

US 97 Parkway Plan Phase 2

Technical Memorandum #3 - Future Traffic Forecast

October 30, 2018

Final

Prepared for:



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This memorandum documents the process followed for forecasting future traffic volumes for the US 97 Parkway Plan Phase 2 project for the year 2040. The forecasted traffic volumes will be used in evaluation of future conditions without proposed improvements. It should be noted that the methodologies and model referenced in this memorandum are consistent with methods in use for the Bend Metropolitan Transportation Plan (MTP) update currently in progress.

1 BEND-REDMOND TRAVEL DEMAND MODEL

The Oregon Department of Transportation (ODOT) has developed and maintains a travel demand model that estimates daily and p.m. peak hour demand for the existing year (2010) and future year (2040) transportation system. The travel demand model includes the surrounding communities of Bend and Redmond and is called the Bend-Redmond Model (BRM).

The BRM includes two key structures that help estimate future traffic:

- **Transportation Analysis Zones (TAZs):** The TAZs for the BRM typically match geographically to either census blocks or census block groups, with some refinement due to geographic constraints such as waterways or roadways. Each TAZ includes 2010 and projected 2040 land use data. The TAZs are used to generate trips by mode (auto, bus, bike, and walk) for the existing year (2010) and future year (2040).
- **Transportation Network:** The model includes a network of links that generally represents the major transportation system (typically collector roads and above) in the model area. Each link is coded with attributes (e.g., speed and capacity) that approximate the function of existing roadways (for the base year and future year) and roadway improvements for the future year. Each TAZ is connected to links in the model at points that approximate where travelers are expected to enter the network.

1.1 FUTURE TRANSPORTATION NETWORK

To provide a better estimate of 2040 network conditions, the 2040 “Baseline” (Financially Constrained) model was used for the future year network. The current Financially Constrained model contains projects from the following planning studies:

- **Bend MTP (2014 Update):** The most recent completed update to the Bend MTP occurred in 2014. One of the key outcomes of the MTP is the Financially Constrained Project List. All the projects on the 2014 MTP Financially Constrained list are included in the “Baseline” model network. The following list includes projects that are part of the Financially Constrained project list and have a significant impact on traffic operations on US 97. Note that the list does not contain all MTP Financially Constrained projects, but only the projects likely to have significant impact on the US 97 Parkway Plan Study area:
 - **Empire Avenue Widening (MTP Project #7):** Widen Empire Avenue to 5 lanes between 3rd Street and US 97 Northbound Ramps. Also install a signal at the US 97 Southbound Ramps. *Impacts to Study Area: This project will impact the traffic patterns for the US 20 southbound to US 97 southbound movement.*



- Empire Avenue Extension (MTP Project #8): Extend Empire Avenue from Purcell Boulevard to 27th Street.
Impacts to Study Area: This project will impact traffic at the Empire Avenue and US 97 interchange ramp terminals.
- Murphy Road Extension (MTP Project #11): Extend Murphy Road from Brosterhaus Road to 15th Avenue.
Impacts to Study Area: This project will impact the traffic at the Murphy Road and US 97 interchange.
- US 97/Cooley Road Area Improvements (MTP Project #12): Assumed to include grade separation of US 97 at Cooley Road, with signalized connections.
Impacts to Study Area: This project will impact US 97 at Cooley Road.
- Empire Avenue/US 97 Northbound Ramp widening (MTP Project #13): Widen US 97 northbound off-ramp at Empire Avenue to two lanes.
Impacts to Study Area: This project will impact the traffic on US 97 at Empire Avenue.
- North Frontage Road (MTP Project #17): New two-lane frontage road from Murphy Road to Powers Road. Assumed to include closure of the Badger Road and Pinebrook Boulevard Right-In/Right-Out.
Impacts to Study Area: This project will impact traffic operations on US 97.
- South Frontage Road (MTP Project #18): New two-lane frontage road from Murphy Road to Ponderosa Street.
Impacts to Study Area: This project will impact the traffic at the Murphy Road and US 97 interchange.
- US 97/Murphy Road Interchange Ramps (MTP Project #25): Northbound on-ramp and southbound off-ramp.
Impacts to Study Area: This project will impact traffic operations on US 97.
- US 20 Widening (MTP Project #42): Add second southbound lane between Cooley Road and 3rd Street.
Impacts to Study Area: This project will impact travel demand on US 97 southbound.
- **Bend Urban Growth Boundary Expansion:** The Bend Urban Growth Boundary (UGB) was expanded in 2016. As part of the UGB expansion process several projects were added to the Bend Transportation System Plan (TSP). These projects are considered part to the Financially Constrained Project list for the City of Bend and are therefore included in the “Baseline” scenario. The following list includes projects that are part of the Financially Constrained project list and would significantly impact traffic operations on US 97. Note that list does not contain all projects from the Bend TSP Amendment, but only the projects likely to have significant impact on the US 97 Parkway Plan Study area:
 - China Hat Road Widening (#S-1): Widen China Hat Road from two to three lanes from US 97 to Mountain High Drive.
Impacts to Study Area: This project will impact demand at the China Hat access to US 97.

Again, note that the “Baseline” Scenario used for the Bend MTP/TSP update currently underway is the same scenario that will be used as the future “No-Build” scenario for the US 97 Bend Parkway Project.



1.2 PROJECTED LAND USE CHANGES

Land use is a crucial factor in forecasting future transportation demand. The amount of land that is to be developed, the type and scale (housing units or number of employees) of the land uses, and how the land uses are arranged within the model area has a direct impact on the future system.

Projected land uses were developed for the model area with the general development patterns based on the Comprehensive Plan designations for the City of Bend. The overall growth in land uses was applied to individual TAZs with detailed input and review from staff at agencies within the region as part of the Bend MTP/TSP Update process, incorporating the land use forecasts developed as part of the Integrated Land Use and Transportation Plan (ILUTP) created during the UGB expansion process. These population and employment assumptions form the basis for the BRM model used in forecasting.

1.3 GROWTH WITHIN IN THE BEND-REDMOND AREA

The projected household and employment growth between 2010 and 2040 within the Bend MPO area is shown in Figures 1 and 2. Note that this growth is identical to the growth assumed for the Bend MTP/TSP update currently underway.



Figure 1: Household Growth (2010-2040)

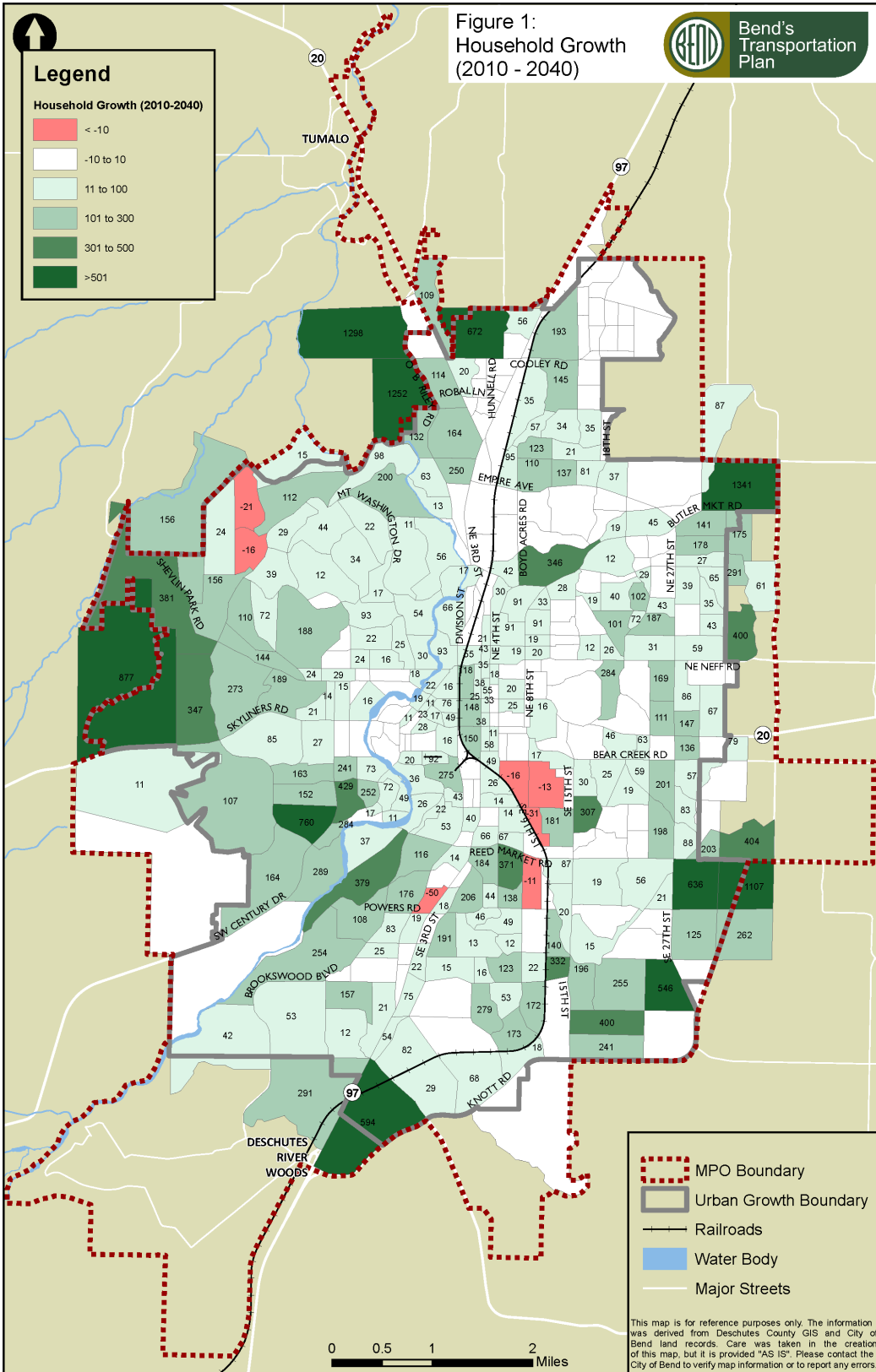
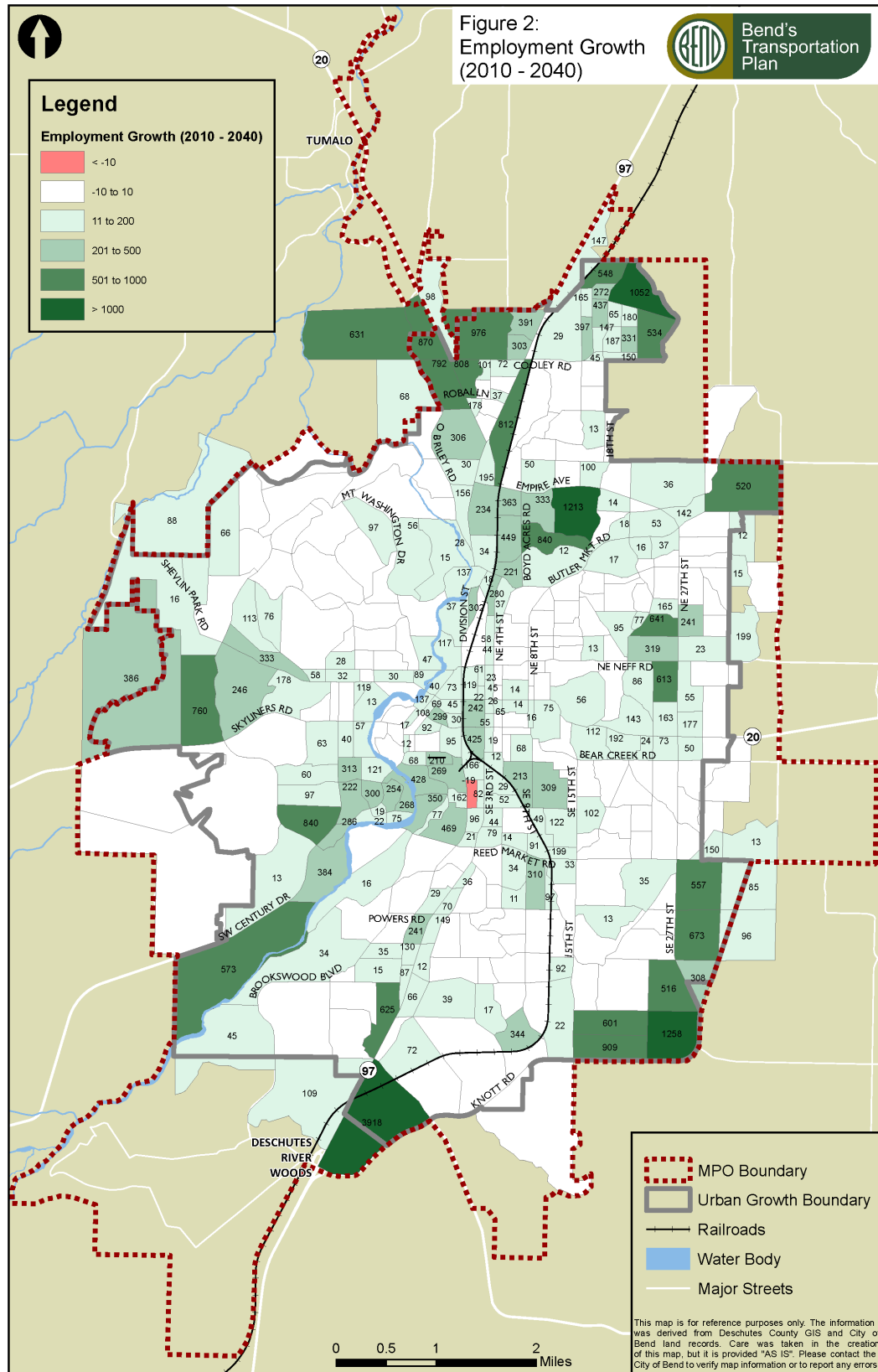




Figure 2: Employment Growth (2010-2040)





1.4 POST PROCESSING AND MODEL APPLICATION

The year 2010 and year 2040 model assignments were prepared and provided by ODOT. Limited additional minor network refinements were applied during the forecasting process to add detail to account for local connectivity and circulation patterns, particularly in the vicinity of project study intersections. Adding the new network detail helps refine local circulation within the study area without affecting routing in the overall regional model. Modifications include:

- Adjusting the connector for TAZ 541 to provide access to O.B Riley Road as well as 3rd Street, to better represent the access around the O.B. Riley Road and 3rd Street project study intersection.

The existing (2017) counts were collected during a time-period that coincided exactly with the Average Weekday in Bend (mid-April of 2017). These counts were then seasonally factored to the 30th Highest Hour (30HV) for the existing conditions analysis, as described in detail in the Existing Conditions memorandum.¹ These factors ranged from approximately 11% in the north to around 30% in the south. Recreational traffic has been increasing rapidly in Bend. The proposed approach deviates from the typical procedure used by TPAU, which is to develop 30HV volumes from the counts, then post-process the future turn forecasts off the 30HV turn volumes using link growth from the regional model. As the regional model represents average weekday traffic, the typical processing method essentially assumes that the seasonal (recreational in Bend) portion of the traffic will remain the same as it is today. To account for some potential future growth in recreational traffic, a different approach was used. The volume forecasting was first completed for the average weekday volumes, then the seasonal factors developed in the Existing Conditions memorandum¹ were applied to the future forecasts, thereby applying the seasonal factor not only to the count, but to the post-processed growth increment generated by the travel demand model (which is an average weekday volume) as well.

PM peak hour link model volumes were extracted from the model for both the base year (2010) and forecast year (2040) scenarios. A “post processing” technique following NCHRP 765 Methodology was used to refine link level model travel demand to average weekday turn movement forecasts (Appendix B). The average weekday forecasts were then manually adjusted to reflect local circulation impacts and balanced across the network (Appendix C – adjustments, Appendix D – final average weekday volumes). Seasonal factors (Appendix E) developed during Phase 1 of the project were then applied to the average weekday 2040 turn movement forecasts (Appendix F). Final balancing adjustments (Appendix G) were then applied to the now 30HV forecasts, resulting in the final 30HV volume forecasts (Appendix H – volume table, Appendix A – volume figure).

¹ Technical Memorandum #2 Existing Conditions, October 30, 2018