt efficiency measures identified in UGB project.
- Set policy supporting incentives approach to TDM[5] and increasing applicability of TDM programs
- Conduct analysis and feasibility for parking management and pricing
- Establish TDM requirements for institutional and employment master plans
- Support and maintain 2016 service improvements
- Define and enhance transit centers and corridors in opportunity and core areas.
- Propose new and enhanced transit funding
- Implement selective "road diets" where safety issues have been identified
- Implement programmed streetscape projects
- Prioritize streetscapes in opportunity and core areas and transit corridors.

[5] Transportation Demand Management

9.3.4 ILUTP Standards and Measures

The approach to implementation was to identify corridors and centers (e.g. opportunity areas in the core) that have the highest likelihood to reduce VMT. The greatest VMT reductions will happen in locations that have some or many of the needed land use and transportation attributes already in place, such as diversity of land uses, density, connected and walkable design, and accessibility to key destinations. For modest amounts of funding, such areas can greatly reduce reliance on the automobile.

The City also has created standards that will be used to measure progress towards reducing VMT. The standards are performance measures that provide insights into the effectiveness of the City's ILUTP strategies. They are linked to variables that are key to changing travel behavior. The City's standards emphasize evaluating performance in certain targeted areas of the City, including opportunity areas, transit corridors, and the central core. This reflects the City's overall approach of focusing resources on areas that will have the highest likelihood to reduce VMT. The measures include:

- Activity density (population plus employment over area) in targeted areas
- Streetscape Project Implementation (streetscape and bicycle/pedestrian safety improvement projects completed in targeted areas)
- Household and employment transit access (percent of residents and employees within a quarter mile of a transit stop)
- Access to commercial services (percent of residential and employees within a half-mile of an existing or planned commercial area)
- Active TMAs & institutional TDM programs
- Jobs-housing balance (ratio of jobs to housing in the specified area)

9.3.5 ILUTP Implementing Policies

- The City will implement the land use, transportation demand management, parking management, transit, and complete streets strategies, projects and programs that are identified as Proposed Strategies in Chapter 4 of the ILUTP (Appendix F).

- The City will conduct a planning study to evaluate the potential for Transportation Management Areas for the opportunity areas, transit centers, and public and private institutions and companies.

- The City will include streetscape projects in opportunity and core areas and transit corridors when developing the transportation CIP priorities and projects.

- The City will develop transit priority corridors in the opportunity and core areas that include a combination of land use policies and codes and transportation enhancements that encourage transportation options.

- The City will update the assessments of the ILUTP standards at each update of the Bend MPO regional transportation system plan and the City TSP.

9.4 Bend Central District Plan

9.4.1 Overview

The Bend Central District is an Opportunity Area that has been the subject of extensive planning efforts. The Bend Central District Plan built on work previously completed for the Bend Central Area Plan (CAP) and focused specifically on an area between the Bend Parkway and 4th Street and between approximately Revere and Burnside Streets. The Bend Central District looked at ways to improve connections for people traveling in the area by foot, bike, bus, car, or freight truck. It also looked at ways to develop the area to include a combination of housing, businesses, shops and other uses to create a distinct and vibrant district.

The Bend Central District Plan included conceptual transportation facility design standards that are specific to the District. Therefore, implementing the Central District Plan will require adopting the transportation-specific policies included below.

9.4.2 Bend Central District Plan Policies

- The city will partner with property owners and developers to make improvements to transportation facilities within the District Overlay to improve connections for all modes of travel, including implementing a well-connected system for pedestrians, bicyclists, and transit users.
- The city will implement street concepts identified in the District Plan over the long term. Improvements may be phased in over time and will be refined, as needed and appropriate, through more detailed facility design processes.
- The city will encourage and work with local businesses and residents to implement transportation demand management programs and strategies.
- The city will work with local businesses and property owners to develop and possibly implement a parking strategy for the Bend Central District that meets local parking needs while also encouraging use of alternative modes (e.g., bicycling, walking, and transit) to travel to, from, and within the District.

9.5 Projects Needed to Implement the UGB Expansion

9.5.1 Overview

The Bend TSP Remand items were adopted by the City of Bend in 2012 and acknowledged by DLCD in 2013, following completion of a transportation system financing plan. The TSP included a list of projects needed to support Bend's project growth through 2032[6]. These were divided into near (1-10 years), mid (11-20 years), and far-term (beyond 20 years).

[6] The TSP's 20-year planning horizon is 2032. Although this is slightly different than the UGB's 2028 planning horizon, it is reasonably similar.

Projects needed to implement the UGB expansion are divided into two groups. The first is improvements to transportation facilities **within** the existing UGB generated by the planned intensification of land uses in the Opportunity Areas (Figure 9.1)). The second group of projects are those that will be needed as part of development of the Expansion Areas **outside** of the existing UGB at the time of Area or Master Planning and annexation.

9.5.2 Opportunity Area Projects

The TSP projects support the UGB Opportunity Areas and efficiency measures except for an improvement needed to Highway 20 between Cooley Road and 3rd Street. The TPR analysis found that this section will further degrade above ODOT's mobility target. To remedy this impact, the corridor can be improved by a project that is already identified in the Bend 2040 MTP. This project would add a travel lane to southbound Hwy 20 from Cooley Road to 3rd Street. It is identified in the Bend 2040 MTP as an ODOT-funded project to be completed before 2040.

9.5.3 Expansion Area Projects

The City has identified 10 UGB expansion areas to provide needed housing and employment. These areas will require either Area or Master Planning (depending on whether they are in multiple or single ownership) prior to annexation. At that time, needed infrastructure, including transportation facilities, will be specified, including the funding sources and strategies for each project.

The City has conducted a high level transportation analysis of all of the Expansion Areas in order to determine their suitability for urban development. The analysis identified projects such as the construction of new arterials or collectors, the upgrade of rural arterials or collectors to urban standards, and the need for other improvements such as bridges over irrigation canals. These projects are summarized in Tables 9.1 and 9.2 and shown in Figures 9.2 and 9.3.

Table 9.1: Rural Road Network Upgrade Summary & Approximate Costs

Number	Street Name	Length (ft)	Classification	Improvement Description	Cost*
R1	O.B. Riley Rd	4,450	Major Collector	Curb and sidewalk on east side, bike lanes both directions	$2.4
R2	Cooley Rd	1,650	Major Collector	Curbs, sidewalks and bike lanes both directions	$1.3
R3	Cooley Rd	2,700	Minor Arterial	Curb and sidewalk on north side, bike lanes both directions	$1.1
R4	Hunnell Rd	1,300	Major Collector	Sidewalk on west side	$0.2
R5	Yoeman Rd	3,200	Major Collector	Curbs, sidewalks and bike lanes both directions	$2.5
R6	Deschutes Market Rd	950	Major Collector	Curb and sidewalk on east side, bike lanes both directions	$0.5
R7	Deschutes Market Rd	1,650	Major Collector	Curb and sidewalk on east side	$0.4
R8	Butler Market Rd	1,350	Minor Arterial	Curb and sidewalk on north side	$0.3
R9	Butler Market Rd	550	Minor Arterial	Curbs, sidewalks and bike lanes both directions	$0.4
R10	Butler Market Rd	2,100	Minor Arterial	Curb and sidewalk on north side, bike lanes both directions	$1.1
R11	Butler Market Rd	2,650	Minor Arterial	Curbs and sidewalks on both sides	$1.1
R12	Eagle Rd	1,000	Major Collector	Curb, sidewalk, and bike lane on east side	$0.4
R13	Stevens Rd	2,300	Major Collector	Curbs, sidewalks and bike lanes both directions	$1.9
R14	SE 27th St	3,300	Minor Arterial	Curb, sidewalk, and bike lane on east side	$1.3
R15	SE 27th St	1,150	Minor Arterial	Curb and sidewalk on east side, bike lanes both directions	$0.6
R16	SE 27th St	650	Minor Arterial	Curb and sidewalk on east side	$0.1
R17	SE 27th St	2,950	Minor Arterial	Curbs and sidewalks on both sides	$1.3
R18	SE 27th St	650	Minor Arterial	Curbs, sidewalks and bike lanes both directions	$0.5
R19	Knott Rd	6,800	Minor Arterial	Curbs, sidewalks and bike lanes both directions	$5.5
R20	15th St	1,300	Minor Arterial	Curb and sidewalk on east side, bike lanes both directions	$0.7
R21	Knott Rd	1,550	Minor Arterial	Curb and sidewalk on north side	$0.3
R22	Skyliners Rd	2,300	Major Collector	Curb and sidewalk on north side	$0.5
R23	Clausen Dr	1,450	Major Collector	Sidewalk on west side	$0.2
R24	China Hat Rd	500	Major Collector	Sidewalks on both sides	$0.2
R25	China Hat Rd	N/A	Major Collector	Widen bridge to include sidewalks on both sides	$0.4
R26	Deschutes Market Rd	N/A	Major Collector	Widen bridge to include sidewalk on west side	$0.4
				Total Cost	**$25.6**

*Rounded, in Millions

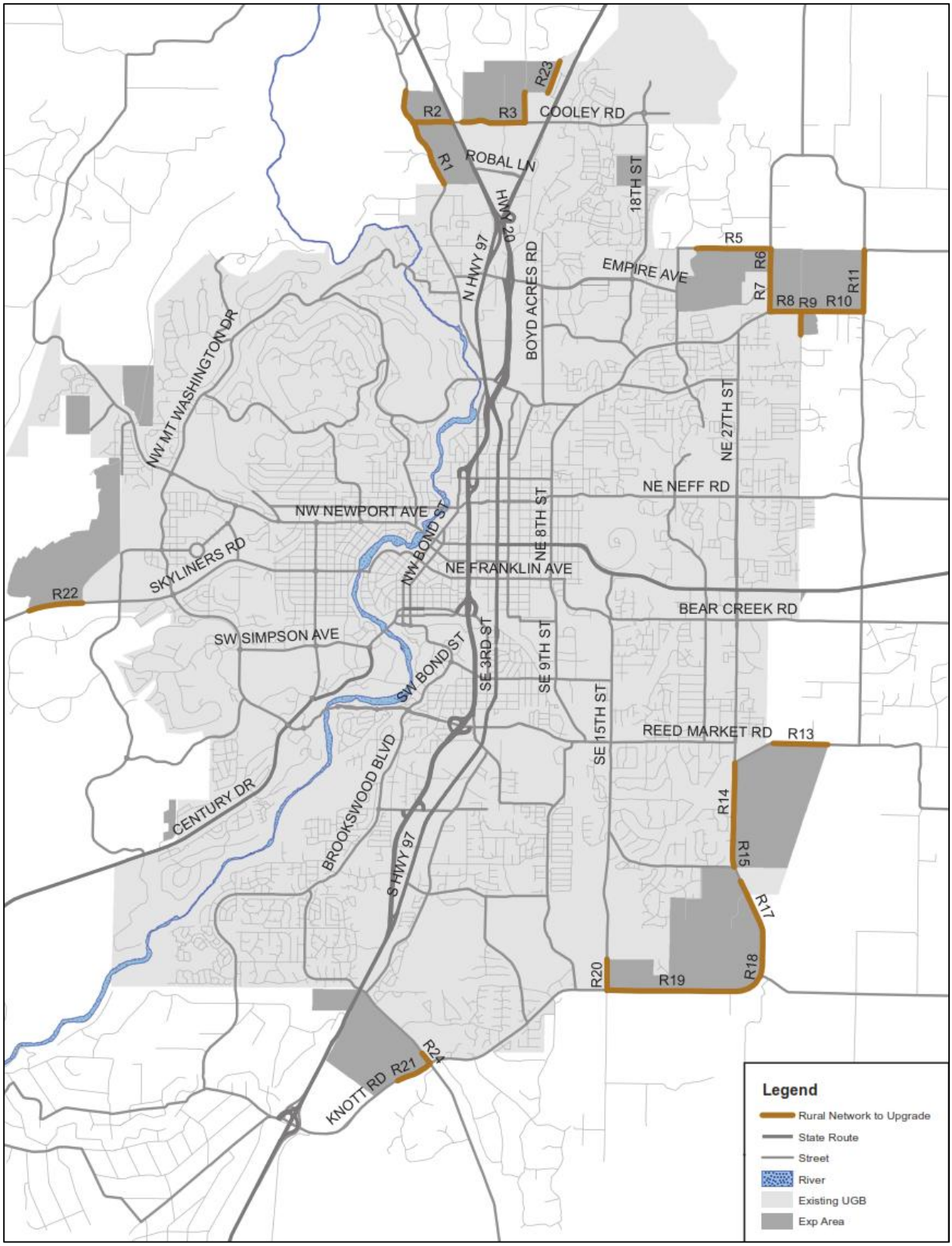

Figure 9.2 Rural Road Network Upgrades

Table 9.2: New Roadway, Corridor, and Intersection Cost Summary

ID	Roadway Name	Subarea	Miles	Lanes	Class	Base*	ROW	Crossing	Total
201	Skyline Rnch Rd Ext	West	0.95	2	Collector	$6.0	$3.0	$0	$9.0
202	Crossing Drive Ext	West	0.54	2	Collector	$3.4	$1.7	$0	$5.1
204	New Rd	OB Riley	0.28	2	Collector	$1.8	$0.8	$0	$2.7
205	Hunnell Rd Ext	Triangle	0.25	2	Collector	$1.5	$0.8	$0	$2.4
206a	New Rd	Triangle	0.27	2	Collector	$1.7	$0.8	$0	$2.5
207a	Yeoman Rd Ext	NE Edge	0.76	2	Collector	$4.8	$2.4	$3.7	$10.9
210	New Rd to Stevens	DSL	0.3	2	Collector	$1.9	$0.9	$3.7	$6.6
211	New Rd	DSL	1	2	Collector	$6.3	$3.1	$0	$9.5
212	New Rd	DSL	0.12	2	Collector	$0.7	$0.4	$0	$1.1
213	New Rd	Elbow	0.42	2	Collector	$2.6	$1.3	$0	$4.0
214	New Rd	Elbow	0.61	2	Collector	$3.8	$1.9	$0	$5.8
214b	New Rd	UGB	0.48	2	Collector	$3.0	$1.5	$0	$4.5
214c	New Rd	UGB	0.49	2	Collector	$3.1	$1.5	$0	$4.6
215a	New Rd	DSL	0.41	2	Collector	$2.6	$1.3	$0	$3.9
216	New Rd	Elbow	0.16	2	Collector	$1.0	$0.5	$0	$1.5
219	Skyline Ranch Rd	Shevlin	0.28	2	Collector	$1.8	$0.8	$0	$2.7
224	New Rd	Elbow	1.08	2	Collector	$6.8	$3.4	$0	$10.2
224a	New Rd	UGB	0.28	2	Collector	$1.7	$0.9	$0	$2.6
225	New Rd	Elbow	0.32	2	Collector	$2.0	$1.0	$0	$3.0
226	New Rd	Elbow	0.75	2	Collector	$4.7	$2.4	$0	$7.1
228	New Rd	Thumb	0.45	2	Collector	$2.8	$1.4	$0	$4.3
229	New Rd	Thumb	0.26	2	Collector	$1.6	$0.8	$0	$2.5
230	New Rd	Shevlin	0.24	2	Collector	$1.5	$0.7	$0	$2.3
234	Raintree Ct Ext	Elbow	0.25	2	Collector	$1.5	$0.8	$0	$2.4
235	Raintree Ct Ext N	UGB	0.26	2	Collector	$1.6	$0.8	$0	$2.4
248	Loco Rd Ext	Triangle	0.56	2	Collector	$3.5	$1.8	$0	$5.3
S-1	Corridor improvement, China Hat, widen from 2 to 3 lanes								$2.5
I-23	Roundabout @ Murphy Rd/SE 15th Street								$2.4
								TOTAL NEW PROJECTS	**$123.8**

*Cost in millions, rounded

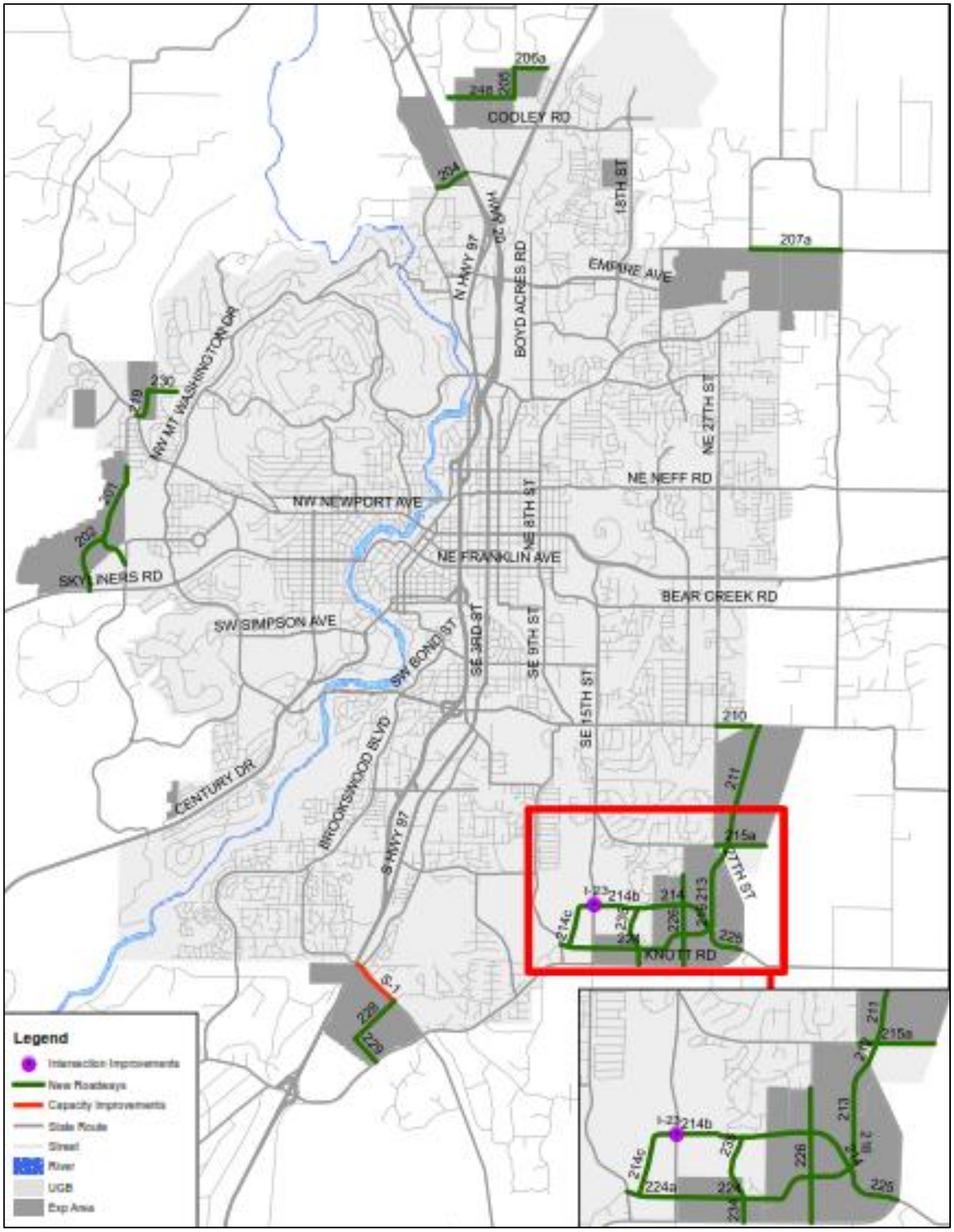

Figure 9.3: New Roadway, Corridor, Intersection Locations

9.6 Financial Plan

The following are possible funding strategies for transportation projects listed in Section 9.4 as being needed as a result of the proposed UGB expansion.

The funding strategies identified below for these new projects are **in addition to** those identified in the Bend TSP Chapter 7 Financial Forecast.

The strategies listed in Chapter 7, along with those summarized below, represent reasonably likely methods for funding projects that are needed as a result of the opportunity areas inside the existing UGB as well as for the expansion areas.

The strategy or method for funding groups of individual Scenario 2.1G projects will be determined by the City Council at the time of annexation as part of an area plan or master plan. Area plans are intended, in part, to determine how infrastructure is funded and implemented, and may include refinements of an expansion area projects.

It is probable that a combination of strategies will be used to finance new UGB transportation projects, similar to projects identified on the existing TSP project list (see Appendices A-E). The funding source will depend on the type of development, location, benefits or impacts to the existing transportation system, and timing related to other planned projects.

- **Expansion Area Supplemental SDCs:** A supplemental SDC may be paid in addition to the Citywide SDC. The supplement would be directed to a specific transportation project or group of projects within an expansion area. The area would be defined and a list of projects determined as part of the required Area Plan.

- **Sub-Area or District Contributions:** A sub-area or district contribution could be an outcome or in combination with other properties and development inside the existing UGB and one or more expansion areas. The City would need to determine the boundaries of the Sub-Area or District. Depending on traffic impacts and distributions and the nearby expansion areas, it may be advantageous to form larger pools of development contributions for larger more significant projects.

9.7 Updated Maps

The following figures are provided to update and replace maps provided with the 2012 TSP and General Plan updates:

- Figure 9.4: Bend Urban Area Street System
- Figure 9.5: Bend Urban Area Bicycle and Pedestrian System
- Figure 9.6: Bend Urban Area Primary Multi-Use Trail System
- Figure 9.7: Bend Urban Area Transit System

Note: North Third Street roadway classification to change when Highway 97 is realigned. See TSP 6.5.1

NOTE: The proposed roadway alignments shown on this map are general in nature. Precise roadway alignments will need to comply with City of Bend street standards and other engineering and design work that will be conducted as part of the land development process.

This map is for reference purposes only. The information was derived from Deschutes County and City of Bend GIS. Care was taken in the creation of this map, but it is provided "AS IS." Please contact the City of Bend to verify map information or to report any errors.

Map prepared by City of Bend GIS
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CITY OF BEND

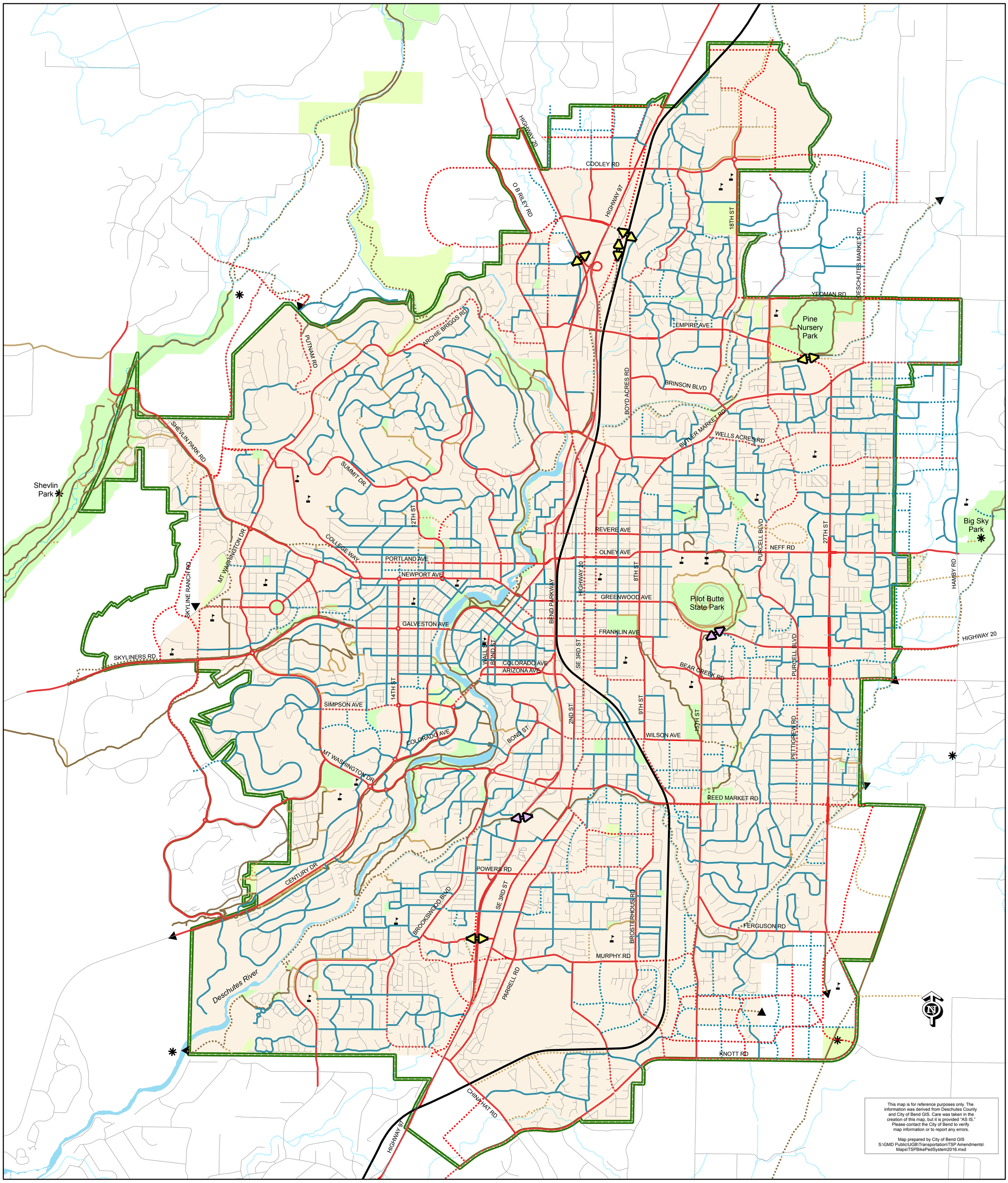
Figure 9.4: Bend Urban Area Street System

July 2016

0 0.25 0.5 1 1.5 2 Miles

Legend

- Expressway
- Proposed Expressway
- Principal Arterial
- Proposed Principal Arterial
- Major Arterial
- Proposed Major Arterial
- Minor Arterial
- Proposed Minor Arterial
- Major Collector
- Proposed Major Collector
- Frontage Road
- Proposed Frontage Road
- Railroad
- Deschutes River
- Tumalo Creek
- City Limits
- UGB - Urban Gowth Boundary



CITY OF BEND

Figure 9.5: Bend Urban Area Bicycle and Pedestrian System

July 2016

0 0.25 0.5 1 1.5 2 Miles

Legend

- Existing Bicycle Lane
- Future Bicycle Lane
- Existing Shared Roadway
- Future Shared Roadway
- Existing Multi-Use Path, Primary
- Future Multi-Use Path, Primary
- Existing Multi-Use Path, Connector
- Future Multi-Use Path, Connector
- Rails with Trails Opportunity Corridor
- Developed Parks
- Undeveloped Parks
- Proposed Major Roadway & Trail Grade Separation
- Existing Major Roadway & Trail Grade Separation
- Canal, Unpiped
- Connection
- Destination
- Schools
- City Limits
- UGB - Urban Gowth Boundary

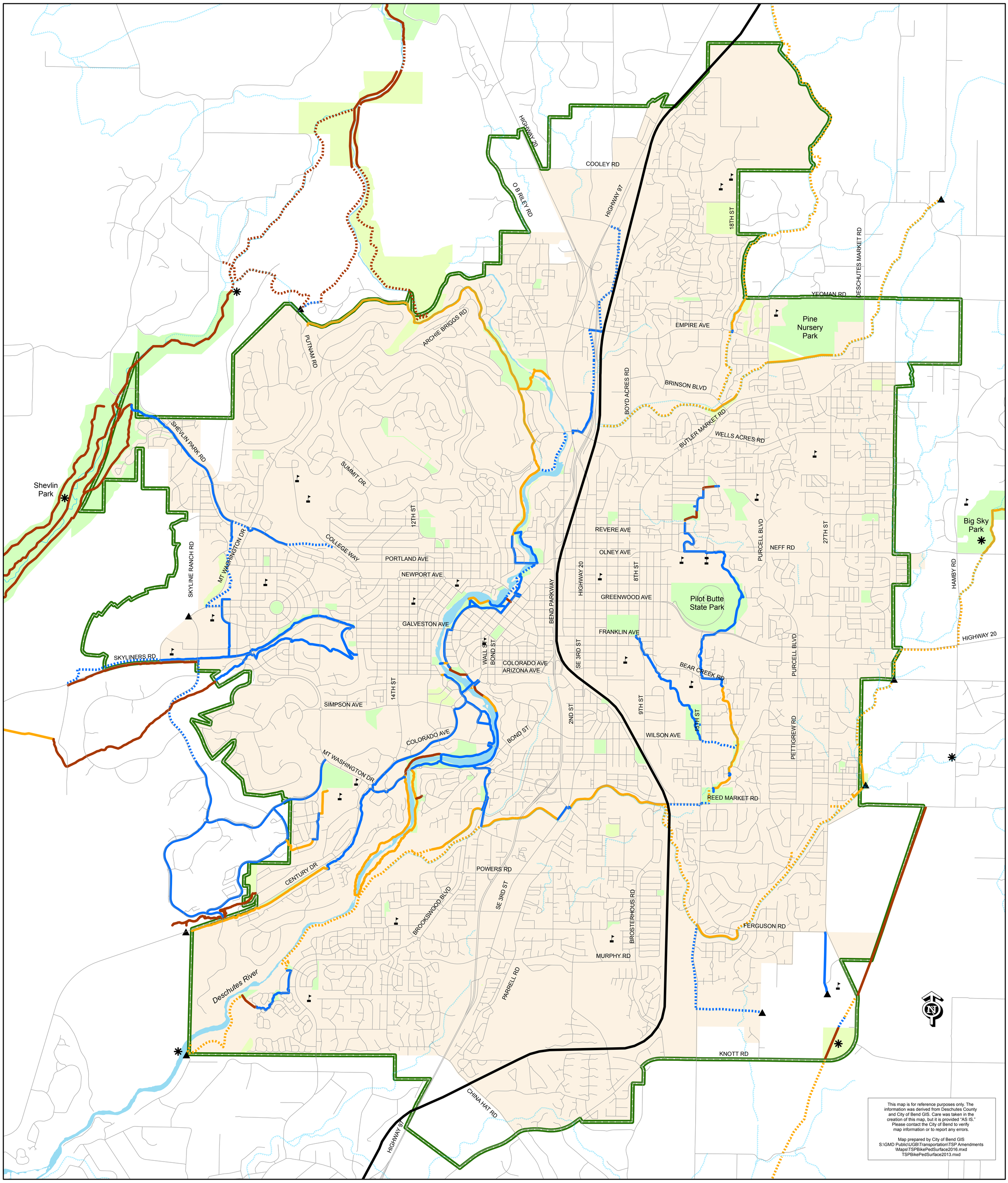


Figure 9.6: Bend Urban Area Primary Multi-Use Trail System

July 2016

CITY OF BEND

0 0.25 0.5 1 1.5 2 Miles

Legend

Surface Types:

- Native, Existing
- Native, Proposed
- Alternative, Existing
- Alternative, Proposed
- Hard, Existing
- Hard, Proposed
- Rails with Trails Opportunity Corridor
- City Limits
- UGB - Urban Growth Boundary
- Developed Parks
- Undeveloped Parks
- Canal, Unpiped
- Connection
- Destination
- Schools

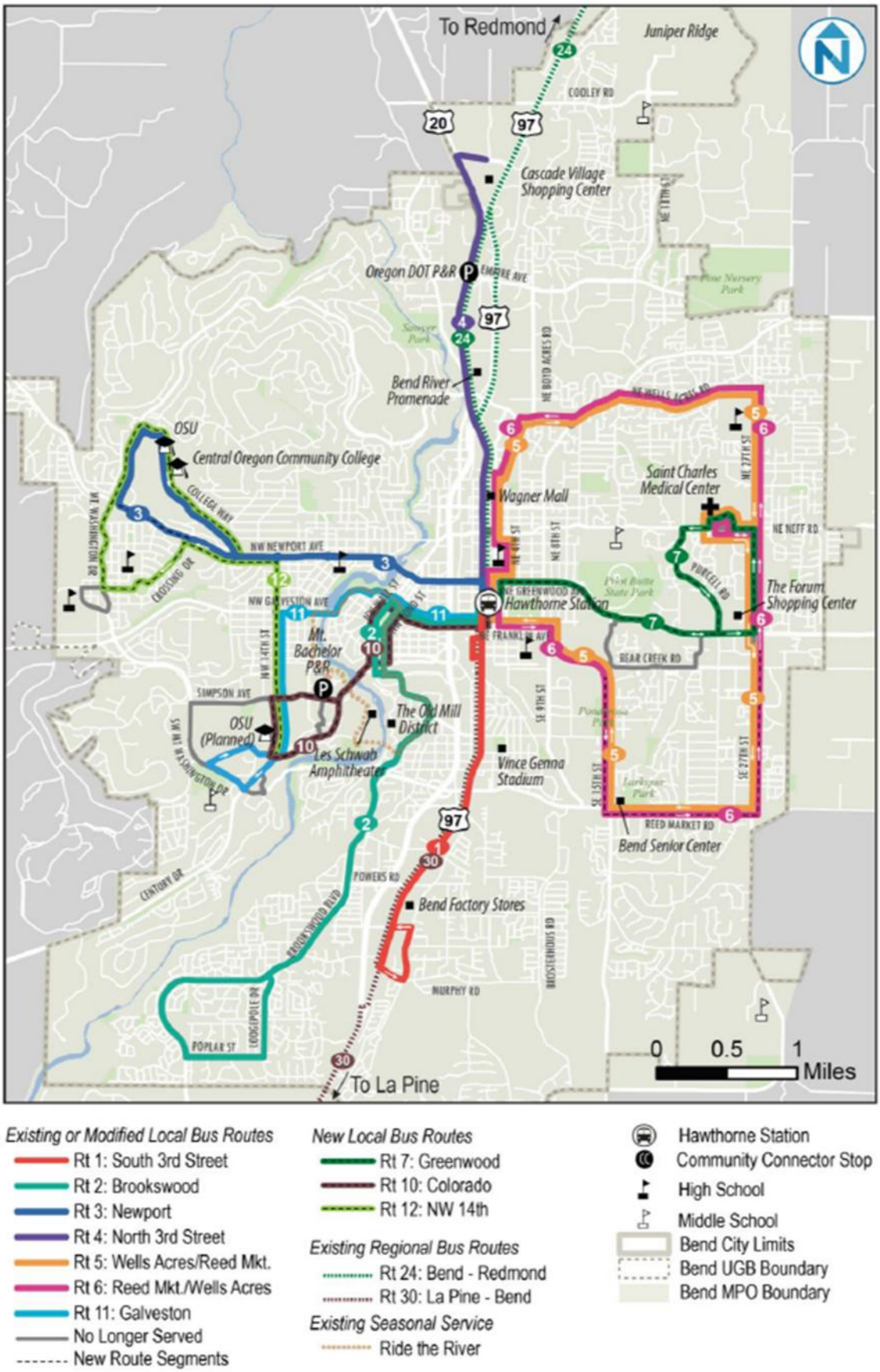
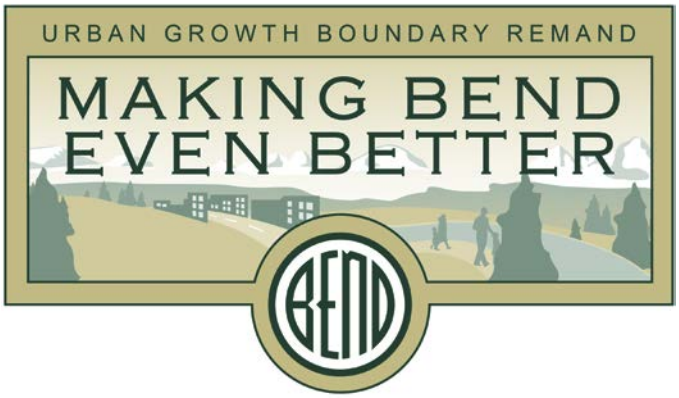


Figure 9.7: Bend Transit System 2016



Bend Integrated Land Use and Transportation Plan

July 19, 2016

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EXECUTIVE SUMMARY

What is an ILUTP?

Oregon's Transportation Planning Rule (TPR) requires Oregon's larger communities, including Bend, to plan transportation systems and land use patterns that increase transportation choices and reduce reliance on the automobile. How much people are driving, measured as vehicle miles traveled (VMT) per capita (the average distance driven in a day per person) is a key measure of reliance on the automobile. When a city's adopted land use and transportation plans are expected to result in an increase in VMT per capita, the TPR requires preparation of an Integrated Land Use and Transportation Plan (ILUTP) that sets standards and policy direction to change that trend. The purpose of the ILUTP is to describe what can be done to lessen that increase in VMT and "demonstrate progress towards increasing transportation choices and reducing automobile reliance" (Oregon Administrative Rule 660-012-0035(5)).

In addition to being subject to legal requirements, policies to reduce VMT are also important to quality of life in Bend. Having more options to get around and shorter distances to travel to meet daily needs, both of which lead to VMT reduction, also improve quality of life. Lowering VMT has a positive effect on air quality and public health, and transportation safety, as well as reducing fossil fuel consumption, greenhouse gas emissions, and travel costs.

VMT Analysis and Key Findings to Date

As is true with most U.S. cities of Bend's age, urban form, and rapid growth, Bend's VMT per capita has been increasing in recent decades. Bend is measuring growth in VMT per capita against baseline years of 2003 (as specified in the Remand) and 2010 (which the project team believes is a better indicator of conditions in 2008 – the beginning of the 20-year planning horizon for the UGB work). In order to evaluate the impact of various VMT reduction strategies, a series of land use and transportation packages, or scenarios, were created and tested. These scenarios included:

- Three UGB expansion scenarios and three "Supplemental Analysis Area Maps" (SAAMs) for 2028 testing different potential growth areas, with consistent assumptions about growth, redevelopment and transit service inside the UGB;
- A hypothetical land use and transportation scenario for 2028 to test the impact of increasing redevelopment in the core, increasing transit frequency, and increasing connectivity in new neighborhoods;
- The draft and final preferred UGB expansion scenario; and
- Several iterations of hypothetical 2040 scenarios to understand how the policies and strategies identified in this ILUTP may affect VMT over time and determine what it will take to reverse the trend on VMT growth in the long term.

Key conclusions and findings from the VMT analysis are summarized below.

UGB Scenarios and SAAMs

- Each of the six scenarios tested increased per capita VMT relative to 2010 (ranging from a 2.9% to a 5.1% increase) due to the amount of growth located outside the center of the

city. The increase relative to 2003 ranged from 8.1% to 10.3%. The TPR requires VMT to not increase by more than 5%.

- Scenarios with an emphasis on complete communities in expansion areas and using growth areas to complete existing neighborhoods generally performed better on VMT.
- Even where there are complete communities in outer neighborhoods, the downtown remains a key destination. As a result, trip lengths and household VMT are generally lower in the central core of the city.
- Scenarios that focused growth close to the key transit and multimodal corridors that connect to downtown generally had shorter average trip lengths.

2028 Hypothetical Scenario

- A significant shift in housing and jobs from expansion areas to opportunity areas in the core (roughly 1,000 housing units additional and 2,000-2,500 additional jobs in the core relative to Scenario 2.1G, with a corresponding reduction in expansion areas), combined with significant transit service improvements and greater connectivity in new master planned neighborhoods, would reduce household VMT per capita slightly relative to 2014.
- The amount of redevelopment that was assumed in the core in this hypothetical scenario is not reasonably likely by 2028; significant transit service improvements may not be feasible by 2028; and increasing connectivity in master planned neighborhoods through smaller block sizes would have downsides including additional land being used for right of way, greater impervious surface area, and less developable area.
- The ideas tested in the hypothetical scenario are more appropriate for long-range strategies than for implementation by 2028.

Official VMT Results for 2028

The table below summarizes the results of the VMT analysis for the preferred UGB Expansion scenario (using the regional travel demand model) in comparison to both the 2003 and 2010 baseline years. VMT per capita increases by just over 1% relative to the 2010 baseline. Because there was nearly a 5% increase between 2003 and 2010, comparing to the 2003 baseline yields just over a 6% increase in VMT per capita. However, the TPR allows local governments to take credit for plans, programs, and actions implemented since 1990 that have already contributed to achieving VMT reductions. To assess this, the City compared 2028 VMT to what VMT *would have been* in 2003 without the connectivity improvements that the City has implemented since 1990 (which have been shown to reduce VMT growth). That comparison showed a VMT increase of less than 5% relative to the modified 2003 baseline. Thus, with this ILUTP, the City is in compliance with TPR requirements related to VMT, regardless of which baseline year is considered. See TPR Compliance Section in this document for further explanation.

	2003 baseline	2010 baseline	Preferred UGB Expansion Scenario (2028 projection)[1]
Daily Vehicle Miles Traveled per capita	9.18 / 9.38 [2]	9.64	9.76
Percent increase relative to 2010	N/A	N/A	1.2%
Percent increase relative to 2003	N/A	5.0%	6.3% / 4.1%[2]

Strategies to Reduce VMT in Bend

The approach to implementation will be to identify corridors and centers (e.g. opportunity areas in the core) that have the highest likelihood to reduce VMT. Coordination of the transportation system and land use patterns has the most impact on VMT reduction. The greatest VMT reductions will happen in locations that have some or many of the needed land use and transportation attributes already in place, such as diversity of land uses, density, access to transit and transit routes, connected and walkable design, and accessibility to key destinations. For modest amounts of funding, such areas can greatly reduce reliance on the automobile.

The ILUTP identifies "Proposed Strategies", which are intended to be adopted with the UGB expansion proposal, and also "Additional Strategies for Further Consideration" over the longer-term future. Key strategies are summarized below.

ILUTP Element	Proposed Strategies	Additional Strategies for Further Consideration	
		Medium-Term	**Long-Term**
Land Use Strategies	Designate and ultimately rezone mixed use opportunity areas identified in UGB project. Adopt efficiency measures identified in UGB project.	Designate additional mixed use areas along transit corridors Adopt design standards for key pedestrian areas and transit corridors. Strengthen connectivity standards for new master-planned neighborhoods.	Consider up-zoning selected neighborhoods where there is potential and community support for infill development.
Transportation Demand Management (TDM) and Parking Management	Set policy supporting incentives approach to TDM and increasing applicability of TDM programs Conduct analysis and feasibility for parking management and pricing Establish TDM requirements for institutional and employment master plans	Consider transportation SDC reductions for TDM measures Require TDM programs for additional large businesses / institutions Partner to establish TMAs for certain areas Implement parking management programs in key areas based on outcomes of parking study	Implement parking pricing in key areas (e.g. downtown and 3rd Street / Central Area), based on the results of the parking study.

[1] With average daily trip reductions assumed for Juniper Ridge (5%), COCC (10%), and OSU (10%) based on existing and proposed TDM programs.

[2] With credit for connectivity improvements since 1990. See Attachment 6 for details.

ILUTP Element	Proposed Strategies	Additional Strategies for Further Consideration	
		Medium-Term	Long-Term
Transit	Support and maintain 2016 service improvements Define and enhance transit centers and corridors in opportunity and core areas. Propose new and enhanced transit funding	Implement most components of Bend Transit Plan, including additional hours of service, more frequent peak headways, and two new routes.	Implement further hours of service, improved service and headways on specific routes primarily in opportunity and Core areas, and conversion of 3 routes from bus service to pre-BRT types of service
Roadway Improvement Management and Policies	Implement selective "road diets" where safety issues have been identified	Develop pedestrian and biking safety projects for the opportunity areas that enhance walking, biking, and transit modal splits.	Continue to develop and implement policies that increase walking and biking safety by modifying street standards
Complete Streets and Connectivity Investment	Implement programmed projects Prioritize streetscapes in opportunity and core areas and transit corridors.	Evaluate funding mechanisms for complete street improvements Implement planned but not-yet-funded projects, focusing improvements in opportunity areas and adjoining corridors.	Refinement and potential implementation of aspirational projects

Standards to Measure Progress

The City also must propose standards that will be used to measure progress towards reducing VMT. The proposed standards are performance measures that provide insights into the effectiveness of the City's ILUTP strategies. They are linked to variables that are key to changing travel behavior. The City's draft proposed standards emphasize evaluating performance in certain targeted areas of the City, including opportunity areas, transit corridors, and the central core. This reflects the City's overall approach of focusing resources on areas that will have the highest likelihood to reduce VMT. The standards will be revisited when the City undertakes a more comprehensive Transportation System Plan update in the future. The draft proposed standards include:

- Activity density (housing units plus employment per acre) in targeted areas
- Complete Street Project Implementation (streetscape and bicycle/pedestrian safety improvement projects)
- Household and employment transit access (percent of housing units and employees within a quarter mile of transit)
- Access to commercial services (percent of housing units within a half-mile of existing or planned commercial areas)
- Active TMAs and institutional TDM programs
- Jobs-housing balance (ratio of jobs to housing units) in targeted areas

CHAPTER 1. INTRODUCTION

Purpose of the Integrated Land Use and Transportation Plan

The purposes of this Integrated Land Use and Transportation Plan (ILUTP) are to:

- Provide a policy framework for increasing transportation choices in Bend through an integrated set of long range land use and transportation strategies
- Address Transportation Planning Rule[3] (TPR) and Urban Growth Boundary (UGB) Remand[4] requirements related to reduction of Vehicle Miles Traveled (VMT) per capita and reduced reliance on the automobile
- Describe Bend's policies and standards to be used in demonstrating progress toward a reduction of VMT over time

This ILUTP is a supporting and supplemental document to the Bend Comprehensive Plan and Transportation System Plan (TSP). Bend's Comprehensive Plan and TSP have many policies and standards that support transportation choices. This ILUTP provides an additional policy framework that is specifically targeted at the purposes listed above.

What is an ILUTP?

Oregon's TPR requires that local governments within larger regions plan for transportation systems and land use patterns in ways that increase transportation choices and reduce reliance on the automobile. One way that this is often expressed is through how much people are driving, measured as VMT per capita, the average distance driven in a day per person.

When the City's adopted land use and transportation plans are expected to result in an increase in VMT per capita, the TPR requires preparation of a plan that sets standards and policy direction to change that trend (see below for the full legal context). The central purpose of the plan is to describe what can be done to lessen that increase in VMT and therefore "demonstrate progress towards increasing transportation choices and reducing automobile choices".[5]

As a practical matter, an ILUTP addresses four types of strategies for reducing VMT growth:

- Land use strategies
- Transportation demand management strategies
- Public transit planning
- Policies related to review and management of major roadway improvements

[3] Oregon Administrative Rule (OAR) 660, Division 12

[4] Remand Record 05844 (Section 8.6 e (c) page 121)

[5] OAR 660-012-0035(5)

Why VMT Matters to the Community

In addition to being the subject of legal requirements, VMT is also important to quality of life in Bend. VMT per capita measures how much people are driving; it generally reflects a combination of the following factors:

- Availability and desirability of alternatives to driving (such as transit service and bike lanes), which influences whether and to what degree people can meet their needs without using the car;
- Proximity between land uses (e.g. the distance from home to the grocery store, work and school), which affects both the potential to reach a destination by walking or biking and the length of the car trip for those who drive; and
- Efficiency of the transportation system (e.g. whether there are direct routes between destinations or whether drivers must travel out of their way to reach their destinations).

Lower VMT can result from fewer and shorter auto trips, and by converting auto trips to other modes such as walking, biking, or transit. Having more options to get around and having shorter distances to travel to meet daily needs, both of which lead to VMT reduction, are generally seen as improvements to quality of life. VMT also impacts transportation emissions, which affect air quality and public health, as well as fossil fuel consumption, greenhouse gas emissions, transportation safety, and travel costs.

Legal Context

The Transportation Planning Rule and Remand Requirements

State administrative rule (Oregon Administrative Rule 660, Division 12, Section 0035; Division 12;also called the TPR) requires that TSPs be based upon "evaluation of potential impacts of system alternatives that can reasonably be expected to meet the identified transportation needs."[6] Areas, such as Bend, that are in Metropolitan Planning Organizations (MPO) must "evaluate alternative land use designations, densities and design standards to meet local and regional transportation needs."[7]

This evaluation informs a strategy and adopted standards "for increasing transportation choices and reducing reliance on the automobile".[8] There are a number of strategies that must be evaluated such as improvements to existing facilities and services, enhancements to alternative modes of travel, transportation systems management, travel demand management, and land use standards. These strategies must result in "adopted standards to demonstrate progress towards increasing transportation choices and reducing automobile reliance." This requires a qualitative and quantitative description in the plan demonstrating that:

- Reliance on the automobile is reduced;
- The availability or convenience of alternative modes is significantly increased;

[6] OAR 660-012-0035(1).
[7] OAR 660-012-0035(2).
[8] OAR 660-012-0035(4).

- There is a likelihood of a significant increase in travel by alternative modes;
- VMT will not increase more than five percent; and
- The standards are measurable and reasonably related to the goal of reducing reliance on the auto.[9]

The TSP must include "policies to evaluate progress towards achieving the standard or standards adopted and approved pursuant to this rule. Such evaluation shall occur at regular intervals corresponding with federally-required updates of the Bend Metropolitan Planning Organization (BMPO) regional transportation plan. This shall include monitoring and reporting of VMT per capita."[10] The current TSP has policies directed at reducing reliance on the automobile and improving access to alternative modes. However, the TSP will be amended to include new policies specific to meeting the TPR requirements about reducing VMT.

If an MPO can show that adopted plans and measures are likely to achieve a five percent reduction in VMT per capita over the 20-year planning period, it will be found to be in compliance with the rule, but must still adopt interim benchmarks for VMT reduction and evaluate progress with each TSP update.[11]

If an alternate standard is approved, but an increase in VMT (of less than 5%) is anticipated, the local jurisdictions in the MPO area must prepare and adopt an ILUTP containing specific required elements within three years of the approval of the standard.[12] The required elements are:[13]

- Changes to land use plan designations, densities, and design standards such as increasing residential densities adjacent to transit, major employment areas, and major retail areas; increasing employment densities in designated community centers; designating land for neighborhood shopping centers; and providing housing opportunities in close proximity to employment areas (see full list below);
- A transportation demand management (TDM) plan that includes significant new TDM measures;
- A public transit plan that includes a significant expansion in transit service; and
- Policies to review and manage major roadway improvements to ensure that their effects are consistent with achieving the adopted strategy for reduced reliance on the automobile.

The land use strategies that local governments "shall consider" are listed in detail below.

> *"(a) Increasing residential densities and establishing minimum residential densities within one quarter mile of transit lines, major regional employment areas, and major regional retail shopping areas;*

[9] OAR 660-012-0035(5).
[10] OAR 660-012-0035(5)(e)
[11] OAR 660-012-0035(6)
[12] OAR 660-012-0035(5)(c)
[13] OAR 660-012-0035(5)(c) and OAR 660-012-0035(2)

"(b) Increasing allowed densities in new commercial office and retail developments in designated community centers;

"(c) Designating lands for neighborhood shopping centers within convenient walking and cycling distance of residential areas; and

"(d) Designating land uses to provide a better balance between jobs and housing considering:

"(A) The total number of jobs and total of number of housing units expected in the area or subarea;

"(B) The availability of affordable housing in the area or subarea; and

"(C) Provision of housing opportunities in close proximity to employment areas."[14]

The examples given in the TPR of policies regarding review and management of major roadway improvements (defined to include "new arterial roads or streets and highways, the addition of travel lanes, and construction of interchanges to a limited access highway") include:[15]

"(i) An assessment of whether improvements would result in development or travel that is inconsistent with what is expected in the plan;

"(ii) Consideration of alternative measures to meet transportation needs;

"(iii) Adoption of measures to limit possible unintended effects on travel and land use patterns including access management, limitations on subsequent plan amendments, phasing of improvements, etc..."

Prior Work and Remand Issues

In the 2008 UGB expansion effort, the City did not address compliance with OAR 660-012-0035.[16] The Remand from the Land Conservation and Development Commission (LCDC) summarizes it as follows: "The [Department of Land Conservation and Development (DLCD)] Director's Decision found that:

- The metropolitan planning requirements of the TPR are applicable to Bend at this time;
- Bend has not complied with provisions of the TPR applicable to metropolitan areas for adoption of standards and benchmarks to reduce reliance on the automobile; and
- The metropolitan area planning requirements in the TPR must be met prior to a significant amendment of the UGB." [17]

[14] OAR 660-012-0035(2)

[15] OAR 660-012-0035(5)(c)(D)

[16] Note that Bend's adopted TSP projects a 6% decrease in VMT from 2000 to 2020. However, due to issues with land use buildout consistencies and partner agency support of the technical modeling work that underlies the analysis, it does not provide an adequate basis for establishing compliance with the TPR.

[17] Remand Record 05844 (Section 8.6 pages 119-121).

The City appealed this aspect of the Director's Decision, arguing that it is not required to comply with these requirements before amending its urban growth boundary.[18] The Remand states that *all* goals and rules apply to a UGB amendment, except for the listed exceptions, and there is no exception for the metropolitan area planning requirements specified in OAR 660-012-0035; the City is required to comply with OAR 660-012-0035 before it may complete its UGB expansion.

The Remand identifies three possible outcomes based on the estimated change in VMT per capita projected to result from the revised UGB expansion, along with proposed land use and transportation measures:[19]

> (a) A decline of 5% or more per capita means the City is in compliance with this aspect of the TPR under 0035(6).
>
> (b) A decline of between 0% and 4.99 percent per capita means the City may proceed by preparing for DLCD/LCDC review and approval concurrently with the revised UGB, a work program/plan to achieve a reduction of 5% or more over the planning period.
>
> (c) An increase in VMT per capita means the city must prepare, submit and obtain DLCD/LCDC approval of an integrated land use and transportation plan as provided in OAR 660-012-0035(5) prior to approval of a revised UGB.

While the Remand requirements do not exactly match the administrative rule, the City's approach is to first meet the requirements of the rule, and then the Remand Order. The City worked collaboratively with the State during the preparation of this ILUTP, and the approach cited here has been reviewed and approved in concept by DLCD staff.[20]

Time Periods Used in this ILUTP

OAR 660-012-0035 assumes that VMT analysis is being conducted as part of evaluating and selecting transportation system alternatives for the TSP. Determination of transportation needs for a TSP for a jurisdiction within a UGB must be based on population and employment forecasts for 20-years or more.[21] OAR 660-012-0005 includes the following definition:

> *(22) "Planning Period" means the twenty-year period beginning with the date of adoption of a TSP to meet the requirements of this rule.*

Because the City has been required to address OAR 660-012-0035 as part of the UGB adoption rather than as part of a comprehensive updated to the TSP, and because the City is under Remand, the 20-year planning period in question is the planning period for the UGB: 2008 to 2028. However, there is no travel demand model available to represent 2008. Instead, there are models for conditions in 2003 and 2010.

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[18] Remand Record 05844 (Section 8.6 pages 119-121)

[19] Remand Record 05844 (Section 8.6 pages 119-121)

[20] Personal communication between Karen Swirsky, Senior Planner with the City of Bend and Bill Holmstrom, DLCD Transportation Planner, January 13, 2016

[21] OAR 660-012-0030(3)(a)

The Remand specifies 2003 as the baseline year. A later clarification letter from DLCD staff[22] also described using the regional travel demand models for year 2003 and 2030 (which were the model years available at the time to approximate the 2008 to 2028 planning horizon). However, the MPO and the Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit (TPAU) have since updated the regional models to base year 2010 and future year 2028. The updated base 2010 travel demand model includes enhancements that better reflect 2008 conditions in Bend and are better for assessing the Remand requirements. The enhancements include (see Attachment 1 for more details):

- An updated base land use developed for the Metropolitan Transportation Plan (MTP), which more closely aligns with 2008 land use patterns in Bend compared to the prior model base year of 2003;
- An updated transportation network to reflect what was built between 2003 and 2010, which more closely aligns with the 2008 network in Bend compared to the prior model base year of 2003; and
- A transit model component to reflect the transit system that now exists in Bend but was not present in 2003.

The year 2028 future scenario includes updates to model components consistent with year 2010 model (noted above) and offers an analysis year that aligns with Remand (as opposed to prior model year 2030).

In addition to providing the benefits listed above, the distinction between the baseline years is important because VMT increased in the Bend area by nearly 5% between 2003 and 2010. For purposes of analysis, the project team is evaluating both 2003 and 2010 as baseline years, and will demonstrate compliance with the TPR requirements based on both baseline years due to the legal uncertainties discussed above.

The ILUTP uses 2028 as the future year for the purposes of measuring VMT changes over the planning horizon. However, the analysis done as part of preparing this ILUTP also looked further ahead to how the policies and measures included in this ILUTP could affect VMT in the longer-range future to 2040. This analysis was intended to provide insights for long-range City policies and for the City's next TSP update, which will have a new 20-year planning period to consider, and will need to demonstrate compliance with the TPR standards, including section -0035. The long-range evaluation is summarized in Attachment 5.

[22] RE: Questions relating to the Bend Urban Growth Boundary (UGB) Vehicle Miles Traveled (VMT) Analysis, Letter from DLCD, November 10, 2011.

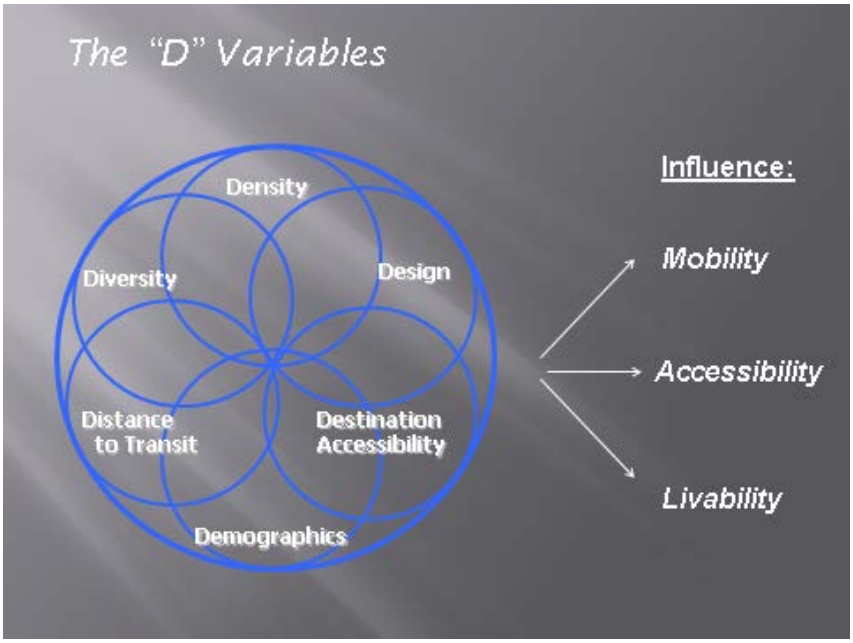
CHAPTER 2. BEST PRACTICES

This chapter provides a brief overview of the key factors that influence VMT -- land use, transportation demand management, parking, and the design of the transportation system -- and examples from other Oregon communities related to these factors. For examples of how these best practices are already being used in Bend, please see Chapter 4, Existing and Proposed VMT Reduction Strategies.

Land Use: The "D" Variables

Research by Drs. Chris Nelson and Reid Ewing of the University of Utah (among others) has identified a number of key factors that influence travel behavior, as summarized in Figure 1.

Figure 1: The "D" Variables



In brief, this research has found the following estimated impacts on travel behavior from the variables identified above:[23]

- Density (Housing and employment densities):
  - Doubling housing density reduces VMT 4%, increases walking and transit usage 7%
  - Doubling of commercial density increases walking 7%
- Diversity (mix and types of land uses primarily housing and commercial):
  - Doubling diversity of land uses, aka "Entropy" score within one mile (0-1 score) yields -9% VMT, +15% walking, +12% transit (twice as influential as housing density)
  - Doubling ratio of jobs to housing (i.e. 0.5 to 1) yields -2% VMT, +19% walking (significant impact on walking, less so on VMT)

[23] Ewing, Tan, Goates, Zhang, Greenwald, Joyce, Kircher, and Greene (2014) Varying influences of the built environment on household travel in 15 diverse regions of the United States, *Urban Studies* 1-19.

- Design (Design refers to street patterns and also streetscape design) :
  - Intersection density important, but measures of connectivity (% 4-way intersections) have a compounding influence; doubling intersection density yields -12% VMT, +30% increase in walking. Most influential predictor of walking.
- Destinations (Accessibility to employment and uses central to an urban area such as downtowns):
  - Employment within 1 mile, employment within 20 and 30 minutes by auto, and employment within 30 minutes by transit: most influential variable on VMT – doubling job accessibility by auto yields a 20% reduction in VMT.

The approach outlined above is supported in the technical literature. Washington State Department of Transportation published an analysis of the relationships between urban form and travel behavior[24], and the Florida Department of Transportation confirmed that strategies to reduce transportation demand via coordination of land use and transportation planning can contribute to meeting future mobility needs[25].

In addition, the City used an extensive literature review to ensure that the proposed approaches would be effective. In particular, the Transportation Research Board has published a paper documenting the positive effects of growth management policies on travel demand[26]. The City has considered measures from the Environmental Protection Agency's Guide to Sustainable Transportation Performance Measures, which describes 12 performance measures that can be used in transportation decision-making, from transit accessibility to bicycle and pedestrian facilities[27].

The urban form studies prepared for the UGB project illustrate where many of the key variables identified above are present in Bend today, including density, connectivity, access to destinations / neighborhood completeness, and access to transit. Key diagrams from those studies are included on the following pages. The land use diagrams were instructive in the beginning of the ILUTP analysis to show broad patterns of land uses in relationship to the transportation system and the "D" variables. In addition, the UGB scenario evaluations included analysis of many of these indicators for the future urban form expressed in the scenarios.

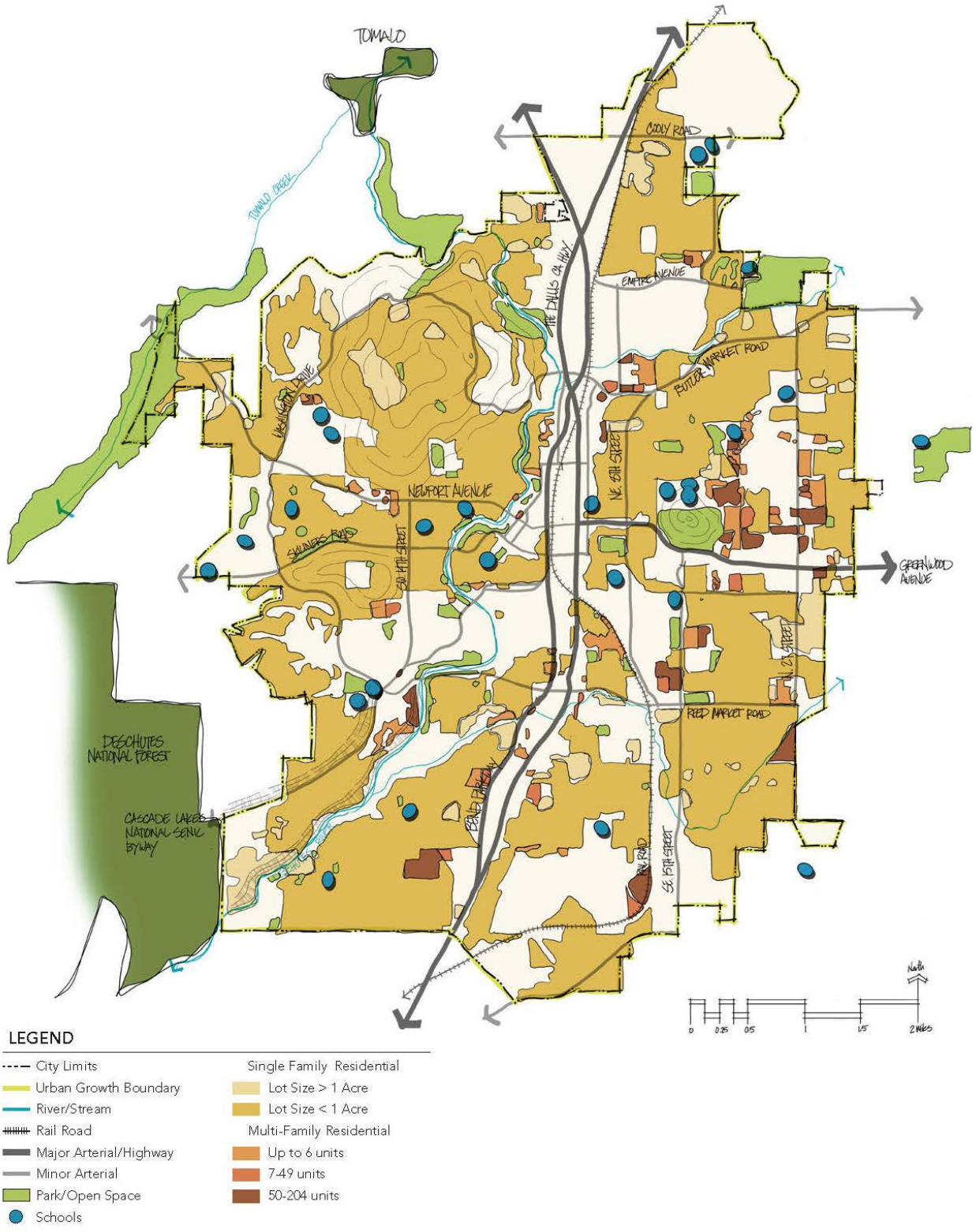
[24] Washington Department of Transportation, 1994, Publication WA-RD 351.2: An Analysis of Relationships between Urban Form (Density, Mix and Jobs-Housing Balance) and Travel Behavior (Mode Choice, Trip Generation, and Travel Time).

[25] Florida Department of Transportation, 2004, Publication BC353-46: The Relationship between Land Use, Urban Form, and Vehicles Miles of Travel: The State of Knowledge and Implications for Transportation Planning.

[26] Transportation Research Board, 2013, Publication SHRO 2 C16: The Effect of Smart Growth Policies on Travel Demand.

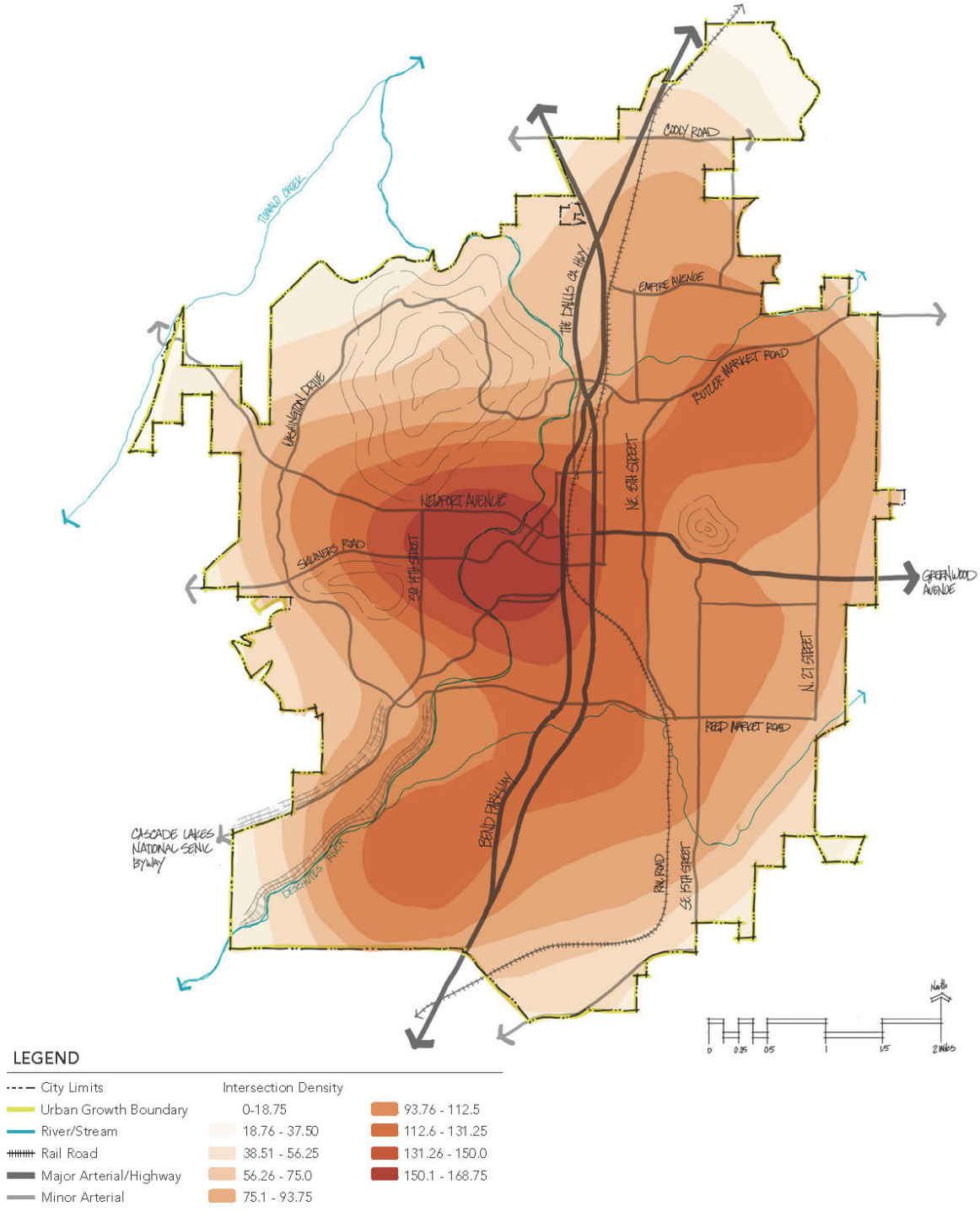
[27] Environmental Protection Agency, 2011, Publication 231-K-10-004: Guide to Sustainable Transportation Performance Measures

Figure 2: Residential Density and Schools and Parks



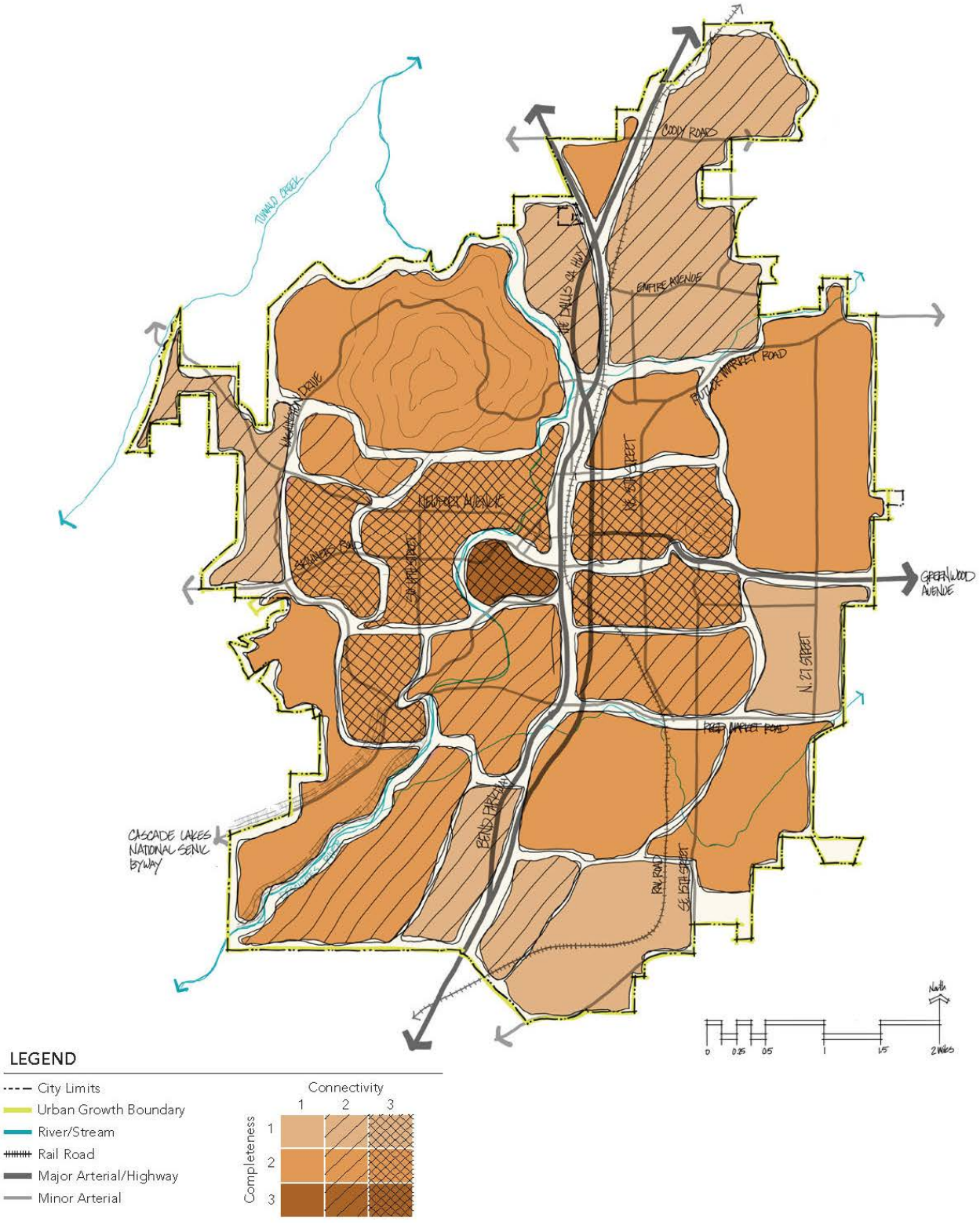
RESIDENTIAL DENSITY

Figure 3: Intersection Density and Connectivity



CONNECTIVITY

Figure 4: Neighborhood Connectivity & Completeness Ratings



Reducing VMT may be achieved by focusing growth in areas that already have the necessary conditions, such as intersection density (grid system of streets), proximity to employment and services, and/or transit corridors. A parallel strategy is to improve conditions in areas that lack one or more of the "D"s and also have vacant land or infill/redevelopment opportunities. For instance, in Bend, the older grid pattern neighborhoods close to downtown tend to lack safe pedestrian and bicycle crossings and other streetscape elements that encourage walking and transit use.

Transportation Demand Management

TDM aims to maximize the efficiency of the urban transportation system by discouraging unnecessary private vehicle use, managing the use of the existing system more efficiently, and promoting alternatives to the single occupant motor vehicle. TDM strategies can be more cost-effective than capital investments in new roads or parking lots.

TDM strategies focus on changing travel behavior – trip rates, trip length, travel mode, time-of-day, etc. – generally in order to reduce traffic during congested (peak) periods. TDM strategies generally focus on reducing travel in automobiles and light-duty trucks. The Federal Highway Administration has conducted studies that demonstrate the effectiveness of various TDM strategies.[28]

Some TDM measures require large-scale system changes (e.g., new transit routes), while others can be implemented on a local or site-by-site basis. When TDM is implemented on a site-by-site basis through land use and zoning, the focus is typically on creating supportive infrastructure or employer-based incentives. In many communities, some form of TDM is already required by the development code, such as bicycle parking. Because the land use process usually involves a one-time decision, it lends itself more easily to reviewing these types of built improvements. Programmatic TDM measures that require ongoing monitoring are more challenging to implement through land use review.

Examples of Development-Related TDM Measures[29]	
TDM-Supportive Infrastructure	**Programmatic TDM**
Pedestrian or transit oriented design	Subsidized transit passes for employees
Parking maximums	Parking cash-out programs
Minimum bicycle parking standards	Provide bicycle safety education classes
Requirements for transit amenities	Transportation Management Associations

Other TDM program elements can include such strategies as:

- Priced parking
- Free emergency rides home

[28] http://www.fhwa.dot.gov/environment/air_quality/conformity/research/mpe_benefits/mpe03.cfm

[29] Transportation Demand Management (TDM) Plans for Development. Transportation and Growth Management Program, September 2013.

- Alternative transportation commute planning
- Preferential rideshare parking
- Employee vanpools (may be subsidized by employer)
- Bicycle parking (short- and long-term)
- Financial incentives for transit, biking, walking, or carpooling
- Car-sharing programs

TDM strategies can vary from voluntary to regulatory programs and can be focused on specific areas such as institutions or office parks.

Transportation Management Associations (TMAs) are organizations that are created to implement TDM measures in a coordinated fashion. Commute Options conducted a study for the City of Bend in 2015[30], examining five TMAs in Oregon (Go Lloyd TMA, South Waterfront TMA, Swan Island TMA, Westside Transportation Alliance, and Metro Medford). The formation of Go Lloyd, South Waterfront, and Swan Island TMAs were driven by traffic congestion and limited parking. The Westside Transportation Alliance was created to assist Washington County companies to comply with the Department of Environmental Quality Employer Commute Options Rules. Metro Medford's impetus was the availability of federal Congestion Mitigation and Air Quality funds. For all of them, continued and reliable funding is the greatest challenge.

The following suggestions were gleaned from interviews that Commute Options conducted with the five TMAs:

- Business Support: Businesses must believe there is a problem that affects their ability to be successful. Each needs a compelling reason to participate.
- Stable Funding: Having guaranteed funding on a consistent basis is critical. It allows staff to focus on programs and services rather than worrying where the next grant will come from and for how much.
- Geographic Area: Have a small, clearly-defined geographic area. Larger areas generally mean more diverse transportation needs. Having a small area with a common problem to solve has a greater likelihood of success. Downtowns, campuses, and major activity centers are great places for a TMA.
- Create a Non-Profit TMA: A TMA that is housed under another organization is often subject to shared funding and priorities that are not in their best interest. A non-profit is eligible for more grants and can take advantage of discounts in services and products. In a business association where there are multiple members, it can be difficult to get consensus. With a non-profit there is a board of directors that have been chosen because of their expertise and priorities that support the TMA.
- Share Your Successes: Make sure people throughout the community, especially those that questioned the need or value of the TMA, know how well it's working and the programs and services you offer.

[30] A Report on Transportation Management Associations, Commute Options, June 1 2015.

A review of literature on the impact of TDM and TMA programs revealed a wide range of trip reduction impacts from less than 5% to over 30% for individual strategies. This is summarized in Attachment 3.

Parking

Managing parking is often a central component of a TDM program and is frequently the reason that a TMA is created. The supply and use of parking are influenced by — and have influences on — development practices, local policies, economic impacts on builders and households, and community goals. The supply and price of parking also have direct relationships with travel behavior. Too much parking correlates with more automobile ownership, more vehicle miles traveled, more congestion, and higher housing costs. In addition, excess parking interferes with the efficient development of urban land, which presents barriers to creating an efficient transit system or increasing land use density and diversity. Parking supply and pricing often have a direct impact on the ability to create compact, healthy communities.[31]

VMT has been demonstrated to be strongly related to measures of accessibility to destinations, particularly the supply of parking.[32] Parking strategies such as establishing maximums and pricing, when combined with mode split goals, tend to decrease VMT.

Parking Management is a general term for strategies that encourage more efficient use of existing parking facilities. This reduces total parking demand, shifts travel to other modes, reduces VMT and ensures a minimum number of parking spots are always available, avoiding the "circling" problem adding to congestion. Managing parking helps to reduce the undesirable impacts of parking demand on local and regional traffic levels and the resulting impacts on community livability and design. Parking management can be particularly effective when used in specific areas, such as downtowns or complete neighborhoods. The most effective parking strategies are those that link parking rates more directly to demand or provide financial incentives and/or prime parking spaces to preferred markets such as carpools, vanpools and short term parkers in commercial areas[33].

[31] Urban Land Institute Northwest, "Right Size Parking," 2013

[32] Ewing R, Cervero R. (2010). Travel and the built environment. Journal of the American Planning Association 76(3): 265–294.

[33] Best Practices Transportation Demand Management (TDM), Seattle Urban Mobility Plan, January 2008.

Some key parking management practices that may be applicable to Bend[34] include:

- **Ensure right-sized parking.** Older development codes (such as Bend's) can require more parking than is really needed or desired. Setting minimum parking requirements at the lowest level appropriate for a given use and context ensures that excessive off-street parking is not required.
- **Strengthen parking maximums in key areas.** When a limit is imposed on the number of off-street parking spaces provided at new developments, this strategy can help encourage transit use and other alternatives to single-occupant automobile use.
- **Encourage shared parking.** This strategy can shift parking demand into shared facilities rather than a duplicative of dedicated, accessory spaces. This strategy is particularly effective in areas of dense, mixed land uses.
- **Unbundle off-street parking costs.** This strategy allows off-street parking spaces for a development to be leased or sold separately from the rent or sale price. This gives a financial incentive inducing individuals to drive less or own fewer cars for residential uses, and for commercial uses, encouraging companies to increase transit commute rates among their employees. Including the price of parking in an overall lease can increase costs by as much as 25% – and so can have an effect on affordability.
- **Build park-and-ride lots.** Remote lots connected with shuttles, transit, or carpool programs can help alleviate demand for parking in congested areas. This is a strategy being considered by Oregon State University for its new urban Cascades campus to minimize parking demand.
- **Create new parking management districts.** Parking districts, similar to the existing downtown Bend central business district, can provide centralized and coordinated management of parking services. Centralization of management can occur through public/private partnerships between the city and a business association, parking authority, or economic/business improvement district. New parking districts can be a part of a TMA or a separate entity.
- **Institute cost-based parking in appropriate areas.** The most effective parking strategies are pricing measures that charge users to park. Cost-based pricing is appropriate for parking districts, such as downtowns, and for major destinations (such as institutions) with limited parking. Linking parking rates more directly to demand or providing financial incentives and/or prime parking spaces to preferred markets such as carpools, vanpools and short term parkers can further enhance effectiveness. This reduces total parking demand, shifts travel to other modes, reduces VMT and ensures a minimum number of parking spots are always available, avoiding the "circling" problem adding to congestion.

Some examples of successful parking programs include:

- Bellevue, Washington – Shared use, and unbundling parking

[34] The City is currently conducting a city-wide parking study that may result in recommendations to change parking requirements in certain zones utilizing some or all of these tools.

- Milwaukie, Oregon – Shared parking in mixed use districts
- Hood River, Oregon – Downtown Parking Pricing
- Portland, Oregon – Variable rate parking depending on location
- Seattle, Washington – Parking maximums instead of minimums

Transit

A solid transit system can be a powerful tool for reducing VMT by offering a viable alternative to automobile use. The "D" factors discussed above have been demonstrated to increase transit use.[35] Enhanced transit service such as decreased headways, system improvements such installing bus-only lanes at intersections and improving pedestrian access increases transit use. Focusing these efforts along transit corridors and between identified destinations such as large employment centers and commercial districts is also effective.

Bend's transit provider, Cascades East Transit (CET), recognizes that the City's plans to intensify land uses inside the UGB will support their efforts to grow the system. As funding becomes available, CET plans to implement best practices such as:

- Providing headways of no more than 30 minutes on all routes;
- Providing 15 minute headways on key routes;
- Creating new hubs in quadrants of the City of Bend;
- Providing Sunday service and improving Saturday service; and
- Upgrading buses to coach style with low floors to improve comfort and efficiency.

Longer term, CET plans to create new routes and study the possibility of Bus Rapid Transit.

An example of a mid-sized transit district that has successfully implemented the best management practice is Lane Transit District (LTD) in Eugene. LTD began in 1970 with 18 buses and two vans, and it has grown and changed along with the community. The District continually improved routes and stops, coordinated land use and transit plans, incorporated major transit centers into the comprehensive plan and then constructed the centers, and streamlined routes to eventually form a Bus Rapid Transit system.

Road and System Improvements that Influence Walking and Biking

Walking, bicycling, and transit use become more attractive with street and safety projects such as the addition of bike lanes, buffered bike lanes, bicycle boulevards, and enhanced pedestrian crossings[36]. In particular, the literature demonstrates that real and perceived safety issues have a strong influence on mode choice. Numerous studies indicate that projects to eliminate or reduce conflicts with vehicles will substantially increase walk and bike modes. In addition, streetscape or complete street projects that satisfy the Design variable will increase walking and

[35] Moudon E, Stewart O. (June 2013). Tools for Estimating VMT Reductions from Built Environment Changes. Washington State Department of Transportation.

[36] Moudon E, Stewart O. (June 2013). Tools for Estimating VMT Reductions from Built Environment Changes. Washington State Department of Transportation.

biking. For example, bicycle ridership increases between 50%-100% on buffered bike lane corridors and bicycle boulevards.[37,38.] Similarly, good pedestrian-oriented street design, including wide sidewalks, street trees, and safe crossings, can significantly increase walking safety by 50%.[39]

Bellingham, Washington is an example of a city that regularly commits planning and construction resources to improving bicycle, pedestrian, and transit facilities, and has seen a resulting increase in use of these modes.[40]

The City of Bend has conducted a traffic safety study[41] that found, among other things, that multi-lane (more than three lanes of traffic) higher-volume and higher-speed roadways were significantly more likely to have a higher number of serious pedestrian and biking crashes. The study concluded that the City should focus efforts and funding on high-crash locations on multi-lane roadways. In 2015, the City created a concept plan for implementing safety projects[42], which summarizes the conceptual design of safety solutions at priority locations in four corridors:

- 3rd Street between Greenwood Avenue and Murphy Road
- Colorado Avenue between Bend Parkway and Bond Street
- Greenwood Avenue West between 3rd Street and Awbrey Road
- Greenwood Avenue East between 3rd Street and 12th Street

Within those four corridors, the City has selected a number of projects for design and implementation. These are noted in Chapter 4, along with the City's other priority pedestrian and bicycle improvement projects (see page 46).

VMT Reduction Efforts in Other Oregon Communities

Portland Metro satisfied the VMT requirement by adopting and implementing the Metro 2040 Plan. Since that time Metro has adopted the Green House Gas Emissions strategy and plan that includes VMT reduction policies and actions such as increasing transit intensity, pricing, and promoting mixed use development.

TransPlan is the Eugene-Springfield land use and transportation plan that adopted VMT reduction polices and strategies for the area. TransPlan centered on a set of land use, transit, demand management, and bicycle strategies and transportation system performance measures.

Rogue Valley MPO has been working with DLCD to draft alternative measures for increasing transit and non-motorized travel mode splits. These measures include increasing the percent of

[37] "Evaluation of Innovative Bicycle Facilities," Final Report, Portland Bureau of Transportation (2011).
[38] "Traffic Calming: State of the Practice," ITE/FHWA, 1999.
[39] Georgia Department of Transportation, Pedestrian and Streetscape Guide, 2003.
[40] http://www.cob.org/services/transportation
[41] City of Bend Multimodal Traffic Safety Study 2012-2014.
[42] City of Bend Safety Implementation Plan, 2015.

residences within a ¼ mile walk of transit service, percent of collectors and arterials with bicycle and pedestrian facilities, and increasing employment in mixed-use pedestrian-friendly areas.

The Corvallis Area MPO has been working on a Greenhouse Gas Emissions Reduction Project. The resulting plan includes strategies to reduce VMT through pricing, demand management, infrastructure improvements (particularly for non-motorized modes), increasing mixed use land development, and increasing transit investment.

Salem MPO jurisdictions adopted local code and ordinances that set existing and benchmark measures for reducing reliance on the automobile. Pedestrian and biking infrastructure increases and land use actions such as encouraging employment and dwelling units along or near transit stops were some of the general types of measures.

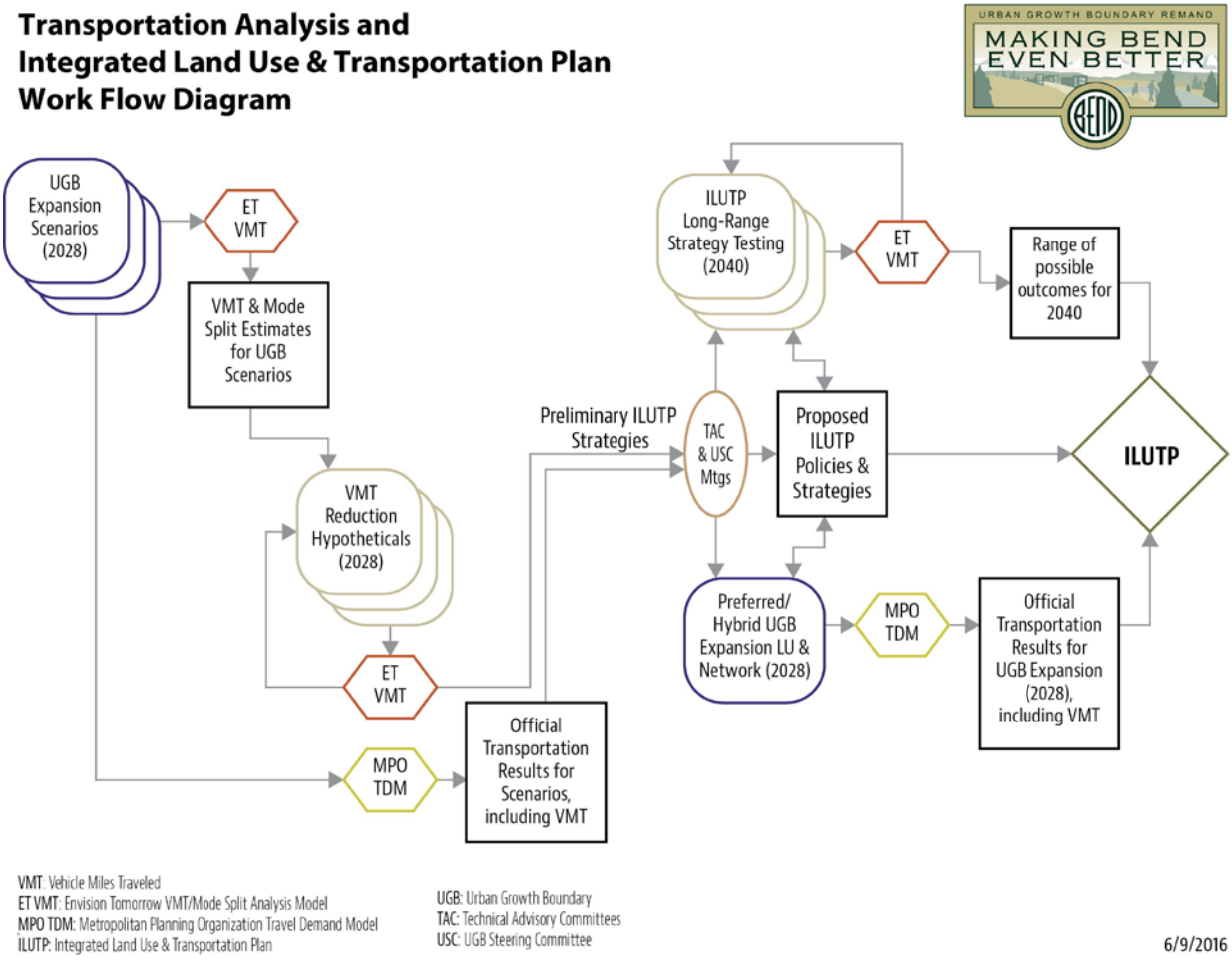
CHAPTER 3. ANALYSIS: METHODS, APPROACH AND RESULTS

This chapter summarizes the analysis that underlies the strategies and standards proposed in Chapters 4 and 5 of this ILUTP. Note that the analysis for this ILUTP was performed in conjunction with the evaluation of alternative UGB expansion scenarios for the 2016 UGB proposal.

Methodology

The analysis used two primary tools, Envision Tomorrow (ET) 7D Travel Model and the Bend MPO regional travel demand model. These tools were used, in tandem, to assess preliminary outputs from the UGB scenarios, develop a final scenario, and ultimately make findings that address TPR requirements for the Remand (VMT) and changes that may be implemented through the ILUTP.

Figure 5: Analysis process for ILUTP



The purpose of ET in the transportation analysis was to assist in identifying and analyzing the land use and transportation strategies that would be required in Bend to achieve the levels of

VMT reduction required by the TPR and Remand. The ET 7D Travel Model is sensitive to changes previously described in the "D" variables, including Density, Design, Destinations, Demographics[43] and Diversity of land uses.[44] The ET model is able to estimate total internal and walking trips resulting from land uses. It does not measure VMT in the precise way suggested by the TPR, but it is well-calibrated to the travel demand model and offers a quick and efficient way to estimate the big picture transportation impacts from different land use and transportation strategies.

The MPO Travel Demand Model was used for formal analysis of transportation system performance and VMT as defined in the TPR. The travel demand model is primarily used and accepted by ODOT to measure VMT; however, it is not as sensitive to measuring transportation performance with the built environment and walking and biking trips that result from a diversity of land uses in an area. The travel demand model was run through the formal four-step process with Transportation Planning and Analysis Unit (TPAU) to analyze the alternative scenarios, and then the proposed UGB expansion scenario. The modeling methodology is documented in the June 15, 2015 memorandum from DKS Associates (see Attachment 2).

Approach

Scenario Testing

In order to evaluate the impact of various VMT reduction strategies, a series of land use and transportation packages, or scenarios, were created and tested. As illustrated in Figure 5, these scenarios included:

- Three UGB expansion scenarios and three “Supplemental Analysis Area Maps” (SAAMs) for 2028 testing different potential growth areas, with consistent assumptions about growth, redevelopment and transit service inside the UGB;
- Two iterations of hypothetical land use and transportation scenarios for 2028 to test the impact of increasing redevelopment in the core, increasing transit frequency, and increasing connectivity[45] in new neighborhoods;
- The draft and final preferred UGB expansion scenario; and
- Several iterations of hypothetical 2040 scenarios to understand how the policies and strategies identified in this ILUTP may affect VMT over time and determine what it will take to reverse the trend on VMT growth in the long term.

[43] The supporting socio-demographic factors for the land use data include household size, household income, and the number of workers in a household. As scenarios are “painted” with ET, these socio-demographic factors are updated based on the type of predicted development.

[44] Envision Tomorrow Plus (ET+) User manual, Metropolitan Research Center University of Utah, http://www.envisiontomorrow.org/storage/user_manuals/20131029ENVISION%20TOMORROW%20PLUS_USER%20MANUAL_1st%20COMPLETE%20VERSION_updated_sm2.pdf

[45] Greater connectivity was modeled in Envision Tomorrow by reducing assumed future block sizes below current standards to increase intersection density. There are other ways to get at increased connectivity, particularly for pedestrians and bicyclists, without reducing block size (e.g. stricter mid-block accessway requirements), but those would not be reflected in the model.

The six initial UGB expansion scenarios are summarized in Chapter 5 of the Bend Urbanization Report, as is the final preferred UGB expansion scenario. The 2028 hypothetical scenario was summarized for the Residential and Employment Technical Advisory Committees (TACs) of the UGB Remand project in the presentation provided in Attachment 3. The hypothetical scenarios for 2040 are described in Attachment 5. A full list of the VMT-reduction strategies considered through the analysis is provided in the following section.

Analysis of VMT-Reduction Strategies

This section offers a brief summary of the VMT-reduction strategies considered for inclusion in this ILUTP. Those included in the modeling work to identify the most promising strategies are shown on **bold** below. Those not in bold were considered but could not be adequately captured with the modeling tools available. Instead, they were evaluated in a qualitative manner using the research cited in Chapter 2. The full list of strategies proposed as part of this ILUTP can be found in Chapter 4.

Land Use Strategies

- **Development code efficiency measures (from the UGB Remand project) including increasing the minimum density in the RS zone, making it easier to build a variety of housing types in the RS zone, and increasing density requirements for master planned neighborhoods***
- **Land use changes within Opportunity Areas (from the UGB Remand project) including designating new mixed use centers in central portions of the city that have potential for redevelopment***
- **Implementation of the Bend Central District Multi-Modal Mixed Use Area Plan***
- **Implementation of the Central Westside Plan***
- **The "Complete Communities" approach in expansion areas***
- **Focusing growth along strategic portions of transit corridors***

* Land use strategies were tested using the ET 7D travel model (through the type and intensity of development projected in each area of the city) as well as the regional travel demand model (through the housing and employment allocations at the transportation analysis zone level).

Transit system

- **Increase service frequency in primary transit corridors***
- **New corridors to serve growth areas***
- Capital improvements (e.g. major bus stop improvements)
- Transit priority lanes and queue jumps at major signalized intersections
- Enhancements to connect to transit services (e.g., pedestrian & bike improvements within ¼ mile of bus stops)

* Transit service improvements were tested using the Envision Tomorrow 7D travel model and the regional travel demand model by adjusting the assumed future transit networks and service frequencies.

Transportation Facility Improvements and Policies

- Streetscape improvement policies (looking at intersection and street "completeness" for all modes)
- Alternative transportation performance measures such as safety policies that can trump mobility concurrency requirements
- Planning for 3-lane corridors and minimizing the number of 5-lane corridors in the future
- Consideration of roadway grid completeness (e.g., local and collector street spacing)
- Major bike and pedestrian enhancements at transit nodes and targeted mixed use centers and corridors – implement the city bike and pedestrian priority projects
- **Stronger connectivity standards for new neighborhoods and large developments to increase intersection density***
- Urban Renewal Districts at Juniper Ridge, Murphy Crossing, and consideration of forming new Urban Renewal Districts in the Central Area and other locations to help fund multimodal transportation improvements

* The effect of greater connectivity in new master planned neighborhoods was evaluated through the ET 7D travel model by reducing assumed future block sizes below current standards to increase intersection density. The model takes future intersection density into consideration in estimating mode split and other travel outcomes. There are other ways to get at increased connectivity, particularly for pedestrians and bicyclists, without reducing block size (e.g. stricter mid-block accessway requirements), but those could not be reflected in the model.

Demand Management/Transportation Options

- **TDM programs in key areas/institutions (for example: Juniper Ridge and COCC (existing), OSU Cascades, Downtown Central Business District, Central Area, Medical Overlay District/St. Charles, and/or other opportunity areas)***
- TDM plan requirements in development code (e.g., for site with 50 or more employees)

* The effect of TDM in the key areas noted was estimated through post-processing analysis of the regional travel demand model – adjusting the trip generation from those areas slightly (e.g. 5-10% reduction based on literature review and best practices) to simulate the effect of commute trip reduction programs or other TDM efforts.

Key Findings from VMT Scenario Testing

Key conclusions and findings from the VMT analysis of the alternative scenarios for 2028 described above are summarized in this section.

UGB Scenarios and SAAMs

Testing of the six initial UGB scenarios and SAAMs using the regional Travel Demand Model revealed the following:

- Each scenario increased VMT relative to 2010 (ranging from a 2.9% to a 5.1% increase) due to the amount of growth located outside the center of the city. The increase relative to 2003 ranged from 8.1% to 10.3%. The TPR requires VMT to not rise above a 5% increase.

- Scenarios with an emphasis on complete communities in expansion areas and using growth areas to complete existing neighborhoods generally performed better on VMT.
- Even where there are complete communities in outer neighborhoods, the downtown remains a key destination. As a result, trip lengths and household VMT are generally lower in the central core of the city (see Figure 6 and Figure 7).
- Scenarios that focused growth close to the key transit and multimodal corridors that connect to downtown generally had shorter average trip lengths.
- The UGB scenarios that had the lowest growth in VMT all included better connectivity and more complete communities. (Note that the UGB Steering Committee selected a preferred UGB expansion scenario which had one of the lowest rates of VMT growth for further refinement as demonstrated by the UGB expansion proposal.)
- The ET household VMT estimate correlates closely to the VMT results from the regional travel demand model.

See the Scenario Evaluation Report, dated October 20, 2015, for detailed VMT results from the UGB expansion scenarios and Supplemental Analysis Area Maps.

2028 Hypothetical Scenario

Testing of a hypothetical scenario for 2028 using the ET 7D transport model provided the following insights:

- Shifting roughly 1,000 housing units and 2,000-2,500 jobs from expansion areas to opportunity areas in the core (above and beyond what is identified in Scenario 2.1G), combined with transit service improvements and reduced block size in new master planned neighborhoods, would reduce the growth in household VMT per capita slightly relative to 2014.
- The amount of redevelopment that was assumed in the core in this hypothetical scenario is not reasonably likely by 2028; significant transit service improvements may not be feasible by 2028; and increasing connectivity in master planned neighborhoods through smaller block sizes would have downsides including additional land being used for right of way, greater impervious surface area, and less developable area.
- The ideas tested in the hypothetical scenario are more appropriate for long-range strategies than for implementation by 2028.
- A focused approach to land use and transportation policies, programs, and projects in opportunity areas and the Core area has greatest effect on reducing or maintaining VMT growth.

The 2028 hypothetical scenario that was shared with the Residential and Employment TACs and its results are summarized in the presentation provided in Attachment 3.

VMT Analysis for the Preferred UGB Expansion Scenario

The VMT analysis discussed in this section was done using the Bend MPO Regional Travel Demand Model, in compliance with the specifications in the TPR for such analysis. This represents the official VMT estimate for the Preferred UGB Expansion Scenario.

Key Assumptions

The TPR allows local governments to take credit for "regional and local plans, programs, and actions implemented since 1990 that have already contributed to achieving the objectives specified...", including that VMT per capita is unlikely to increase by more than five percent. [46] This has been interpreted to mean that the local government may estimate an amount of VMT reduction that is being achieved through plans, programs and actions taken prior to the planning period but since 1990. The City of Bend implemented several connectivity improvements that would be expected to reduce VMT per capita, such as a new river crossing and an extension of Empire Avenue. The regional transportation model was used to test the impact of these improvements by analyzing 2003 land use with both the 2003 model network and a 1990 network that did not include the connectivity improvements. VMT per capita from these model runs were compared in order to calculate the benefit of the connectivity improvements since 1990. This analysis is documented in Attachment 6.

In addition, based on the literature summarized in Attachment 3, the following reductions in average daily trip generation (i.e. the number of cars entering and leaving) has been assumed for 2028 based on existing and proposed TDM programs and strategies:

- Juniper Ridge: 5% reduction based on the TDM program and requirements in effect there (see Chapter 4 page 41);
- COCC: 10% reduction due to the TDM program in effect there (see Chapter 4 page 41);
- OSU Cascades: 10% reduction based on the proposed Institutional Master Plan requirement to implement a TDM program / strategies.

These reductions have been factored into the projected VMT results for the Preferred UGB Expansion Scenario.

VMT Results

Table 1 summarizes the results of the VMT analysis with the regional travel demand model for the preferred scenario in comparison to both the 2003 and 2010 baseline years. VMT per capita increases by just over 1% relative to the 2010 baseline. Because there was nearly a 5% increase between 2003 and 2010, comparing to the 2003 baseline yields just over a 6% increase in VMT per capita. However, comparing the 2028 VMT to what VMT *would have been* in 2003 without the connectivity improvements that the City has implemented since 1990 (which have been shown to reduce VMT growth) showed a VMT increase of less than 5% relative to the modified 2003 baseline. Thus, with this ILUTP, the City is in compliance with TPR requirements related to VMT, regardless of which baseline year is considered. See TPR Compliance Section in this document (page 56) for further explanation.

[46] OAR 660-012-0035(5)(b)

Table 1: VMT per Capita in 2003, 2010, and 2028 (preferred UGB expansion scenario)

	2003 baseline	2010 baseline	Preferred UGB Expansion Scenario (2028 projection)
Daily Vehicle Miles Traveled per capita	9.18 / 9.38 [47]	9.64	9.76
Percent increase relative to 2010	N/A	N/A	1.2%
Percent increase relative to 2003	N/A	5.0%	6.3% / 4.1% [47]

VMT Performance by Area

VMT, mode share, and average trip length vary throughout the City. The maps on the following pages illustrate the variation in average trip length (Figure 6), based on the MPO travel demand model; household VMT per capita (Figure 7), based on the ET 7D transport model; and mode split (Figure 8), based on the ET 7D transport model. (Note that VMT per capita and mode split data are not available at the TAZ level from the MPO travel demand model.)

[47] With credit for connectivity improvements since 1990. See Attachment 6 for details.

Figure 6: Average trip lengths from UGB Expansion Scenario 2.1G

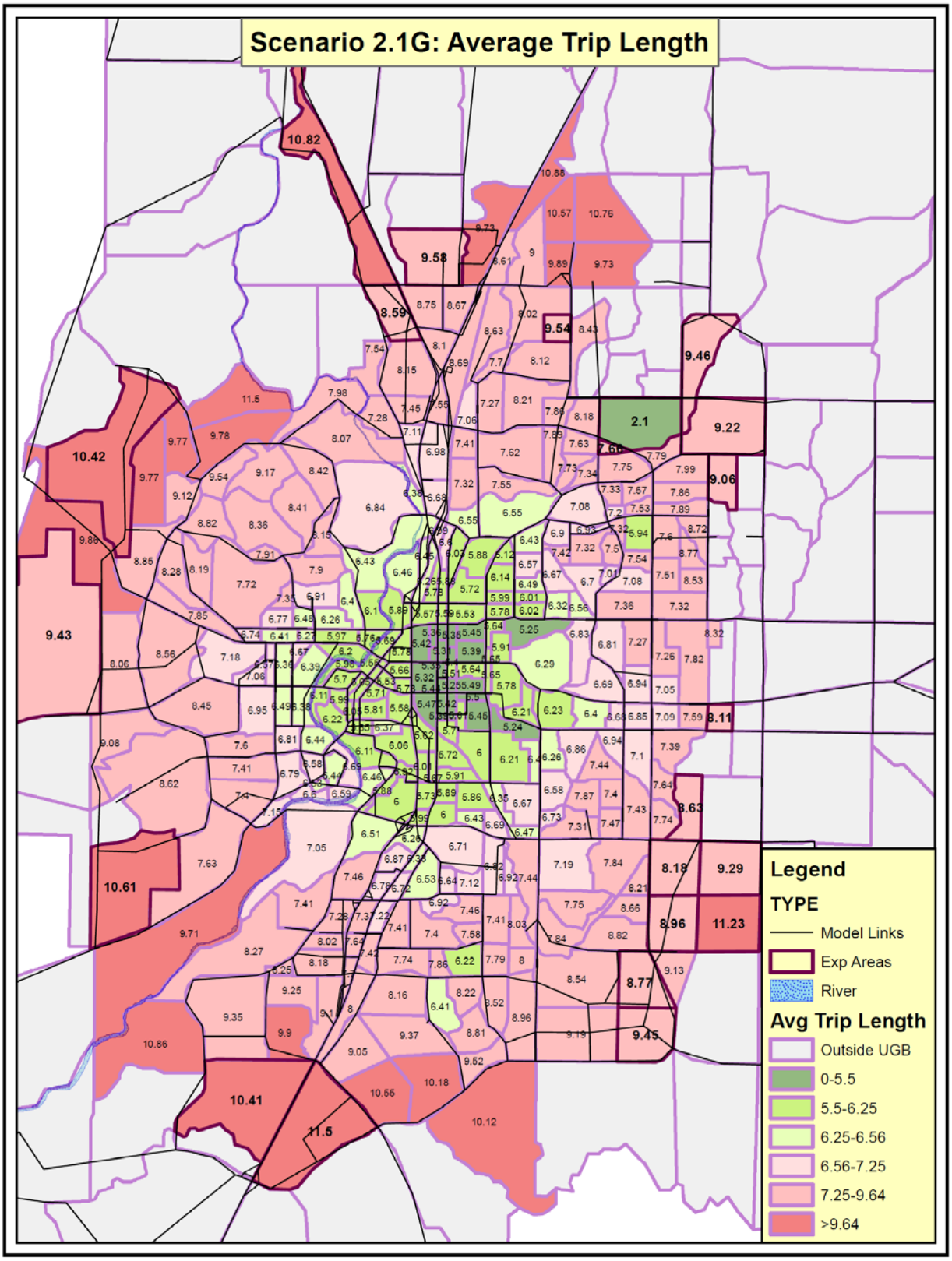


Figure 7: VMT per capita from UGB Expansion Scenario 2.1G

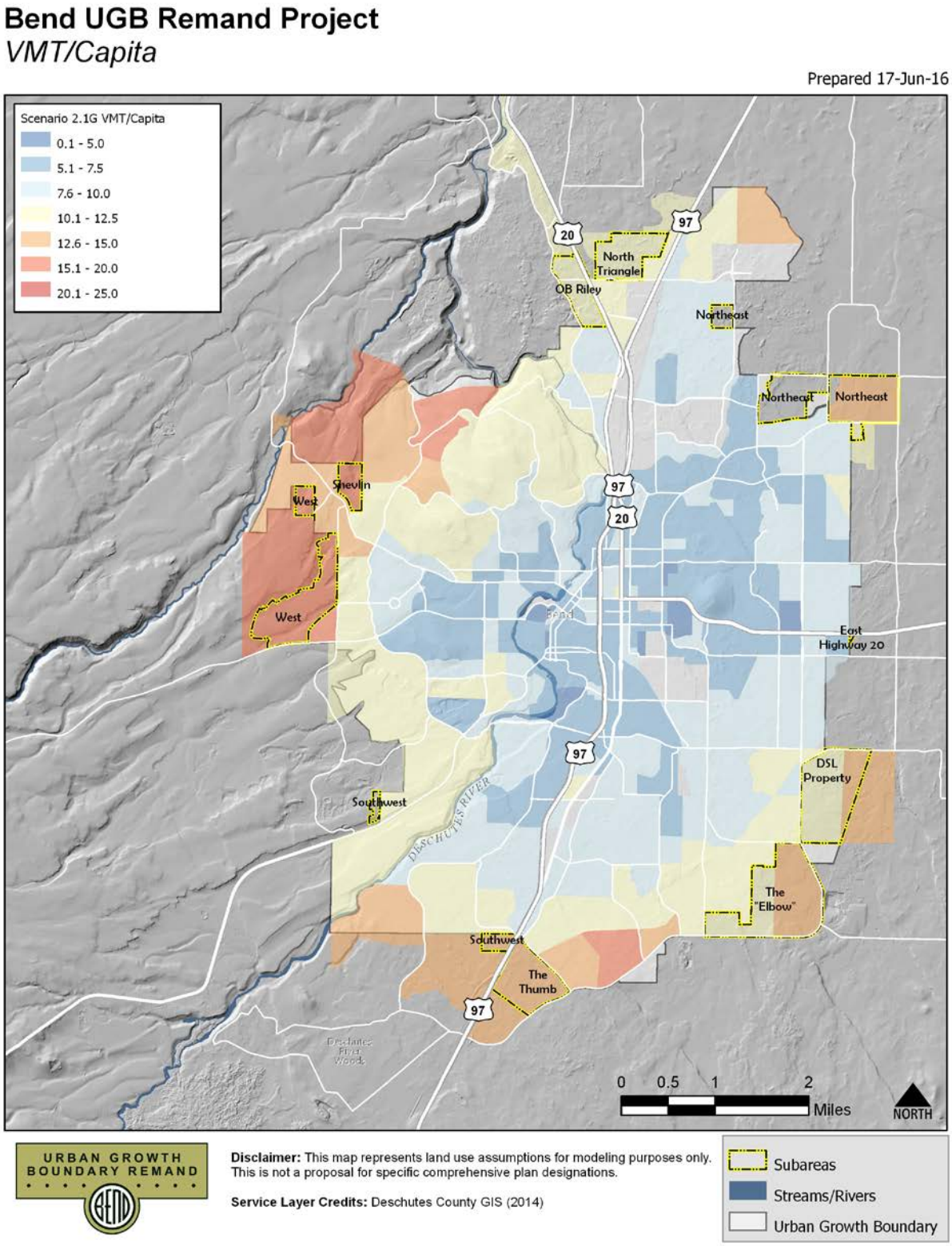
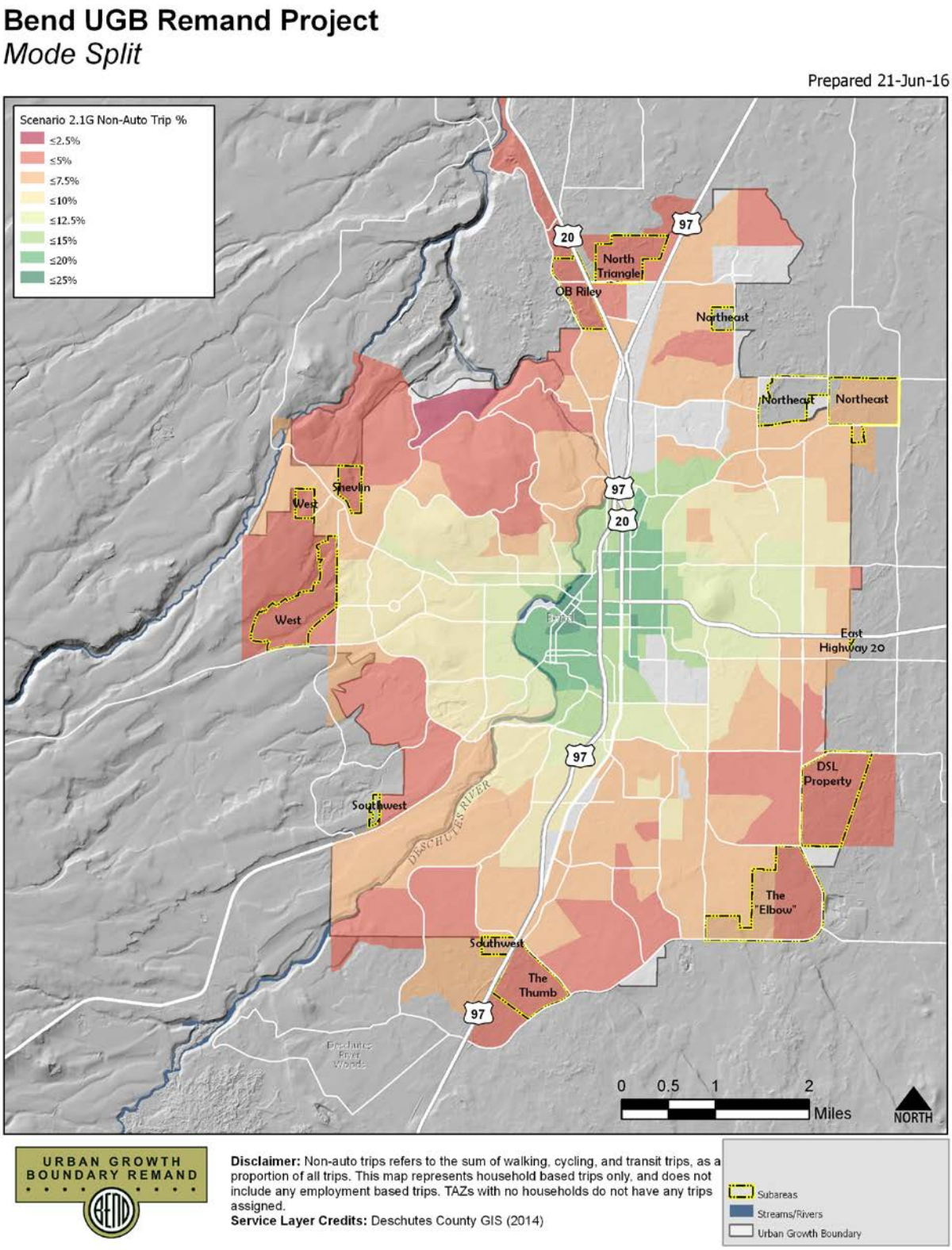


Figure 8: Mode Split from UGB Expansion Scenario 2.1G



CHAPTER 4. EXISTING AND PROPOSED VMT REDUCTION STRATEGIES

Introduction

High Level Outcomes

The high level outcomes intended for this ILUTP are to:

- Support the City's goal to create a balanced transportation system;
- Create a transportation system and facilities that support the City's complete communities goal;
- Implement a transportation system that supports the City's vision for opportunity areas, the Central Core, and UGB expansion areas;
- Increase transportation choices and reduce reliance on the automobile; and
- Over time, reduce VMT per capita in Bend.

This plan takes a comprehensive approach, where land use, transportation, and other tools are integrated to achieve the above-stated outcomes. The plan recognizes that land use and transportation policies and strategies focused on the opportunity and core areas will have the best chances for reducing VMT. This plan also takes an evolutionary approach, recognizing that both short- and long-term strategies are essential, and that time and monitoring of progress will be needed for successful implementation.

The approach to implementation will be to identify corridors and centers (e.g. opportunity areas in the core) that will have the highest likelihood to reduce VMT for a set of costs. Coordination of the transportation system and land use patterns will have the most impact on VMT reduction. The greatest VMT reductions will happen in locations that have some or many of the needed land use and transportation attributes already in place, and which, for modest amounts of funding, can greatly reduce reliance on the automobile. Assessing how the "7 Ds" (see page 11) interact along corridors or in centers will be important as projects and programs are developed and implemented to reduce VMT. For instance, neighborhoods and centers that have an extensive network of gridded streets may only require key pedestrian or bicycle safety projects to greatly increase the potential for walking and biking trips.

Overview and Organization

This chapter is organized by the topic areas identified as elements of an ILUTP under Division 12, Section 0035(5)(C):

- Land use strategies
- TDM strategies[48]
- Public transit planning
- Policies related to review and management of major roadway improvements

[48] Parking management is combined with TDM in this chapter, since parking management is a component of TDM.

- Additional Plan and Ordinance Provisions (focused on Complete Streets and connectivity investments)

The strategies are grouped into three categories:

- *Efforts to date*: existing policies and work that Bend has done since 1990 to address the topic.
- *Proposed strategies*: the new actions, policies, and plan or code amendments that are proposed at present to address the topic. These are proposed to be included with the 2016 UGB adoption package, unless otherwise noted. All proposed strategies will be implemented within three years.
- *Additional strategies for further consideration*: additional measures that require more detailed planning or additional funding, which may be implemented over the medium- to long-term.

This chapter closes with a summary by topic area of the *proposed strategies* and "medium-term", and "long-term" levels of implementation of the *additional strategies for further consideration* described in the sections below. The "medium-term" and "long-term" levels of implementation correspond to varying degrees of effort and cost as well as time.

Note that where specific existing policies are cited in this chapter, the numbering is based on the General Plan as of 2016 and also reflects the numbering in the TSP. This numbering may change with updates to Chapter 7 of the newly titled Comprehensive Plan. The policies in the TSP will remain as a record of the original policies, and the policies cited may be found there by their original numbering.

Land Use Strategies

Efforts to Date

- In 2005, Bend established minimum densities for all residential zones.
- The parking code was updated in the mid-2000s to match TGM Smart Code parking standards, establishing parking maximums.
- In 2006, the Bend code was updated to allow the maximum height to be increase by 10 feet above maximum when residential uses are provided above the ground floor in all commercial zones.
- RM zoning is already focused near major employment and retail shopping areas and in proximity to transit corridors.
- The City developed the Bend Central District Refinement Plan in 2014 to bring a greater mix of uses to that area and help it transition to a less auto-oriented development pattern.
- Existing Neighborhood Commercial standards allow small neighborhood commercial services in residential areas without a zone change.
- Current neighborhood masterplan standards require new neighborhoods to provide convenient access to commercial services inside or outside the neighborhood.

Proposed Strategies

The City is adopting a package of "efficiency measures" with the 2016 UGB expansion that also address many of the land use strategies identified in the TPR. The measures proposed that address each of the required categories are summarized below.

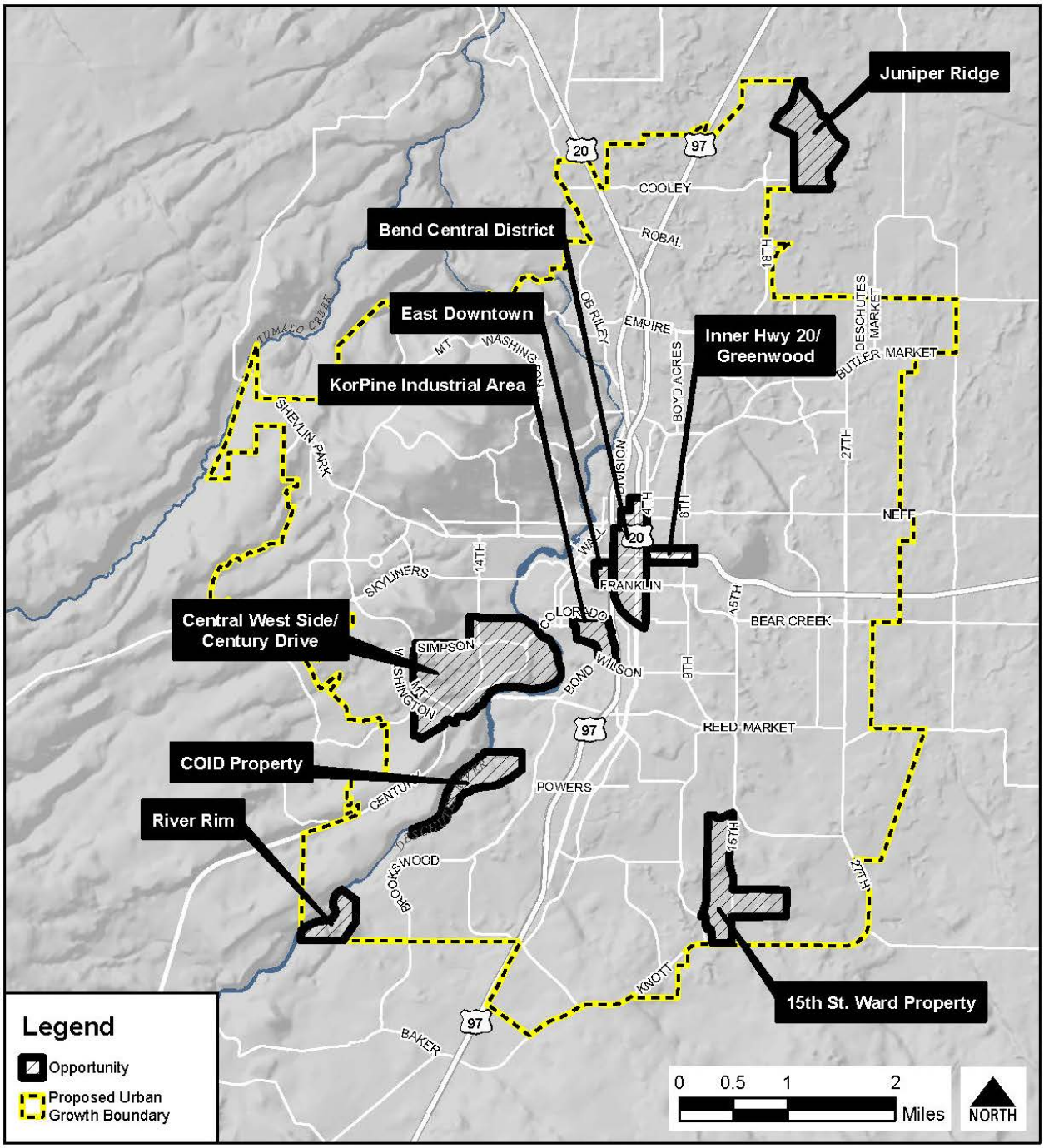
> *"(a) Increasing residential densities and establishing minimum residential densities within one quarter mile of transit lines, major regional employment areas, and major regional retail shopping areas;*
>
> *"(b) Increasing allowed densities in new commercial office and retail developments in designated community centers;*

In Bend, many areas in close proximity to transit, employment, and retail areas that have the most opportunity to increase residential development are currently designated for commercial or industrial uses. The city is proposing a set of land use re-designations in key "Opportunity Areas" identified through the UGB project and other planning studies (e.g. the Central Westside Plan (CWP) project and the Bend Central Multimodal Mixed Use Area study). Many of these are changes from commercial or industrial designations to mixed use designations that allow for and encourage residential development and more compact form. Specifically, new mixed use designations and/or zones are proposed in concert with the 2016 UGB expansion for:

- The Bend Central District, between the Parkway and 4th Avenue from roughly the railroad on the south to Revere on the north (implemented as a special plan district);
- CWP/Century Drive opportunity site (implemented using the new mixed use plan designations developed for the UGB project; the land use designations and projects in the CWP have been predicted through both Envision Tomorrow and transportation demand modeling to result in lower VMT);
- KorPine opportunity site (implemented using the new Mixed Use - Urban plan designation and zone developed for the UGB project);
- East Downtown opportunity site (implemented using the new Mixed Use - Urban plan designation and ultimately the new Mixed Use - Urban zone developed for the UGB project); and
- The Inner Highway 20 / Greenwood Ave opportunity site (implemented using the new Mixed Use - Neighborhood plan designation and ultimately the new Mixed Use - Neighborhood zone developed for the UGB project).

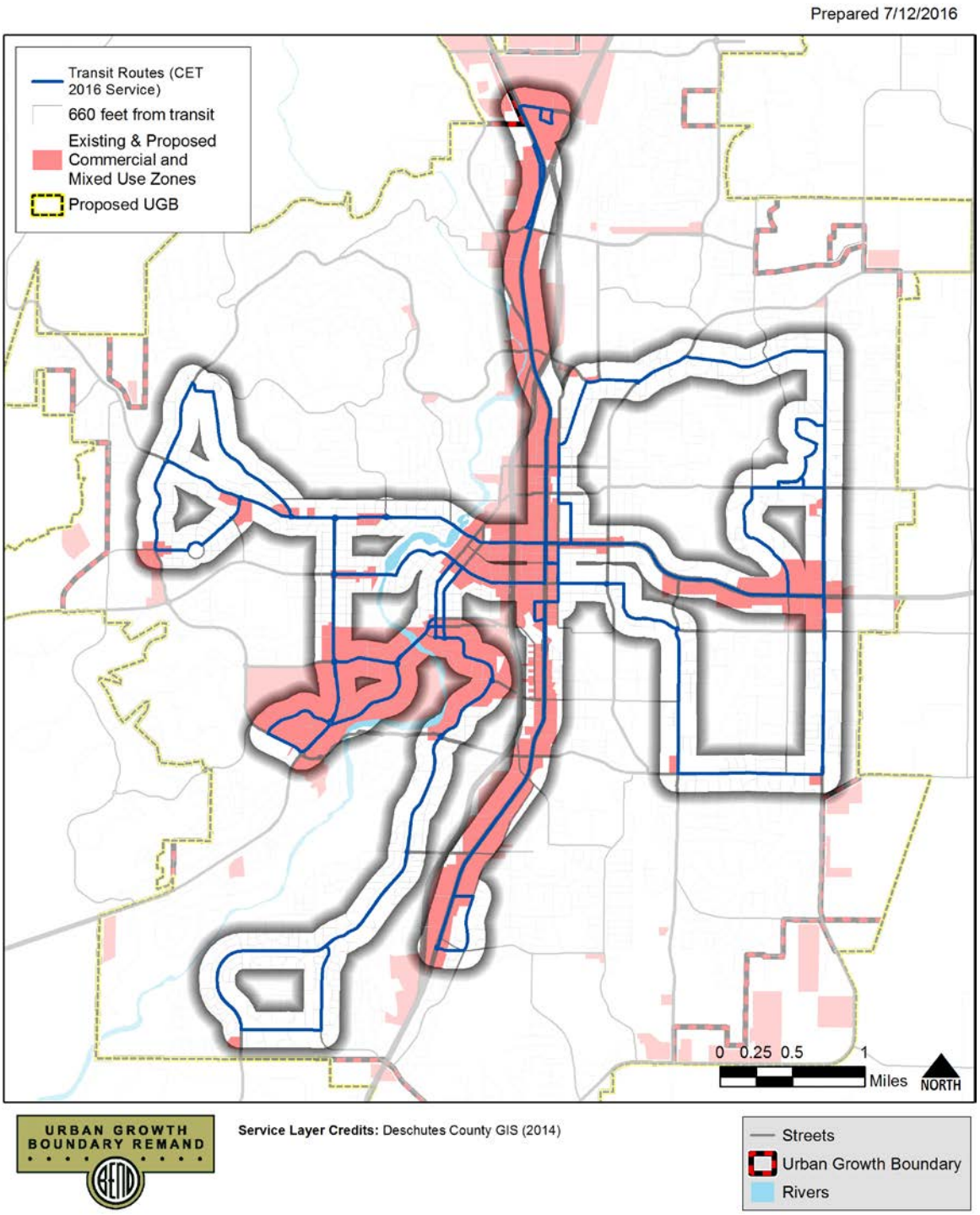
See Figure 9 for a map of these and other opportunity areas.

Figure 9: Opportunity Areas



By enabling and encouraging mixed use, more residential development will be possible in close proximity to transit, employment, and shopping within Bend's core. In addition, a minimum residential density is proposed for residential development in commercial and mixed use zones within 660 feet of transit (see Figure 10) so that the land is used efficiently and developed at transit-supportive densities.

Figure 10: Commercial and Mixed Use Zones and Transit Routes



The new mixed use zones also reduce parking standards and allow for taller buildings and more urban development patterns that effectively increase allowed density for new commercial office and retail developments.

In addition, because there are many existing low-density neighborhoods near transit, employment, and retail, several of the city-wide modifications to the development code also have the effect of potentially increasing residential densities in those targeted areas. This proposed package of efficiency measure code changes include:

- raising the minimum density in the RS zone (especially for new master-planned neighborhoods);
- allowing a greater mix of housing types outright in the RS zone;
- increasing the maximum residential density in RL zone; and
- removing the cap on net density for multi-family housing in the RM and RH zones to allow greater flexibility in reaching the allowed maximum gross density.

Other proposed code amendments being adopted in the UGB Remand allow for greater densities in the ME zone by removing maximum lot coverage and the minimum front setback, among other changes. This zone is largely applied along major roadway corridors that are also transit routes. Finally, proposed reductions to parking requirements for mixed use development and for development within 660 feet of a transit route also have the effect of slightly increasing allowed densities for new office and retail development, particularly around transit.

> *"(c) Designating lands for neighborhood shopping centers within convenient walking and cycling distance of residential areas;*
>
> *"(d) Designating land uses to provide a better balance between jobs and housing considering:*
>
> > *"(A) The total number of jobs and total of number of housing units expected in the area or subarea;*
> >
> > *"(B) The availability of affordable housing in the area or subarea; and*
> >
> > *"(C) Provision of housing opportunities in close proximity to employment areas."*

All UGB expansion areas include commercial nodes to complete existing and new residential neighborhoods. In addition, new commercial nodes are proposed on the largest vacant residential site in the existing UGB (the 15th Street opportunity area). These new nodes will help provide walkable local services for many more neighborhoods. Over time, as the UGB expansion areas develop as complete neighborhoods, it is assumed that VMT growth could be minimized because of the complete neighborhoods and street patterns.

The expansion areas also help improve jobs/housing balance in many areas, including:

- South and Southeast Bend, where new employment areas are proposed north of Knott Road and east of US 97 to help balance a largely residential area of the city;

- the “North Triangle”, where a mix of housing types, including multifamily housing, is proposed in an area dominated by employment uses with excellent access to jobs; and
- the OB Riley area, where a mix of housing and employment is proposed, providing additional housing opportunities in close proximity to large employment areas.

Furthermore, the adoption of new mixed use designations in opportunity areas within central Bend also helps provide affordable housing opportunities in the central core where there is access to significant employment opportunities.

Additional Strategies for Further Consideration

In order to ensure that the new mixed use areas succeed, the UGB project also identified several longer-range land use strategies that merit additional consideration in the future as the City begins to monitor and measure VMT over time. The focus for the City will be to concentrate land use changes and transportation investments in the Core and Opportunity Areas. These are summarized below.

- The UGB project identified potential for infill and redevelopment over the longer-term future in the Bear Creek & 27th Avenue residential area, in addition to the opportunity areas where mixed use zones and/or plan designations are being adopted along with the UGB. The project team also conducted an evaluation of long-term redevelopment potential in transit corridors outside the UGB project opportunity areas, which is summarized in Attachment 7. The City may consider rezoning selected areas along transit corridors that are identified as having the greatest potential for transit-supportive infill and redevelopment.

- Along transit corridors and in other key pedestrian areas, the City may adopt additional code measures to support pedestrian- and transit-oriented development. Draft development code language related to enhanced pedestrian-/transit-oriented design areas is included in Attachment 8 as an example and a starting point for further refinement.

- The City may consider changes to block size and/or connectivity standards for new master-planned neighborhoods, or other tools to increase bicycle and pedestrian connectivity and intersection density in new neighborhoods.

In addition, the City may identify other amendments which increase densities, destination density and diversity, and good pedestrian design.

Transportation Demand Management

Efforts to Date

Education and Outreach

Currently, the city contracts with Commute Options for implementing a voluntary TDM program (Drive Less Connect), which includes education and outreach about transportation options such as walking, biking, and includes a ridesharing matching tool. Commute Options directs its efforts toward larger employers, and currently has approximately 50 businesses in Bend

participating. In addition, Cascades East Transit and Commute Options offer a group bus pass program.

General Development Code Incentives

The City's Development Code provides existing incentives for TDM:

- Chapter 4.7 allows a reduction of trip generation rates for traffic impact analysis of up to a total of 25% for implementing TDM measures including:
    - Providing employee showers, lockers and secure indoor bicycle parking ;
    - Providing no more than the minimum required parking through maximizing the use of permitted on-street parking and shared parking agreements.
    - Providing a minimum of 5% of the overall required parking as free priority parking for carpools and vanpools
    - Providing twice as many covered, secured bike parking facilities as required
    - Being located within ¼ mile of a transit facility and participating in the CET Group Bus Program
    - Charge the actual cost to provide on-site parking on an annual basis for employee parking (exempting carpool/vanpool)
    - Participate in a TDM incentive program recognized by the City
    - Provide other TDM elements as approved by the City
- Chapter 3.3 provides a reduction to off-site parking requirements of up to 10% based on TDM measures, including:[49]
    - Designating at least 10% of the employee motor vehicle parking spaces as carpool/vanpool parking and placing such spaces closer to the building than other employee parking;
    - Providing showers and lockers for employees who commute by bicycle;
    - Providing twice as many covered, secured bicycle parking racks or facilities as required by this code; and
    - Providing a transit facility (e.g., bus stop) that is approved by the local transit authority, with related amenities. Related amenities include, but are not limited to, a public plaza, pedestrian sitting areas, shelter, and additional landscaping.
    - Other incentives provided in an approved Employee TDM Plan.

The City's development code also contributes to parking management by allowing credit for on-street parking up to 50% of required parking,[50] allowing shared parking under certain circumstances,[51] setting parking maximums,[52] lowering parking requirements in the CB zone (downtown),[53] and allowing development within the CB zone to pay a fee in lieu of providing off-street parking[54].

[49] BDC 3.3.300(D)(1)(b)
[50] BDC 3.3.300(B)(2)
[51] BDC 3.3.300(B)(5)
[52] BDC 3.3.300(E)
[53] BDC 3.3.300(A)
[54] BDC 3.3.200

Area-Specific TDM Requirements

The City currently imposes TDM requirements on two subareas: Central Oregon Community College (COCC) and Juniper Ridge Employment Sub-District, through the Special Planned District section of the Bend Development Code.

Central Oregon Community College

For COCC, Section 2.7.1007 (Transportation) states:

> "Trip reducing mitigation measures, including but not limited to a coordinated TDM plan, may be evaluated and credited in connection with each development application. In accordance with BDC Chapter 4.2, applications for the development of Campus Village and Core Campus uses must demonstrate that transportation facilities have adequate capacity to serve the proposed use."

Juniper Ridge

For Juniper Ridge Employment Sub-District, TDM measures are the result of a trip cap placed on the area through negotiation with ODOT. Codes, Covenants and Restrictions are placed on all lots within the sub-district that require to form a Transportation Management Association (TMA) to:

> "…assure a ten percent (10%) reduction in peak hour traffic within the Juniper Ridge Employment Sub-District from the traffic that would otherwise be generate absent the existence or enforcement of TDM provisions…"

Section 2.7.2030(D) of the Bend Development Code requires the creation of a TMA, as follows:

> "Transportation Management Association (TMA). A TMA organized to operate in a manner that is consistent with the Transportation Demand Management goals and policies in the City's Transportation System Plan and BDC 4.7.500 will be developed for the Employment Sub-District. All site development review applications within the Employment Sub-District that are subject to review under BDC Chapter 4.2 shall demonstrate conformance with Employment Sub-District TMA program requirements."

Commute Options has prepared a TMA guideline for the Juniper Ridge Employment Sub-District businesses to follow in the future. TDM measures are imposed on new businesses developing at Juniper Ridge.

Proposed Strategies

A new policy is proposed that will address the direction and intent for increasing the use of TDM in appropriate areas of the City. The intent is to create an incentives approach to TDM and to focus on businesses and institutions with 50+ employees and/or students and/or specific geographic areas such as downtown, Central Area, portions of the Medical District Overlay Zone around St Charles, Juniper Ridge (existing) and COCC (existing).

In addition, the City is currently in the process of updating regulations for master plans for large institutional uses. As part of that update, the City will incorporate requirements for TDM

measures that will apply to all new institutional master plans, including OSU's Cascades campus.

The City is also committed to conducting an analysis of parking management and pricing options (see below). Depending on the outcomes of the parking study, the City may have additional policies and commitments relating to parking practices and policies that are tied to VMT reductions.

Additional Strategies for Further Consideration

Additional Incentives – SDC Fees

One near-term strategy for further consideration is to apply the trip-generation reductions currently under consideration for traffic impact studies to the Transportation System Development Charge (SDC) methodology. The City will be updating the Transportation SDC methodology next year (2017). At that time, it may consider making the TDM trip generation reduction automatic for those applicants who have been approved to use it for the traffic impact study. This would provide an additional monetary incentive to implement TDM.

Expanded TDM Requirements and Support for TMAs

An expanded TDM program, such as the Commute Trip Reduction Program directed by the Washington Department of Transportation[55], specifically directed toward larger employers, could be an effective VMT reduction tool, particularly for peak travel times. The City could consider using a regulatory plus incentives approach to TDM, through actions such as:

- Requiring TDM plans for large businesses (in addition to the institutions currently being considered). This could be targeted in a number of different ways, such as:
    - limited to specific areas, such as within 660 feet of transit;
    - limited to zones that generally have conditions conducive to successful TDM programs, such as the new mixed use zones and the Central Business District;
    - limited to large employment developments that go through a master plan process; or
    - limited to businesses/institutions with more than a certain number of employees or students of driving age (e.g. 50 or 100), or those projected to generate more than a certain number of trips.
- Partnering with employers to create new TMAs in certain geographic areas such as downtown, Bend Central District, portions of the Medical District Overlay Zone around St Charles, and COCC (which has an existing TDM program, but not a separate TMA).
- City incentives and support for small businesses located along major pedestrian corridors (e.g. Newport Avenue, NW 14th Street, or 3rd Street).

The City will also conduct a review of the potential for TMAs and related TDM and parking strategies for the opportunity areas identified in the UGB remand. The strategies would be part of a more comprehensive transportation approach in these areas to broaden travel options and reduce VMT.

[55] http://www.wsdot.wa.gov/transit/ctr

Parking Management

The City of Bend is currently conducting a city-wide parking study, which began in the fall of 2015. The City is required to comply with TPR OAR 660-012-0045(5)(c), which requires the development of a parking plan that would result in a city-wide 10% reduction of per capita parking spaces, among other tools. Currently, the City does not have a citywide parking plan. This project will create new policies and code language that will result in parking programs to support Bend's goals for a livable and economically healthy city.

In 2016-17, the City will also conduct two parking studies to determine the feasibility and appropriate tools for establishing parking management districts and/or transportation management areas. These studies will be conducted for the Galveston Avenue and 14th Street corridors. The City's only existing parking district is in downtown.

Transit

Efforts to Date

The City of Bend has a long range transit plan created in 2012 that included service plans and potential for future routes and services based on broad land use assessments, development opportunities and demographics. Cascades East Transit has recently implemented transit service improvements that were identified in the long-range plan as "mid-term" improvements (e.g. adding new bus routes, extending service hours, and decreasing headways in peak periods). The plan estimated the mid-term improvements (the changes in service that went into effect Sept 21, 2015) to have an annual operating cost of about $2.4 million.

In addition, the City has existing policies in the transportation section of the comprehensive plan that support transit and encourage transit-supportive land use and street design, including several policies that the city will work with other agencies to plan and seek funding for transit, and a policy regarding transit-supportive land use:

- *To accommodate a fixed-route transit system, land use ordinances and other regulations shall be implemented that establish pedestrian and transit-friendly design along potential or existing transit routes.* (6.9.5.5)

Proposed Strategies

Enhance transit priority corridors in the opportunity areas through a combination of land use codes (i.e. new mixed use zones in opportunity areas) and transportation enhancements that support increased transit use. Propose new and enhanced transit funding.

Include transit policies and enhancements when conducting transportation and land use planning studies within identified opportunity areas.

Additional Strategies for Further Consideration

The long range transit plan includes additional service improvements for the mid- to long-term contingent on funding:

- Add one hour of new service in the morning from 5-6 am (60 minute service during that extra hour)
- Add two hours of new service in the evening from 8-10 pm (would be 60 minute service)
- Extending Saturday service to operate from 7 am to 7 pm (30 or 60 minute service depending on route) – service today is roughly 8 am – 5 pm with 60 minute service
- Add Sunday service from 8 am – 5 pm (currently only limited dial-a-ride service on Sundays)
- Add a new route that would provide service to part of the Butler/Brinson/Empire business area as well as Juniper Ridge
- Decrease headways to 15 minutes during peak periods (6-9 am and 3-6 pm) on primary routes (3rd Street, and Greenwood, Brookswood, and Galveston avenues, and possibly others). During non-peak hours, those routes would operate on 30 minute headways.
- Decrease headways on non-primary routes to 30 minutes during peak periods and either 30 or 60 minute headways during non-peak periods.

The plan estimated the long-term improvements to have an annual operating cost of about $5.7 million. A potential new route to serve the opportunity area in southeast Bend has also been discussed as part of the UGB project, but requires more detailed evaluation.

Beyond the improvements identified in the long-range plan, additional ideas that need more work include developing new point to point routes and developing additional transit centers. Cost estimates for these types of improvements will be determined during the planning for specific areas and corridors.

The most ambitious and expensive transit plan would include planning, design and construction of a bus rapid transit system along major transit corridors. This could begin with a series of incremental improvements, such as preferred lanes, queue jumps, and transit signal priority.

A description of potential Medium-Term and Long-Term transit service scenarios developed to support modeling efforts for this ILUTP is attached as Attachment 9. These have been discussed informally with COIC and the MPO but are not intended to represent an approved plan.

Roadway Improvement Management and Policies

Efforts to Date

The City's General Plan includes a policy that minor arterials may not be widened for additional travel lanes without first evaluating the potential for eliminating the need to widen by implementing certain transportation demand management and transportation system management measures[56]. This is intended to emphasize community and streetscape design that will continue to foster and enable non-automobile modes of travel. In the text of the TSP,

[56] Bend Area General Plan, Chapter 7, policy 6.9.6.21.

specific minor arterials in the Central Area of Bend are identified as "not authorized for lane expansion" unless the Plan is amended by Council action.[57] These include:

- NW 14th Street between Newport and Galveston avenues
- NW Newport Avenue between 14th and Wall streets
- NW Galveston Avenue between 14th Street and Riverside Avenue
- NW Greenwood Avenue between Wall Street and the Parkway
- NW Riverside Avenue between Tumalo and Franklin avenues
- NW Franklin Avenue between Wall Street and the Parkway
- NW Wall Street between Greenwood and Franklin avenues
- NW Bond Street between Greenwood and Franklin avenues
- NE 8th Street between Olney/Penn and Franklin avenues
- NE Olney Avenue between 4th and 8th streets
- NE Franklin Avenue between 4th and 11th streets
- NE Bear Creek Road between Franklin Avenue and 15th Street

Other relevant existing policies in the Transportation System Plan and General Plan include:

- *The City shall adopt land use regulations to limit the location and number of driveways and access points, and other access management strategies on all major collector and arterial streets.* (6.9.2.1)
- *The City and State shall implement transportation system management measures to increase safety, reduce traffic congestion to improve the function of arterial and collector streets, and protect the function of all travel modes.* (6.9.2.3)
- *Access control shall be part of the design standards for major collectors, arterials, principal arterials and expressways to ensure that adequate public safety and future traffic carrying capacity are maintained while at the same time preserving appropriate access to existing development and providing for appropriate access for future development. ...* (6.9.6.6)

The City standards and specifications include Roundabout Design Guidelines which is a comprehensive approach to intersection design, The Guidelines focus on roundabouts as the preferred intersection form in the City. Roundabouts are significantly safer, have lower carbon emissions, and more efficient capacity. These attributes, although not directly related to VMT reduction, roundabouts increase the possibilities for safer pedestrian and biking mode splits in complete communities.

The Bend Development Code, Chapter 10-10, Section 3.1.400, includes standards and procedures for evaluating and managing vehicular access and circulation during development review to maintain adequate safety and operational performance standards, and to preserve the functional classification of roadways as required by the City's TSP.

[57] Bend Transportation System Plan, Section 6.5.1.4

In addition, the City has updated the Transportation Analysis chapter (Chapter 4.7) of the Bend Development Code. The amended code includes two key changes:

- Allows flexibility in requiring turn lanes or other widening, including analysis of safety, adjacent land uses, and other factors.
- Grants the City Manager the ability to suspend the mobility standard for a particular intersection. This will benefit projects that affect intersections in unique situations, such on streets within special planned areas, the Central Business District, historic districts, that are identified in the City's TSP as "not being authorized for lane expansion," or where widening might result in unacceptable tradeoffs to other modes of travel, but may exceed the City's operation standards.

Outcomes from the 2012 Safety Study found that roadways larger than three travel lanes have more frequent and serious injury pedestrian and biking crashes. The 3rd Street and Highway 20 corridors were found to have systemic crash issues. These corridors are also in or adjacent to the East Downtown, Central Area Plan, and Central Highway 20 opportunity areas. Because of this, the City recognizes that adding width to roadways to achieve mobility standards might be counter-productive.

Proposed Strategies

The City has been implementing selective "road diets" consisting of lane removal or narrowing in areas where specific safety issues related to lane configuration have been identified through the citywide Safety Implementation Project. The City has identified the following projects:

- Franklin Avenue between 1st Street and 5th Street
- Greenwood Avenue between Awbrey Road and 3rd Street
- Colorado Avenue (Parkway to Bond or Lava Street
- 3rd Street in vicinity of the RR underpass
- Revere Street in vicinity of Division Signal (Wall Street to 4th Street)

Additional Strategies for Further Consideration

Develop pedestrian and biking safety plans for the opportunity areas that enhance the possibility for higher walking, biking, and transit modal splits.

Additional Plan and Ordinance Provisions: Complete Streets and Connectivity Investments

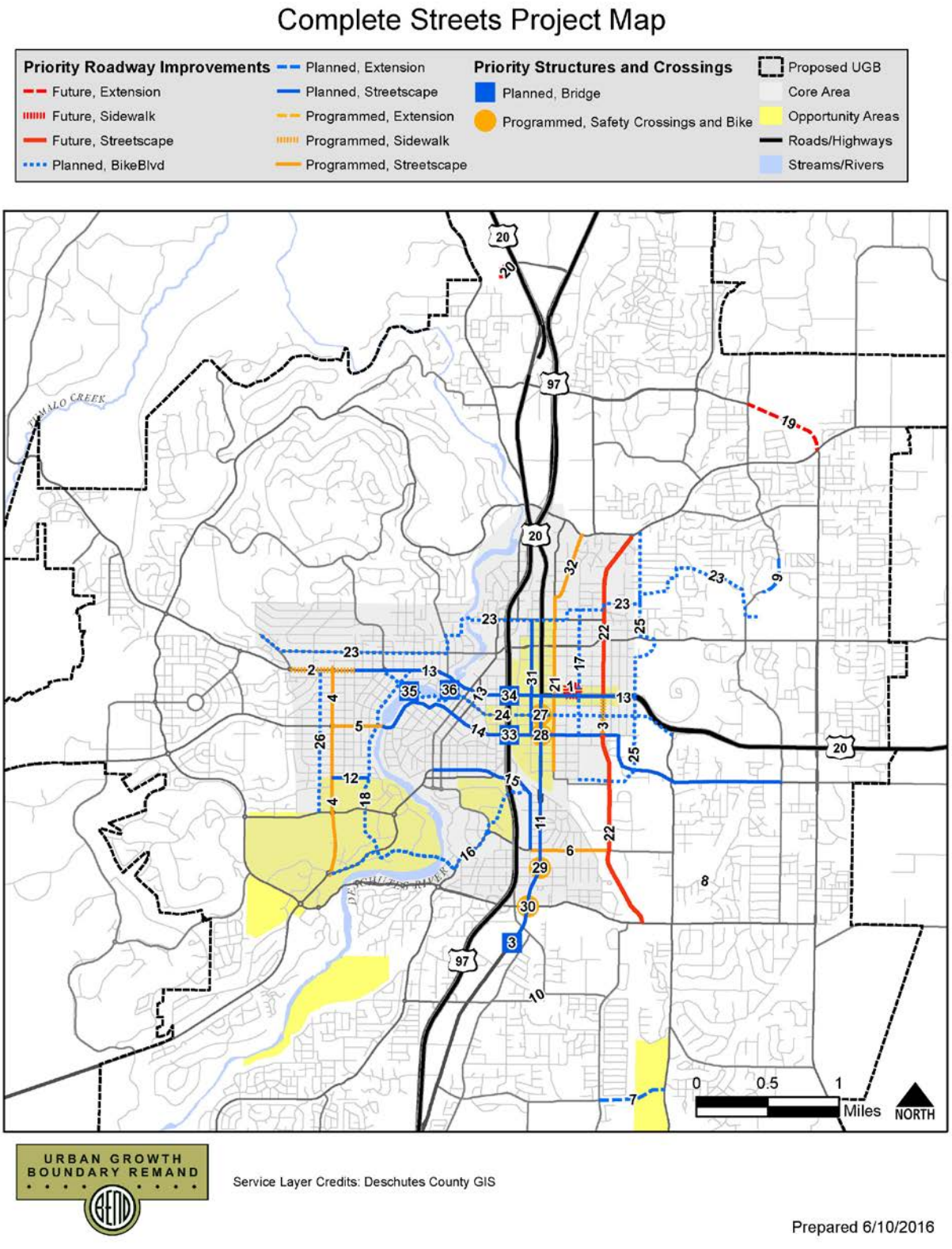
Efforts to Date

The City of Bend has a program for identifying pedestrian and bicycle improvement priorities[58]. There are $3-5 million for design and construction of pedestrian and bike improvement projects in the current Capital Improvement Program. The City has a list of priority safety crossing projects identified in the 2012 Bend Safety Implementation Plan and another priority list for walking and bicycling corridors, and bicycling and walking structures found in the 2014 Strategic Implementation Plan for Pedestrian and Bike Infrastructure. These projects are identified on

[58] See "Safety Implementation Plan" 2014; "2014 Strategic Implementation Plan for Walking and Biking"

Figure 11, and listed (along with estimated project costs) in Attachment 10. For instance, there are safety crossing projects on 3rd Street and Highway 20 corridors that are in, adjacent, or lead to and through three opportunity areas: East Downtown, Central Area, and Highway 20. The pedestrian and bike plan priorities were created by identifying existing walkable and biking areas in the City that had the most potential to increase those mode splits. These areas in most cases overlap with the UGB opportunity and core areas.

Figure 11: Complete Streets Projects



Proposed Strategies

The City will review the existing pedestrian and biking plan and priorities for consistency with the opportunity and core areas. This will include an update to the methods and approaches to the priorities.

The City will update the transportation CIP and the transportation system development charge policies and documents within three years after the UGB remand is approved. The updates will include the ILUTP implementation.

In the near-term (by 2028), the City anticipates being able to implement planned and funded ("programmed") projects from the work described above, including sidewalks, bike lane improvements, and up to six enhanced roadway crossings in or adjacent to opportunity areas. As part of this implementation work, the City recognizes that multimodal traffic data is needed for assessing the effectiveness its complete streets projects. The City has embarked on a program to install both temporary and permanent counters to collect bike and pedestrian trip data before and after the roadway improvement.

The City will also conduct planning and prioritization of streetscape corridors in opportunity and core areas and transit priority corridors and centers. In the near-term, the City anticipates being able to construct two or more streetscape projects in opportunity areas or transit corridors (14th Street, Galveston, and Newport streetscape improvements are scheduled for construction in 2018).

Additional Strategies for Further Consideration

As funding allows, the City can implement additional projects that are planned but not funded, focusing improvements in opportunity areas and adjoining corridors. Examples include streetscape corridor enhancements, canal bridges and key structures (such as Greenwood and Franklin undercrossing improvements) and bike boulevards. The City may evaluate funding mechanisms such as Urban Renewal for areas including Opportunity Areas to provide additional funding for such projects.

Over the long-term, the City can pursue aspirational projects, such as major roadway connections, bike/pedestrian US 97/Parkway crossings, and additional streetscape corridors.

Summary and Implementation

Table 2 summarizes how the city can implement supportive strategies to reduce VMT through implementation of the "Proposed Strategies" associated with the UGB expansion proposal, and also with "Additional Strategies for Further Consideration" over the longer-term future. The second column captures the implementation of the policies and programs that are already in place and those that are proposed for adoption with the UGB. The third and fourth columns capture additional work the city could do to further reduce reliance on the automobile over the long term if staff time and funding allow. There is a time component to the feasibility of implementing the additional strategies in the sense that the actions generally build on one another and greater levels of implementation may be possible and appropriate over time based

on available public funding and private redevelopment proposals. This is reflected in the categorization of the additional strategies as “Medium-Term” or “Long-Term”.

ILUTP implementation is dependent on City Council goals and CIP priorities. The projects and programs that implement the ILUTP will need to be prioritized with other community transportation and land use plans and projects. Funding, staff resources, and community values will have to be constantly weighed and balanced as the ILUTP is implemented and will influence the timing of the ILUTP projects and programs. Another factor that guides how fast and to what degree the ILUTP is implemented is how the private market responds to the UGB remand land use policies, especially in the opportunity areas. Standards or benchmarks to reduce VMT rely on land use strategies such as diversity and density that are dependent not only on land use policies but the national, regional, and local land use market trends that the City does not control. Consequently, ILUTP implementation must be managed with the understanding the City plans to implement the land uses to allow the market to respond in a way that ultimately reduces VMT through a combination of land use and transportation actions.

The UGB Remand has analyzed Bend urban typologies and form in relation to VMT reduction. The initial findings indicate that the Core area of the City, including several identified Opportunity Areas, have the greatest chance for reducing VMT. Therefore, the implementation strategies will also focus transportation projects and programs in these areas and corridors. This does not preclude implementation in other areas of the city which will also support lowering VMT. This approach builds on and supports the goals and policies found in the UGB Growth Management Report and will ensure that limited transportation resources are applied strategically to lower VMT.

Table 2: Summary: VMT Reduction Strategies[59]

ILUTP Element	Proposed Strategies[60]	Additional Strategies for Further Consideration	
		Medium-Term	Long-Term
Land Use Strategies	Designate and ultimately rezone mixed use opportunity areas identified in UGB project.[61] Adopt city-wide modifications to the development code to increase efficiency and housing mix for new residential development and offer targeted reductions to parking standards.	Designate additional mixed use areas along transit corridors where there is redevelopment potential Adopt design and development standards for key pedestrian areas and transit corridors Strengthen connectivity standards for new master-planned neighborhoods	Consider up-zoning selected residential neighborhoods in the city where there is potential for infill development based on additional analysis and community support
Transportation Demand Management and Parking Management	Set policy supporting incentives approach to TDM and increasing applicability of TDM programs Conduct citywide analysis and feasibility for parking management and pricing Establish TDM requirements for large institutional and employment uses as part of master plan requirements	Consider allowing transportation SDC reductions for TDM measures Require TDM programs for additional large businesses / institutions (e.g. those with over a certain number of employees in certain areas) Partner to establish TMAs for certain areas (e.g. St. Charles Medical Center, downtown, Bend Central District, etc.) Implement parking management programs in key areas based on outcomes of citywide parking study	Parking pricing implemented in key areas, based on outcomes of the parking pricing study (e.g. downtown and Bend Central District).

[59] This table is a summary. Please see the text in Chapter 4 for the full description of all strategies.

[60] Proposed strategies will be implemented with the UGB Remand adoption or within three years of adoption.

[61] Zoning may be deferred in some opportunity areas until requested by the property owner.

ILUTP Element	Proposed Strategies[60]	Additional Strategies for Further Consideration	
		Medium-Term	Long-Term
Transit[62]	Support and maintain the recent service improvements as of 2016 Define and enhance transit centers and corridors in opportunity and core areas. Propose new and enhanced transit funding	Implement most components of Bend Transit Plan, including additional hours of service, more frequent peak headways, and two new routes.	Implement further additional hours of service, improved headways on specific routes primarily in opportunity and Core areas, and conversion of 3 routes from bus service to pre-BRT types of service
Roadway Improvement Management and Policies	Implement selective "road diets" where safety issues have been identified	Develop pedestrian and biking safety plans for the opportunity areas that enhance the possibility for higher walking, biking, and transit modal splits.	Continue to develop and implement policies that increase walking and biking safety by modifying street standards
Complete Streets and Connectivity Investment[63]	Implementation of programmed projects, which include many projects in or adjacent to opportunity areas. The City will count bike and pedestrian trips before and after as part of project implementation. Conduct planning and prioritization of streetscape corridors in opportunity and core areas and transit priority corridors and centers.	Evaluate funding mechanisms for complete street improvements, such as Urban Renewal for areas including Opportunity Areas Implementation of planned but not-yet-funded projects, focusing improvements in opportunity areas and adjoining corridors.	Refinement and potential implementation of aspirational projects, such as major roadway connections, US 97/Parkway bike/pedestrian crossings, and additional streetscape corridors.

[62] See attached Explanation of Transit Scenarios and CET Service Schedule for details.

[63] See attached Complete Streets and Connectivity – Future Scenarios for details.

CHAPTER 5. POLICIES, STANDARDS AND BENCHMARKS

Proposed ILUTP Policies

The Bend TSP and General Plan include existing goals and policies that call for reducing reliance on the automobile and encourage mixed use development, which support the ILUTP. The policies below are new policies specific to implementing the ILUTP. These policies will be added to Chapter 7 (Transportation) of the City's Comprehensive Plan and included as an amendment to the City's TSP as part of the UGB expansion project.

- The City will implement the land use, transportation demand management, parking management, transit, and complete streets strategies, projects and programs that are identified as Proposed Strategies in Chapter 4 of the ILUTP.
- The City will conduct a planning study to evaluate the potential for Transportation Management Areas for the opportunity areas, transit centers, and public and private institutions and companies.
- The City will include streetscape projects in opportunity and core areas and transit corridors when developing the transportation CIP priorities and projects.
- The City will develop transit priority corridors in the opportunity and core areas that include a combination of land use policies and codes and transportation enhancements that encourage transportation options.
- The City will update the assessments of the ILUTP standards at each update of the Bend MPO regional transportation system plan and the City TSP.

Proposed Standards

In addition to tracking implementation of the strategies identified in Chapter 4, the City proposes to use the standards identified in this section to measure progress towards developing and implementing transportation systems and land use plans that increase transportation choices and reduce reliance on the automobile. The proposed standards focus on outcomes that are not fully within the City's control; they can be thought of as performance measures that provide insights into the effectiveness of the City's ILUTP strategies. They are linked to the "D" variables discussed in Chapter 2 of this ILUTP because those have been shown to be key drivers of travel behavior.

The proposed standards emphasize evaluating performance in certain key areas of the City, including opportunity areas, transit corridors, and the Central Core. This reflects the City's overall approach of focusing the available resources on areas that will have the highest likelihood to reduce VMT. These key areas are shown on Figure 12. Note that there is (intentionally) a great deal of overlap among these key areas; however, because they are each important for their own reasons, the City proposes using the combination of these areas to track progress.

Figure 12: Central Core area, Transit Corridors, and Opportunity Areas

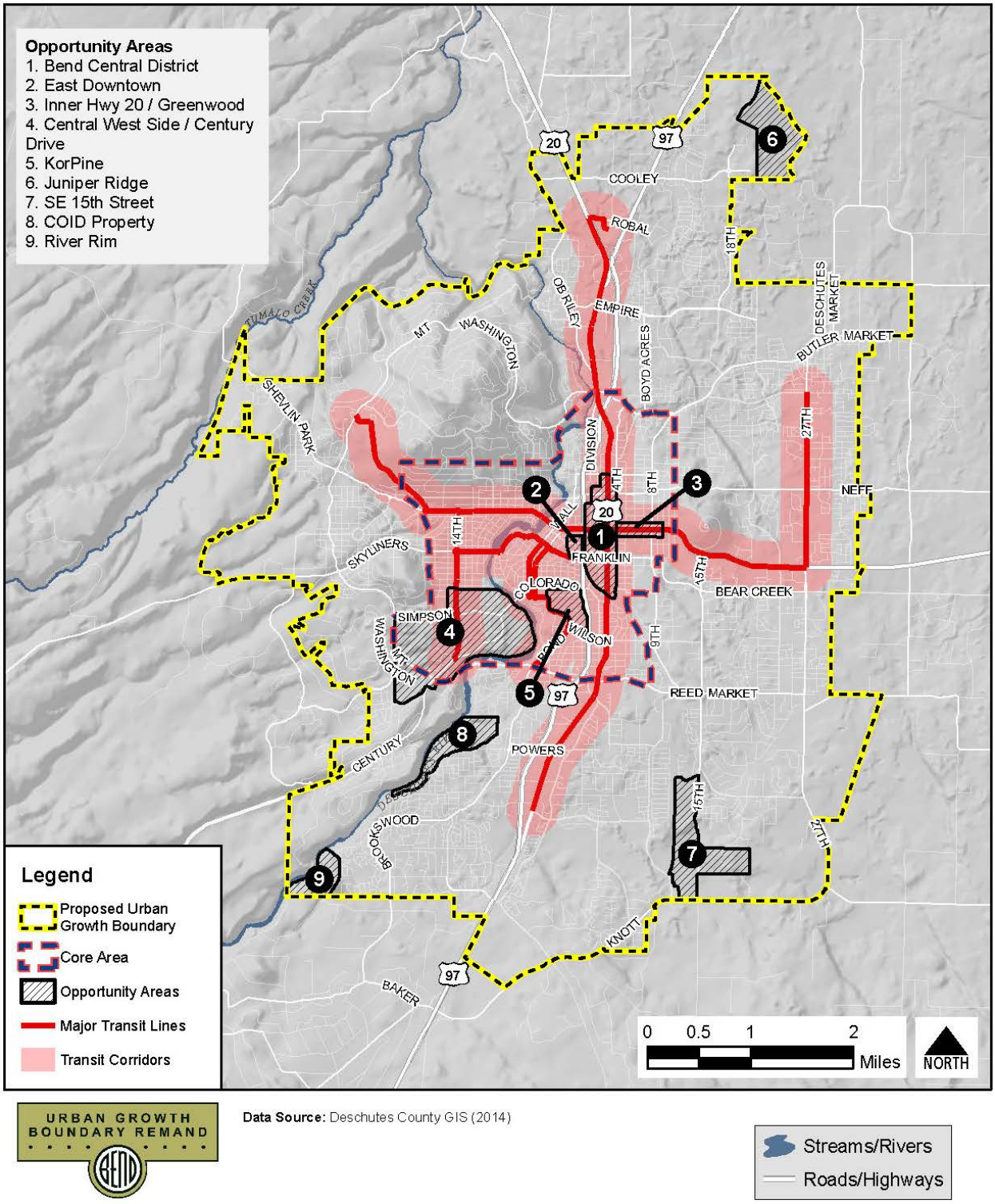


Table 3: Standards for Reducing Reliance on the Automobile

Topic	Measure	Geographic Area[64]	Current (2014)	2028 – preferred UGB
Density (Land Use)	Activity density (housing units[65] plus employment[66] over total area in acres)[67]	Central Core	7.67	9.10
		Core Opportunity Areas	7.64	11.24
		Key Transit Corridors	6.29	7.93
Design (Complete Streets)	Implementation of Complete Streets Projects (see Figure 11 and Attachment 10)	City/UGB-wide	N/A	All programmed projects
Destinations (Transit, Land Use, and TDM)	Household transit access (percent of housing units[65] within a quarter mile of transit[68])	City/UGB-wide – all transit corridors	55%	At least 49% [69]
		Key Transit Corridors	45%	At least 41% [69]
	Employment transit access (percent of employment[66] within a quarter mile of transit[68])	City/UGB-wide– all transit corridors	82%	At least 65% [69]
		Key Transit Corridors	81%	At least 64% [69]

[64] See Figure 11 for a map of the specific areas in question. Note that "Key Transit Corridors" is limited to primary transit corridors, and does not include all transit routes.

[65] Existing housing unit locations are based on the Buildable Lands Inventory. Future housing unit locations for the 2028 standard are based on projected future development using Envision Tomorrow. Note that future housing units are inclusive of on-campus student housing at Oregon State University's Cascades Campus (OSU Cascades).

[66] Existing employment location is based on the 2013 Quarterly Census of Employment and Wages (QCEW) provided by the Oregon Employment Department. Future employment locations for the 2028 standard are based on projected future development using Envision Tomorrow. Future employment is inclusive of employment at OSU Cascades.

[67] Activity density is measured using the TAZs that best represent the specified area. Area is based on GIS calculation of the total area of each TAZ in acres.

[68] Transit routes for both 2014 and 2028 are based on the 2016 Cascades East Transit (CET) routes. Unlike the "Key Transit Corridors", this measure includes all transit routes. Parcels were selected based on the center point of the parcel being within a quarter-mile buffer from a transit route. Distance to transit is measured as the crow flies from the transit route and does not account for stop locations or barriers such as rivers or highways.

[69] The standard acknowledges that new transit lines are not included in the "proposed strategies" for 2028, and that the City is not relying on major expansions in transit service by 2028 in order to generate the forecast VMT results. Updates to the Transit Plan will be needed in order to address the land use recommendations of the UGB project. The decline in transit accessibility reflects this lag. The standard is included to ensure that transit accessibility declines no more than expected by 2028, with the intention that transit accessibility (at least for housing) may, in fact, increase by 2028 if transit service is extended to outlying opportunity and/or expansion areas that are currently vacant. The percentage of households with access to transit in 2028 may be lower than today, but over the longer term, as the opportunity areas grow and transit is expanded, the household access to transit percent will increase again.

Topic	Measure	Geographic Area[64]	Current (2014)	2028 – preferred UGB
	Access to commercial services (percent of total housing units[65] within one half mile of existing and planned commercial areas[70])	City/UGB-wide	79%	86%
	Active TMAs & institutional TDM programs	City/UGB-wide	2 (Juniper Ridge, COCC)	3 (Juniper Ridge, COCC, OSU)
Diversity (Land Use)	Jobs-housing balance[71] (ratio of employment[66] to housing units[65])	Central Core	2.23	2.05
		Core Opportunity Areas	17.82	5.33

TPR Compliance

These standards comply with the TPR requirements as demonstrated below.

(A) Achieving the standard will result in a reduction in reliance on automobiles;

The standards listed in Table 3 have been selected because they have been shown to be linked to less driving (see Chapter 2). Achieving the standards will reduce reliance on automobiles as follows:

- An increase in activity density in the Central Core, Core Opportunity Areas, and Key Transit Corridors will put more households and more jobs in areas that are walkable, bikeable, and accessible by transit, facilitating use of alternate modes and reduced reliance on automobiles. It will also help provide the level of activity density needed to make transit operate more efficiently and help support additional businesses that are focused toward foot traffic rather than vehicle traffic.
- Implementation of all programmed Complete Streets Projects will increase pedestrian and bicycle safety and convenience, supporting the choice to walk or bike around town.
- Increasing the percentage of households and employees with access to transit means that more people have the choice to take transit to work, to school, or to key destinations such as downtown and medical appointments.

[70] Existing and planned commercial areas for 2014 are based on current General Plan designations: CB, CC, CG, CL and MR. Existing and planned commercial areas for 2028 are based the current General Plan designations as well as commercial and mixed use development types used in Envision Tomorrow, including: CB, CC, CC2 (a more walkable version of the CC zone), CG, CL, ME, MR, MU 1 (now called MN for zoning and plan designations), and MU-2a (now called MU for zoning and plan designations).

[71] Jobs-housing balance is measured using the TAZs that best represent the specified area.

- Implementing an additional TMA or institutional TDM program at OSU Cascades will reduce reliance on the automobile by ensuring that students and faculty have incentives and information to support using alternative modes to access the campus.
- Achieving a more even balance of jobs and housing in the Central Core and Core Opportunity Areas will mean that more people live in employment-rich areas, and that there are more opportunities to live and work within the Central Core.

(B) Achieving the standard will accomplish a significant increase in the availability or convenience of alternative modes of transportation;

Achieving the standard will significantly increase the availability or convenience of alternative modes as follows:

- An increase in activity density in the Central Core, Core Opportunity Areas, and Key Transit Corridors will put more households and more jobs in areas that are walkable, bikeable, and accessible by transit, making alternative modes more convenient and available to those households and employees.
- Implementation of all programmed Complete Streets Projects will increase pedestrian and bicycle safety and convenience.
- Increasing the percentage of households and employees with access to transit means that more people have the choice to take transit to work, to school, or to key destinations such as downtown and medical appointments. Transit is significantly more convenient to use for those who live within a quarter mile of service.
- TMAs or institutional TDM programs often provide subsidies for transit passes, shuttle service, or other incentives to use alternate modes. Expanding these programs will help make alternative modes more convenient and desirable for those participating in the TMA or TDM program.

(C) Achieving the standard is likely to result in a significant increase in the share of trips made by alternative modes, including walking, bicycling, ridesharing and transit;

The regional travel demand model is closely calibrated for vehicle trips, because of its focus on the vehicular transportation network. There is less focus on bicycle and pedestrian modes in that model. Compared to the regional travel demand model, the Envision Tomorrow 7D transport model is more focused on reflecting the impacts of land use and built environment changes on mode choice. Using ET 7D, the preferred scenario is projected to result in a 7.8% non-auto share and a 92.2% auto share for all household trips, UGB-wide. This is essentially unchanged from the ET model estimate of existing conditions (using 2014 built environment and demographic data and 2016 transit service), which estimates an 8.5% non-auto share and a 91.5% auto share for all household trips UGB-wide (including existing population in proposed UGB expansion areas). However, these results do not capture all of the City's proposed strategies in this ILUTP. The reasons for this include:

- The 2016 transit service expansion was factored in to the existing mode split evaluation, although it was not in place as of 2014. Thus, the impact of this recent transit improvement is already captured in the existing mode split data.

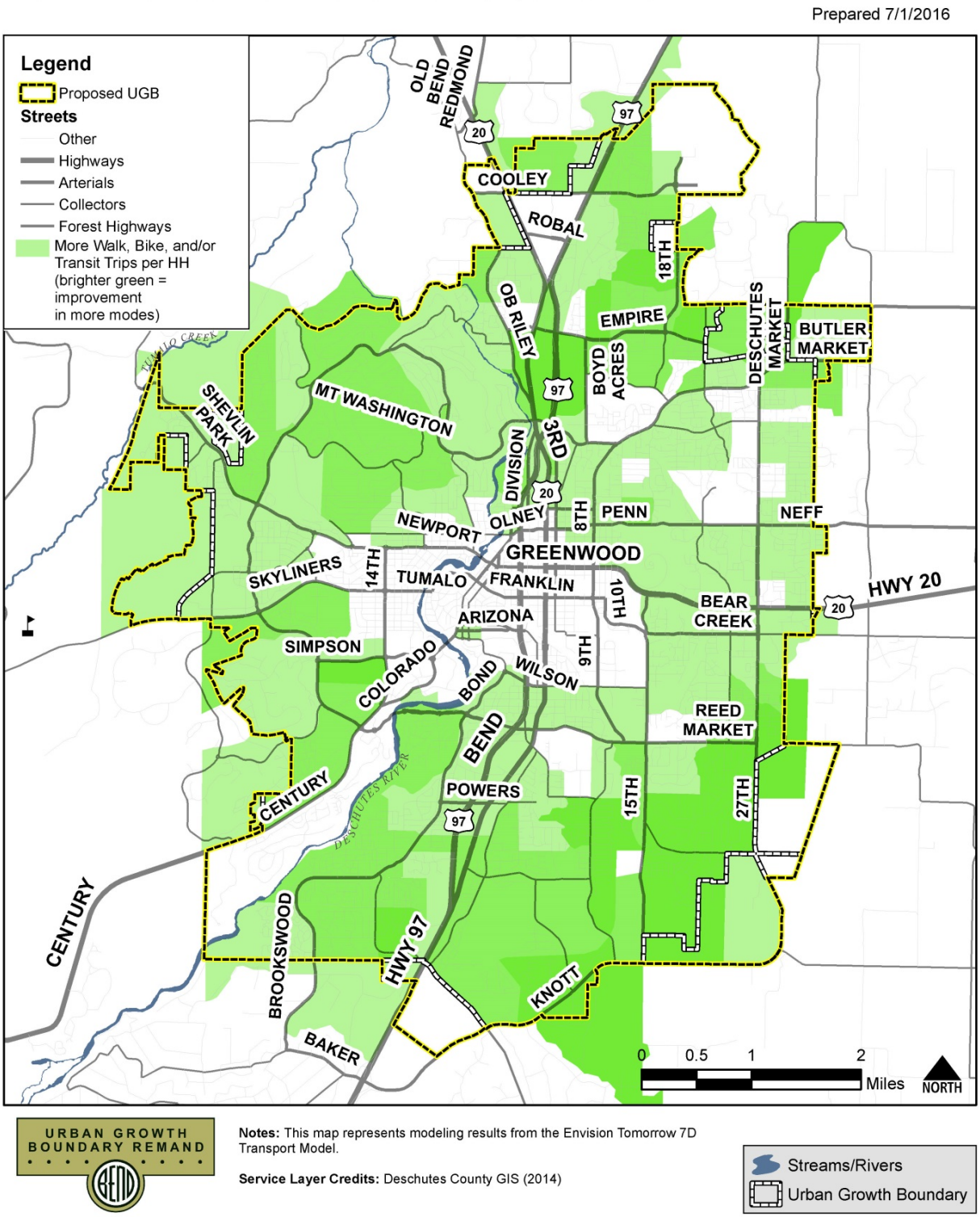
- While the land use efficiency measures proposed with the 2016 UGB expansion are significant, their impact on redevelopment in the Central Core is projected to be relatively modest through 2028.
- Even the ET model, which is sensitive to the built environment, does not account for the quality of the street environment in a connected area (e.g. the presence of street trees, sidewalk width, or the availability of bike lanes), nor does it fully account for gaps and barriers in the bicycle and pedestrian network, such as unsafe crossing points of major roads. As a result, the model is not reflecting the benefits of the complete streets improvements that the City has committed to funding and building by 2028.
- The ET model does not account for existing or proposed TDM programs at OSU, COCC, or Juniper Ridge. These would tend to shift travel in these areas to alternative modes (including ride sharing and shuttles, which are not identified as separate modes in ET) beyond what the built environment and demographic factors would suggest.

While the overall mode split UGB-wide shows little change from 2014 to 2028, analysis of the rates of non-auto trips per household reveals that the complete communities approach to UGB expansion will encourage greater walking, biking, and transit usage in many peripheral areas inside the current UGB and adjacent to UGB expansion areas. These areas will have new opportunities to walk and bike to parks, schools, and commercial services. The areas where the number of daily walking, biking, or transit trips per household is projected to increase are shown in green on Figure 13. Lighter green areas show an improvement on one of these three modes; brighter green areas show improvement in two or even all three modes.

Note that rate of walking, biking and transit usage per household within the Central Core is not expected to improve relative to existing conditions because those areas are already highly complete and connected and have the best transit service in the city. The households already living in those areas enjoy these conditions today. And, as noted above, the complete streets improvements are not reflected in the mode split estimates by the ET model.

In order to more accurately reflect the impact on walking and biking due to the City's proposed Complete Streets improvements, the City will be installing permanent pedestrian and bicyclist counters at key locations in the Central Core (e.g. Newport, Portland, Colorado, Reed Market, Greenwood, and Franklin bridges). These will provide baseline data prior to complete streets improvements as well as on-going bicycle/pedestrian count data following the improvement.

Figure 13: Areas with Increases in Non-Auto Modes



(D) VMT per capita is unlikely to increase by more than five percent; and

As shown in Table 1 on page 29, based on evaluation using the regional travel demand model to measure VMT per capita as specified in the TPR, the preferred UGB Expansion Scenario (2.1G) is expected to result in a 1.2% increase in VMT relative to the 2010 baseline that best reflects the 2008 starting point of the 20-year planning horizon for the UGB Remand. Because of the roughly 5% increase in VMT estimated between the 2003 model and the 2010 model, this translates to a 6.3% increase relative to 2003. However, OAR 660-012-0035(5)(b) allows that "In reviewing proposed standards for compliance with subsection (a), the commission shall give credit to regional and local plans, programs, and actions implemented since 1990 that have already contributed to achieving the objectives specified in paragraphs (A)–(E) above."

As documented in detail in Attachment 6, the City of Bend implemented several connectivity improvements between 1990 and 2003 that would be expected to reduce VMT per capita, such as a new river crossing (Healy Bridge) and an extension of Empire Avenue. To measure the benefit of these improvements, 2003-level demand was applied to both the base 2003 model network and to a 1990 network that did not include these connectivity improvements. VMT per capita from these model runs were compared in order to calculate the VMT benefit of actions implemented in the intervening 13 years. This analysis showed that VMT per capita in 2003 would have been roughly 2.2% higher if not for the connectivity improvements made since 1990. When the 2028 VMT results are compared against the VMT that would have resulted in 2003 without the benefit of those connectivity improvements, the increase is 4.1%. Given this, the evidence demonstrates that VMT per capita is unlikely to increase by more than 5% over the 20-year planning horizon of the UGB Remand, especially when considering the actions (connectivity improvements) that the City has implemented since 1990 that have already contributed to reducing growth in VMT.

(E) The standard is measurable and reasonably related to achieving the goal of increasing transportation choices and reducing reliance on the automobile as described in OAR 660-012-0000.

The standards listed in Table 3 are measurable, given Census data, data from the Oregon Employment Department, and GIS data on transit routes, all of which the City has access to. The standards are reasonably related to achieving the goal of increasing transportation choices and reducing reliance on the automobile as described in response to (A) and (B), above.

ATTACHMENT 1 COMPARISON OF 2003 AND 2010 REGIONAL TRAVEL DEMAND MODELS

Memorandum

July 18, 2016

To: Karen Swirsky, Nick Arnis

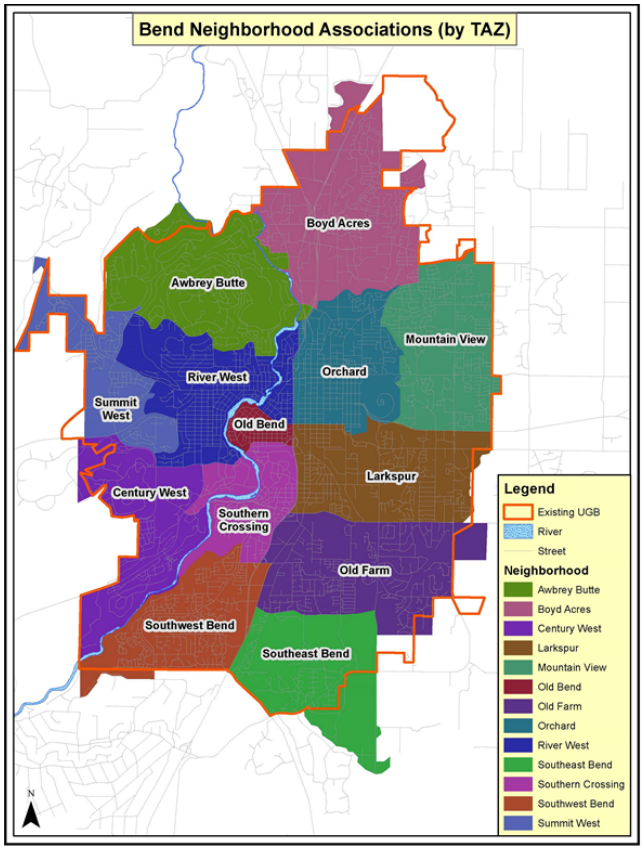
From: Chris Maciejewski, PE, PTOE, DKS Associates
Aaron Berger, DKS Associates

Re: Base Year Travel Demand Model Selection for VMT Evaluation

The purpose of this memo is to describe why we recommend the UGB project team use the newer base year 2010 model scenario (as opposed to the prior 2003 base year model scenario) to measure VMT per capita to represent year 2008 conditions. In summary, the travel demand model scenario for 2003 described in the UGB Remand does not account for the increases in population, the new roadway network additions, and the new transit system that occurred between 2003 and 2008. These factors affect the amount and location of trips, mode choice, and trip distribution/assignment, which significantly affects the VMT per capita calculation. Therefore, the 2003 model scenario is not a valid predictor of 2008 VMT per capita conditions compared to the 2010 model scenario.

Background

The UGB Remand described using the regional travel demand models for year 2003 and 2030, which were the model years available at the time of the prior UGB evaluation to approximate the 2008 to 2028 planning horizon. Since the time of the UGB Remand,, the Bend MPO and ODOT TPAU have since updated the regional model scenarios to base year 2010 and future year 2028. This memo discusses the differences between the 2003 and 2010 base year model scenarios and how closely they relate to 2008 conditions.



Land Use

The year 2010 base model scenario is proposed for use over the 2003 base model scenario as it provides a much closer comparison to 2008 land use conditions. The

2010 base model scenario was developed for the Metropolitan Transportation Plan (MTP), and includes updated land use reflecting the 2010 development conditions in Bend. Between 2003 and 2008, the population of Bend increased from 59,646 to 77,181[1], an annual growth rate of 5.3%/year. With the economic downturn occurring in 2008, the population of Bend remained virtually the same between 2008 and 2010, dropping slightly from 77,181 to 76,639[2]. The population growth between 2003 and 2008 was verified through comparison of historical aerial imagery of housing units in each Neighborhood Association in Bend. Figure 1 shows the Neighborhood Association mapped to the TAZs used in the travel models.

The growth in each neighborhood was verified against the household growth between the 2003 and 2010 base model scenarios. The residential land use changes between the 2003 and 2010 base model scenarios are summarized by neighborhood Table 1.

Table 1: 2003/2010 Model Residential Comparison

Neighborhood Association	2003 Model Households	2010 Model Households	2003-2010 Model Household Growth	Locations of primary residential growth between 2003 and 2008 verified in the model
Awbrey Butte	1,291	1,645	354	North of Farewell Dr
Boyd Acres	1,524	2,434	910	Along Boyd Acres Rd and Morningstar Rd
Century West	961	1,412	451	West of Cascade Middle School
Larkspur	3,173	3,498	325	Along the 27th St corridor
Mountain View	4,975	5,405	430	West of 27th St
Old Bend	1,024	945	-79	Did not experience residential growth
Old Farm	2,505	3,108	603	Multi-family units along Hwy 96 and single family units on the Brosterhouse Rd corridor
Orchard	2,535	3,095	560	Multi-family units near Pilot Butte and single family units north of Butler Market Rd
River West	3,906	3,899	-7	Did not experience residential growth
Southeast Bend	1,050	1,147	97	Did not experience significant residential growth
Southern Crossing	915	983	68	Did not experience significant residential growth
Southwest Bend	1,893	2,954	1,061	West of Brookswood Blvd
Summit West	644	1,305	661	Fairly distributed but very high growth
Totals	**26,396**	**31,830**	**5,434**	**20.6% increase in households between models**

Employment totals did not change significantly between the 2003 and 2010 model scenarios.

[1] U.S. Census Bureau; American Community Survey, 2008 Vintage Population Estimates

[2] U.S. Census Bureau; American Community Survey, 2008 and 2012 Vintage Population Estimates

Roadway Network

The 2010 base model scenario network was also updated to reflect following projects constructed between 2003 and 2010:

- American Lane Re-alignment with Brosterhous Road
- NW Crossing Drive Connection between Shevlin Park Road and NW Morningstar Road
- NW Hunnell Road Connection between Cooley Road and Robal Road

Each of the projects listed were constructed prior to 2008. Therefore, the 2010 base model scenario is a more accurate representation of the roadway network in 2008

Transit Network

The 2010 base model scenario network includes transit service that exists today in Bend, but was not present in 2003. The 2010 base model scenario transit network detail closely matches the transit service that was in place in 2008. Therefore, the 2010 base model scenario is a more accurate representation of the transit network in 2008

Conclusions

Due to the updated land use, roadway network, and transit network developed for the 2010 base model scenario, the UGB project team believes it is necessary to use the 2010 base model scenario over the 2003 base model scenario for VMT per capita analysis to estimate 2008 conditions. These model scenario inputs for 2010 are a much better and accurate representation of the land use and transportation in Bend in 2008. As stated, these inputs affect the amount and location of trips, mode choice, and trip distribution/assignment, all of which significantly affect VMT per capita analysis.

ATTACHMENT 2 SCENARIO EVALUATION METHODOLOGY MEMO

MEMORANDUM

720 SW Washington St.
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Portland, OR 97205
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DATE: June 15, 2015

TO: Bend UGB Project Team

FROM: Chris Maciejewski, DKS Associates
Garth Appanaitis, DKS Associates

SUBJECT: **Bend UGB Remand Phase 2**
Task 9.10.1-2– Scenario Evaluation Methodology P#14073-000

The purpose of this memorandum is to summarize the scenario evaluation methodology that will be applied for the Bend Urban Growth Boundary (UGB) analysis. The following sections describe the tools that will be used to evaluate transportation impacts, with a specific focus on analysis of Vehicle Miles Traveled (VMT) per capita and integration of land use and transportation strategies. This is a draft methodology intended for coordination with the City, Bend Metropolitan Planning Organization, ODOT, DLCD and others involved in the transportation evaluation process.

BACKGROUND AND CONTEXT

The City of Bend has entered the next phase of its UGB expansion to chart a path for Bend's future growth. The City is working with a team of planning experts and advisors to address requirements of a "Remand" of the City's previously proposed UGB expansion. This two-year process – scheduled to end April 2016 – is addressing specific technical issues and planning requirements established by the Oregon Land Conservation and Development Commission (LCDC) in the Remand. Work related to satisfying the Remand and proposing a new UGB is using a planning horizon of the year 2028, consistent with state law. The City is also planning for the longer term for some policy-related strategies, such as the integration of land use and transportation. The end result of this planning process, for both short and long term needs, will be to meet local objectives and Remand requirements, including those related to compliance with the Transportation Planning Rule (TPR)[1] and state-mandated VMT reduction requirements. Specifically, in order to achieve a comprehensive look at land use and transportation, the following three requirements will be addressed through this process:

- Goal 14 (Alternatives Analysis) – Use transportation tools and evaluation metrics to compare potential UGB expansion scenarios including boundary location, arrangement of land uses, and supporting transportation system improvements.
- TPR Section -0035 (VMT Analysis) – Use transportation planning tools to determine whether the growth scenarios and the proposed UGB expansion will achieve the VMT reduction requirements stated in the UGB Remand, or what other measures are needed to achieve the required VMT reduction in the long-term.

[1] Oregon Administrative Rule (OAR) 660-012 is commonly referred to as the Transportation Planning Rule.

- TPR Section -0060 (Plan Compatibility) – If applicable, determine if specific changes to the Comprehensive Plan would have a significant effect on the transportation system and identify potential system improvements to mitigate those effects.

PROCESS OVERVIEW

The process for developing and justifying a new UGB will require a range of integrated land use and transportation scenarios and analyses. Figure 1 summarizes the general scenario development and analysis process that will be applied for the UGB analysis. The process begins with the development of alternative land use and transportation scenarios that are consistent with the initial technical findings and policy framework that have been developed during the project to date. The process will then make use of two primary tools, Envision Tomorrow (ET) and the travel demand model (TDM). These tools will be used, in tandem, to assess preliminary outputs from and refine scenarios, develop a final scenario, and ultimately make findings that address TPR requirements for the Remand (VMT) and changes that may be implemented through the ILUTP. These specific stages (as shown in Figure 1) include:

June

- UGB Expansion Scenarios (2028) –Develop alternative UGB expansion scenarios based on preliminary Goal 14 evaluation of study area land and TAC input

July

- ET VMT and Mode Split Estimations – ET will be used to estimate VMT and mode split for the UGB expansion scenarios that will provide an initial indicator of whether an Integrated Land Use and Transportation Plan (ILUTP) will be necessary.

July/August

- VMT Reduction Hypotheticals – VMT reduction strategies will be grouped and tested as hypothetical scenarios to determine reduction potential.
- ET VMT Analysis – ET will be used to conduct preliminary VMT analysis of the hypothetical scenarios, which will create an iterative approach to hypothetical scenario development based on these preliminary findings.
- TDM Analysis of UGB expansion scenarios – The TDM will be used to evaluate and compare the UGB expansion scenarios formally for the purposes of Goal 14 alternatives analysis, including VMT as well as transportation performance measures.

August/September

- Preliminary ILUTP Strategies – The evaluation of VMT hypotheticals in ET will identify preliminary ILUTP strategy recommendations to share with the TAC.
- Official Transportation Results – Formal analysis results comparing the UGB expansion scenarios, including VMT, transportation performance, and planning-level cost estimates, will be prepared for the TAC using the TDM, ET results, and other qualitative assessments.

October/November

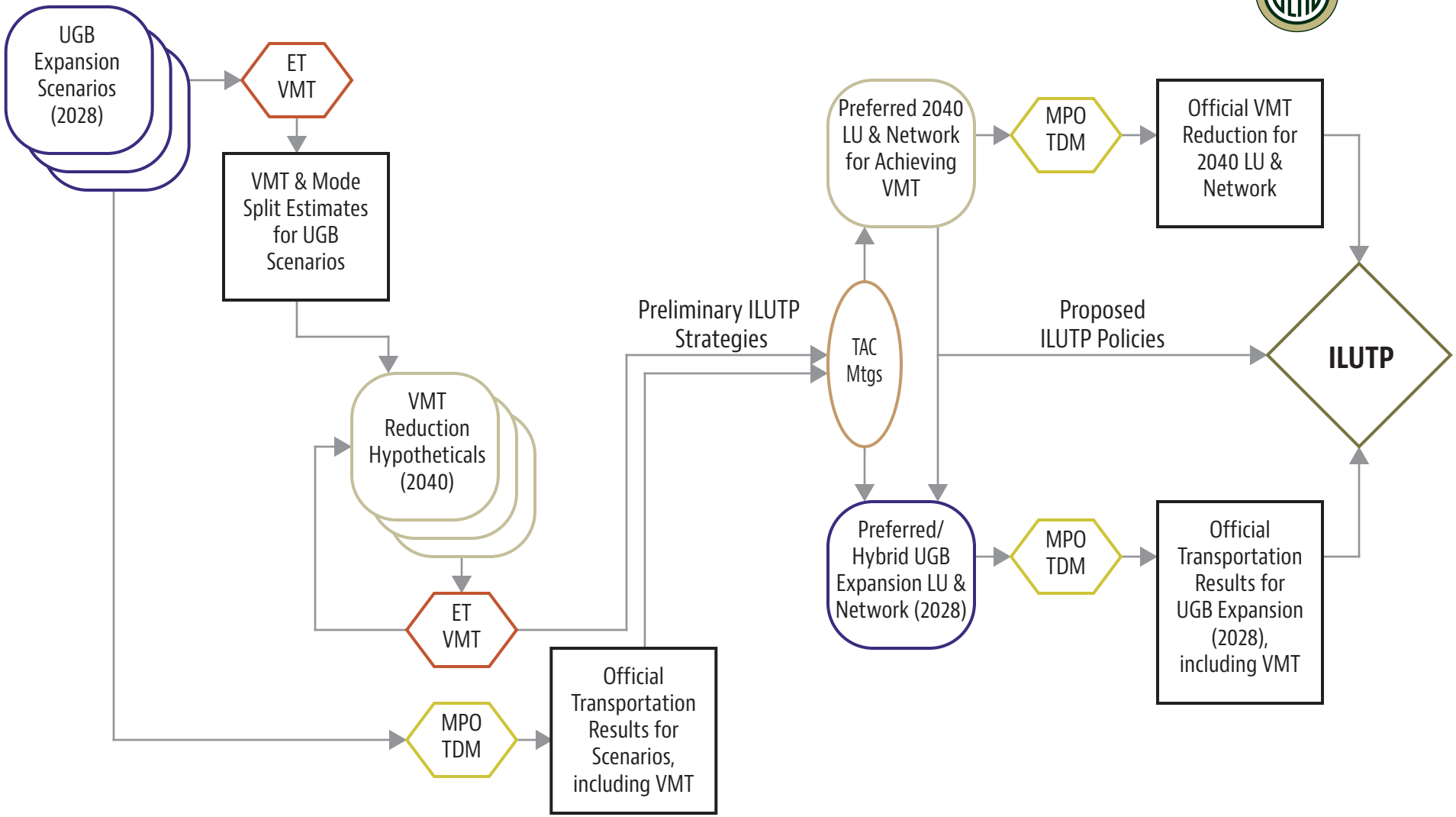
- Preferred/Hybrid 2028 UGB Scenario – The Goal 14 analysis of the UGB expansion scenarios, including TDM model findings, along with TAC input and the preliminary ILUTP strategies, will be used to develop a preferred UGB expansion scenario. The travel demand model will be used to analyze the preferred expansion scenario and report transportation system performance findings.
- Preferred 2040 Land Use and Network - The preliminary ILUTP strategies will be refined with TAC input and used to shape a preferred 2040 VMT reduction scenario, which will be analyzed with the TDM to develop the official VMT results for Remand and TPR compliance.
- Integrated Land Use and Transportation Plan (ILUTP) Policies – Based on the preferred 2040 VMT reduction scenario, a set of ILUTP policies will be developed to begin transitioning to the preferred plan.

December

- ILUTP – The findings and components from the 2040 preferred VMT reduction scenario, the 2028 UGB expansion scenario, and the ILUTP policies will be used to develop the ILUTP.

Transportation Analysis and Integrated Land Use & Transportation Plan Work Flow Diagram

URBAN GROWTH BOUNDARY REMAND
MAKING BEND EVEN BETTER



JUN	JUL	AUG	SEP	OCT	NOV	DEC

ET VMT: Envision Tomorrow VMT/Mode Split Analysis Model
MPO TDM: Metropolitan Planning Organization Travel Demand Model
ILUTP: Integrated Land Use & Transportation Plan
VMT: Vehicle Miles Traveled
UGB: Urban Growth Boundary
TAC: Technical Advisory Committees

Timing is approximate and subject to change

DRAFT: 6/11/2015

Table 1 summarizes the roles for each party in the analysis processes.

Table 1: Analysis Roles for Team Members

Team Member	ET	TDM
City of Bend	• Scenario Development • Identify potential VMT reduction strategies to test • Review ET Findings	• Participate in scenario evaluation • Confirm conclusions from scenario evaluations • Confirm/provide direction for proposed UGB and potential Integrated Land Use and Transportation Plan
Consultant	• Scenario Development • Identify potential VMT reduction strategies to test • ET Model Runs • Review ET Findings	• Coordinate evaluation process • Interpret Results of TDM • Prepare Final Scenario • Prepare products for Committee and public review
TPAU / MPO	• Provide Base TDM Land Use and Travel Network for use in calibrating the ET Tool (complete)	• Run Final Scenarios in TDM and Provide Output to Project Team

The process concludes with the reported findings that will be derived from the travel demand model and other analysis tools. The following sections describe each of these tools in more detail.

KEY ENVISION TOMORROW (ET) METHODS

The purpose of Envision Tomorrow in the transportation analysis is to assist in identifying and analyzing the land use and transportation strategies that would be required in Bend to achieve the levels of VMT reduction required by the TPR and Remand. The team will develop a series of "what if" scenarios for testing. For example, "What if significant redevelopment along transit corridors occurred?" Envision Tomorrow is a key tool for the analysis because it is a quick and efficient way to estimate the big picture transportation impacts from the scenarios. The City's buildable lands analysis, General Plan designations, and working Central Westside Plan recommendations are all calibrated into ET.

Envision Tomorrow Overview

The ET 7D Travel Model[2] is sensitive to changes in a variety of variables, commonly referred to as the "D" variables. These variables include Density, Design, Destinations, Demographics[3] and Diversity of land uses. The

[2] Envision Tomorrow Plus (ET+) User manual, Metropolitan Research Center University of Utah, http://www.envisiontomorrow.org/storage/user_manuals/20131029ENVISION%20TOMORROW%20PLUS_USER%20MANUAL_1st%20COMPLETE%20VERSION_updated_sm2.pdf

model uses these inputs to run the 7D Model predictive equations, which result in neighborhood-level predictions of several daily, household-level travel metrics including:

- Vehicle Miles Traveled (VMT)
- Auto Trips
- Transit Trips
- Bike Trips
- Walk Trips

Envision Tomorrow Comparison to Travel Demand Model

The information in Table 2 provides a comparison overview of Envision Tomorrow and how it differs from the travel demand model.

Table 2: Comparison of Envision Tomorrow to Travel Demand Model Tools

Tool Element	Envision Tomorrow (ET)	Travel Demand Model (TDM)
Purpose	Scenario development and analysis, including preliminary VMT reduction analysis	Provide more rigorous tool for analyzing the impacts to the transportation network for the final set of scenarios
Methodology	1. Populate Tool with Base Data (Network, Land Use, etc.) 2. Create Scenarios (Land Use or other Policies) 3. Extract Regional Indicators for Each Scenario 4. Advance/Modify Scenarios based on Indicators	1. Create Scenarios (TAZ Land Use and Transportation Network) 2. Run Model to Determine Transportation System Impacts 3. Determine Transportation System Improvements Required to Complement/Mitigate Scenario 4. Rerun Model with Identified Transportation System Improvements to Verify Benefit (If Needed)
Input Data	• Travel Network • Land Use Patterns (Specific TAZ Land Use Data or Policies) • Existing and Future VMT (for calibration)	• Travel Network (with capacity and service characteristics) • Land Use by TAZ
Output Metrics	• Land use – Density and Type of New Housing or Jobs • Mode Split • Network VMT (preliminary)	• Vehicle Trips by Zone • Traffic Volumes on Corridors • Trip Routing by Corridor • Corridor Congestion

[3] The supporting socio-demographic factors for the land use data include household size, household income, and the number of workers in a household. As scenarios are "painted" with ET, these socio-demographic factors are updated based on the type of predicted development.

Tool Element	Envision Tomorrow (ET)	Travel Demand Model (TDM)
	• Fuel Consumption • Caloric Energy Expended through Walking and Biking (full list of potential indicators attached)	• Network VMT
Strengths	• Quick Comparison of Scenarios as the Scenarios are Developed • Indicators Populated with National Assumptions (Reduces Input)	• Traffic Routing Accounts for Network Constraints • Transportation Mitigation Can be Tested at Regional Level
Limitations	• No Consideration for Road Capacity • Does not Identify Road Congestion • Indicators Populated with National Assumptions (Reduces Specificity)	• Network and Land Use Scenarios Must be Well Defined • Network Setup can be Laborious

Initial Scenario Development and Preliminary Evaluation

Envision Tomorrow will be used to develop land use inputs for the TDM based on the 2028 UGB expansion scenarios approved for analysis by the TAC. The ET 7D Travel Model will also be used for preliminary evaluation of the UGB expansion scenarios. Some of the measures that will be considered to address Goal 14 include:

- VMT/capita
- Mode split
- Housing & jobs within ¼ mile of transit corridors (# and %)
- Intersection density
- # of new lane miles
- Rough costs for transportation improvements ($ per lineal foot) by scenario
- Roll up of cost per acre for UGB expansion area associated with each scenario

This mix of measures will be used to provide a comprehensive view of the system to guide the decision-making process in a flexible fashion, rather than dictating actions based on individual measures. Other types of qualitative measures that may be considered (potentially outside ET using other tools such as GIS), may include:

- Job accessibility by transit
- Job within one mile
- Distance to downtown and/or other key attractors
- Variables for Diversity (land use mix-distance to a store) and Design (intersection density-4 way intersections)

In addition, there are other qualitative methods and approaches that may be used that are not quantifiable in Envision such as measuring walking and biking safety.

Testing VMT Reduction Strategies

Envision Tomorrow will provide a preliminary analysis of VMT impacts and will use a short term time horizon of 2028 and a longer term time horizon of 2040/General Plan build-out (consistent with the Bend MPO MTP). The longer term time horizon is important to evaluating redevelopment, transit enhancement, and other strategies that may not be fully implemented/realized by 2028. The following is an initial list of strategies to be evaluated in the Envision Tomorrow analysis of VMT reduction hypotheticals:

- Redevelopment within transit corridors
- Implementation of the (working) Central Westside Plan
- Implementation of other sub-area plans or significant site specific projects
- Transportation demand management strategies for larger institutions (e.g. St Charles Medical Center and medical overlay area, OSU-Cascades and COCC)

The preliminary analysis using Envision Tomorrow will be used to inform: (1) whether the City will likely need to prepare and adopt an Integrated Land Use and Transportation Plan (ILUTP, as referenced in the Remand) and what strategies should be within the ILUTP; and, (2) potential General Plan policies and map designations that would support an ILUTP or other growth management goals in Bend. The VMT reduction conclusions will be preliminary because they will be generated by the ET model. The team recognizes that the transportation modelling performed using the Travel Demand Model will provide VMT analysis that will serve as an important part of the official evaluation and factual base for Remand compliance and an ILUTP. The team will be able to utilize the TDM to expand upon the measurable impacts with indicators such as congestion, time of travel and identifying capacity deficiencies. In addition, the land use and socio-demographic outputs of the ET model runs will be utilized for creating formal TDM model run inputs.

KEY TRAVEL DEMAND MODEL METHODS FOR VMT EVALUATION

The travel demand model will be run through the formal four-step process with TPAU to analyze the alternative scenarios, and then the proposed hybrid scenario (proposed UGB). These scenarios will include network characteristics that are not captured in the ET tool, including:

- Specific land use by TAZ consistent with the MPO model input types (demographics and bins)
- Specific transportation network and facility sizing
- Transit routes and service

The project team will develop the TDM scenarios and coordinate with TPAU to obtain full model runs. The results of the model runs will be used to assess the impacts on the transportation system for each scenario.

Model and Network Assumptions

The travel demand model network will be based on the Bend Metropolitan Planning Organization (MPO) Metropolitan Transportation Plan (MTP), inclusive of motor vehicle facilities and transit service that is included in the financially constrained system. City of Bend Transportation System Plan (TSP) improvements at the local

level that were not identified in the MTP will be incorporated as needed. For the year 2028, the project team and MPO staff will continue to coordinate with local transit service providers to determine appropriate assumptions for the 2028 transit system.

The Bend MPO travel demand model that was used for the MTP development will initially be used for model runs and analysis. A combined Bend-Redmond model is currently in development and may be available later in the process for the final scenario analysis.

VMT Analysis Methodology

The following sections describe the process for evaluating the VMT changes using the Bend MPO EMME travel demand model. This process was developed with input from Department of Land Conservation and Development (DLCD)[4] staff. This methodology is specific to the EMME software that ODOT's Transportation Planning Analysis Unit (TPAU) utilizes to assign trips as part of the Bend MPO regional travel demand model. If TPAU converts the regional model to VISUM software as part of developing the combined Bend-Redmond model, the same process would be applied (with different software terminology). The VMT analysis will take place only within the Bend UGB versus the MPO regional model area, which is larger than the Bend UGB.

Evaluation Tool

The regional travel demand model (EMME software platform) developed by TPAU for the Bend MPO will be utilized for the evaluation. For each land use alternative that will be formally evaluated, TPAU will complete a full 4-step model run. The trip assignment component of the model run will be utilized by the consultant team to extract VMT information.

Model Scenarios

The average daily weekday demand scenarios[5] developed for base year (2010) and future year (2028) conditions will be utilized for this evaluation. The daily traffic volume is assigned to the roadway network utilizing a 16-hour link capacity, which approximates some congestion impacts in peak periods on the route choice for the trips.

While the DLCD clarification letter described using the regional travel demand models for year 2003 and 2030 (which were the model years available at the time to approximate the 2008 to 2028 planning horizon), the MPO and TPAU have since updated the regional models to base year 2010 and future year 2028. The updated models provide the following benefits for assessing the Remand requirements:

- Year 2010 base update

[4] RE: Questions relating to the Bend Urban Growth Boundary *UGB) Vehicle Miles Traveled (VMT) Analysis, Letter from DLCD, November 10, 2011.
[5] These scenarios represent average weekday volumes – which are equivalent to typical spring or fall conditions, not summer peak conditions.

    - Updated base 2010 travel demand model includes enhancements that better reflect conditions in Bend
        - Updated base land use developed for the Metropolitan Transportation Plan (MTP), which more closely aligns with 2008 land use patterns in Bend compared to the prior model base year of 2003
        - Updated transportation network to reflect what was built between 2003 and 2010, which more closely aligns with the 2008 network in Bend compared to the prior model base year of 2003
        - Includes transit model component that now exists in Bend but was not present in 2003
- Year 2028 scenario
    - Includes update to model components consistent with year 2010 model (noted above)
    - Analysis year that aligns with Remand (as opposed to prior model year 2030)

Due to the enhancements made to the updated regional travel demand model, we propose using the base 2010 and future 2028 models for the VMT analysis. DLCD and TPAU will need to approve this recommendation prior to utilizing this approach.

Isolating Internal-Internal Trips

The Transportation Planning Rule (TPR) definition[6] for VMT analysis specifies that only internal-internal, non-freight (i-i) trips (i.e., trips both starting and ending in the UGB) are included in the evaluation. To isolate the i-i trips in the travel demand model, the following steps will be taken:

- Determine which TAZs should be included as part of the UGB
    - TAZs with any significant portion within the UGB will be included
    - A different set of TAZs will be used for the base and future year scenarios, corresponding to the UGB boundary at that time
- Create an ensemble of TAZs included in the UGB (e.g., gc01)
- Create an i-i trip table by copying original trip table (MF0x) to new trip table (MF0y)
    - From matrix: MF0x
        - subset including origins=gc01 and destinations=gc01
    - To matrix: MF0y
        - subset including origins=gc01 and destinations=gc01
- Run a new trip assignment with additional demand
    - Fixed demand traffic assignment

[6] OAR 660-012-0005 (41) and DLCD interpretation included in RE: Questions relating to the Bend Urban Growth Boundary *UGB) Vehicle Miles Traveled (VMT) Analysis, Letter from DLCD, November 10, 2011.

- Single class assignment on auto mode (MF0x), which populates the link attribute "volau"
- Assign additional demand (additional options assignment) (MF0y), which populates the link attribute "volad"
- No additional path attributes calculated

Calculating Internal-Internal VMT per Capita

To calculate the VMT for i-i trips based on the new assignment, the following steps will be utilized:

- Calculate VMT (volad*len) for all links, which is the VMT for inter-zonal trips
- Calculate VMT for intra-zonal trips (i.e., trips that start and end in the same TAZ, and aren't assigned to the roadway network)
  - Matrix calculation to determine minimum trip distance for each zone (i.e., the distance to the nearest TAZ)
  - Multiply the minimum trip distance * 0.50 to approximate an intra-zonal trip distance
  - Multiply the intra-zonal trip distance by the intra-zonal trips
- Divide the total network i-i inter-zonal and intra-zonal VMT by population within UGB (based on population estimates provided with the TAZ -level land use)

KEY GOAL 14 AND TPR 0060 TRAFFIC EVALUATION METHODS

The results from the TDM and ET will be used to support Goal 14 scenario evaluation. The following measures may be utilized:

- Scenario balances VMT between highway and other street classifications and between trip types (local, city-wide, regional)
- Scenario supports system that provides logical connections and progression of system hierarchy (local street – collector – arterial – highway)
- Scenario balances flow across available facilities and improves utilization of under-capacity roadways (congestion analysis)
- Scenario better balances number of system lane miles for both state and local system
- Scenario improves grid system for pedestrian/bicycle travel
- Scenario supports efficient transit corridors
- Types and costs of transportation improvements, including the need for new transportation facilities, such as highways and other roadways, interchanges, arterials and collectors, additional travel lanes, other major improvements (identified by scenario and UGB expansion area associated with each scenario). This will include the use of travel model link volume-to-capacity ratio data, similar to the development of the Bend MPO MTP.

Other measures, some of which may be GIS-based or qualitative, may be identified through continued work in scenario refinement.

In addition, the TDM results related to the types and costs of transportation improvements and the need for new transportation facilities, and volume-to-capacity ratios may also be used to support findings to address TPR section 0060 regarding significant effects from comprehensive plan changes. It is assumed that intersection level operations will not be needed to support Phase 2. If needed to support adoption, additional operational measures such as intersection capacity analysis may be addressed in Phase 3 of the analysis.

ATTACHMENTS

The following items provide additional details about the information provided in this memorandum.

- Envision Tomorrow Indicators – Full List with Web Link Descriptions

ATTACHMENT 1: ENVISION TOMORROW INDICATORS

The comprehensive list of ET indicators, which may not all be used in the Bend UGB study, include:

- Urbanized Acres
- Infill Development or Redevelopment
- Cost of New Infrastructure
- Building Value and Revenue
- Housing Affordability and Demand
- Housing Mix
- Parking Spaces Costs
- Jobs-to-Housing Ratio
- Distribution and Employment Space
- Regional Density
- Connectivity
- Urban Parks per Capita
- Loss of Agricultural Land and Rangeland
- Acres of Impervious Surface
- Impervious Cover in Special Areas (e.g. Aquifers)
- Building Energy Use
- Carbon Emissions
- Internal Water Consumption
- Landscaping Water Consumption
- Solid Waste Production
- Waste Water Production
- Enhanced ROI
- Balanced Housing
- Building Energy Consumption App

ATTACHMENT 3 TDM AND TMA PROGRAM IMPACTS

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application / Context	% Trip Reduction	Factors	Source
Trip Reduction Requirements							
Set trip reduction requirements for mutlifamily residential or commercial development	Require as a condition of approval for developments (either commercial, multifamily residential, or both) that certain TDM measures are implemented on an ongoing basis, or that specified vehicle trip reduction requirements are met.	Cities	Planning code or other municipal ordinance	Any urban area with good transit service; suburban downtowns, commercial and mixed use areas; transit stations. (particularly in high-growth areas)	5%-15%; Enables other strategies	Effects of this strategy depend o the location/accessibility of the development site(s), demographics of the project's residential/commercial occupants/tenants and the type of measures required. The US EPA notes that "reasonable initial targets for the programs established under a trip reduction ordinance (TRO), might be a 5-10 percent reduction in single occupant vehicle (SOV) trips, with somewhat larger reductions (perhaps 15 percent) if substantial fees for parking are imposed."	http://www.epa.gov/otaq/stateresources/policy/transp/tcms/trip_reduction.pdf
Establish a Transportation Management Association	Establish an organization to assist businesses in reducing vehicle trips, either by administering programs, providing services (such as shuttle service), or providing technical assistenace to businesses. Often implemented together with a trip reduction requirement.	Cities or business associations	Planning code or other municipal ordinance; or voluntary action by business association	Commercial area or other major business or employment districts	6%-7%	The TDM Resource Center (1996) estimated that just by improving coordination, and providing information on travel alternatives, establishment of a TMA can reduce commute-related vehicle trips by 6%-7%, with greater impact when implemented in concert with other trip reduction, TDM and parking management programs and services.	TDM Resource Center (1996), Transportation Demand Management; A Guide to Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov), as cited in the Victoria Transporation Policy Institute's TDM Encyclopedia (http://www.vtpi.org/tdm/tdm44.htm).
Implement an employee-trip reduction program for municipal employees.	Appoint an employee commute coordinator, and implement incentive programs to reduce single-occupant vehicle commuting among municopal employees. Elements may include: Subsidized transit passes; employee parking and/or parking cash-out programs; commuter checks; Direct financial incentives to bike, walk, carpool or take transit; Ride sharing; Shuttles; Vanpools	Cities	Modify agency procedures	Any	4-20%	Management support and the presence of an on-site employee transportation corridor are important factors in the success of a program. Mandatory employee/commute trip reduction (CTR) ordinances often require employers with more than 50 or 100 employees at a given employment site to implement a CTR program. This reduces the costs of administering TDM programs and compliance with survey and reporting requirements, but prevents such programs from reaching the majority of employees in a given city/region who work for small to mid-sized firms and organizations with less than 50 employees.	Marlon G. Boarnet, Hsin-Ping Hsu and Susan Handy (2010), Draft Policy Brief on the Impacts of Employer-Based Trip Reduction Based on a Review of the Empirical Literature, for Research on Impacts of Transportation and Land Use-Related Policies, California Air Resources Board http://arb.ca.gov/cc/sb375/policies/policies.htm); Philip Winters and Daniel Rudge (1995), Commute Alternatives Educational Outreach, National Urban Transit Institute, Center for Urban Transportation Research, University of South Florida; Tom Rye (2002), "Travel Plans: Do They Work?," Transport Policy, Vol. 9, No. 4 (www.elsevier.com/locate/tranpol), Oct. 2002, pp. 287-298.
Safety Net							
Guaranteed/Emergency Ride Home program	Provide a guaranteed ride home for people who do not drive to work alone to ensure they are not stranded if they need to go home in the middle of the day due to an emergency, or stay late for work unexpectedly.	Cities/ Employers		Any	9%-38%	Coupled with active progam marketing by employers, including marketing of other TDM programs and financial incentives, such as parking pricing, the Alameda County Guaranteed Ride Home program has been shown to reduce drive alone vehicle trips to particpating employment sites by as much as 38% (Draft Alameda County Guaranteed Ride Home Progam Evaluation (Nelson\Nygaard 2012).	Draft Alameda County Guaranteed Ride Home Progam Evaluation (Nelson\Nygaard 2012)
Parking Management							
Demand-responsive pricing of on-street spaces	Set on-street parking prices based on parking demand in area to achieve parking availability targets. Recommend use parking revenue to increase transportation options	Cities	Municipal code; capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	4%-18%	One of the most significant factors affecting motorists' choice of whether to drive or travel by another mode is the price of parking at the destination. Moreover, up to 28% of traffic in mixed-use districts is attributable to cruising for parking. By encouraging use of alternative modes and reducing parking search related delays for transit, demand responsive pricing can significantly reduce vehicle trips to major destinations/districts. The impact of parking pricing depends on the overall supply and availability of both on-street and off-street parking and the extent to which employers subsidize such parking.	Low-end estimate per Harvey and Deakin (1997), who estimated that parking pricing for work and non-work trips would reduce regional vehicle trips by 2.8% (Greig Harvey and Elizabeth Deakin (1997), "The STEP Analysis Package: Description and Application Examples," Appendix B, in Apogee Research, Guidance on the Use of Market Mechanisms to Reduce Transportation Emissions, USEPA (Washington DC; www.epa.gov/omswww/market.htm)). High end estimated based on the Victoria Transportation Policy Institute, Trip Reduction Tables (http://www.vtpi.org/tdm/tdm41.htm).Additional resource:http://www.spur.org/publications/library/report/critical_cooling/option27

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application / Context	% Trip Reduction	Factors	Source
Reduced or eliminated minimum parking requirements	In areas that are well-served by transit and other alternatives to driving, allow developers to build residential and commercial buildings with fewer parking spaces or no parking.	Cities	Modify planning code	Any area with quality transit service	9%-16%	This policy reform does not directly influence vehicle travel demand associated with existing development, although elimination of minimum off-street parking requirements does remove a barrier to changes of use, and/or the lease or sale of underutilized private off-street parking constructed in accordance with previous requirements, supporting the development of market-based parking pricing that in turn reduces vehicle travel.	Range of vehicle trip reduction impact of eliminating minimum parking requirements on Los Angeles' Westside, as incorporated in the vehicle trip reduction impact analysis conducted for the Los Angeles Westside Mobility Plan (http://www.westsidemobilityplan.com/transportation-demand-model/)
District-based parking management	Manage parking supply in a defined area as a unified whole in order to better manage parking demand between different facilities to eliminate cruising for parking and improve the customer experience.	Cities	Modify city agency procedures;	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Enables compact development	As with shared parking facilities, the coordinated provision and management of a shared, publicly accessible supply of on-street and off-street parking at a district-scale can reduce vehicle trips by facilitating dense/compact, clustered, and mixed-use development and by reducing expenditure of land and financial resources on off-street parking, thereby reducing an effective subsidy for auto access and mobility.	
Incentivize shared parking.	Facilitate the sharing of parking among multiple land uses that have complementary schedules (e.g. an office with greater demand during the day and restaurant with greater demand at night).	Enabled by cities, brokered by private businesses or developments	Modify planning code	Urban or suburban downtowns, commercial and mixed use areas.	Enables compact development	Shared parking facilities can reduce vehicle trips by reducing the need for construction of dedicated off-street parking facilities for each land use/activity commensurate with the peak parking demand for that use. By so doing, shared parking facilities can enable dense, clustered development that facilitates a greater share of trips by walking, cycling and public transit..	Shared Parking does not directly reduce vehicle travel if it substitutes for increased parking supply. To the degree that it increases the available supply of parking and reduces parking prices it can encourage automobile travel. To the degree that Shared Parking allows more Clustered Development it can encourage use of alternative modes.
Improved parking wayfinding signage	Install wayfinding signage to make parking easier to find. This can help to shift parking demand away from overfull spaces to underutilized areas and can help reduce local traffic impacts caused by searching for parking.	Cities	Capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Not available.	Enhanced wayfinding, signage and provision of real-time information about parking supply and availability can reduce Vehicle Miles Traveled (VMT), and traffic congestion by reducing parking search time, but impacts on total vehicle trips are unclear.	
Urban Form and Land Use							
Compact, mixed use development and “park once” districts	Encourage development of districts that allow people to park just once if they drive to reach the district, and walk to destinations within the area once they are there.	Cities are responsible for zoning, land use planning, and development permissions	Amending general plans and zoning codes to plan for and facilitate compact, mixed-use development in appropriate areas. Support implementation of compact, mixed-use development by establishment of public development commissions and other mechanisms to support public investment.	Urban; suburb and downtown; transit station	20% to 40%	Recent literature indicates that compact development can reduce VMT per capita by 20%-40% compared to conventional "sprawl type" development characterized by low density and segregation of land uses and activities (vehicle trips are assumed to be reduced by a corresponding 20%-40%). Cumulative effects depend on the pace of new development in the County relative to the base of existing development (at a more rapid pace and extensive geographic scale, compact/mixed-use development/redevelopment can lead to greater reduction in vehicle trips.	Ewing, R, K. Bartholomew, S. Winkelman, J. Walters, and D. Chen (2008). Growing Cooler: The Evidence on Urban Development and Climate Change. Washington, DC: Urban Land Institute (ULI), p. 33
Multi-Modal Infrastructure							
Bicycle sharing services	Bicycles are available to members for short-term rental and can be returned at any bike share station. Bike share may be offered in city neighborhoods, near transit hubs, or at major employment centers.	Cities or private bicycle sharing companies (usually at invitation of a city)	Urban; suburban downtown; transit station		2% to 8%	The impact depends on the larger bike network and bicycling conditions. This research does not state if the shift from automobile trips to bicycle trips is for commute or non-commute trips, nor does the research state at what time of day these trips occur, i.e. peak or non peak trips.	Victoria Transport Policy Institute (2008), Public Bike Systems: Automated Bike Rentals for Short Utilitarian Trips, www.vtpi.org/tdm/tdm126.htm.
Enhanced transit service	Improve transit service to better serve potential riders and shift travel from driving trips.	Transit agencies, funded by cities, counties, TMAs, BIDs, regional agencies	Any		5% to 30%	Impacts depend on the level and quality of improvements. The elasticity of transit use with respect to transit service frequency is about 0.5, which means that a 1.0% increase in service (measured by transit vehicle mileage or operating hours) increases average ridership by 0.5%. Not all persons will be shifting from auto to transit so the relationship is not one to one.	Richard Pratt (2000) Traveler Response to Transportation System Changes, Interim Handbook, TCRP Web Document 12. http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_webdoc_12.pdf.

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application / Context	% Trip Reduction	Factors	Source
High Occupancy Vehicle/Toll (HOV/HOT) lanes	Implement a system of express lanes for high-occupancy vehicles, transit, and/or people who pay a toll. This provides a time savings to people who commute by modes other than driving alone.	Highway districts, often led by counties or regional agencies	Freeways, any context		2% to 30%	Comsis (1993) and Turnbull, Levinson and Pratt (2006) find that HOV facilities can reduce vehicle trips on a particular roadway by 4-30%. Ewing (1993) estimates that HOV facilities can reduce peak-period vehicle trips on individual facilities by 2-10%, and up to 30% on very congested highways if HOV lanes are separated from general-purpose lanes by a barrier. (Turnbull, Levinson and Pratt, 2006) suggests that HOV highway lanes are most effective at reducing automobile use on congested highways to large employment centers in large urban areas with 25 or more buses per hour during peak periods, where transit provides time savings of at least 5 to 10 minutes per trip.	Comsis Corporation (1993), *Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience* , USDOT and Institute of Transportation Engineers (www.ite.org); available atwww.bts.gov/ntl/DOCS/474.html. Katherine F. Turnbull, Herbert S. Levinson and Richard H. Pratt (2006), HOV Facilities – Traveler Response to Transportation System Changes, TCRB Report 95, Transportation Research Board (www.trb.org); available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c2.pdf.
Financial Incentives							
Subsidized transit passes	Employers/developers provide discounted or free transit passes to employees/residents; transit agencies sell passes at reduced rates based on purchase of passes for all employees/residents regardless of transit use (e.g., universal pass programs).	Employers, housing developments or TMAs/Business Improvement Districts are the most common distributors of discounted transit passes; agreements are made with transit agencies. Cities sometimes include distribution of transit passes as a part of a development's conditions for approval or in zoning	Direct grant to workers or residents	Urban or suburban areas with high quality transit	4% to 20%	Depends on level of transit service	Alameda CTC Issue Paper: Transportation Demand Management (TDM) and Parking Management
Pricing employee parking and/or parking cash-out programs	Charge employees for parking or, if parking is free, pay employees who do not drive the cash value of the parking space.	Employers are responsible, but parking cash-out can be mandated by cities, regions or states	Direct grant to workers or residents	Any	5% to 30%	Depends on the rate of parking pricing and location as it is more effective in denser locations with more transportation options	Victoria Transport Policy Institute (2008), *Land Use Impacts on Transport* , http://www.vtpi.org/landtravel.pdf
Commuter checks	Provide direct payment or pre-tax discounts to employees who commute to work by transit, biking, walking, carpool, or vanpool.	Employers	Direct grant to employees	Any	Not available	Impact of transit subsidies depend upon robustness of existing transit network. Tax subsidies alone provide a moderate incentive for transit use.	
Direct financial incentives to bike, walk, carpool or take transit	Provide a direct financial incentive to people who commute by bike, walk, carpool, vanpool, or take transit. Commute benefit programs that result in tax savings for employers and employees are the most typical.	Any organization, public or private;	Direct grant to or other stakeholders	Any	5% to 40%	Depends on the amount of the subsidy, location (suburban, urban), transit options, and if there is a fee for parking and if so what that fee is	http://www.vtpi.org/tdm/tdm41.htm
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes.	Employers			1-2%		
Shared Vehicle Services							
Encourage ride sharing	Encourage workers to carpool to work instead of driving alone. Public agencies may encourage this by providing rideshare matching websites.	Any organization, public or private	Provide ridematching web site (public agencies or employers); Provide preferential parking (employers)	Any	5% to 30%	5-15% if they consist solely of educational efforts, and up to 30% if combined with cash incentives such as parking cash out or vanpool subsidies	Reid Ewing (1993), TDM, Growth Management, and the Other Four Out of Five Trips Bryon York and David Fabricatore (2001), Puget Sound Vanpool Market Assessment, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov).
Facilitate Vanpools	Commute to work in a shared van with 7-15 people. Public agencies may facilitate vanpooling by providing rideshare matching websites and the van or other subsidies or incentives.	Any organization, public or private	Provide ridematching web site (public agencies or employers); Subsidize vans or provide preferential parking (employers)	Any	5% to 30%	5-15% if they consist solely of educational efforts, and up to 30% if combined with cash incentives such as parking cash out or vanpool subsidies	Reid Ewing (1993), TDM, Growth Management, and the Other Four Out of Five Trips Bryon York and David Fabricatore (2001), Puget Sound Vanpool Market Assessment, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov).

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application / Context	% Trip Reduction	Factors	Source
Provide Shuttles	Operate a free or subsidized shuttle service to major employment centers or schools to reduce demand for driving and parking. Often financed wholly or in part by contributions from businesses along route.	Any organization, public or private	Provide or contract service	Any	0-13%	The design of a shuttle services varies greatly, from last mile/first mile connections to and from transit centers, to long distance employer shuttle, to local circulator services. As a general proxy the elasticity of transit use with respect to transit service frequency can be used	California Air Pollution Control Officers Association (2010), Quantifying Greenhouse Gas Mitigation Measures
Alternative Commute Schedule							
Telecommuting	Employers allow employees to work one or more days from home in order to reduce the number of automobile trips to work.	Employers		Any	2% to 10%	The range is large depending on the study examined. Also one study found that telecommuting and compressed work weeks together generate larger trip reductions	Reid Ewing (1993), TDM, Growth Management, and the Other Four Out of Five Trips. Center for Urban Transportation Research (1998), A Market-Based Approach to Cost-Effective Trip Reduction
Compressed work weeks	Employers allow employees to compress their work week by working fewer but longer days. For example, instead of working 5, 8-hour days, an employee may work 4, 10-hour days.	Employers		Any	2% to 10%	The range is large depending on the study examined. Also one study found that telecommuting and compressed work weeks together generate larger trip reductions	Reid Ewing (1993), TDM, Growth Management, and the Other Four Out of Five Trips. Center for Urban Transportation Research (1998), A Market-Based Approach to Cost-Effective Trip Reduction Program Design, http://ntl.bts.gov/lib/3000/3600/3633/cashdoc.pdf. Apogee (1994), Costs and Cost Effectiveness of Transportation Control Measures; A Review and Analysis of the Literature, National Association of Regional Councils, www.narc.org. Amy Ho and Jakki Stewart (1992), "Case Study on Impact of 4/40 Compressed Workweek Program on Trip Reduction," Transportation Research Record 1346, TRB, www.trb.org, pp. 25-32 Genevieve Giuliano (1995), "The Weakening Transportation-Land Use Connection, ACCESS, Vol. 6, University of California Transportation Center, www.uctc.net, Spring 1995, pp. 3-11.
Promotional Activities							
Travel marketing programs	Promote awareness of alternative travel modes through campaigns.	Any organization, public or private		Urban or suburban areas with high quality transit	5% to 8%	There is often a greater increase alternative mode share than reduction in vehicle trips given that some individuals switch between alternative modes or shift from driving alone to ridesharing. One study estimates that marketing increases the effectiveness of other TDM strategies by up to 3% (Shadoff, 1996)	Steven Spears, Marlon G. Boarnet and Susan Handy (2011), Draft Policy Brief on the Impacts of Voluntary Travel Behavior Change Programs Based on a Review of the Empirical Literature, for Research on Impacts of Transportation and Land Use-Related Policies, California Air Resources Board (http://arb.ca.gov/cc/sb375/policies/policies.htm). John Shadoff (1996), Transportation Demand Management; A Guide for Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov/Mobility).
Personalized Travel Planning	Promote awareness of alternative travel modes through personalized travel planning.	Any organization, public or private		Urban or suburban areas with high quality transit	5% to 15%	Effectiveness depends upon the travel options available and the level of investment into personalized marketing. Ongoing investment may be required to maintain effectiveness over time.	Transport Today, Issue 334, pg 10 (2002) http://www.vtpi.org/tdm/tdm23.htm
On-site transportation coordinators	Employers hire dedicated staff member to oversee TDM programs and/or provide one-on-one employee travel education/training.	Employers, housing developments		Any	Not available	The presence of a transportation coordinator can help increase the effectiveness of other TDM programs	
Bike/ped maps, education, and promotion	Maps of safe biking/walking routes, educational classes on safe biking/walking, and promotional activities such as Bike to Work Day; usually provided by public agencies or non-profit organizations.	Any organization, public or private		Any	Not available	This strategy has limited impact if implemented alone. Most effective if implemented as part of a comprehensive TDM strategy.	

ATTACHMENT 4 DOCUMENTATION OF 2028 VMT HYPOTHETICAL SCENARIO

URBAN GROWTH BOUNDARY REMAND

MAKING BEND EVEN BETTER

ILUTP

Land Use & Transportation Changes

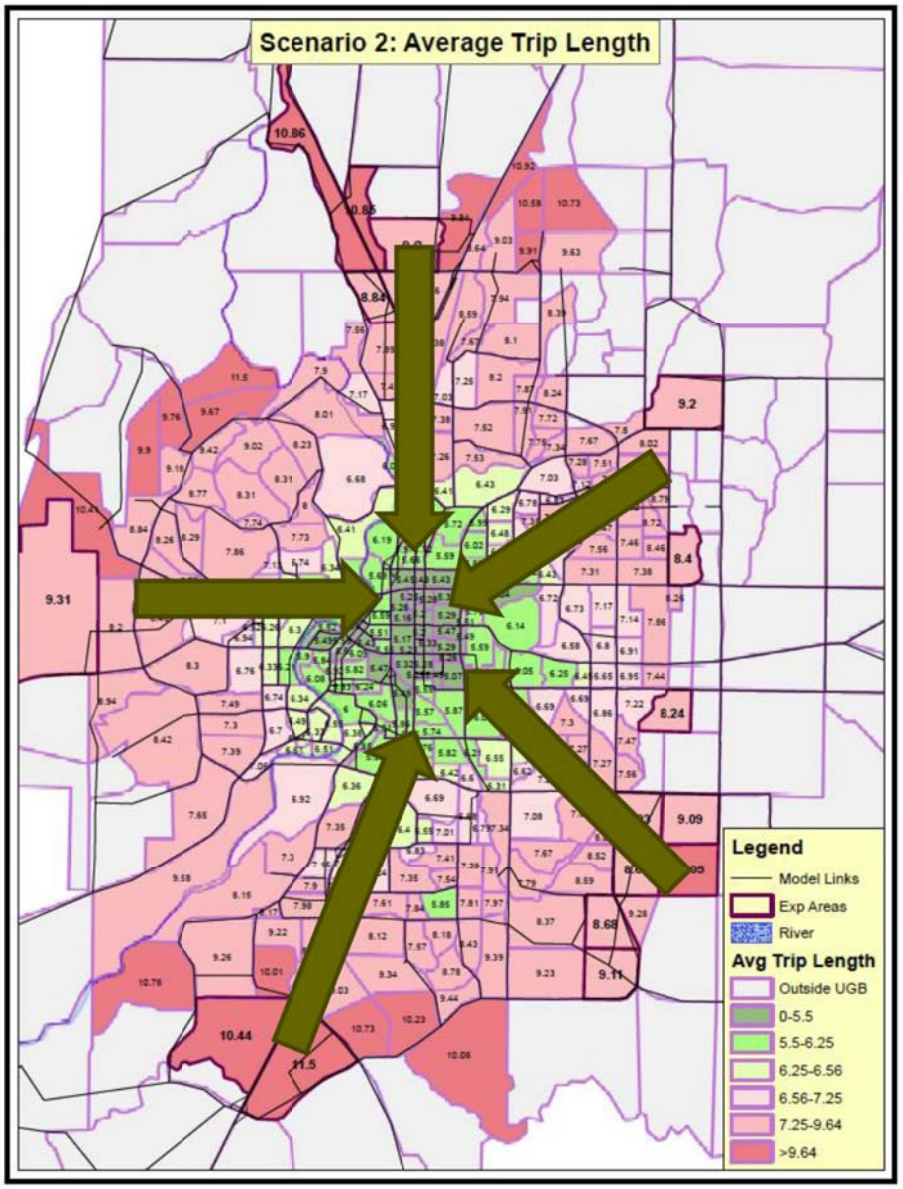
Alex Joyce - Fregonese Associates Inc.

10/07/15

General Philosophy

- Reallocate growth from high VMT areas to Low VMT areas
  - ***From "red areas to green areas"***

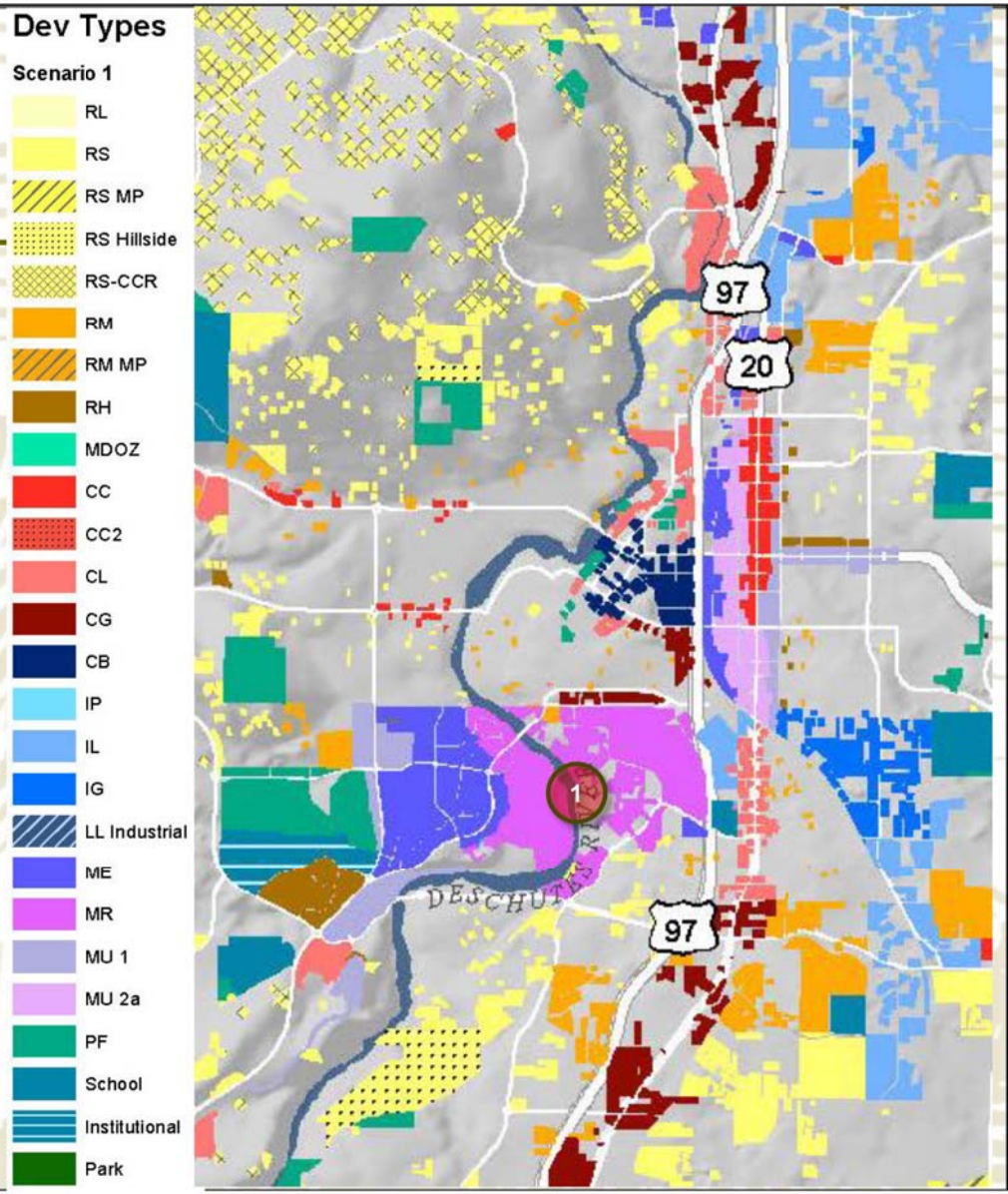
- Primary focus:
  - Multifamily
  - Creative office and industrial ("maker space")



Proposed Land Use Changes for ILUTP

#1: Old Mill District

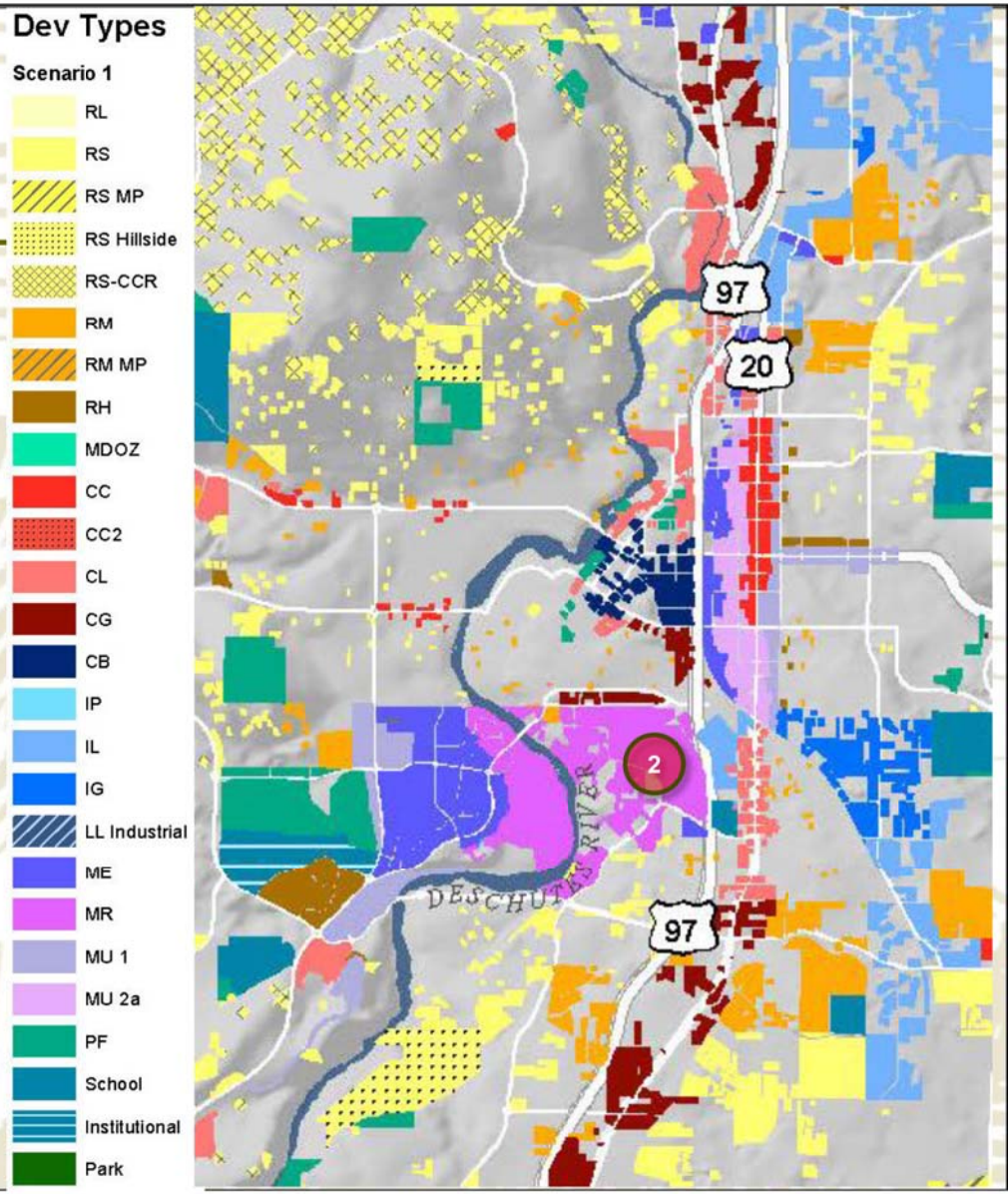
- **Today**: Mixed Riverfront (MR) Plan designation
  - Height: 35' max, except with variance
  - Allows single family and multifamily housing outright
  - Allows office, manufacturing, small- to medium-scale retail, etc.
- **Scenarios**: Mixed Riverfront (MR) Development Type
  - Primarily office with some retail and industrial
  - Small amount of single family and multifamily housing
  - 1-3 story buildings
- **ILUTP test**: MU-1 (Neighborhood Mixed Use) Development Type
  - Mix of retail and office, multifamily housing, some single family attached
  - Up to 4 story buildings



Proposed Land Use Changes for ILUTP

#2: Core Pine

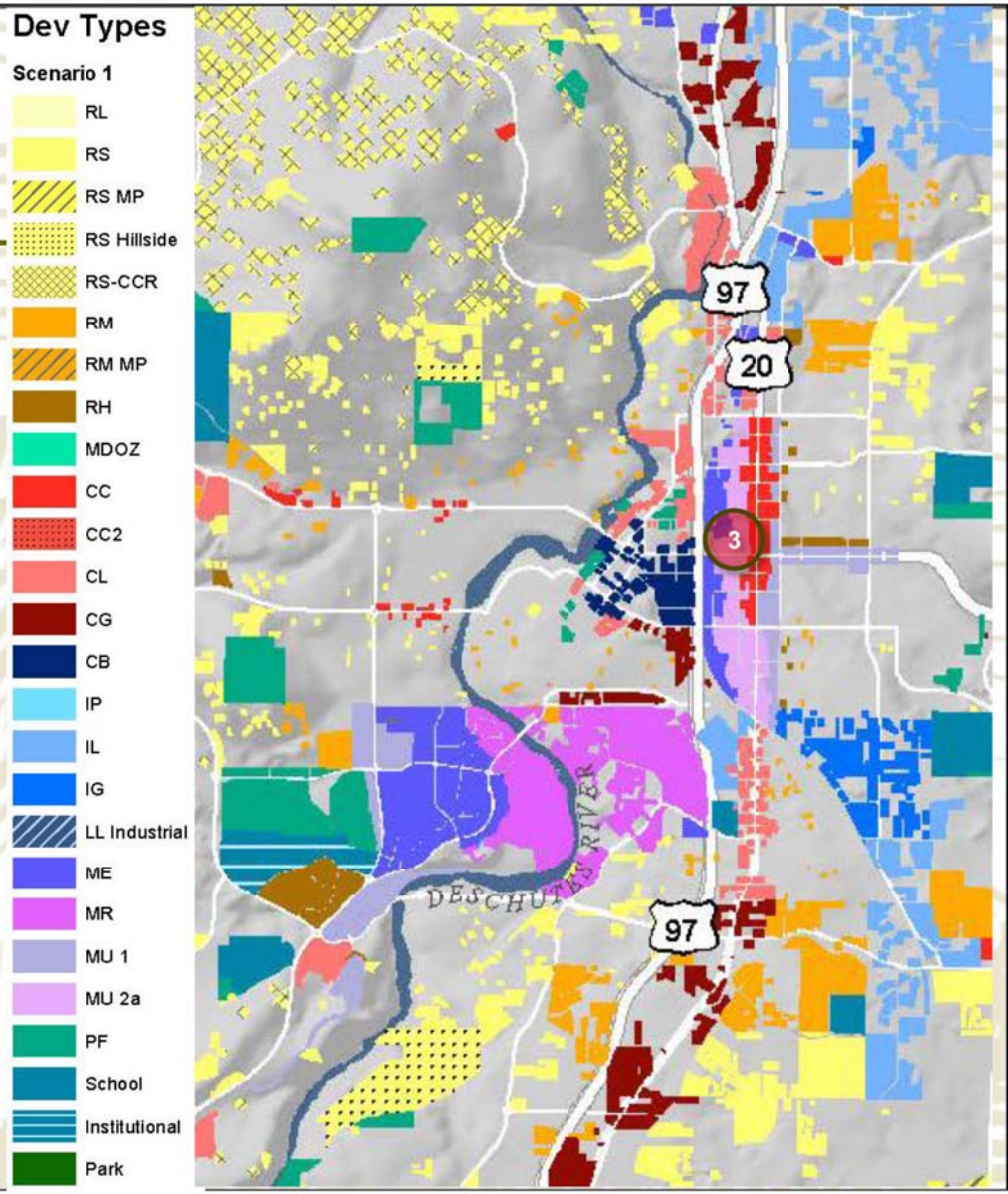
- **Today**: Light Industrial (IL) Plan designation
  - Height: 50' max, except with variance
  - Prohibits nearly all residential
  - Allows a range of industrial & manufacturing, limited office, very limited retail
- **Scenarios**: Mixed Riverfront (MR) Development Type
  - Primarily office with some retail and industrial
  - Small amount of single family and multifamily housing
  - 1-3 story buildings
- **ILUTP test**: MU-2a (Urban Mixed Use) Development Type
  - Mix of retail and office, multifamily housing, some single family attached
  - Up to 5 story buildings



Proposed Land Use Changes for ILUTP

#3: Central Area Plan

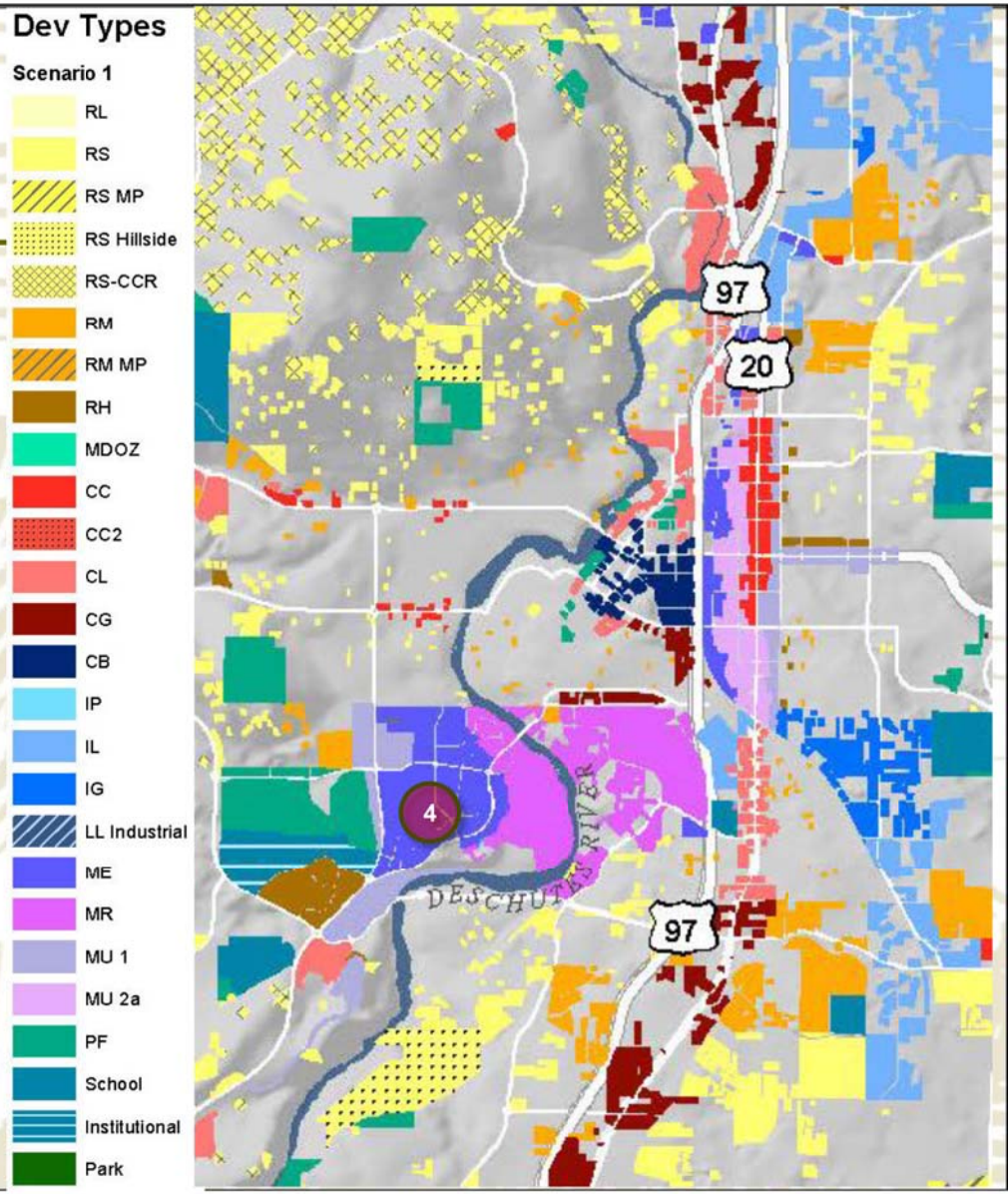
- **Today**: Mixed Employment (ME) and Limited Commercial (CL) Plan designations
  - Height: 45'-55'
  - Residential allowed as secondary use / part of mixed use
  - Allow office, auto-dependent retail, some manufacturing and industrial
- **Scenarios**: follows CAP land uses
  - roughly: ME along 1st, MU2a along 2nd, CC along 3rd, MU1 along 4th
  - Up to 5 story buildings along 2nd, lower elsewhere
- **ILUTP test**: Replace CC along 3rd with MU2a and ME along 1st with Urban Industrial / Maker Space



Proposed Land Use Changes for ILUTP

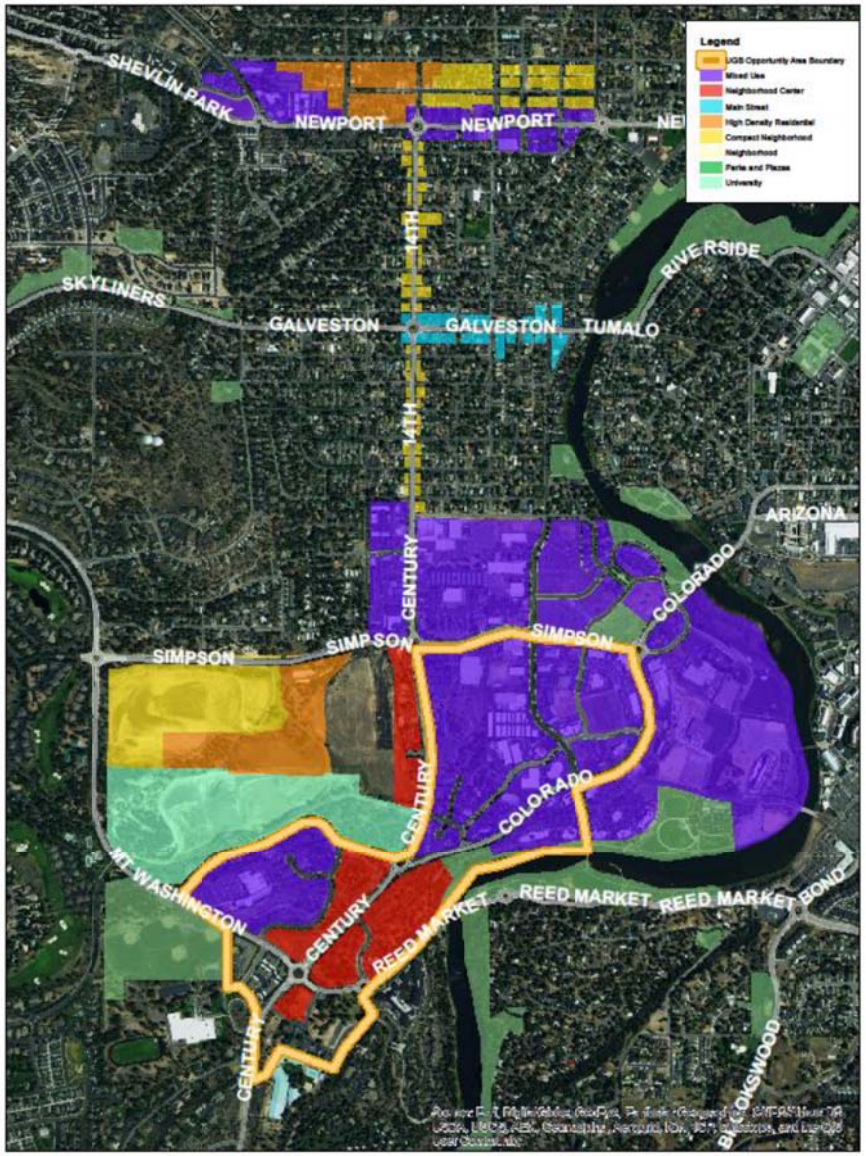
#4: Central Westside

- **Today**: Community Commercial (CC), General Commercial (CG) along Century; Light Industrial (IL) and Mixed Employment (ME) west of Colorado; and Limited Commercial (CL) north of Mt. Washington
  - Height: 35'-55' (varies by zone)
  - Residential allowed as secondary use / part of mixed use in some areas, prohibited in others
  - Allow office, auto-dependent retail, manufacturing and industrial
- **Scenarios**: MU1 along Century; ME west of Colorado; some RH north of Mt. Washington
- **ILUTP test**: MU2a west of Colorado (otherwise same as scenarios)



Central West Side

- Orange boundary is UGB Opportunity Area
- Central West Side Plan considered larger area
- ILUTP changes limited to purple (mixed-use) area



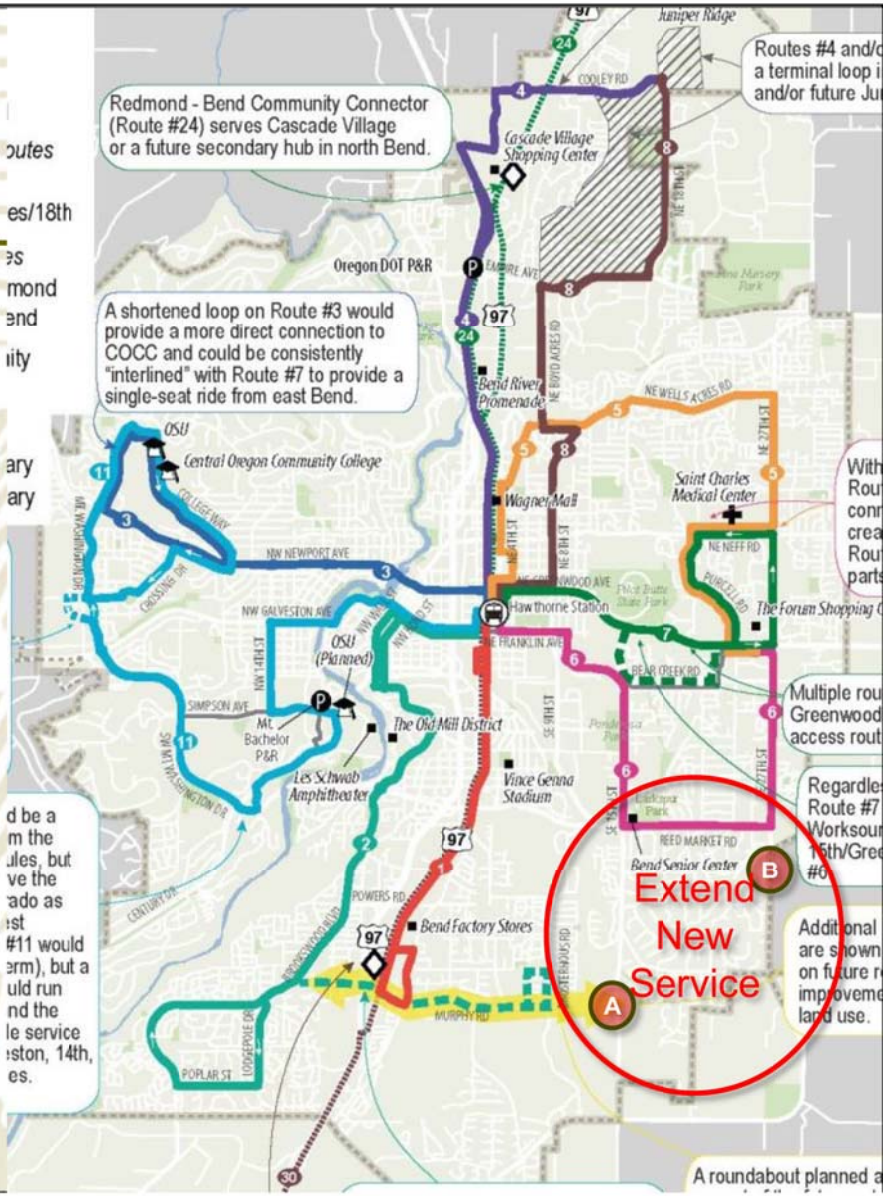
Transportation Changes

Transit

- Use mid- to long-range service concept as starting point
- Increase priority transit corridor bus frequency by reducing headways to 15 minutes
- Additional route options
  - A. Murphy / 15th Ave
  - B. 27th Ave extension

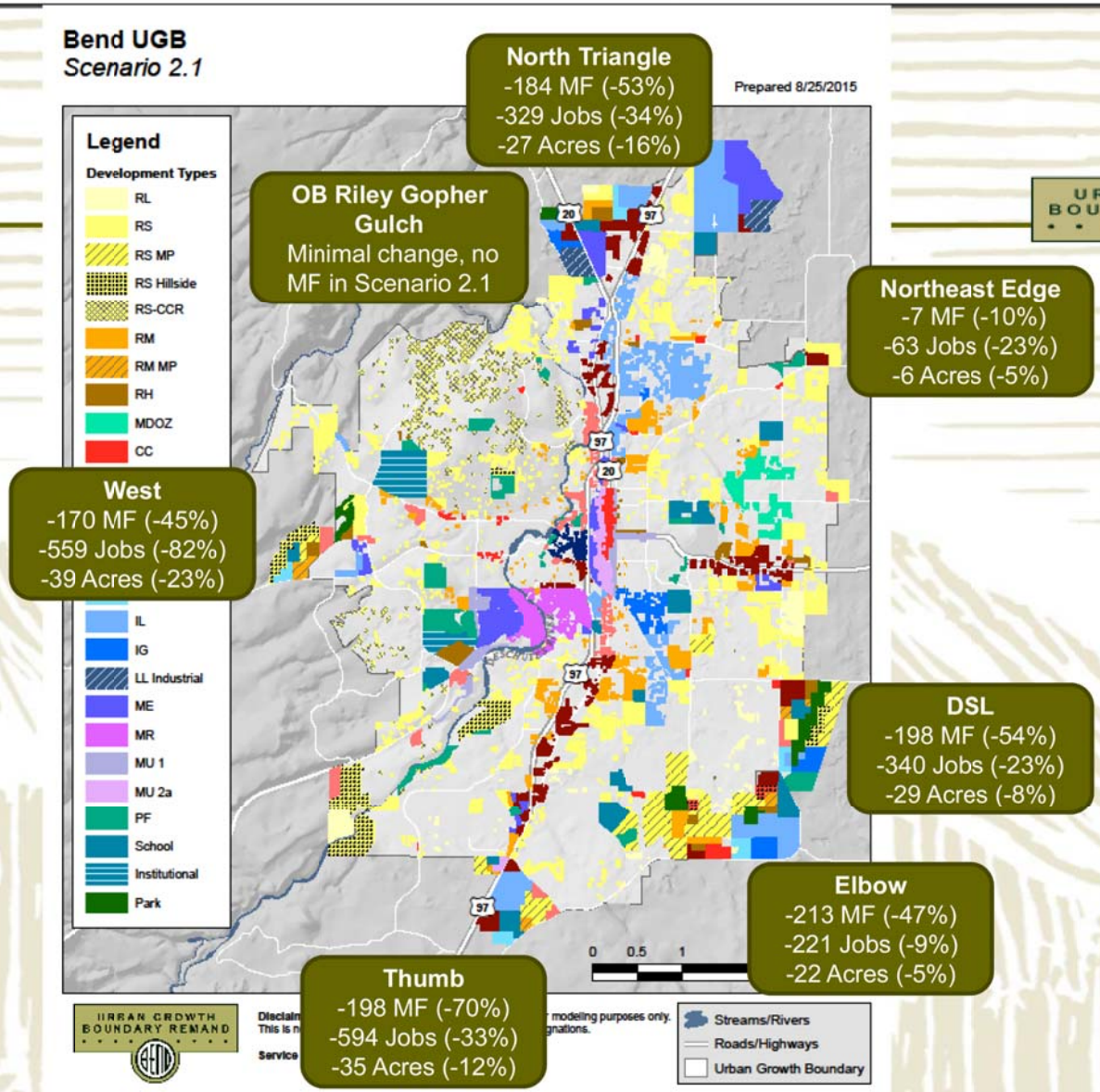
Street Connectivity

- Increase street connectivity (intersection densities) in master planned areas
- Increase walkability



Reductions in Expansion Subareas

- Generally: MU1 removed or converted to CC2; RH removed
- MU1 is a modest density, vertical mixed-use place type, that contains apartments, retail and mixed-use
- CC2 is a walkable retail and office place type -- residential uses generally surround those areas, so would be "horizontal mixed-use"



Changes to Expansion Areas

URBAN GROWTH BOUNDARY REMAND

Expansion Area - Subareas	Total Acres				MF				OFF				IND			
	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change
DSL Property	362	333	(29)	-8%	369	170	(198)	-54%	530	336	(194)	-37%	677	498	(178)	-26%
Elbow	427	405	(22)	-5%	452	239	(213)	-47%	830	646	(184)	-22%	1,086	916	(169)	-16%
North Triangle	172	145	(27)	-16%	346	162	(184)	-53%	319	157	(163)	-51%	502	274	(228)	-46%
Northeast Edge	114	108	(6)	-5%	75	68	(7)	-10%	93	50	(43)	-46%	15	8	(7)	-44%
OB Riley Gopher Gulch	120	116	(4)	-4%	6	8	2	25%	143	137	(6)	-4%	260	263	3	1%
Thumb	289	254	(35)	-12%	282	84	(198)	-70%	634	288	(347)	-55%	735	532	(203)	-28%
West	171	132	(39)	-23%	373	204	(170)	-45%	324	50	(274)	-85%	241	2	(239)	-99%
Total	1,656	1,495	(161)	-10%	1,904	934	(969)	-51%	2,874	1,663	(1,211)	-42%	3,515	2,493	(1,022)	-29%

Opportunity Areas	Total Acres				MF				OFF				IND			
	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change	Pre	Post	Diff	% Change
Central District Mixed-Use Multimodal Area (MMA)	137	129	(8)	-6%	534	571	37	7%	349	379	29	8%	13	47	34	267%
Central Highway 20	19	19	-	0%	35	51	16	45%	40	16	(24)	-60%	-	-	-	-
COID Property	90	90	-	0%	24	21	(2)	-10%	6	6	-	0%	-	-	-	-
East Downtown	8	8	-	0%	-	25	25	-	181	102	(79)	-44%	-	-	-	-
Juniper Ridge	219	219	-	0%	5	6	1	25%	488	1,121	633	130%	677	873	196	29%
Mill District/Core Pine	61	61	-	0%	11	367	357	3247%	68	202	134	198%	12	1	(11)	-90%
River Edge	69	69	-	0%	21	19	(2)	-10%	1	1	-	0%	-	-	-	-
SE 15th St	274	274	-	0%	295	236	(59)	-20%	61	56	(6)	-9%	-	-	-	-
SW Century Drive	138	103	(36)	-26%	310	780	470	151%	313	404	91	29%	94	14	(79)	-85%
Total	1,016	973	(43)	-4%	1,235	2,077	842	68%	1,508	2,287	779	52%	795	936	140	18%

Big Picture Shifts

URBAN GROWTH BOUNDARY REMAND

Acres:

- 161 fewer acres developed in expansion areas (-10%)
- No new acres "painted" in Opportunity Areas
  - Increased capacity assumed on existing "painted" lands (i.e.- up-zone)

Housing and Jobs:

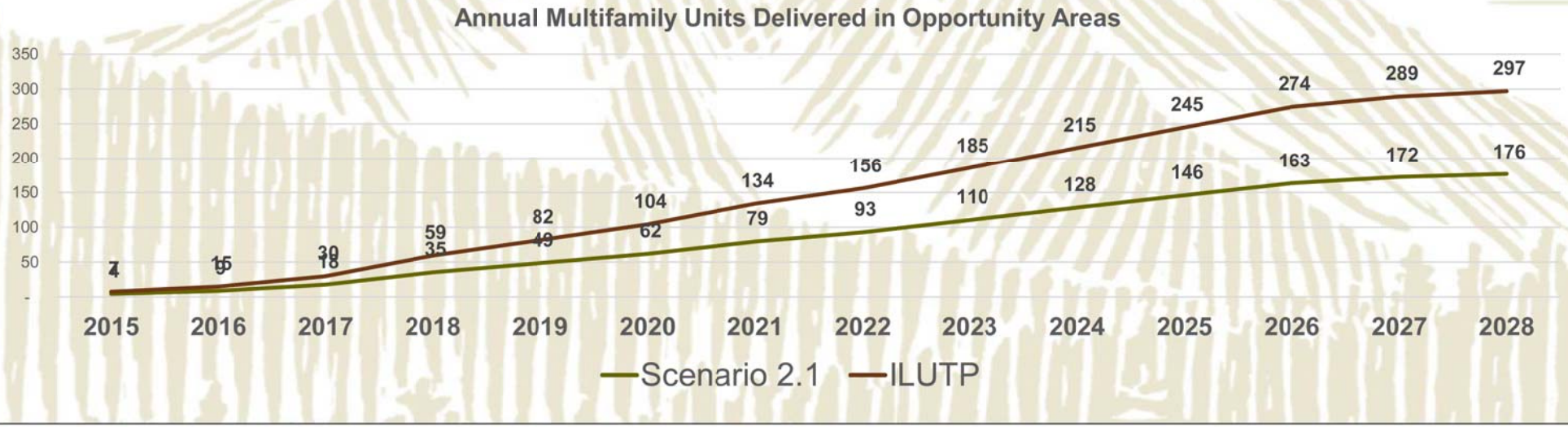
- 1,000 MF units shifted to green areas (53%)
  - 1,900 multifamily units currently assumed in expansion areas
- 1,000 industrial jobs shifted
  - New place type created; 1 and 2 story flex employment (i.e.- "maker space," for tech, light fabrication, brewing, etc.)
- 1,200 office jobs shifted
  - Office jobs increased in new and up-zoned mixed-use areas

Expansion Area Housing Mix			
Scenario	**SF**	**TH**	**MF**
ILUTP	52%	15%	33%
Scenario 2.1	40%	14%	46%

How to Think About the Magnitude

URBAN GROWTH BOUNDARY REMAND

- 1,235 vs. 2,077 ***OR*** 88 vs. 148 units per year on average
- Typical single site, urban apartments have 20-40 units
  - 1-2 additional apartments or mixed-use buildings annually compared to Scenario 2.1?
- Hypothetical annual MF unit pipeline in Opportunity Areas (2015 – 2028)



The Bulletin

1,500 new apartments on the way in Bend

Apartment-building boom might be coming

By Joseph Ditzler / The Bulletin / @josefditzler

Published Oct 4, 2015 at 12:01AM / Updated Oct 4, 2015 at 05:57AM

New plans for apartment complexes in Bend submitted this year bring the total number of proposed units in a rental-starved market to more than 1,500.

However, most of those applications remain on the drawing board, or in some phase of plan review at the city Community Development Department. Two projects are under construction and a third, a public housing project, opened its doors to tenants this summer.

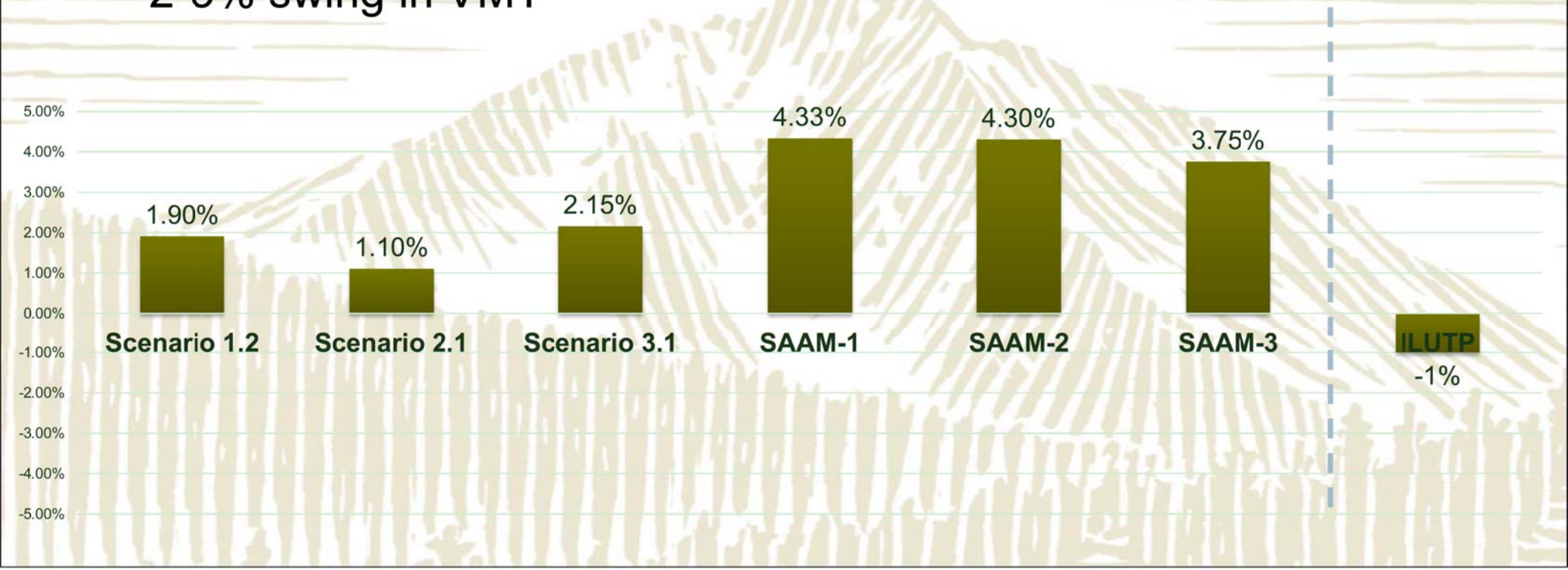
One project, filed by Monte Vista Homes, would erect a five-building apartment complex of 136 units on Empire Avenue. The developer, SGS Development, of Bend, in August applied for five building permits for the project, valued at nearly $17 million. A company representative did not return calls seeking comment.

Other projects have shown little progress beyond the first meeting with city planning staff and would-be

Transportation Impacts

URBAN GROWTH BOUNDARY REMAND

- Reversal of VMT trends (-1% VMT)
- 2-5% swing in VMT



ATTACHMENT 5 EVALUATION OF LONG-RANGE VMT TRENDS AND STRATEGIES

Memorandum

July 18, 2016

To:	Bend Growth Management Team
Cc:	Project Team
From:	Angelo Planning Group and Fregonese Associates
Re:	2040 Long-Range Evaluation of Integrated Land Use and Transportation Plan (ILUTP) Strategies

PURPOSE

The purpose of this memorandum is to evaluate the potential impact of a select set of strategies identified in Bend's Integrated Land Use and Transportation Plan (ILUTP) over the long-range future, beyond the 2028 planning horizon of the Urban Growth Boundary (UGB) Remand. The following ILUTP Scenarios (A, B and C) go out to 2040. There are three reasons for evaluation the strategies. First, this work is intended to provide insights for long-range City transportation and growth management planning and policies, particularly implementation of the following overarching outcomes and goals from the UGB process:

ILUTP High Level Outcomes

- Support the City's goal to create a balanced transportation system;
- Create a transportation system and facilities that support the City's complete communities goal;
- Implement a transportation system that supports the City's vision for opportunity areas, the Central Core, and UGB expansion areas;
- Increase transportation choices and reduce reliance on the automobile; and
- Over time, reduce vehicle miles traveled per capita in Bend.

Comprehensive Plan Growth Management Chapter Goals

- Encourage the city's evolution from small town to livable city, with urban scale development, amenities, and services in appropriate locations, while preserving and enhancing the natural environment and history of the community;
- Use Bend's existing urban land wisely, making efficient use of land inside the boundary, with infill and redevelopment focused in appropriate areas within the Central Core, along transit corridors, and in key opportunity areas;
- Create new walkable, mixed use and complete communities by leveraging and complementing land use patterns inside the existing boundary and using expansion to create more complete communities;

- Locate jobs in suitable locations, where there is access to transportation corridors, larger parcels, and good visibility for commercial uses;
- Plan Bend's infrastructure investments for the long term;
- Meet state requirements for growth management and the UGB while achieving local goals;
- Lay the groundwork for the future growth of Bend by taking into consideration the context of lands beyond the UGB;
- Utilize best practices (e.g. cluster development, transect planning) in appropriate locations to reinforce the City's urban form, reduce risk of wildfire, and recognize natural features that present "hard edges" for urbanization; and
- Implement an overall strategy to *"Wisely grow up and out".*

Secondly, this memo will roughly measure out to 2040 three possible housing and employment development patterns and growth with broad intensities and transit improvements. The three scenarios described below establishes "what if" scenarios about development which gives the City some insight about what it would take in terms of land uses and transit to stabilize or begin lowering VMT.

Finally, this evaluation is also intended to inform the City's next TSP update, which will have a new 20-year planning period to consider, and will need to demonstrate compliance with the Transportation Planning Rule (TPR) standards documented in the ILUTP, including section -0035. This evaluation will frame the type of work scope needed to assess the ILUTP during the TSP update.

HORIZON YEAR

The analysis summarized in this memo predicts how key policies and measures included in Bend's ILUTP may affect Vehicle Miles Traveled (VMT) in the year 2040. 2040 was selected as the long-range future year because it aligns with the Bend Metropolitan Transportation Plan (MTP). It may also align reasonably well with the 20-year planning horizon for Bend's TSP when it is updated in the next several years. Population and employment forecasts from the MTP were used as the control totals for the 2040 analysis work. Table 1 provides a summary of the growth forecasts (rounded to the nearest 1,000 for the sake of simplicity).

	2014 (Estimated)	**2028 (Projected)**	**2040 (Projected)**
Population	84,000 *Source: Census Population Estimate*	115,000 *Source: Bend Housing Needs Analysis*	141,000 *Source: Bend MTP*
Employment	43,000 *Source: Quarterly Census of Employment and Wages*	67,000 *Source: Bend Employment Opportunities Analysis*	81,000 *Source: Bend MTP*

ABOUT THE 2040 SCENARIOS

Three scenarios for 2040 were tested. Each was built from the modeling work for the UGB, taking the UGB expansion and set of "efficiency measures" (map amendments and changes to the development code to increase land use efficiency within the existing UGB) proposed for the

2028 planning horizon as a starting point. The scenarios were intended to test different levels of implementation of the strategies set forth in the ILUTP. Due to the limitations of the Envision Tomorrow model, the main strategies that were evaluated are changes to modelled land use / development assumptions and changes to transit service.

The 2040 scenarios were created using the 2028 UGB Scenario as the base to allocate more employment and housing in the existing and proposed UGB.[1] Table 1 provides an overview of the three scenarios. Scenario A allocates relatively more housing and employment outside the UGB whereas Scenario C locates more housing and jobs within the existing UGB --- these are the bookends. Scenario B growth assumptions fall in between Scenario A and C. This is explained in more detail below. "Heat maps" that illustrate generally where employment and housing growth is focused in each scenario are provided in Figure 1, on the following page.

All scenarios share similar basic land use assumptions, including:

- Continuation of efficiency measures to be adopted with UGB in 2016, with increased redevelopment in core opportunity areas.
- Increased density and redevelopment, in some transit corridors (beyond opportunity areas), including some vertical mixed use development. Densities and development assumptions are consistent with upper limits of what is allowed by current commercial plan designations, but beyond what has been seen historically.
- Modest amounts of residential redevelopment and ADUs in existing neighborhoods where allowed by existing zoning / plan designations.
- Density for new growth past 2028 assumed to increase relative to assumptions used for 2028 UGB work (still within allowed ranges).

The primary differences between the scenarios in terms of land use are redevelopment rates, housing and employment densities, and degree of additional UGB expansion beyond the 2028 UGB.

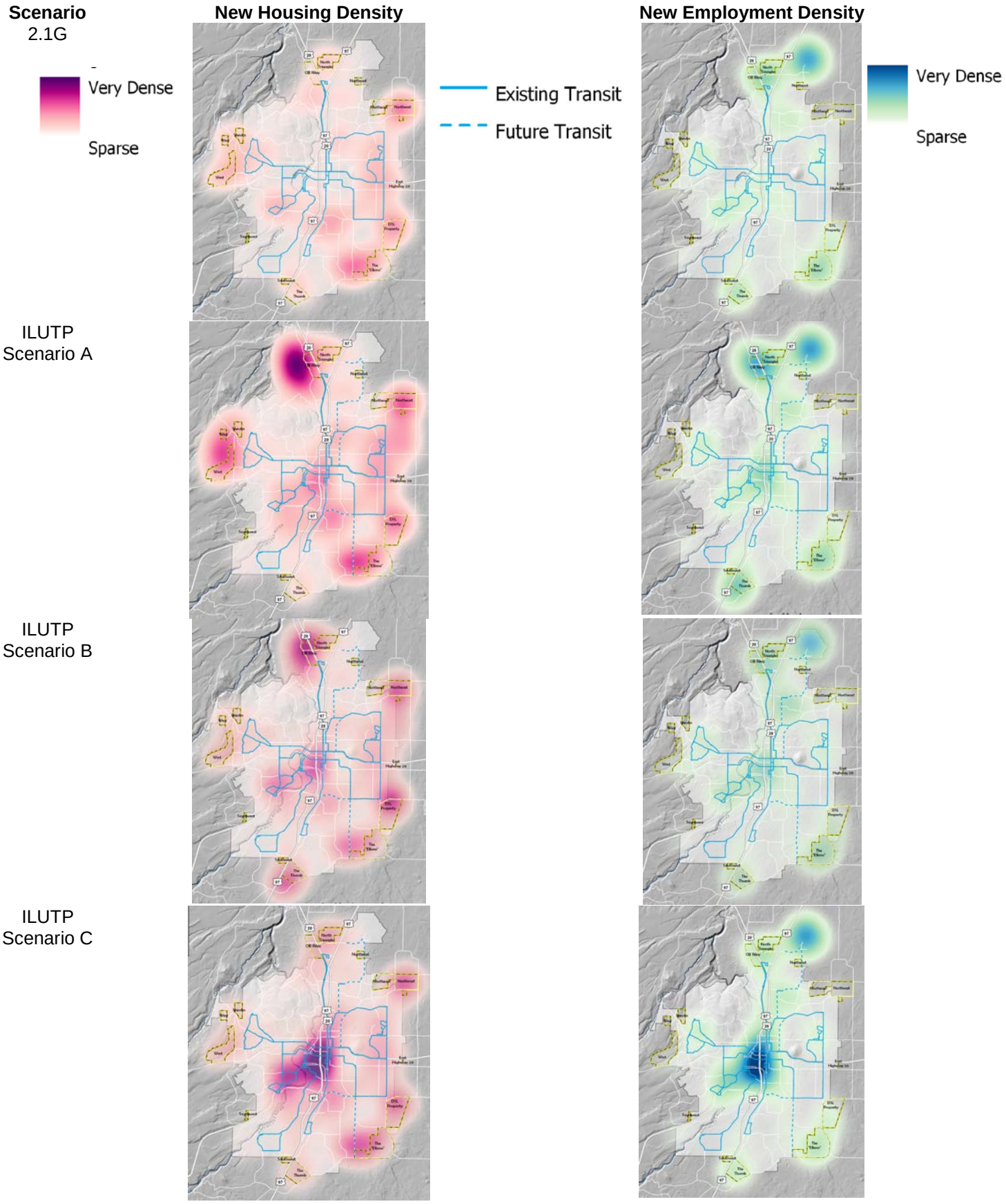
Table 1: Summary of 2040 ILUTP Scenarios

Scenario	Land Use	Transit
ILUTP Scenario A	Redevelopment rates nearly double relative to Scenario 2.1G for core opportunity areas and transit corridors. Increase in residential development & density in mixed use zones and CB UGB expansion assumed on high-performing land that was not included in the proposed 2028 UGB	Two new routes (southeast and northeast), same frequency as today

[1] Due to timing, only ILUTP Scenario B uses UGB Scenario 2.1G as the 2028 base. Other ILUTP scenarios, prepared before Scenario 2.1G was finalized, use earlier, slightly different (though largely similar) versions of the preferred UGB scenario as the base.

Scenario	Land Use	Transit
ILUTP Scenario B	Redevelopment rates more than double relative to Scenario 2.1G for core opportunity areas and transit corridors. Increase in residential development & density in new mixed use zones and CB Limited UGB expansion assumed on high-performing land that was not included in the proposed 2028 UGB	"Medium" long-range transit service (2 new routes, plus improved frequency)
ILUTP Scenario C	Significant increase in redevelopment in core, opportunity areas and transit corridors (redevelopment rates more than four times as high as in Scenario 2.1G). Significant increase in residential development & density in mixed use zones and CB No additional UGB expansion assumed beyond proposed 2028 UGB	"High" long-range transit service (2 new routes, improved frequency and pre-BRT service on key corridors)

Figure 1: Housing and Employment Heat Maps by Scenario

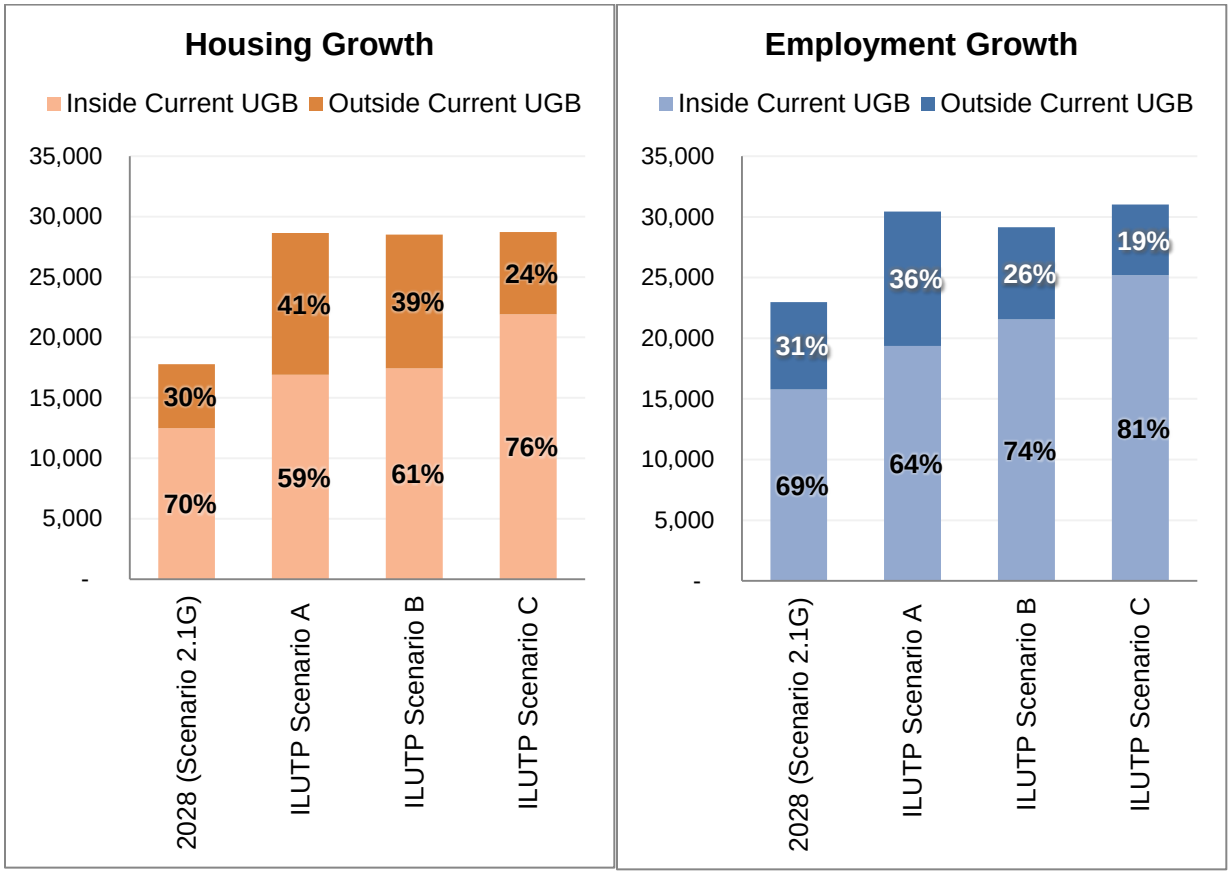


GROWTH PATTERNS FOR ILUTP SCENARIOS

The charts in Figure 2 illustrate the share of growth from 2014 to the horizon year that is accommodated inside the current UGB and in UGB expansion areas for Scenario 2.1G and each of the 2040 scenarios.

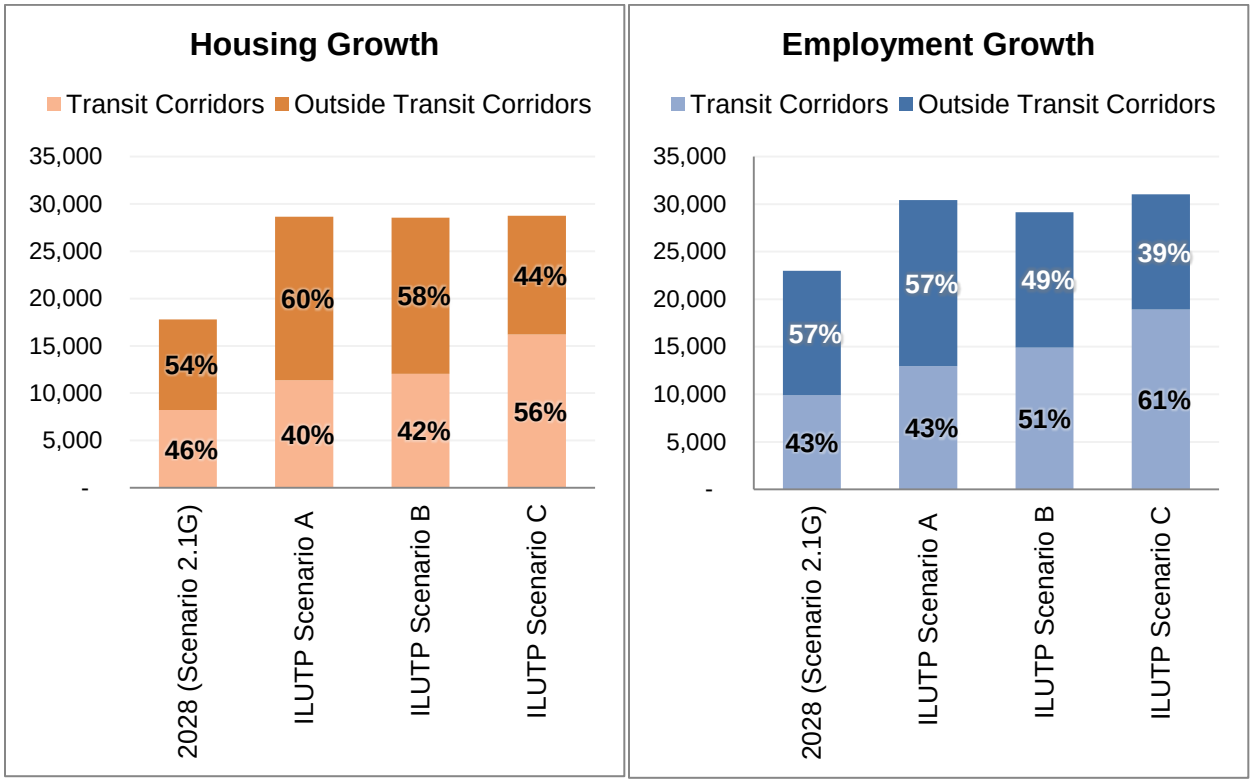
Figure 2 shows that all of the ILUTP scenarios accommodate additional housing and employment within the current UGB relative to the 2028 Preferred UGB Scenario. Because most of the remaining vacant land within the current UGB is projected to develop by 2028, this additional growth inside the UGB through 2040 is primarily due to additional redevelopment and infill, along with some increases in the intensity of future development (i.e. density of new development increasing over time). The amount of additional housing and employment growth projected within the current UGB increases from ILUTP Scenario A to C as the assumed redevelopment rate and intensity of development increases. In ILUTP Scenario C, the residual housing and employment growth outside the current UGB for 2040 is nearly the same in absolute terms as in the preferred scenario (2.1G) for 2028, meaning that little or no additional UGB expansion would be needed beyond that being proposed in 2016. In contrast, ILUTP Scenario A assumes further UGB expansions, with nearly twice as much housing and roughly 50% more employment outside the current UGB as projected for 2028. ILUTP Scenario B falls between these two extremes.

Figure 2: Housing and Employment Growth Inside and Outside Current UGB



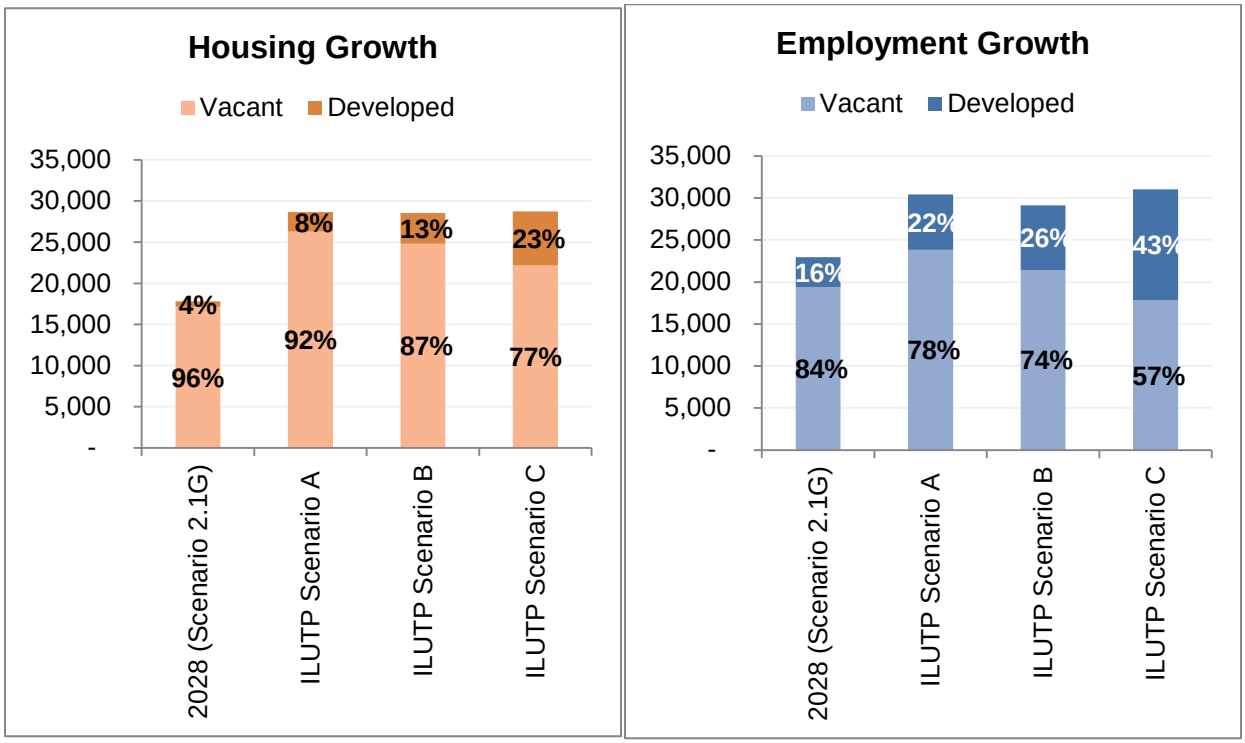
The 2040 scenarios also differ in the degree to which they focus development around transit, as shown in Figure 2. All three of the 2040 scenarios share the same transit route locations (which include two new routes not assumed to operate as of 2028), although the frequency of service varies. ILUTP Scenario C accommodates a majority of total forecast housing and employment growth within a quarter mile of existing and future transit corridors.

Figure 3: Housing and Employment Growth Inside and Outside Transit Corridors



As with growth inside the current UGB, maintaining or increasing the share of growth in proximity to transit as the City grows requires substantial infill and redevelopment. This is illustrated on Figure 4.

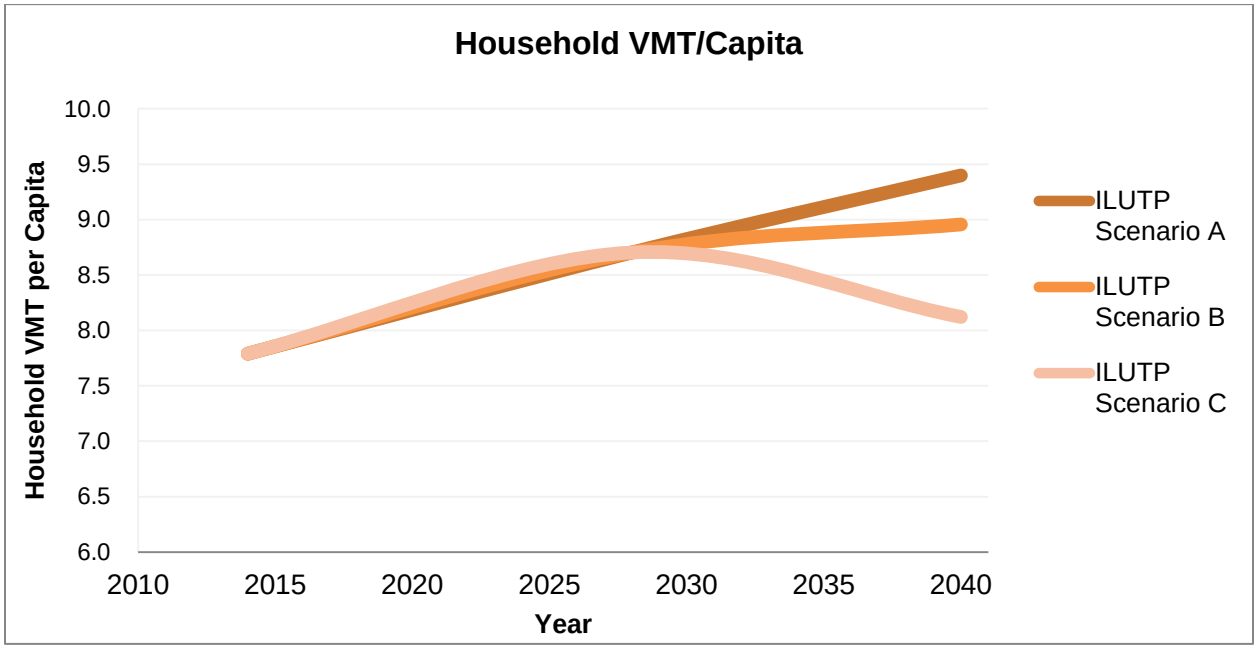
Figure 4: Housing and Employment Growth on Vacant vs. Developed Land



ILUTP SCENARIO VMT RESULTS

The range of potential outcomes for VMT per capita is illustrated on Figure 3, below. Note that the VMT results reported below are for household VMT per capita, as estimated by the Envision Tomorrow "7D" transport model. This metric measures only trips that begin or end at home. The Bend area regional Travel Demand Model calculated total VMT per capita (all trips) and is used for official analysis of VMT under the Transportation Planning Rule. The analysis below is intended as an indicator of the magnitude and direction of VMT changes rather than as a precise estimate of the future VMT. As mentioned above, the 2040 scenarios only used a set of the possible strategies identified in the ILUTP. Figure 3 illustrates a constant set of assumptions for existing VMT and for 2028 VMT based on Scenario 2.1G (the preferred UGB expansion scenario), with a range of possible outcomes for 2040 depending on the land use and transit assumptions in each of the scenarios.

Figure 5: Household VMT per Capita Trends



As shown in Figure 3, Scenario C significantly bends the curve relative to 2028, but still does not reach a decline relative to existing VMT per capita. Scenario A continues the trend line established with 2028, while Scenario B flattens the line somewhat, but continues upward.

SUMMARY: VMT AND FUTURE LAND USE PATTERNS AND TRANSIT IMPROVEMENTS

The 2040 scenarios in this evaluation memo explored how housing and employment located inside and outside the proposed UGB influences VMT. The scenario also assumed transit improvements to support the land uses. The City will at some point in the near future update the TSP which includes an update of the VMT strategies, goals, and requirements. Using only housing and employment growth and levels of transit improvements, it appears, with no other

factors, that most of the new development out to 2040 would have to occur within the proposed UGB Scenario 2.1G boundary for VMT to be reduced relative to existing (2014) conditions. In order for that to happen, the City would have to invest in a significant amount of transit funding to implement a much higher level of transit service that includes Bus Rapid Transit. Similarly, further changes to the development code and increased investment in parks, open space, schools and other amenities would be needed to support the infill and redevelopment projected in Scenario C. Additional financial support or other incentives for redevelopment and higher density might also be needed in order to generate that level of redevelopment. The 2040 analysis presented in this memo is a first attempt to understand what it would possibly take to bend VMT downward, without detailed analysis about rates of redevelopment, costs, household incomes, household mode preferences over time, and other factors that influence and limit or enhance development within the UGB. It is intended to inform further evaluation of the additional strategies identified in the ILUTP and the City's upcoming TSP update.

ATTACHMENT 6 ANALYSIS OF BENEFIT OF CONNECTIVITY IMPROVEMENTS SINCE 1990

DRAFT MEMORANDUM

DATE: **October 20, 2014**

TO: **Nick Arnis, City of Bend**

FROM: Chris Maciejewski, P.E., PTOE
Ray Delahanty, AICP
Aaron Berger, EI

SUBJECT: **DRAFT Bend VMT Study Process Summary** P#11123-000

The purpose of this memorandum is describe the framework developed for analyzing strategies for Vehicle Miles Traveled (VMT) reduction for the City of Bend. The process for developing methodology and assumptions is discussed, and the scenarios analyzed are described as well.

BACKGROUND

In 2012, the City of Bend embarked on an effort to develop a future land use and Urban Growth Boundary (UGB) scenario that would meet both (1) the City's future growth needs and (2) state planning requirements laid out by the Department of Land Conservation and Development (DLCD). Scenario development was in response to a remand from the Land Conservation and Development Commission (LCDC) regarding the City's proposed UGB expansion. The primary goal of this exercise was to identify a combination of land use and transportation strategies that would achieve a reduction in daily VMT per capita – ideally 5% or more.

Transportation Planning Rule (TPR)

The TPR requires metropolitan planning organizations (MPOs) to assess the likely change in VMT per capita over a 20-year planning period. If VMT per capita increases over the 20-year period, then jurisdictions within the metro area will be directed to prepare an integrated land use and transportation plan. Land use and transportation strategies should not result in a likely increase of 5% or more. In assessing the change in VMT per capita, LCDC shall give credit to regional and local plans, programs, and actions implemented since 1990 that have already made progress toward VMT goals. VMT, as defined in the TPR, refers only to trips that begin and end within the MPO boundary, and transit, heavy truck, and commercial vehicle miles are not included.

DEVELOPING A FRAMEWORK

Project Chartering

To keep the project on course for an outcome that would fulfill City growth objectives as well as state policy, a project charter was developed. The charter outlined the following elements:

- Project purpose and members, including the City of Bend, Bend MPO, DLCD, and ODOT
- Project goals, including strategies for addressing VMT/capita supported by project charter members
- Key project milestones
- Project roles and responsibilities
- Decision making process, including dispute resolution
- Project communication

Analysis Approach

To satisfy the requirement of a 20-year analysis, the base and horizon years of 2008 and 2028 were selected. The Bend MPO travel demand model was used to estimate VMT in these two years, using a daily demand and a 16-hour roadway capacity assignment to represent daily VMT (assignment methodology developed in coordination with ODOT's Transportation Planning Analysis Unit and DLCD). The project team agreed that the travel demand model's base and future years of 2003 and 2030 were appropriate proxies for 2008 and 2028, respectively. The analysis included the following steps:

1. **Credit for actions implemented since 1990.** The City of Bend implemented several connectivity improvements that would be expected to reduce VMT per capita, such as a new river crossing and an extension of Empire Avenue. To measure the benefit of these improvements, 2003-level demand was applied to both the base 2003 model network and to a 1990 network that did not include these connectivity improvements. VMT per capita from these model runs were compared in order to calculate the credit due to actions implemented in the intervening 13 years.
2. **Accounting for the Bend Parkway.** Because the Bend Parkway is an improvement of a much larger magnitude than others constructed between 1990 and 2003, and because it was oriented toward statewide rather than local travel, an additional version of the 1990 network was created with the Parkway in place. This allowed the team to isolate the effect of the Parkway on VMT per capita.
3. **Measuring likely changes between 2008 and 2028.** Model runs were performed for the proxy years of 2003 and 2030. The total length of all trips internal to the set of transportation analysis zones (TAZs) that lie within or overlap the UGB was divided by the population assumed for those TAZs. This resulted in a VMT per capita calculation for each scenario.

In addition to the 2008 and 2028 scenarios, recently created scenarios for the MTP Update (including a 2010 base year and 2040 horizon year) were analyzed for the MPO boundary as part of the MTP Update process. The information from that analysis is presented in the following section to provide information regarding the changes in VMT that could be attributed to updated census data and new land use growth forecasts and development patterns for a 2040 horizon year.

SUMMARY OF SCENARIOS

Model scenarios evaluated are summarized in the table below, along with the VMT per capita results.

Scenario	Network	Land Use	VMT	Population	VMT per capita
1990 without Parkway	1990 travel demand model network	2003	600,553	64,007	9.38
1990 with Parkway	1990 travel demand model network with Bend Parkway in place	2003	610,701	64,007	9.54
2003	*2003 travel demand model network	2003	587,557	64,007	9.18
2010	**2010 travel demand model network	2010	837,670	84,003	9.97
2030	*2030 travel demand model network including improvements from the financially constrained list	2030	1,248,220	126,988	9.83
2040	**2040 travel demand model network including improvements from the financially constrained MTP project list	2040	1,403,266	152,837	9.36

**An initial evaluation done using PM peak demand (not daily) and an incorrect set of TAZs (not reflecting the full UGB boundary) indicated a reduction in VMT/capita between 2008 and 2028 with the baseline 2008 and 2030 models. This analysis was replaced with the information listed in the table above.*

***The 2010 and 2040 results are based off the travel model developed for the 2014 Bend MTP. The 2010 VMT/capita was calculated based off the existing MPO boundary. The 2040 VMT/capita was calculated based on the predicted 2040 MPO boundary from the land use allocation prepared for the MTP Update.*

AREAS FOR FURTHER EXPLORATION

Because the travel demand model played such an important role in the analysis, a "Modeling 101" workshop for the project team was held in Bend. Based on this workshop and the initial evaluations, further steps were identified, including:

- The VMT analysis was not itself an integrated land use and transportation plan, but its results show that such a plan may be required per the TPR. Such an integrated plan could include an approach where the land use is "reverse engineered" so that modeling results yield the target VMT per capita results (preferably a 5% reduction over the 20 years).
- During the analysis the question was raised as to the effects of demographics on travel behavior, as certain demographic segments may make fewer and/or shorter vehicle trips than others. The project team concluded that assumptions about demographics may have a significant effect on VMT per capita. The City and MPO may consider working with experts in the field to assess and potentially update the demographic assumptions in the future year travel demand model. Note – demographics in the 2030 model are currently the same as the 2003 model.

Oregon
Theodore R. Kulongoski, Governor

Department of Land Conservation and Development
Community Services Division
635 Capitol Street NE, Suite 150
Salem, Oregon 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-5518
www.oregon.gov/LCD

10-Nov-11

TO: Christopher S. Maciejewski, P.E., P.T.O.E.; DKS Associates

FROM: Matt Crall; DLCD TGM Program Coordinator**;**
Robert Cortright, DLCD Land Use-Transportation Planning Specialist;
Gary Fish, DLCD Land Use-Transportation Planner;
Karen Swirsky, DLCD Central Oregon Regional Representative

CC: Rick Root, City of Bend Transportation Planner;
Brian Shetterly, City of Bend Long Range Planning Manager

RE: Questions relating to the Bend Urban Growth Boundary (UGB) Vehicle Miles Traveled (VMT) analysis

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DKS is beginning work analysis of the City of Bend's VMT as part of the Bend UGB effort. This is required by Sub-issue 8.6 of the November 2, 2010 Remand Order from the Land Conservation and Development Commission (LCDC). Sub-issue 8.6 found that the metropolitan planning organization (MPO) requirements of the Transportation Planning Rule (TPR) must be met by the City as part of its UGB expansion work.

DKS Project Manger Chris Maciejewski requested that the department clarify the following issues. We are happy to provide clarification. Our responses follow each numbered issue.

1. Confirm that our interpretation of the TPR definition of VMT for MPO analysis (only internal-internal trips within the UGB) apply for this effort. We are assuming there would be a different UGB boundary for the base year vs. future year comparisons.

The department concurs with DKS's interpretation of the TPR definition. VMT for TPR purposes is include internal travel only. This is covered in the definition of VMT in OAR 660-012-0005:

> (41) Vehicle Miles of Travel (VMT): means automobile vehicle miles of travel. Automobiles, for purposes of this definition, include automobiles, light trucks, and other similar vehicles used for movement of people. The definition does not include buses, heavy trucks and trips that involve commercial movement of goods. VMT includes trips with an origin and a destination within the MPO boundary and excludes pass through trips (i.e., trips with a beginning and end point outside of the MPO) and external trips (i.e., trips with a beginning or end point outside of the MPO boundary). VMT is estimated prospectively through the use of metropolitan area transportation models. (underline added)

On the second part of the question, the use of different boundaries for base and future year is not addressed by the rule. The department does not believe that there was significant VMT generated in the base year in the areas proposed for UGB expansion since the lands are mostly undeveloped in the base year. Thus the different boundaries would not make much difference in the overall results.

2 . Forecast years: The City's UGB study years are 2008 and 2028. As we discussed, the travel demand model has a base year 2003 and a future year 2030 scenario (including corresponding land use data). Further complicating this, we have seen the 2030 scenario now be referred to as a year 2034 scenario (per the ODOT US 97 North Corridor Study). So question is...should we move ahead now with the 2003 and 2030 consistent with our prior UGB analysis? Maybe we change to 2008 and 2028 scenarios when we have developed the final UGB scenario? If we switch to 2008 and 2028, how would we go about creating new approved land use inputs to create those forecast year scenarios?

The TPR does not specify particular years as the base year or planning year. However, the Remand concludes (p. 121) that: *"The City has agreed to prepare analyses of its baseline VMT per capita in 2003…"*

It would be ideal if the City could use a consistent set of assumptions as a basis for all of its land use planning decisions – i.e. for the TSP and the UGB – and that the 2003-2030 would be best. However, if the City chooses to use a different time frame for the UGB than it has for the TSP, it will be necessary to clearly explain how the different planning horizon years – 2028 and 2030 – are consistent with one another. For example, if the 2028 projections were lower than the 2030 projections, and the difference was roughly two years of growth, then they could be consistent without being identical. On the other hand, if the 2028 projections were higher than the 2030 projections, or if the difference were so large it could not be accounted for by two years of growth, then the TSP and UGB work would not be consistent. If they are consistent, relative to population and employment, then either could satisfy the requirement of the Remand and the TPR.

Additionally, the city's obligation to plan for VMT reduction is tied to its designation as an MPO (2002). That would suggest that 2003 will work better as a base year; however, using 2008 as a base year could work, unless there is some significant difference in VMT per capita between 2002 and 2008.

3. Taking credit for actions since 1990: Confirm that it would be correct to modify base year 2003 or 2008 model scenarios to remove major transportation projects that were implemented or constructed since 1990 (e.g., the southern river crossing and the Empire extension). This would include continuing to not include fixed route transit service in the base year scenario.

The intent of the provision in the TPR that allows taking credit for actions implemented since 1990 is to recognize and allow a metropolitan area to "count" actions that have clearly reduced VMT per capita.

The first question for the City is to assess whether base year (2003/2008) VMT per capita is in fact **lower** than 1990 VMT per capita. If it is lower, then the second question would be to

identify actions that the City believes contributed to this reduction (i.e., explaining how actions like the Southern River Crossing and the Empire extension reduced VMT per capita). We want to caution that the effect of new roads on VMT is often mixed, and does not always lead to a reduction in per capita VMT. Although improved connectivity makes some trips shorter, the reduction can be offset by people taking additional trips or traveling to more distant destinations due to increased convenience.

4. **What is the analysis period for the VMT/capita? Average daily vs. weekday PM peak hour? I was assuming weekday PM peak hour, as that is what the MPO model is primarily calibrated to and the focus of the traffic operations analysis for determining impact. I don't see this defined in the TPR.**

The accepted interpretation and approach is to measure or estimate daily or annual VMT per capita – usually expressed as VMT per capita per day based on the average annual VMT. While the definition in 0005(41) does not specify a measurement period, it is not properly applied by measuring peak hour VMT for several reasons. First, peak hour VMT is only a fraction of total VMT.

Second, if the rule were intended to be limited to peak hour VMT, it would have specified that. We are not aware of any circumstances in which only peak hour VMT was used for MPO standards to meet TPR 0035(5).

Finally, the use of peak hour VMT is not appropriate because as congestion increases, travel tends to shift out of the peak hour. This means that over time – i.e. over the 20 year planning period – peak hour VMT per capita should decline simply because of increased traffic congestion. (In other words, it would not be surprising to see a 5% reduction in peak hour VMT per capita as a result of increased traffic congestion causing a shift to other times or modes of travel.)

We suggest that it is useful to think about measurement in the context of the VMT reduction requirement – remembering that the objective of the TPR is to reduce reliance on the automobile and increase the availability and convenience of other modes of transportation.

Again, thank you for the opportunity to discuss and clarify these issues. We look forward to continue working with you and the City of Bend as it moves forward with this important work.

Sincerely,

Karen Swirsky, AICP, Central Oregon Regional Representative
Matt Crall, Transportation and Growth Management Program Coordinator

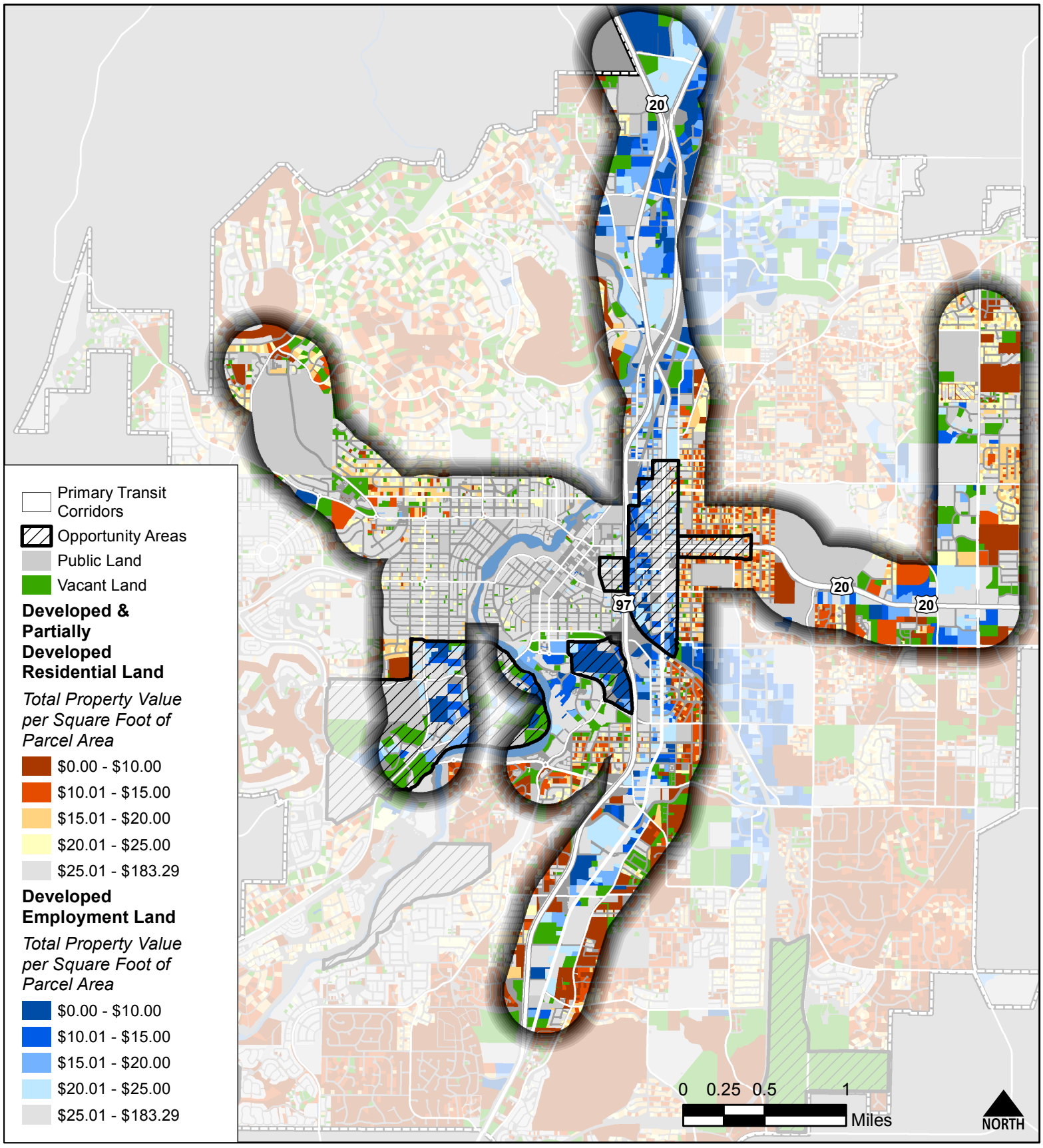
ATTACHMENT 7 ANALYSIS OF LONG-TERM REDEVELOPMENT POTENTIAL IN TRANSIT CORRIDORS

Bend Integrated Land Use and Transportation Plan
July 19, 2016

Bend UGB Remand Project

Redevelopment Potential in Key Transit Corridors

Prepared 6/14/2016



URBAN GROWTH BOUNDARY REMAND

Disclaimer: This map represents land use assumptions for modeling purposes only. This is not a proposal for specific comprehensive plan designations.

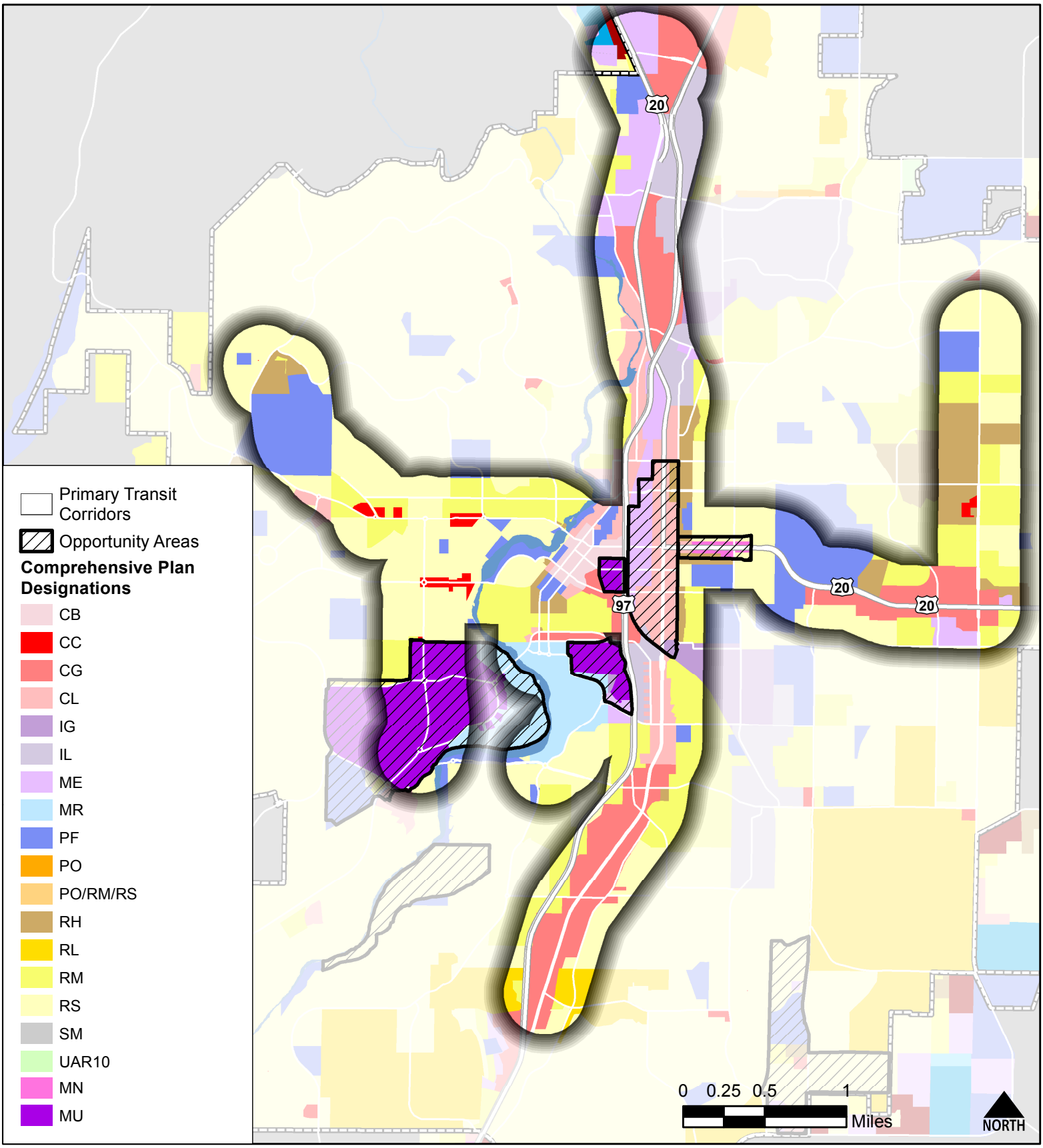
Service Layer Credits: Deschutes County GIS (2014)

Roads/Highways
Rivers
Current UGB

Bend UGB Remand Project

Existing Plan Designations in Key Transit Corridors

Prepared 6/14/2016



URBAN GROWTH BOUNDARY REMAND

Disclaimer: This map represents land use assumptions for modeling purposes only. This is not a proposal for specific comprehensive plan designations.

Service Layer Credits: Deschutes County GIS (2014)

Roads/Highways
Rivers
Current UGB

ATTACHMENT 8 SAMPLE PEDESTRIAN-/TRANSIT-ORIENTED DEVELOPMENT OVERLAY ZONE

Memorandum

July 12, 2016

To: Project Management Team

Cc:

From: Becky Hewitt

Re: Sample Pedestrian-/Transit-Oriented Development Overlay Zone Code Language

INTRODUCTION

This memo provides a starting point of draft language for the Bend Development Code (BDC) that could be used to establish pedestrian and transit oriented design standards for certain commercial corridors as an overlay zone or a set of special standards applied in a geographically specific area. This is provided for informational purposes only. Further refinement and additional public outreach may be needed prior to adoption of such language.

The standards below are largely drawn from existing code language applicable in other parts of the City, such as the Central Business District. They were developed as part of an exploration of "efficiency measures" and amendments to the BDC during the Urban Growth Boundary (UGB) Remand process, but were not recommended for adoption at that time. They have been included as an attachment to the Integrated Land Use and Transportation Plan (ILUTP) to provide an example of development standards that could be applied in these areas. Note that special parking standards, incentives, and/or reductions may also be appropriate in such areas, beyond those provided for in the proposed development code amendments that are part of the UGB adoption package.

SAMPLE CODE LANGUAGE

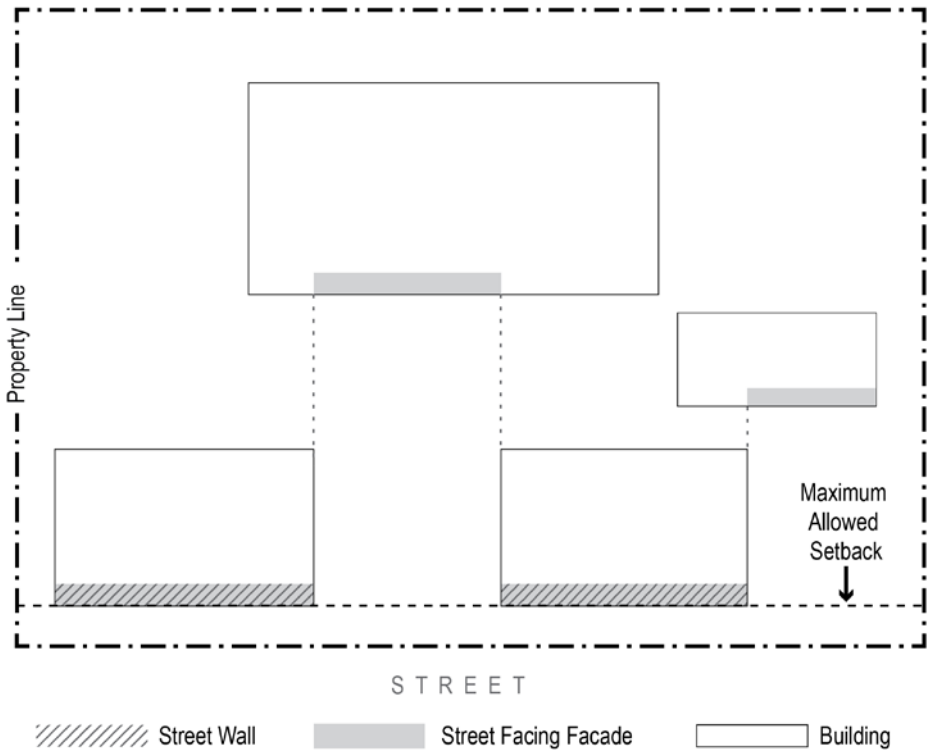
1. Standards for Commercial and Mixed Use Buildings in Pedestrian Districts. For the purpose of this section, "Pedestrian Districts" are defined as properties that have frontage on an Enhanced Pedestrian Design Street, as shown on Figure X.X.

[insert map of streets]

a. Ground-Floor Windows. In Pedestrian Districts, ground-floor windows must be installed for at least 50 percent of the building length and have an area equal to 60 percent of the street-facing ground-floor wall area. Ground-floor wall area includes all wall areas up to 10 feet above finished grade. If the site has two or more frontages, the ground-floor window standard is only required on the primary facade – the facade that fronts the street with the higher classification. The other facade has a minimum ground-floor window requirement of 50 percent of the length and 25 percent of the ground-floor wall area. Windows are required to be transparent to foster

both a physical and visual connection between activities in the building and pedestrian activities on the street.

[EXAMPLE GRAPHIC BELOW]



b. Parking Location. Parking and vehicle circulation areas shall be prohibited between a Street Wall and a street.

c. Main Entrance. The main entrance to a building shall face the street or be on the corner.

d. Human Scale Design Elements. Street Walls in Pedestrian Districts shall provide visual interest for pedestrians by incorporating building details at the ground floor that meet two or more of the following options:

- Incorporating building lighting between 10 and 15 feet from the sidewalk to the bottom of the light fixture.
- Incorporating suspended signs (blade signs) between eight and 12 feet from the sidewalk to the bottom of the suspended sign.
- Incorporating horizontal and vertical elements at the ground floor/the base of the building that are familiar to pedestrians and are at human scale: sign frieze, storefront cornice, window mullions, piers that frame storefronts, engaged columns, arcades, brick coursings, awnings, and well-lit transoms.
- Incorporating a rhythm of awnings and/or canopies.

f. Weather Protection. Weather protection shall be provided along 50 percent of the Street Wall and at all street-facing entrances in Pedestrian Districts. Weather protection projections may include but are not limited to awnings, marquees, balconies, overhangs, umbrellas, fabric tensile structures, or building appendages; weather protection projections are required to extend five feet over the sidewalk in order to meet this standard.

ATTACHMENT 9 MEDIUM-TERM AND LONG-TERM TRANSIT SCENARIOS FOR ILUTP TESTING

EXPLANATION OF TRANSIT SCENARIOS FOR ILUTP

Below is a written summary of future transit service enhancements for the medium and high scenarios.

1) Additional service hours and shorter peak period headways (see attached spreadsheet)
2) Two new routes
    a. Route 8 – start at Hawthorne Station, travel north on 3rd Street to Greenwood Avenue. Turn right (east) on Greenwood to NE 8th Street and travel to NE 8t Street. Turn left (north) on NE 8th Street and travel north to roundabout at Butler Market Road. Turn left (west) at roundabout and travel to NE Boyd Acres Road. Turn right (north) on Boyd Acres Road and travel north to Empire Avenue. Turn right (east) on Empire and travel to 18th Street. Turn left (north) on 18th Street and travel to Cooley Road. Turn left (west) on Cooley and travel to TAZ 534 or TAZ 1517 (see note below under 3a). Turn around and retrace same path back to Hawthorne Station.
    b. Route 14 – start at Hawthorne Station, travel south on 3rd Street to Reed Market Road. Turn left (west) on Reed Market Road and travel to SE 15th Street. Turn right (south) on SE 15th Street and travel to TAZ 1549. Turn around and retrace same path back to Hawthorne Station.
    c. Transit stops are generally spaced at 0.25 mile intervals. At that interval length, all of the TAZs along these new routes should have access to the bus.
3) Route modifications
    a. Route 4 currently terminates in TAZ 535. The route should be extended to travel north along Hunnel Road and then east on Cooley Road to TAZ 534 or TAZ 1517. It would then turn around and retrace its route back to Hawthorne Station
    b. Route 2 – after the bus makes the loop on the south end of the loop and begins to return north, the route should turn right (east) on Murphy Road and travel to 3rd Street. The bus will turn around at the Murphy/3rd roundabout, return to Brookswood and continue north
4) Community connectors and new hubs
    a. Route 24 is the community connector from Redmond to Bend. Currently it's only stop in Bend is at Hawthorne Station. A new hub/stop should be created in TAZ 534 or 1517. Routes 24, 4, and 8 would be served at that hub. Passengers could transfer among those 3 routes at that location.
    b. Route 30 is the community connector from La Pine to Bend. Currently it's only stop in Bend is at Hawthorne Station. A new hub/stop should be created in TAZ 500 or 501. Routes 30, 1, and 2 would be served at that hub. Passengers could transfer among those 3 routes at that location.
5) In the high scenario, routes 1, 4, and 7 convert from bus service to BRT service.

Cascades East Transit Future Service Levels

CET Existing Service - Low Scenario

Service hours: 6 am - 7:30 pm
Bus capacity: 36 seats

Route #	Route Location	Start Time	Finish Time	Peak Headways	Off-Peak Headways	Notes
1	S 3rd Street	6:00 AM	7:20 PM	30 mins	30 mins	
2	Brookswood	6:00 AM	7:32 PM	45 mins	45 mins	
3	Newport-COCC	6:00 AM	7:21 PM	30 mins	30 mins	
4	N 3rd Street	6:00 AM	7:22 PM	30 mins	30 mins	
5	Wells Acre/27th/Reed Mkt	6:00 AM	7:33 PM	45 mins	45 mins	
6	Reed Mkt/27th/Wells Acre	6:00 AM	7:33 PM	45 mins	45 mins	
7	Greenwood/St Charles	6:00 AM	7:22 PM	30 mins	30 mins	
10	Galveston/14th/Colorado	6:30 AM	6:51 PM	30 mins	30 mins	
11	Galveston/14th/Chandler	6:00 AM	7:24 PM	60 mins	60 mins	
12	COCC-OSU via 14th	6:00 AM	7:17 PM	30 mins	30 mins	

CET Planned Service - Medium Scenario

Service hours: 6 am - 10 pm
Bus capacity: 36 seats

Route #	Route Location	Start Time	Finish Time	Peak Headways	Off-Peak Headways	Notes
1	S 3rd Street	6:00 AM	9:20 PM	15 mins	30 mins	
2	Brookswood	6:00 AM	9:32 PM	45 mins	45 mins	
3	Newport-COCC	6:00 AM	9:21 PM	15 mins	30 mins	
4	N 3rd Street	6:00 AM	9:22 PM	15 mins	30 mins	
5	Wells Acre/27th/Reed Mkt	6:00 AM	9:33 PM	45 mins	45 mins	
6	Reed Mkt/27th/Wells Acre	6:00 AM	9:33 PM	45 mins	45 mins	
7	Greenwood/St Charles	6:00 AM	9:22 PM	15 mins	30 mins	
8	8th/Boyd Acres/18th	6:00 AM	9:30 PM	45 mins	45 mins	New route
10	Galveston/14th/Colorado	6:00 AM	9:51 PM	30 mins	30 mins	
11	Galveston/14th/Chandler	6:00 AM	9:24 PM	30 mins	30 mins	
12	COCC-OSU via 14th	6:00 AM	9:17 PM	30 mins	30 mins	
14	3rd/Reed Market/15th	6:00 AM	9:30 PM	30 mins	30 mins	New route

CET Planned Service - High Scenario

Service hours: 5 am - 10 pm
Bus capacity: 36 seats

Route #	Route Location	Start Time	Finish Time	Peak Headways	Off-Peak Headways	Notes
1	S 3rd Street	5:00 AM	9:20 PM	15 mins	30 mins	Convert from bus to BRT
2	Brookswood	5:00 AM	9:32 PM	45 mins	45 mins	
3	Newport-COCC	5:00 AM	9:21 PM	15 mins	30 mins	
4	N 3rd Street	5:00 AM	9:22 PM	15 mins	30 mins	Convert from bus to BRT
5	Wells Acre/27th/Reed Mkt	5:00 AM	9:33 PM	30 mins	45 mins	
6	Reed Mkt/27th/Wells Acre	5:00 AM	9:33 PM	30 mins	45 mins	
7	Greenwood/St Charles	5:00 AM	9:22 PM	15 mins	30 mins	Convert from bus to BRT
8	8th/Boyd Acres/18th	5:00 AM	9:30 PM	30 mins	45 mins	New route (also in medium scenario)
10	Galveston/14th/Colorado	5:00 AM	9:51 PM	30 mins	30 mins	
11	Galveston/14th/Chandler	5:00 AM	9:24 PM	30 mins	30 mins	
12	COCC-OSU via 14th	5:00 AM	9:17 PM	30 mins	30 mins	
14	3rd/Reed Market/15th	5:00 AM	9:30 PM	30 mins	30 mins	New route (also in medium scenario)

ATTACHMENT 10 COMPLETE STREETS PROJECTS TABLE

Project	COST	TYPE	MAP	Phase
Newport (College Way to 12th)	$ 1,010,000	Sidewalk	2	Programmed
9th (Franklin-Greenwood)	$ 1,010,000	Sidewalk	3	Programmed
14th (Colorado to Newport)	$ 4,000,000	Streetscape	4	Programmed
Galveston Corridor (Harmon to 14th)	$ 2,700,000	Streetscape	5	Programmed
Wilson (2nd to 9th)	$ 1,480,000	Streetscape	6	Programmed
Murphy Extension to 15th	$ 16,000,000	Extension	7	Planned
Bronzewood extension over Larkspur trail	$ 500,000	Extension	8	Planned
Purcell Extension (Neff to Wells Acres)	$ 3,000,000	Extension	9	Planned
Chase Extension to Brosterhous	$ 3,000,000	Extension	10	Planned
3rd (Greenwood to COID canal)	$ 5,000,000	Streetscape	11	Planned
Commerce (14th to Columbia)	$ 2,000,000	Streetscape	12	Planned
Newport (NW 12th to Awbrey)	$ 900,000	Streetscape	13	Planned
Franklin -Bear Creek Corridor (3rd to 27th)	$ 800,000	Streetscape	14	Planned
Colorado/2nd Corridor (Bond to Wilson)	$ 800,000	Streetscape	15	Planned
OSU-OMD-Coyner Trial via Aune	$ 500,000	BikeBlvd	16	Planned
Juniper Rec-Bend High-Marshall High via 6th	$ 500,000	BikeBlvd	17	Planned
North - South Bike Blvd (Harmon to Old Mill)	$ 500,000	BikeBlvd	18	Planned
Empire extension (Purcell to 27th)	**$ 15,000,000**	**Extension**	**19**	**Future**
Robal Rd connection (Hwy 20 to O.B. Riley)	**$ 2,000,000**	**Extension**	**20**	**Future**
4th - Studio	**$ 1,500,000**	**Streetscape**	**21**	**Future**
8th (Greenwood to Butler Market)	**$ 800,000**	**Streetscape**	**22**	**Future**
9th (Wilson to Reed Market)	**$ 45,000**	**Streetscape**	**22**	**Future**
8th (Greenwood to Butler Market)	**$ 800,000**	**Streetscape**	**22**	**Future**
COCC to St Charles via 1st St Rapids	$ 500,000	BikeBlvd	23	Planned
COCC to Larkspur Trail via Hawthorne	$ 500,000	BikeBlvd	24	Planned
12th St from Bend High to Butler Mkt	$ 500,000	BikeBlvd	25	Planned
12th St from Bend High to Butler Mkt	$ 500,000	BikeBlvd	25	Planned
NW 15th St (Newport to Simpson)	$ 500,000	BikeBlvd	26	Planned
Hawthorne/3rd	$ 312,000	Safety Crossings and Bike	27	Programmed
Roosevelt/3rd	$ 311,200	Safety Crossings and Bike	29	Programmed
Franklin/3rd	$ 574,000	Safety Crossings and Bike	28	Programmed
Reed Market/3rd	$ 336,000	Safety Crossings and Bike	30	Programmed
2nd Street (Franklin to Revere)	$ 2,000,000	Streetscape	31	Planned
4th Street (Franklin to Butler Market)	$ 2,000,000	Streetscape	32	Planned
Franklin Undercrossing Bridge	$ 5,000,000	Bridge	33	Planned
Greenwood Undercrossing Bridge	$ 5,000,000	Bridge	34	Planned
3rd Street Canal Bridge	$ 2,500,000	Bridge	3	Planned
Drake Park Bridge	$ 5,000,000	Bridge	35	Planned
Hawthorne Crossing	$ 6,000,000	Bridge	36	Planned