# Urban Reserves Transportation Study

## Infrastructure Analysis Summary Report

December 2020

Washington County

## Project Name

| | |
|---|---|
| Project No: | D3221220 |
| Document Title: | Infrastructure Analysis Summary Report |
| Date: | December 2020 |
| Client Name: | Washington County |
| Project Manager: | Scott Richman |
| Authors: | Tara O'Brien, Jacobs |
| | Carl Springer and Amanda Deering, DKS |
| | Andrew Parish, Angelo Planning Group |

## Contents

Acronyms

| | |
|---|---|
| I-5 | Interstate 5 |
| MPH | Mile(s) Per Hour |
| MSTIP | Major Streets Transportation Improvement Program |
| OAR | Oregon Administrative Rules |
| ODOT | Oregon Department of Transportation |
| PCC | Portland Community College |
| ROW | Right-of-Way |
| RTP | Regional Transportation Plan |
| TAC | Technical Advisory Committee |
| TDT | Transportation Development Tax |
| THPRD | Tualatin Hills Park & Recreation District |
| TSMO | Transportation System Management and Operations |
| TSP | Transportation System Plan |
| UGB | Urban Growth Boundary |
| UGMFP | Urban Growth Management Functional Plan |
| URA | Urban Reserve Area |
| URTS | Urban Reserves Transportation Study |
| WCCC | Washington County Coordinating Committee |

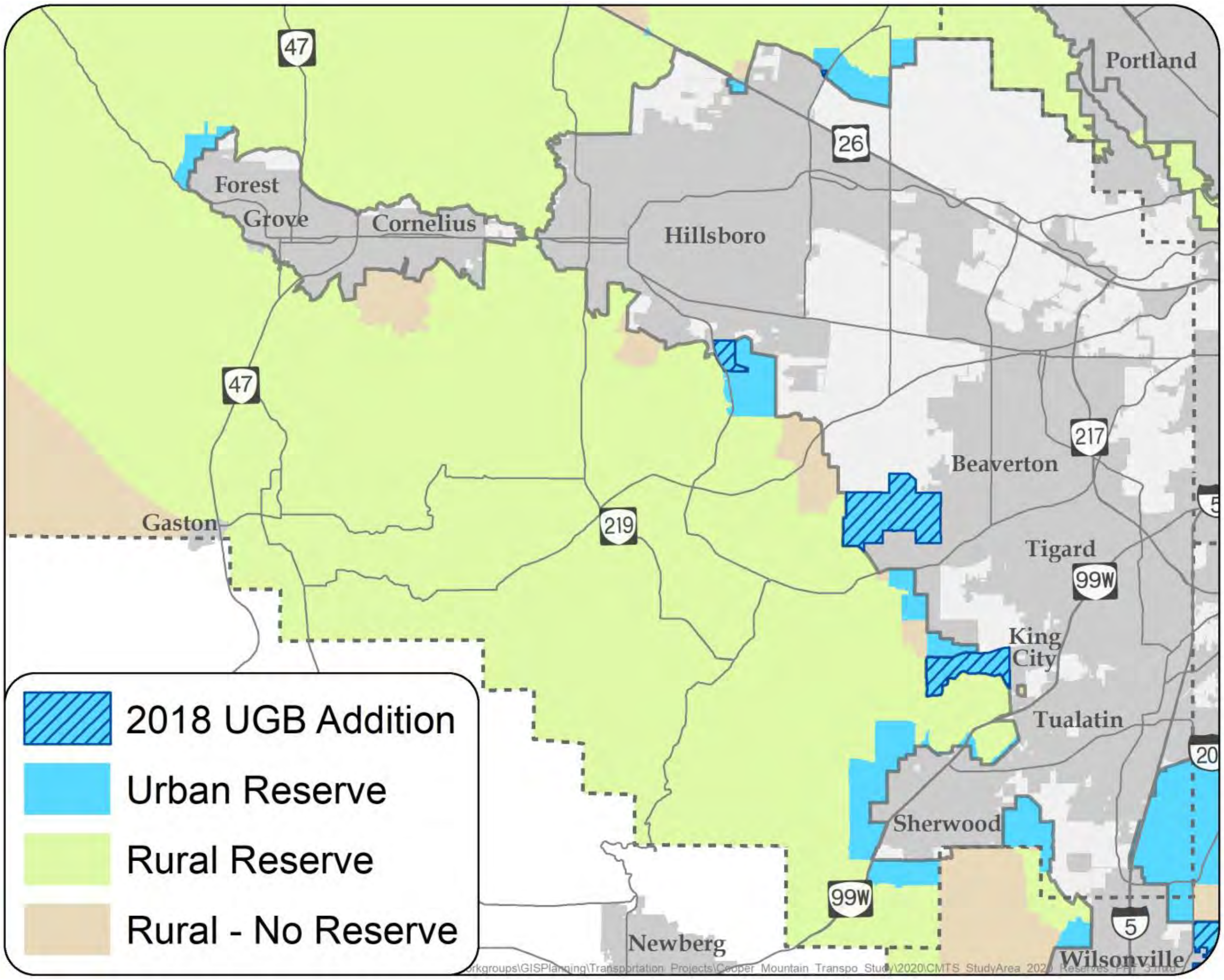
# 1. Introduction to the Urban Reserves Transportation Study (URTS)

## 1.1 Introduction to URTS and this Report

Washington County kicked off the URTS project in 2019 after receiving a Metro 2040 Planning and Development Grant to fund the work. The primary goal of URTS was to evaluate the cumulative transportation impacts of future development assumptions in Washington County's urban reserve areas (URAs) and to identify areas of expected future capacity needs for the County and cities to consider in their future concept and comprehensive planning efforts. There are thirteen URAs in Washington County, shown in Figure 1. URAs are areas outside the existing Metro Urban Growth Boundary (UGB) designated for future urban growth which cities can petition Metro to bring into the UGB if there is insufficient land to accommodate housing and employment growth.

This report summarizes the transportation projects evaluated as part of URTS and provides recommendations and considerations for concept and comprehensive planning for each URA. This initial analysis of transportation needs is meant to serve as a starting point for cities to use as they consider their own transportation and growth needs in the future.

**Figure 1: Urban Reserve Transportation Study Area**



## 1.2 Study Objectives

The four URTS detailed objectives consist of the following:

• *Partner with local jurisdictions to analyze the cumulative transportation impacts of development in the urban reserves*. The URTS project team (consisting of Washington County and Metro staff, plus consultants) compiled past work done by Metro (2018 Urban Growth Report) and cities (previously completed concept plans) to document baseline assumptions for future land use development in the URAs. The URTS project team documented and revised these assumptions with feedback from the URTS Technical Advisory Committee (TAC) prior to beginning travel demand modeling and analysis. The Proposed Land Use Assumptions Memo (revised) is included as Appendix A and defines the housing and employment land use assumptions. The Methods and Assumptions Memo explains the methodology for the travel demand modeling and is included as Appendix B.

• *Identify areas of projected transportation system capacity deficiencies*. These transportation system deficiencies are analyzed and outlined in the Transportation Needs Assessment Memo (Appendix C, completed in March 2020). To identify these capacity issues, the project team populated the Westside Regional Travel Demand Model with the land use assumptions and assessed the cumulative impacts of development in the URAs on the existing and planned transportation system. The planned transportation system for the 2040 model year includes all financially constrained projects from the Metro 2040 Regional Transportation Plan (RTP), all projects identified in Metro's 2018 Urban Growth Report, including new or improved facilities through, and adjacent to, the Urban Reserve areas, and several projects identified as important through the South Cooper Mountain Concept Plan, Cooper Mountain Transportation Study, and other regional studies.

• *Conduct an alternatives analysis and analyze the feasibility and/or prioritization of several adopted/identified regionally significant transportation improvements.* This analysis is detailed in this report, which discusses considerations for further analysis to be addressed through concept and comprehensive planning and identifies recommended Transportation System Plan (TSP) amendments to advance priority projects. Appendix D includes the concept designs and cost estimates for the feasibility projects, as well as the concept design for Basalt Creek Parkway, which was evaluated in a separate study. Appendix E is the Performance Assessment of Supplemental System Improvements.

• *Create an infrastructure funding plan template*. The infrastructure funding plan template will be for cities to use in concept and comprehensive planning, including methods for estimating revenues, developing policy priorities and evaluating funding gaps. It will also include a toolkit with resources and example plans, and model processes that cities can use as a starting point for their Title 11 compliant funding plans.

## 1.3 Methodology and Assumptions

The URTS analysis primarily focused on the County roadway network and transportation projects to address and accommodate future urban growth. Transit access, environmental considerations, and bicycle and pedestrian access and safety were considered as part of this study but are not the primary focus. Though this analysis is focused on needs of the roadway network, it used the baseline mode share assumptions from the RTP which assumes increase in transit, biking, walking and carpooling between now and 2040.

Land use assumptions for each URA were developed in coordination with local cities, Washington County, Metro and the consultant team as a starting point for the analysis. The project team assumed an average of 10 units per acre for most areas as a starting point, based on Metro's 2018 Urban Growth Report, unless there was a concept plan for an area with more refined assumptions. Several cities provided additional information and assumptions for future land use development in the URAs for further refinement, including employment in some areas. Assumptions were documented and reviewed by the TAC prior to the traffic analysis. The final land use assumptions are included in the Reserve Area profiles in Chapter 4, and are detailed in Appendix A. These land use assumptions should be revisited during concept planning of URAs proposed to be added within the UGB.

Washington County conducted travel forecasts which provided peak hour link level traffic volumes and intersection turning movement volumes for the existing base year and future planning year 2040 with and without new development in URAs. When cities seek to conduct their own travel forecasts for concept planning, improvement assumptions and project lists should be revisited. Network improvement assumptions for the 2040 scenarios evaluated included:

- Financially constrained roadway and transit projects listed in the 2018 RTP (2040 Financially Constrained), and
- Improvements included in Metro's 2018 Urban Growth Report.

This study provides a high-level look at roadway capacity issues and identifies potential areas of concern for individual jurisdictions to conduct more detailed analyses during concept and comprehensive planning, and later, more specific development plan analyses. Different jurisdictions use different mobility standards, and Metro and ODOT are re-evaluating their standards. Therefore, this initial list of projects and intersections with concerns about capacity due to increased urban development is intended to be a baseline to guide future analysis.

## 1.4 Planning Process for Urban Reserve Areas

Concept and comprehensive planning identify essential infrastructure projects necessary for new urban development in the area to be added to the UGB. This study precedes that planning process and conducts additional assessment for transportation projects to serve new development in each URA. This study furthers the policies contained in the Washington County TSP, specifically Objective 9.3 and Strategy 9.3.2:

> Objective 9.3: *Coordinate with cities and agencies of Washington County as well as regional agencies to cooperatively plan and operate a seamless network of transportation systems and services.*
>
> Strategy 9.*3.2: Work with cities and other agencies to plan for transportation systems that account for Urban and Rural Reserves. For Urban Reserves, coordinate concept plans to provide transportation systems for these areas, including finance strategies to implement these plans. Coordinate the transportation planning of the urban area to avoid and or limit impacts on Rural Reserves areas.*

The URA planning process is set out in the Metro Urban Growth Management Functional Plan (UGMFP), Title 11: Planning for New Urban Areas. (UGMFP 3.07.1110).[1] A concept plan is required to bring a URA into the Metro UGB. This process is designed to plan interrelated land use, transportation, and public facilities between jurisdictions and service providers to ensure public objectives are met.

A concept plan for an urban reserve area must:

- Be developed by the county responsible for land use planning and any city likely to provide governance or an urban service for the area
- Occur by a date jointly determined by Metro and the county and city/cities involved
- Consider actions necessary to achieve specific outcomes described in Title 11, including:
  - A mix and intensity of uses that will make efficient use of public systems and facilities planned for the area
  - A range of different housing types, tenure, and prices (if the area is intended to meet residential land need) to help create economically and socially vital and complete neighborhoods and cities, and avoid the concentration of poverty and isolation of families and people of modest means
  - Sufficient employment opportunities to support a healthy economy (if the area is intended to meet employment land need)
  - A well-connected system of streets, bikeways, parks, recreational trails, and public transit that link to needed housing to reduce the combined cost of housing and transportation
  - A well-connected system of parks, natural areas, and other public open spaces
  - Protection of natural ecological systems and important natural landscape features
  - Avoidance or minimization of adverse effects on farm and forest practices and important natural landscape features on nearby rural lands
- Contain specific elements, including:
  - General locations of residential, commercial, industrial, institutional, and public uses proposed for the area
  - General locations, preliminary cost estimates, and proposed financing of proposed sewer, park and trail, water and stormwater, and transportation facilities
  - Identify the general number, type, and price of housing units (if the area is intended to meet residential land need)
  - Water quality, flood management, and habitat conservation areas

UGMFP 3.07.1120 includes additional requirements for areas added to the UGB. These plans are sometimes called "master plans" or "community plans," and are more detailed than concept plans for URAs prior to inclusion in the UGB. They require:

- Specific plan designation boundaries
- Provision of land needed to accommodate any housing, employment, open space, and other uses identified in rural reserve plans or imposed as conditions of approval by the relevant Metro UGB decision

[1] Metro. Urban Growth Management Functional Plan. April 2018. https://www.oregonmetro.gov/urban-growth-management-functional-plan

- A conceptual street network that meets the standards of the Regional Transportation Functional Plan
- Coordination with park providers and school districts
- Provision for the financing of public facilities.

## 1.5 Urban Growth Boundary Decisions and Conditions of Approval

Every six years, the Metro Council must review and report on the land supply within the UGB. Metro prepares a forecast of population and employment growth for the region over the next 20 years and, if there is a deficiency in land available for urban development within the current UGB, adjusts the UGB to meet the needs of that forecast. Certain other amendments are allowed outside of this review cycle, but these are normally strategic additions for a specific use like a public facility or needed industrial land.

In its 2018 UGB decision, Metro added land from Rosa, Cooper Mountain, and Beef Bend South urban reserve areas of Washington County to the UGB and imposed several conditions of approval that govern the process and substance of comprehensive planning for the included areas. These include:

- Requirements for a public engagement plan that includes focused efforts to engage historically marginalized populations
- Code requirements that prohibit future homeowners' associations from enacting covenants, conditions and restrictions, or other mechanisms that limit allowed housing types or density
- Specific housing unit requirements for each expansion area
- The allowance of attached housing types including townhomes, duplexes, triplexes and fourplexes in all zones that permit single family housing
- Planning for transportation and other infrastructure in certain cases

Future UGB decisions are likely to include similar conditions of approval related to overall Metro policy and specific issues affecting development of new land included in the UGB.

# 2. Transportation Projects Evaluated

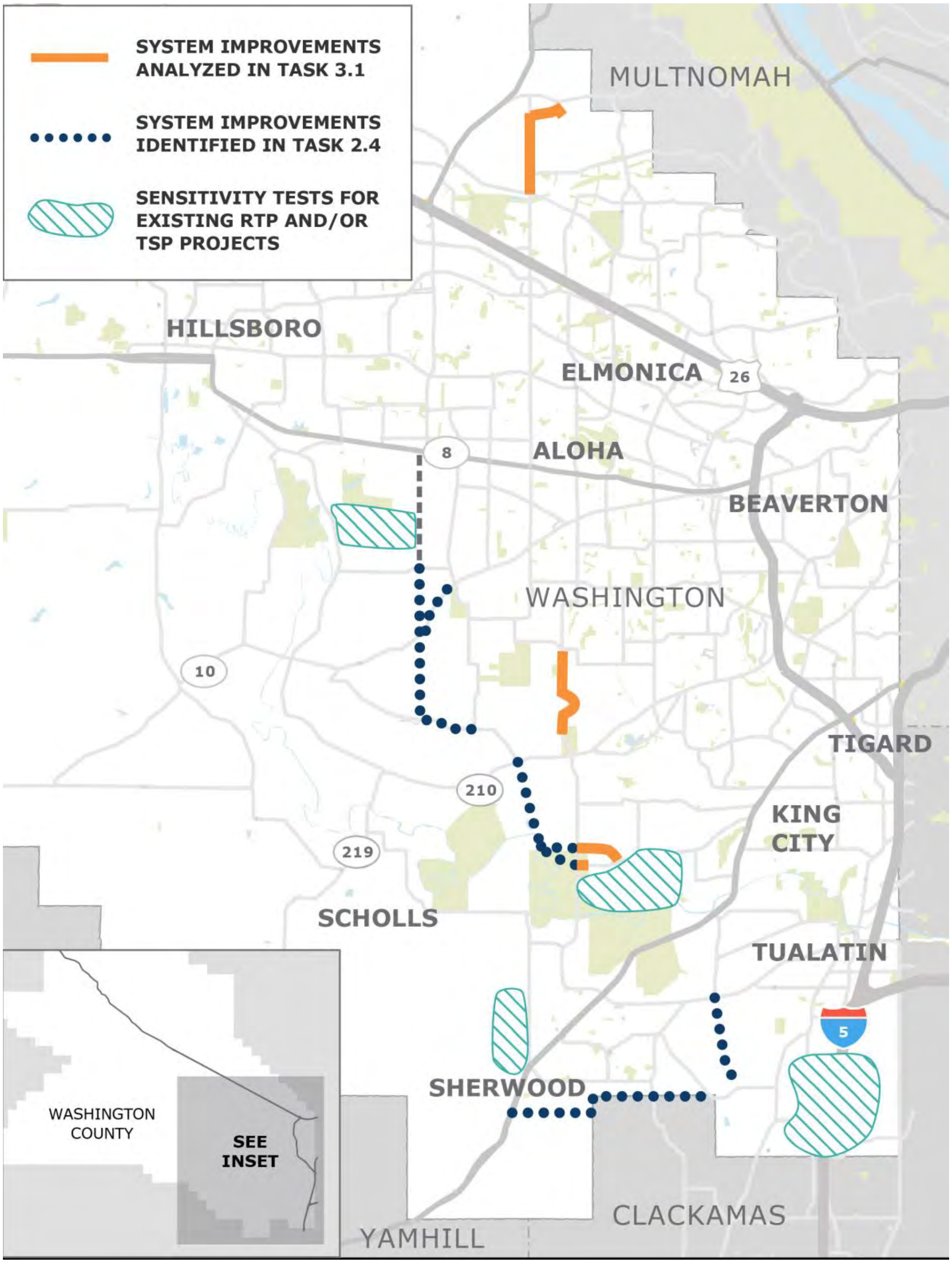
The URTS evaluated several types of transportation projects proposed to mitigate growth impacts, as well as existing system improvements already identified in individual city plans, the Washington County TSP, and the RTP. The projects listed in the following subsections were identified collaboratively among Washington County staff, project management team, and the URTS TAC, which included representatives from the cities of Beaverton, Forest Grove, King City, Hillsboro, Tigard, Tualatin, Sherwood, and Wilsonville. Evaluation highlights and considerations for additional study and analysis for each project are included in the URA profiles in Chapter 4.

Many transportation projects considered as part of this study are needed primarily to serve new urban development while others serve a more regional purpose. For the cities and county to develop a funding plan for advancing these projects, each project was identified as UR (primarily serving the URA where it is located), Regional (serving primarily a regional function), UR/Regional (serving both the URA as well as a regionwide area), or Local. These categorizations are used in the project list in each URA profile.

This study did not prioritize projects but conducted an evaluation process to document the likely benefits and challenges for certain projects. As a result, at the time of concept planning, additional cost benefit analyses should be completed for projects for each URA to evaluate the benefits of the proposed project relative to the costs in a constrained funding environment.

Figure 2 highlights the transportation projects analyzed as part of this study and they are described in more detail below.

## Figure 2: Transportation System Improvements Evaluated



## 2.1 System Improvement Feasibility Analysis Projects

Six projects underwent supplemental engineering analysis to better understand the preferred alignment, expected challenges, and preliminary cost estimates. Each of these projects were found to have substantially higher costs than indicated in earlier preliminary planning as well as some recommended changes to alignments, cross sections, and intersection treatments. The projects included:

- NW Shackelford Road Extension- identified in the Washington County TSP as a future 2-3 lane collector
- NW 185th Avenue Widening- identified in the Washington County TSP as a 4-5 lane arterial
- SW 185th Avenue Extension - identified in the Washington County TSP as a refinement area:
  - o "There is an identified potential future need for an extension of 185th Avenue connecting from SW Gassner Road to SW Kemmer Road."
- SW 175th Avenue Realignment - identified in the Washington County TSP as a straightening of the "kink"
- SW Beef Bend Road Widening and Realignment - identified from the Cooper Mountain Transportation Study
- SW Basalt Creek Parkway Overcrossing – identified in the RTP as a future 2028-2040 Strategic project (East-West Arterial Crossing)

The analysis identified a feasible alignment and proposed cross-sections for each of the extension and realignment projects (Appendix D). These alignments, and their costs, are at a conceptual engineering design level and are for planning purposes only. These projects will be further refined through future planning and detailed engineering efforts, which are expected to include a public outreach component to inform final design.

## 2.2 System Improvement Projects from Transportation Needs Assessment

Several potential projects were analyzed as possible solutions to address new transportation capacity needs, as recommended by the project team and agreed upon by the TAC. The performance assessment of these projects analyzed challenges and benefits of each of the projects listed below based on mutually agreed upon evaluation criteria. This assessment can be found in the Performance Assessment of Supplemental System Improvements in Appendix E and the performance summaries are included in the URA Profiles in Chapter 4.

- Tile Flat Road Extension B (Bull Mountain Road to Beef Bend Road)
- Cornelius Pass Road Extension (Rosedale Road to Farmington Road)
- Brookman Road Extension as Three Lanes (Ladd Hill Road to Basalt Creek Parkway)
- SW 124$^{th}$ Avenue Widening to Five Lanes (Tualatin-Sherwood Road to Tonquin Road)

- Farmington Road Widening to Three Lanes (209th Avenue to Cornelius Pass Road Extension)

Aside from the SW 124th Avenue Widening, these projects are not included in the current Washington County TSP.

## 2.3 Sensitivity Analysis for Overcrossings and Parallel Routes

For some overcrossings and potential parallel routes, the URTS team conducted additional travel demand model sensitivity tests to better understand the performance benefits for projects of countywide and regional significance. These tests included additional evaluation of proposed I-5 overcrossings (Basalt Creek Parkway Extension and Day Road extension) and the impacts of constructing only one, both, or neither on congestion and traffic patterns. This sensitivity analysis also evaluated the potential consequences of not constructing parallel roadways in the Rosa, Beef Bend South, and Sherwood West URAs. The results of these analyses are discussed in detail in Appendix D.

## 2.4 Intersection Performance Assessment

This study evaluated future intersection operations at priority intersections most likely to be impacted by new urban growth. These priority intersections were identified by the project team in consultation with the TAC, as shown in Table 1.

**Table 1:** Urban Reserve and Study Intersections Evaluated

| Urban Reserve | Study Intersection # | Study Intersection Name |
|---|---|---|
| Bendemeer<br>Bethany West | 3<br>4 | NW Cornelius Pass Rd / NW West Union Rd<br>NW 185th Ave / NW Springville Rd |
| Brookwood Parkway | - | No intersections evaluated |
| Rosa<br>Witch Hazel South | 5<br>6 | SW Cornelius Pass Rd / SW Rosedale Rd<br>SW River Rd / SW Rosedale Rd |
| David Hill | 1<br>2 | NW David Hill Rd / NW Thatcher Rd<br>NW Gales Creek Rd / NW Thatcher Rd |
| River Terrace West<br>Cooper Mountain | 7<br>8<br>9<br>10 | SW 170th Ave / SW Rigert Rd<br>SW Clark Hill Rd / SW Tile Flat Rd<br>SW Tile Flat Rd / SW Scholls Ferry Rd<br>SW Roy Rogers Rd / SW Beef Bend Rd |
| River Terrace South<br>Beef Bend South | 10 | SW Roy Rogers Rd / SW Beef Bend Rd |

| Urban Reserve | Study Intersection # | Name |
|---|---|---|
| Sherwood North | 13 | SW Elwert Rd / SW Scholls-Sherwood Rd |
| | 17 | SW Oregon St / SW Tonquin Rd |
| Sherwood West<br>Sherwood South | 13 | SW Elwert Rd / SW Scholls-Sherwood Rd |
| | 14 | SW Elwert Rd / SW Edy Rd |
| | 15 | OR 99W / SW Brookman Rd |
| | 16 | SW Brookman Rd / SW Ladd Hill Rd |
| Tonquin | 17 | SW Oregon St / SW Tonquin Rd |
| Elligsen Road North<br>Elligsen Road South<br>I-5 East | 18 | SW Boones Ferry Rd / SW Norwood Rd |
| | 19 | SW Norwood Rd / SW 65$^{th}$ Ave |
| | 20 | SW Day Rd / SW Boones Ferry Rd |
| | 21 | I-5 SB Ramps / SW Boones Ferry Rd |
| | 22 | SW Elligsen Rd / SW Parkway Center Dr |
| | 23 | SW 65$^{th}$ Ave / SW Elligsen Rd |
| | 24 | SW 65$^{th}$ Ave / SW Stafford Rd |
| Scholls (study area) | 11 | OR 219 / SW Scholls Ferry Rd |
| | 12 | OR 219 / SW Seiffert Rd |

## 2.5 Analysis Results and Recommendations

The transportation projects included in this study were analyzed with the assumption of full buildout of all URAs. As a result of projected growth under these assumptions, there are several roadways and intersections where additional capacity will be needed to accommodate growth within the URAs. This additional roadway and intersection capacity would be in addition to employing urban design, transportation demand management and other strategies to ensure that there are multimodal transportation options available within new URAs and throughout the County.

The intersection improvements recommended in the URA profiles would complement planned improvements previously identified by the County and Metro. There are several areas in need of significant intersection upgrades (that is, realignment or intersection control upgrades), the need for Interchange Area Management Plans and corridor congestion management strategies (such as transportation system management and operations (TSMO), and/or access management strategies are recommended for several intersections and corridors in the Reserve Area profiles. The analysis also showed that several corridors within the existing UGB should consider congestion management, transportation system management and operations (TSMO), and/or access management strategies to mitigate excessive congestion:

- SW Scholls Ferry Road (east of Roy Rogers Road)
- OR 99W (SW Tualatin-Sherwood Road to SW Meinecke Road)
- SW Boones Ferry Road (SW Tualatin Road to SW Bridgeport Road)

Additionally, in some cases, cities have proposed new or expanded roadways outside of URAs to help mitigate future demand. However, Oregon Administrative Rules (OAR) 660 Division 27 precludes new roadway extensions in rural reserve areas. Therefore, all new roadway facilities must be planned for and constructed within UGBs, or within URAs or rural undesignated areas (new roadways outside UGBs still require statewide goal exceptions pursuant to OAR 660 Division 12).

Parallel facilities within URAs can help reduce congestion on arterials adjacent to URAs, particularly when parallel facilities are collectors that can carry trips through the URA. It is assumed that some parallel facilities may not only serve new growth from the URA, but also some regional traffic, and that can be accounted for as the funding model is considered. It is generally effective urban transportation network planning practice to space arterials approximately every mile and collectors at half-mile increments in between arterials. That guidance was a rough starting point for many roadways assumed in Metro’s Urban Growth Report analysis. Appropriately spaced parallel facilities also provide significant benefits to the multimodal transportation network, by providing options for cycling and transit connectivity.

# 3. Using the Results of this Study and Conclusions

## 3.1 Using this Study

The URTS process provided a unique opportunity to assess how the transportation system can support the potential for future development across multiple URAs. Using URTS as a baseline, future concept planning processes will provide additional opportunities for coordination between local jurisdictions, utilities, and other stakeholders. Throughout the URTS feasibility and assessment process, there were multiple areas noted where additional stormwater, parks, trails, or other utility coordination and evaluation would be needed to proceed with project design. Though stormwater mitigation costs are accounted for in the costs of the feasibility projects outlined in Appendix D, more comprehensive mitigation for stormwater and ROW impacts will require additional consideration and add to the projected costs. Further refinement through concept planning is needed in order to identify all system improvements necessary to support a specific urban reserve development plan.

As individual cities initiate concept planning, the URTS outputs provide a starting point for the more detailed analysis that is required to identify new roadway extensions, parallel routes, or areas where improvements to existing roads are necessary to provide additional vehicular, pedestrian, and bike connectivity. When embarking upon concept planning, cities should revisit the land use and travel forecast assumptions used in the modeling for this project with the following considerations:

- Use assumptions from the URTS process when laying out the background amount of regional travel that takes place. This might be different than what the Transportation Planning Rule (TPR) or other regulations require, and thus create a need for multiple modeling scenarios.
- Multiple scenarios for future growth could include both transportation impacts from the buildout of a given concept plan area and a "more aggressive" buildout of all urban reserves as identified in the URTS work.
- It is likely that cities will want to model transportation needs based on the development of only one or two URAs, which will likely show that fewer of these projects are necessary to support development of individual URAs. Those results can be compared to the results of this study to evaluate the phasing and prioritization of transportation improvement projects to support new development.
- The results of this analysis can be acknowledged and incorporated into any relevant findings or projects as alternatives for concept planning. In the absence of additional local modeling work, cities can take on a policy review of priority projects to evaluate how to move forward.
- As cities evaluate how to prioritize and fund the variety of transportation projects to accommodate future growth, additional urban design strategies such as planning compact, mixed-use urban neighborhoods should be utilized to reduce the number of expected SOV trips in new urban areas and improve transportation choices.

Concept and comprehensive planning processes should also make use of the URTS Infrastructure Funding Plan Toolkit, which provides a consistent method to evaluate the feasibility of funding identified infrastructure needs. This approach will enable the cities, County, landowners, and developers to have a clear picture of infrastructure needs, costs, and funding tools as they consider the limited availability of public infrastructure dollars.

## 3.2 Conclusion

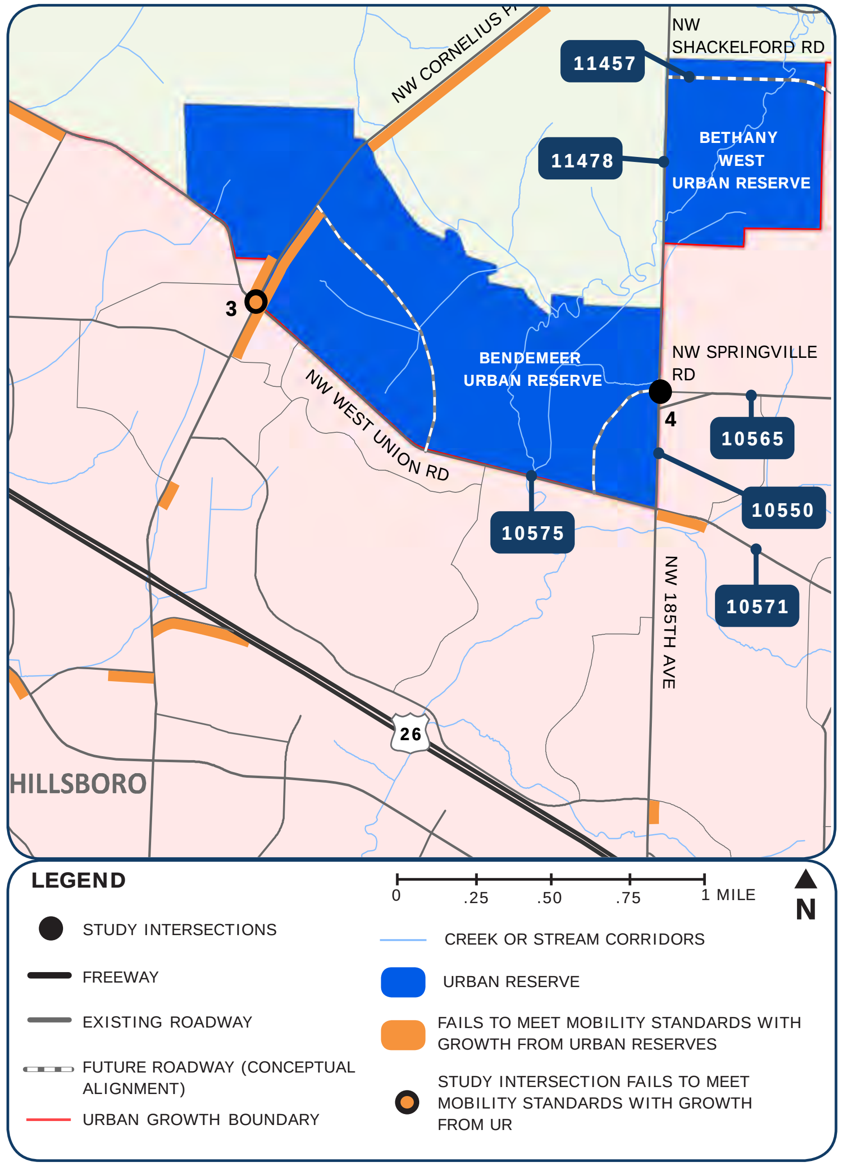
This initial analysis of transportation needs is meant to serve as a baseline for cities to use as they consider their own transportation and growth needs in the future. The study results further validate that the transportation infrastructure investments necessary to accommodate new urban development outside the existing UGB are significant. Planning these new areas will require collaboration between multiple jurisdictions and stakeholders to identify and prioritize funding for these projects. As cities begin to consider the justification and need for bringing new areas into the UGB, the URA profiles in Chapter 4 provide recommendations to consider for concept plans that will inform the development of a funding plan. The URTS process is a first step in ongoing collaboration to make the transportation investments necessary to plan for future growth in Washington County.

# 4. Concept and Comprehensive Plan Considerations by Urban Reserve Area

This section provides profiles for each URA, which include specific recommendations for future concept and transportation planning by Washington County and local jurisdictions. Each profile includes a map, land use assumptions, a list of transportation projects by URA with preliminary estimated costs and recommendations for concept planning. For projects that have undergone more thorough evaluation (Listed in Chapter 2.1-2.3), additional information is provided with an evaluation summary to guide further study and cost benefit analysis for these projects. Information regarding the feasibility projects (Chapter 2.1) in the URA Profiles also include design considerations to be considered for the next phase of project design.

# BENDEMEER AND BETHANY WEST

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Bendemeer | 535 | 2,221 | 301 |
| Bethany West | 166 | 462 | 63 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Multi-modal connections to NW Germantown Road, a popular cycling route, and nearby centers Bethany Town Center and Tanasbourne/Amberglen.
- PCC Rock Creek has existing congestion challenges and integrating new development in the area will require transportation demand management strategies as well as exploring improved transit for the area. Some recreational opportunities are provided on the PCC Rock Creek campus where THPRD has a large facility.
- There are existing rural residential uses and topographic challenges on the west side of NW Cornelius Pass Road. Street connectivity can be difficult to achieve in these areas.
- There are Cul-de-sac style subdivisions in the unincorporated areas adjacent to the planning areas. Improving street connectivity parallel to NW West Union Road, Cornelius Pass Road, and NW 185th will be challenging.
- Regionally significant riparian and upland habitat related to Holcomb Creek will limit the amount of internal connectivity possible - east-west connectivity in the Bendemeer URA will be particularly challenging.
- Rural reserve borders these URAs to the north and west. Natural features and rural residences provide a buffer between future urbanized areas and active agricultural uses, but planning may need to address potential mitigations to lessen impacts of urbanization.
- In planning for future growth in this area, consider needs for additional capacity, TSMO, and/or access management needs on NW Cornelius Pass Road from US-26 to NW Germantown Road as well as potential parallel routes to improve congestion.
- Further evaluation of intersection capacity on NW West Union Road at the intersections with NW 185th Avenue, NW Cornelius Pass Road and NE Century Boulevard is needed.
- Congestion south of US 26 is primarily caused by development south of the highway.

## NW SHACKELFORD ROAD DESIGN CONSIDERATIONS

- The Shackelford Road Extension project extends a three-lane roadway from NW Shackelford Road's existing terminus to NW 185th Avenue and provides a parallel route to Springville Road.
- A minor realignment of NW Shackelford Road at its current western terminus may be necessary to extend it to NW 185th Avenue.
- The connection at NW 185th Avenue should be placed at the bottom of a sag curve to allow maximization of sight distance.
- A structure length of approximately 800 feet will be needed to avoid the floodplain and wetlands.
- The proposed alignment was designed to minimize environmental impacts.
- A design speed of 35 miles per hour (mph) assumed through the extension.
- To build this project as designed, it is estimated that 5.92 acres of ROW would need to be acquired.

## NW SHACKELFORD ROAD EVALUATION SUMMARY

The Shackelford Road Extension project extends a three-lane roadway from NW Shackelford Road's existing terminus to NW 185th Avenue and provides a parallel route to NW Springville Road.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit to NW Springville Road Congestion |
| Cost | Large disadvantage due to high costs of building structure |
| Access and Connectivity | Small benefit from enhanced neighborhood circulation for new urban area |
| Active Transportation | Large benefit from new facilities and connections to existing network |
| Environment | Large disadvantage from wetlands and creek crossings |

# BENDEMEER AND BETHANY WEST

## NW 185TH AVENUE WIDENING DESIGN CONSIDERATIONS

- The NW 185th Avenue complete streets project from NW Springville Road to NW Germantown Road would protect the western edge of the pavement and widen east with proposed intersections at NW Shackelford Road and NW Germantown Road. The NW Shackelford Road intersection is located to maximize the sight distance along the rolling topography.
- Three structures along NW 185th Avenue would be impacted – two box culverts and one sheet pile wall.
- A regional stormwater solution should be considered and special attention given to the wetlands and floodplains in the surrounding area.
- The design speed for the entire length of improvements is 40 mph.
- The proposed cross section will create a shared use path on the eastern side of the improvements from NW Springville Road to NW Shackelford Road, then transition to the Washington County standard rural cross section at the NW Shackelford Road intersection. The center turn lane will continue to NW Germantown Road.
- To build this project as designed, it is estimated that 5.55 acres of right-of-way (ROW) would need to be acquired.

## NW 185TH AVENUE WIDENING EVALUATION SUMMARY

The NW 185th Avenue widening and complete streets project widens the roadway and adds a multi-use path from NW Springville Road to PCC Rock Creek then extends the roadway as a three lane facility to NW Germantown Road.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit to NW Springville Road |
| Cost | Large disadvantage from impacted structures |
| Active Transportation | Large benefit from new facilities and connections to existing network |
| Environment | Large disadvantage from potential wetlands and creek crossings |

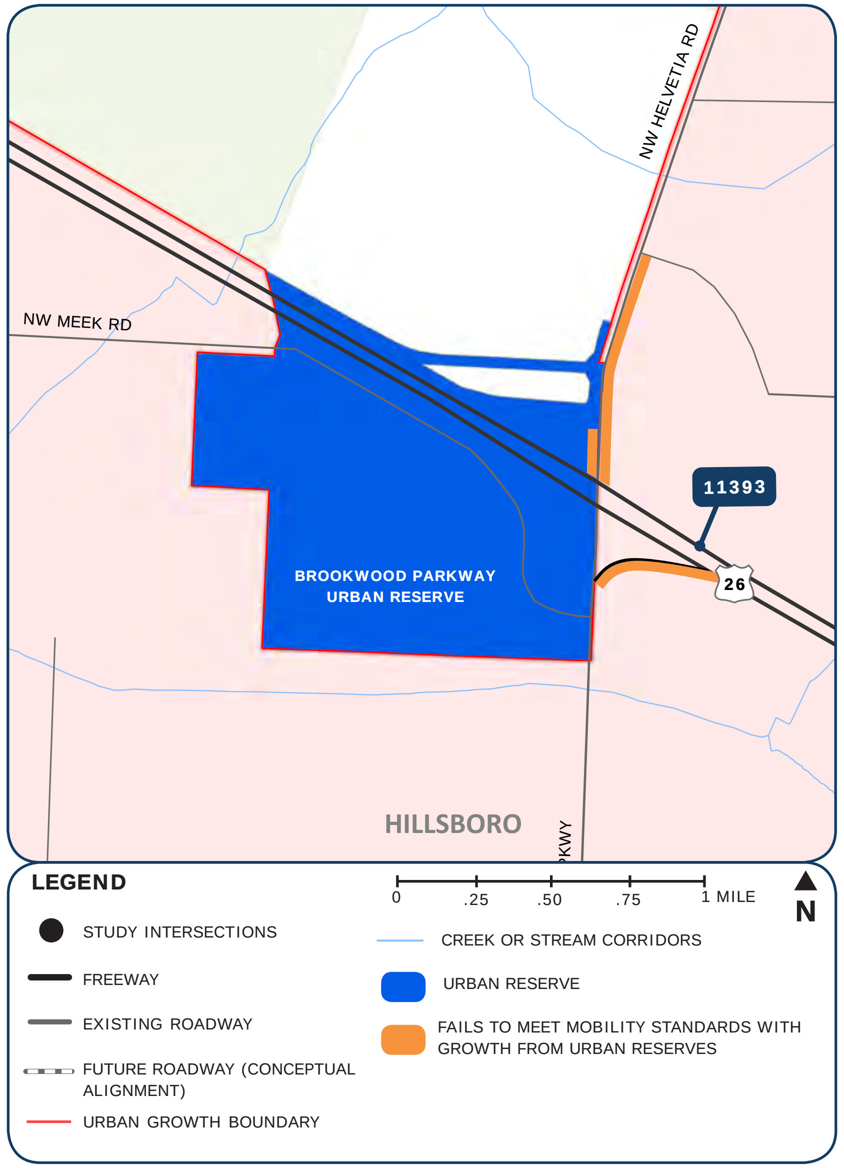
## BENDEMEER AND BETHANY WEST PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11478 | NW 185th Ave | NW Shackelford Rd | NW Springville Rd | Widen to 3 lanes (Note - TSP shows as 4/5 lanes) | FC | - | Planning Level | $60.6M | UR/Regional | County |
| 10565 | NW Springville Rd | PCC Access | NW Joss Ave | Widen to 3 lanes | FC | - | Planning Level | $9.7M | Regional | County |
| 10571 | NW West Union Rd | NW 185th Ave | NW Laidlaw Rd | Widen to 5 lanes | FC | - | Planning Level | $29.0M | Regional | County |
| 10575 | NW West Union Rd | Cornelius Pass Rd | NW 185th Ave | Widen to 5 lanes | FC/MSTIP (Design & ROW only) | - | Planning Level | $22.0M | UR/Regional | County |
| 11457 | NW Shackelford Rd Bridge | | | Bridge | TSP | - | Planning Level | $15.6M | UR/Regional | TBD |
| 11456 | NW Shackelford Rd | NW 185th Ave | Bridge | New 2/3-lane collector roadway | TSP | - | Planning Level | $12.8M | UR/Regional | TBD |
| Metro UGR | NW Cornelius Pass Rd | West Union Rd | UR Boundary (north) | Improve roadway | TSP | 3,160 | $2,000 | $10.0M | UR/Regional | County |
| Metro UGR | NW Springville Rd Extension | NW 185th Ave/ Springville Rd | West Union Rd west of 185th Ave | New 2/3-lane arterial roadway | New | 2,200 | $2,000 | $7.5M | UR | TBD |
| Metro UGR | New Collector Roadway | NW Cornelius Pass Rd north of West Union Rd | West Union Rd east of Cornelius Pass Rd | New 2/3-lane collector roadway | New | 4,590 | $2,000 | $13.5M | UR | TBD |
| **Total** | | | | | | | | **$180.7M** | | |
| **Total UR** | | | | | | | | **$21.0M** | | |
| **Total Regional** | | | | | | | | **$38.7M** | | |
| **Total UR/Regional** | | | | | | | | **$121.0M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# BROOKWOOD PARKWAY

## AREA MAP




## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- This small URA is largely built out with rural residences.
- Concept plan issues will likely revolve around sewer availability. Development of the few vacant parcels and eventual redevelopment of rural residences would likely not have a significant impact on transportation facilities.
- This area has limited development potential and does not have direct access to Brookwood interchange.
- An Interchange Area Management Plan will likely be needed in the future, as US 26 and Brookwood Parkway experience increased demand.

## BROOKWOOD PARKWAY PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | Cost Estimate | UR/Regional[2] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|
| 11478 | US 26 | Brookwood Pkwy | NW Cornelius Pass Rd | Widen US 26 to six lanes | FC | $26.6M | Regional | County |
| **Total** | | | | | | **$26.6M** | | |
| **Total UR** | | | | | | **$0.0M** | | |
| **Total Regional** | | | | | | **$26.6M** | | |
| **Total UR/Regional** | | | | | | **$0.0M** | | |

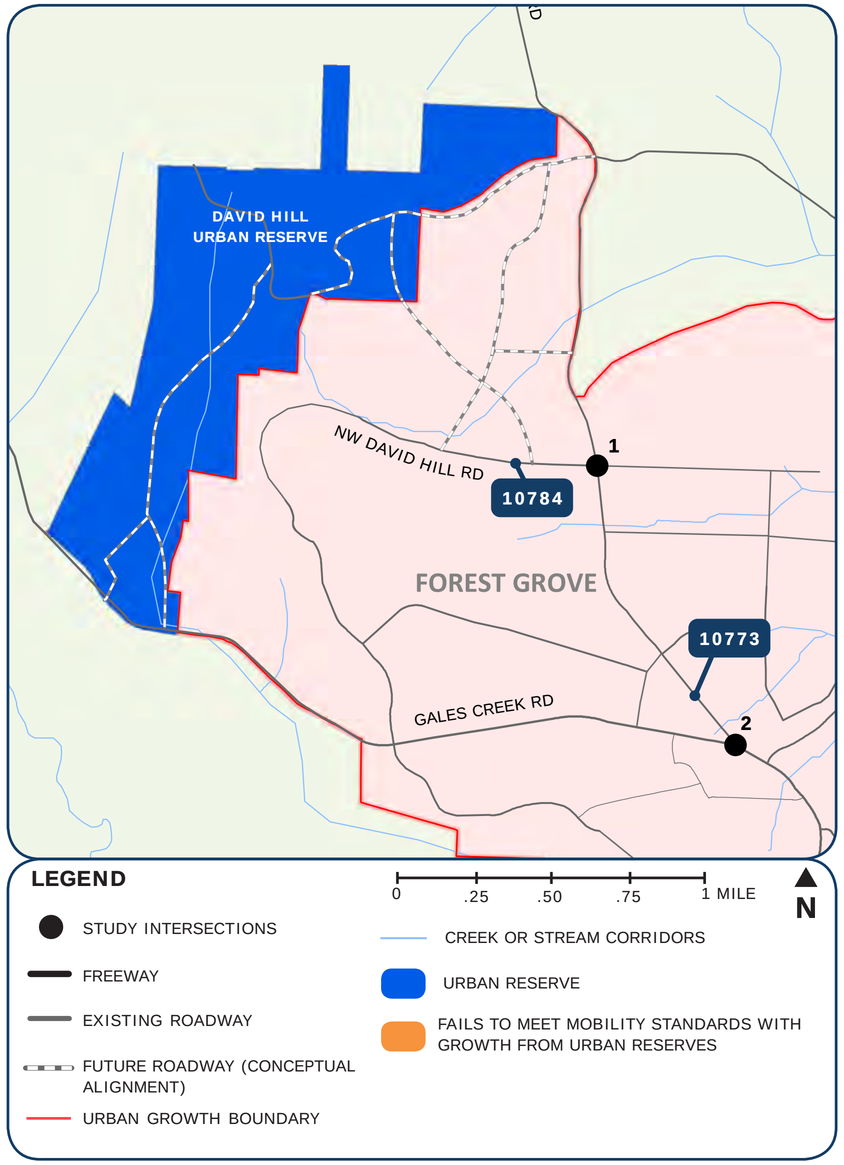
1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Based on expected roadway use, could be used for cost sharing

## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Brookwood Parkway | 39 | 242 | 99 |

# DAVID HILL

## AREA MAP




## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- The development pattern inside the current UGB and stream corridors in the area will limit the possibility of east-west connections through the URA.
- Steep slopes may impact the developability and serviceability of some areas.
- Rural reserve borders the URA on three sides. Some areas are forestry lands, which aren't as sensitive to nearby urbanization as agricultural lands, but mitigation measures may still be needed.
- All study intersections and adjacent roadways accommodate the potential growth within the URA.

## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| David Hill | 321 | 1,435 | 93 |

# DAVID HILL

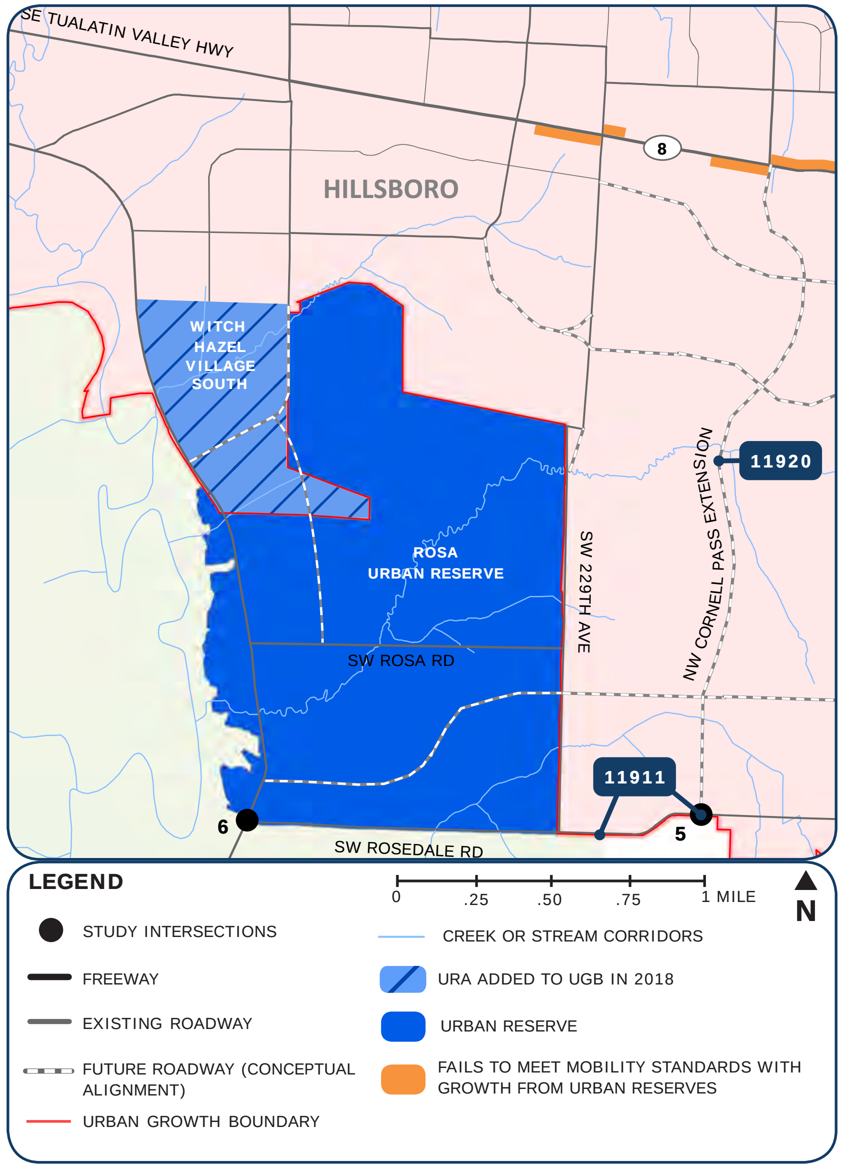
## DAVID HILL PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 10784 | NW David Hill Rd | NW Thatcher Rd | West UGB | Improve to collector road standards | FC | 7,750 | $2,500 | $19.5M | UR/Regional | County |
| 10773 | NW Thatcher Rd | NW Purdin Rd | Gales Creek Rd | Improve to arterial standards and improve intersection w/Gales Creek Rd | FC | $8,100 | $2,500 | $20.5M | Regional | County |
| 11973 | Gales Creek Rd | NW Thatcher Rd | NW Willamina Ave | Improve to arterial standards | FC | - | Planning Level | $1.0M | Regional | County |
| Metro UGR | New Collector 1 | Gales Creek Rd | NW David Hill Rd | New 2/3-lane collector roadway | New | 5,150 | $2,500 | $13.0M | UR | TBD |
| Metro UGR | Creekwood Pl | Gales Creek Rd | New Collector 1 | New 2/3-lane collector roadway | New | 1,350 | $2,500 | $3.5M | UR | Private |
| Metro UGR | New Collector 2 | NW David Hill Rd | NW Purdin Rd | New 2/3-lane collector roadway | New | 4,700 | $2,500 | $12.0M | UR | TBD |
| Metro UGR | New Collector 3 | NW David Hill Rd | New Collector 2 (west) | Improve roadway | New | 3,800 | $2,000 | $9.5M | UR | TBD |
| Metro UGR | New Collector 4 | NW David Hill Rd | New Collector 2 (east) | New 2/3-lane arterial roadway | New | 4,050 | $2,000 | $10.5M | UR | TBD |
| Metro UGR | Plumb Hill Ln | New Collector 4 | NW Thatcher Rd | New 2/3-lane collector roadway | New | 1,000 | $2,000 | $2.5M | UR | Private |
| **Total** | | | | | | | | **$92.0M** | | |
| **Total UR** | | | | | | | | **$51.0M** | | |
| **Total Regional** | | | | | | | | **$19.5M** | | |
| **Total UR/Regional** | | | | | | | | **$21.5M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# ROSA AND WITCH HAZEL VILLAGE SOUTH

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Rosa | 914 | 3,413 | 481 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Several stream corridors traverse the URA, and the western portion of the URA contains a significant amount of Class A Upland Habitat.
- "The Reserve" vineyards and golf club occupy roughly 25 percent of the area, and there are active orchards in the area as well.
- The URA is adjacent to the "South Hillsboro" area previously brought into the UGB. South Hillsboro has plans for a town center and other commercial development that could serve future development in this reserve.
- The URA is bounded to the south by rural reserves with Exclusive Farm Use land and active agricultural uses. Impacts from lighting, pedestrian activity, and other urban elements may require mitigation. Land to the west is buffered by the Tualatin River, which will lessen the impacts of urbanization.
- All study intersections and adjacent roadways are expected to accommodate the potential growth within the Rosa URA.
- The NW Cornelius Pass Road Extension project provides a parallel route to SW 209th Avenue and connects SW Rosedale Road to SW Farmington Road and extends further south to SW Scholls Ferry Road via SW Clark Hill Road and SW Tile Flat Road. This project will also include new sidewalks and bike lanes to minimize out of direction travel for bicyclists and pedestrians. This project would require a County TSP update and statewide planning goal exception.

## SW CORNELIUS PASS ROAD EXTENSION - ROSEDALE ROAD TO FARMINGTON ROAD SUMMARY

The NW Cornelius Pass Road Extension provides a parallel route to SW 209th Avenue and connects SW Rosedale Road to SW Farmington Road and extends further south to SW Scholls Ferry Road via SW Clark Hill Road and SW Tile Flat Road. This project will also include shoulders to minimize out of direction travel for bicyclists and pedestrians.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Large benefit to 209th Avenue |
| Right-of-Way Impacts | Significant |
| Cost | Small disadvantage from potential intersection control upgrades |
| Access and Connectivity | Large benefit from improved access between job centers and residential development |
| Active Transportation | Small benefit from reduced volume on Tualatin Valley Highway and improvements for active transportation connectivity |
| Environment | Constraints likely minimal but potential alignments could impact small wetland areas |

# ROSA AND WITCH HAZEL VILLAGE SOUTH

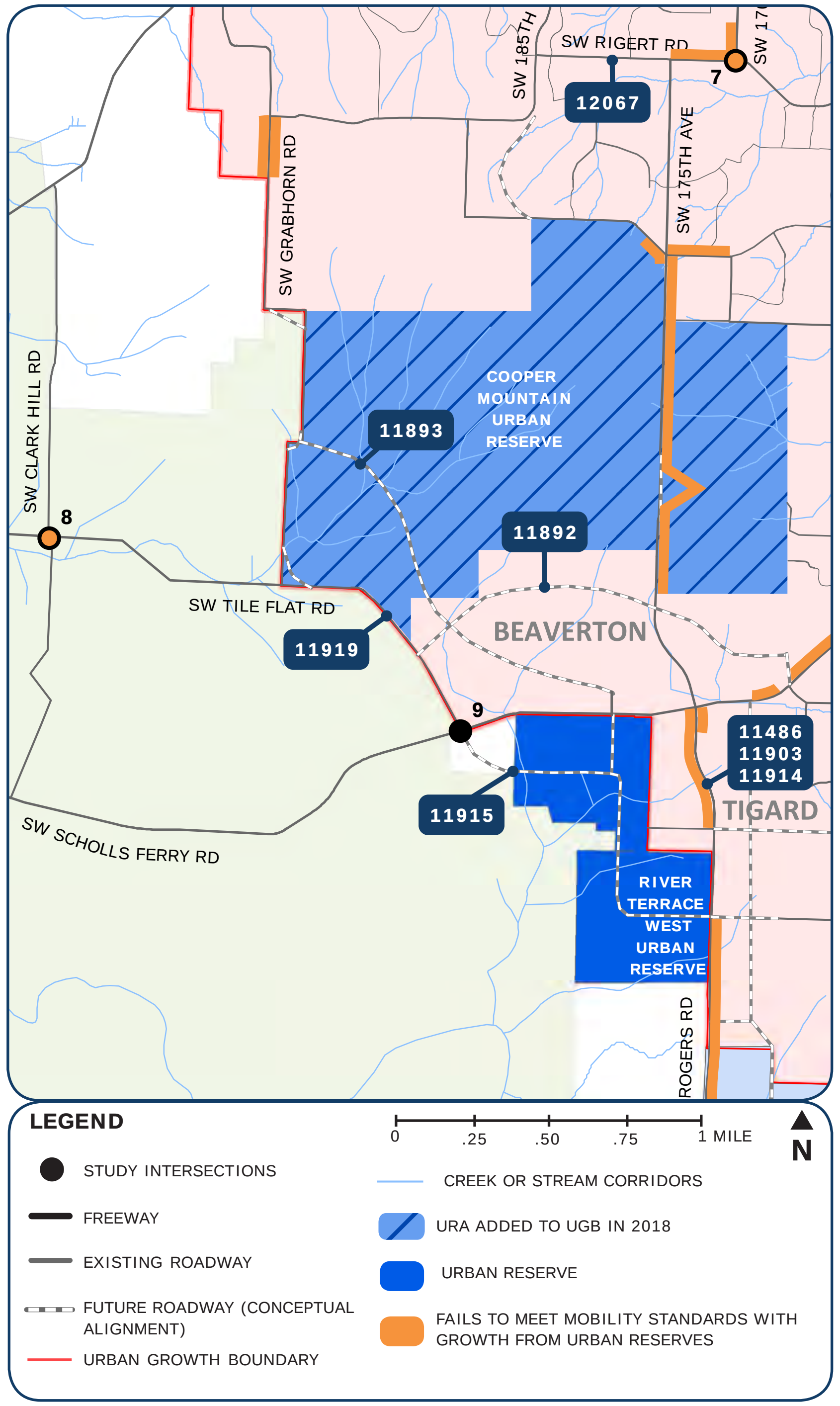
## ROSA AND WITCH HAZEL SOUTH PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11911 | SW Rosedale Rd | SW Century Blvd | 209th | Widen to 3 lanes | FC/SH | - | Planning Level | $10.0M | Regional | County |
| TSP | SW Rosedale Rd | SW Century Blvd | SW River Rd | Widen to 3 lanes | TSP/SH | 4,800 | $2,500 | $12.0M | UR/Regional | County |
| 11920 | NW Cornelius Pass Rd | SW Blanton St | SW Rosedale Rd | New 5-lane arterial roadway | FC/SH | - | Planning Level | $19.8M | Regional | Hillsboro/County/TBD |
| 11921 | | | | | | - | Planning Level | $8.5M | | |
| TSP | SW Century Blvd | Existing terminus (north) | SW Rosedale Rd | New 2/3-lane collector roadway | FC/MSTIP Bonding/ SH | - | Planning Level | $9.8M | UR/Regional | Hillsboro/County |
| TSP | SW River Rd | SW Oakhurst St | SW Rosedale Rd | Improve existing roadway to 2/3-lane arterial standards | TSP | 8,550 | $2,500 | $25.5M | UR/Regional | County |
| Metro UGR | SW Rosa Rd | SW Century Blvd | SW River Rd | Improve existing roadway to 2/3-lane collector | New | 4,900 | $2,500 | $12.5M | UR | TBD |
| TSP | SW Murphy Ln | SW Century Blvd | SW River Rd | Extend existing roadway as 2/3-lane collector | TSP | 5,200 | $2,500 | $13.0M | UR | County |
| Metro UGR | SW Brookwood Ave | SW Oakhurst St | SW River Rd | Extend existing roadway as 2/3-lane collector | New | 3,250 | $2,500 | $10.5M | UR | TBD |
| Metro UGR | New Collector | SW Rosa Rd | SW Brookwood Ave Extension | New 2/3-lane collector roadway | New | 3,350 | $2,500 | $8.5M | UR | TBD |
| **Total** | | | | | | | | **$130.1M** | | |
| **Total UR** | | | | | | | | **$44.5M** | | |
| **Total Regional** | | | | | | | | **$38.3M** | | |
| **Total UR/Regional** | | | | | | | | **$47.3M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# RIVER TERRACE WEST AND COOPER MOUNTAIN

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| River Terrace West | 301 | 1,574 | 1,771 |
| Cooper Mountain | 1,210 | 3,760 | 304 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- There are several regional projects proposed for these URAs – additional planning, design and updated modeling and public process will need to be conducted for the projects with additional evaluation discussed below as local jurisdictions evaluate how to prioritize and fund these projects.
- Future intersection improvement will be needed (signal or roundabout) at SW 170th Avenue/SW Rigert Road, SW Clark Hill Road/SW Tile Flat Road, and SW Elwert Road/SW Scholls-Sherwood Road.
- Additional capacity, TSMO, and/or access management needs on SW Roy Rogers Road from SW Scholls Ferry Road to SW Beef Bend Road should be considered. Coordinated area planning efforts are needed to control access onto Roy Rogers Road, by providing parallel routes within the URAs.
- Future intersection evaluations are needed at SW Scholls Ferry Road/SW Clark Hill Road, SW Clark Hill Road/SW Farmington Road, SW 185th Avenue/SW Bany Road, and SW Tile Flat Road/future extension of SW Barrows Road.
- Additional capacity, TSMO, and/or access management needs on SW Grabhorn Road from SW Farmington Road to SW Stonecreek Drive or widening from the existing two-lane cross section should be considered.
- A road reconfiguration of SW Farmington Road to three lanes between SW 209th and Cornelius Pass Road Extension should be considered for safety. Because this location is rural, no widening can be done outside of the existing right-of-way (ROW), per state law.
- Though in a Rural Reserve adjacent to this URA, due to the significant growth in surrounding areas, it is expected that the OR 219/SW Scholls Ferry Road and OR 219/SW Seiffert Road intersections may need more study and potential mitigation to address safety needs stemming from growth in adjacent urban reserves.
- This area is located near the Tualatin River, which could impact wetlands, require creek crossings, or include other topographic challenges. Environmental challenges in this area could further increase the construction cost.

## TILE FLAT ROAD EXTENSION B EVALUATION SUMMARY - BULL MOUNTAIN ROAD TO BEEF BEND ROAD

The Tile Flat Road Extension will provide a new collector connection between Scholls Ferry Road and Roy Rogers Road, facilitating access to future neighborhoods and providing an alternative route to the Roy Rogers corridor. The SW Tile Flat Road Extension project will extend SW Tile Flat Road south from SW Scholls Ferry Road to connect at SW Roy Rogers Road, with expected connections at SW Jean Louise Road, SW Bull Mountain Road, and SW Beef Bend Road. The extension will be divided into two pieces: Extension A, which is the portion from SW Scholls Ferry Road to SW Bull Mountain Road, and Extension B, which is the portion from SW Bull Mountain Road to SW Beef Bend Road. Tile Flat Road Extension A is within the River Terrace West urban reserve and is expected to be built with development of that area. Tile Flat Road Extension A was included in the baseline project assumptions for this analysis. Tile Flat Road Extension B expands on Extension A to provide a longer parallel route to Roy Rogers, providing greater benefit overall. It is likely that the extension of SW Tile Flat Road will require a functional classification amendment for the portion of Tile Flat Road between Grabhorn Road and Clark Hill Road from a local to a collector.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit to SW Roy Rogers Road but larger benefit when paired with the congestion and volume shift that will occur from the improvements in Tile Flat Ext. A. |
| Cost | Project cost is significant due to high right-of-way (ROW) impacts |
| Access and Connectivity | Would significantly improve connectivity in this area by providing a new connection to SW Beef Bend Rd. (Ext. A). |
| Active Transportation | Large benefit from new neighborhood parallel route. This project will include sidewalks and bike lanes, and lower traffic speeds along the SW Tile Flat Road extension will create a more comfortable multi-modal environment |
| Environment | Large disadvantage from potential wetlands and creek crossings |

# RIVER TERRACE WEST AND COOPER MOUNTAIN

## SW 175TH AVENUE CORRIDOR REFINEMENT DESIGN CONSIDERATIONS

- The SW 175th Avenue Corridor Project would reconstruct the hairpin curves on SW 175th Avenue known as "the kink" and widen to meet the Washington County standards for an urban arterial including widening for bike facilities, center turn lane, and sidewalks.
- The project would revise the horizontal geometry to accommodate a 35 mph design speed. Realignment/extensions of SW High Hill Road and SW Rider Lane would also be required.
- At minimum, five parcels will be impacted with the new alignment recommended in the feasibility assessment. Early coordination with landowners is needed as part of the design and development process.
- The alignment would closely follow the existing topography of SW 175th Avenue and impacts to the surrounding area would be the same, or less than the alignment proposed in the TSP.
- This project will require an amendment to the TSP due to the revised alignment.
- To build this project as designed in the feasibility analysis, it is estimated that 3.24 acres of right-of-way (ROW) would need to be acquired.

## SW 175TH AVENUE CORRIDOR REFINEMENT EVALUATION SUMMARY

The SW 175th Avenue Widening and Realignment would reconstruct the existing hairpin curves on SW 175th Avenue ("the kink"). The widening would bring the road up to current design standards, including a new center two-way left turn lane, consistent with the existing cross-section both north and south of this project, and is proposed to increase the design speed through the curves from 15 mph to 35 mph by smoothing out the kink. The improvements would significantly improve safety on this stretch of roadway, improve access for emergency vehicles and also include bicycle and pedestrian facilities through the project area.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit to SW 175th Avenue for auto capacity. Larger benefit for trucks and future transit vehicles. |
| Cost | Large disadvantage due to right-of-way impacts |
| Access and Connectivity | Large benefit from improved connections between job centers and residential areas |
| Active Transportation | Large benefit from addressing the current gap in the bike and pedestrian network and improving safety |

## SW 185TH AVENUE EXTENSION DESIGN CONSIDERATIONS

- The SW 185th Extension Project extends SW 185th Avenue south from SW Gassner Road to connect with SW Kemmer Road. The project also includes a new alignment option for SW Gassner Road and SW Kemmer Road.
- New intersections are proposed at SW Gassner Road at SW 185th Avenue and at SW Kemmer Road and SW 185th Avenue.
- The proposed alignment of the roadway would extend SW 185th Avenue south to connect with SW Kemmer Road, which would allow for free flow of traffic between the SW Kemmer/175th Ave roundabout and SW 185th. A roundabout for the southern connection to SW Kemmer would impact 1 less property and could also be considered.
- The preferred extension alignment geometry was selected to minimize impacts to the surrounding community and follow the topography of the area, but would impact 6 properties.
- The design speed is assumed to be 35 mph along SW 185th Avenue, 30 mph on SW Kemmer Road, and 15 mph on SW Jeremy Street.
- There are significant wildlife crossings and watersheds in the project area that must be considered and accounted for as project design moves forward.
- To build this project as designed in the feasibility analysis, it is estimated that 7.04 acres of right-of-way (ROW) would need to be acquired.

## SW 185TH AVENUE EXTENSION EVALUATION SUMMARY

The SW 185th Avenue Extension connects SW 185th Avenue south from SW Gassner Road to SW Kemmer Road, creating a short parallel route to SW 190th Avenue and reducing out of direction travel for vehicles on SW 185th Avenue. This project completes a missing link in the SW 185th Avenue corridor that extends north to US 26 and NW Germantown Road/CorneliusPass Road and south to OR 99W via SW 175th Avenue.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit to SW 190th Avenue and SW 175th near extension |
| Right-of-Way | Large disadvantage from six impacted properties |
| Cost | Large disadvantage due to right-of-way impacts |
| Active Transportation | Large benefit from new facilities and connections to existing residential areas and parks |

# RIVER TERRACE WEST AND COOPER MOUNTAIN

## RIVER TERRACE WEST PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/MSTIP Bonding/WWS | - | Planning Level | $0.0M | UR/Regional | County |
| 11903 | | | | | | - | | $11.0M | | |
| 11914 | | | | | | - | | $25.0M | | |
| 11915 | SW Scholls Ferry Rd | SW Tile Flat Rd | SW Roy Rogers Rd | Improve to 5-lane arterial standards | FC/MSTIP Bonding/SCM/RT | - | Planning Level | $8.3M | Regional | County |
| 12067 | SW Rigert Rd | SW 185th Ave | SE 170th Ave | Improve to 2/3-lane collector standards | FC | - | Planning Level | $10.5M | Regional | County |
| 11452 | SW Scholls Ferry Rd | West of Tile Flat Rd | | Realign curves to improve safety | FC | - | Planning Level | $4.6M | Regional | County |
| Metro UGR | SW Tile Flat Rd extension | SW Scholls Ferry Rd | SW Bull Mountain Rd | Extend as 2/3-lane arterial roadway | New | - | Planning Level | $72.9M | UR/Regional | TBD |
| Metro UGR | SW Jean Louise Rd | Existing terminus (west) | SW Tile Flat Rd extension | Extend as 2/3-lane collector roadway | New | 550 | $2,500 | $1.5M | UR | Tigard |
| Metro UGR | New North-South Collector Rd (aligns with Mountainside Way) | SW Scholls Ferry Rd | SW Tile Flat Rd extension | Extend as 2/3-lane collector roadway | New | 1,200 | $2,500 | $3.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$126.3M** |
| **Total UR** | **$4.5M** |
| **Total Regional** | **$12.9M** |
| **Total UR/Regional** | **$108.9M** |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# RIVER TERRACE WEST AND COOPER MOUNTAIN

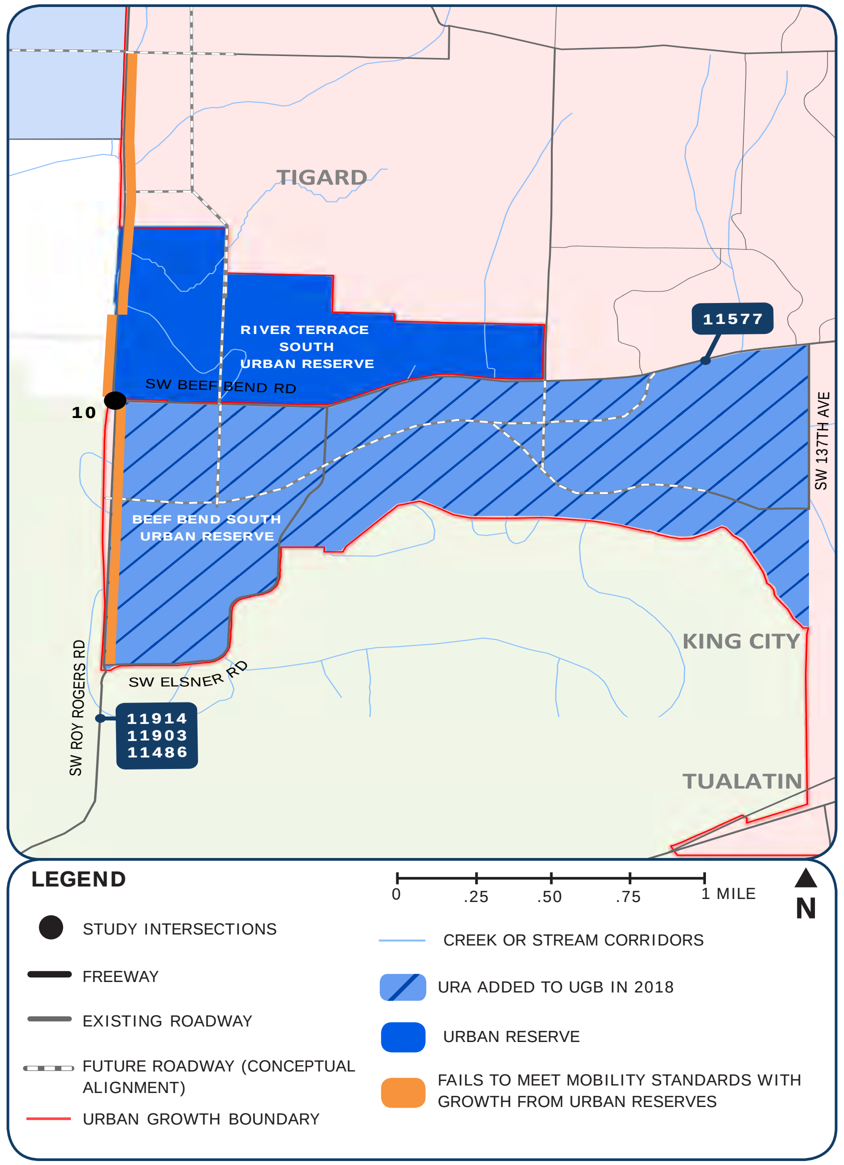
## COOPER MOUNTAIN PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/MSTIP Bonding/WWS | - | Planning Level | $0.0M | UR/Regional | County |
| 11903 | | | | | | - | | $11.0M | | |
| 11914 | | | | | | - | | $25.0M | | |
| 11915 | SW Scholls Ferry Rd | SW Tile Flat Rd | SW Roy Rogers Rd | Improve to 5-lane arterial standards | FC/MSTIP Bonding/SCM/RT | - | Planning Level | $8.3M | Regional | County |
| 12067 | SW Rigert Rd | SW 185th Ave | SE 170th Ave | Improve to 2/3-lane collector standards | FC | - | Planning Level | $10.5M | Regional | County |
| 11452 | SW Scholls Ferry Rd | West of Tile Flat Rd | | Realign curves to improve safety | FC | - | Planning Level | $4.6M | Regional | County |
| 11919 | SW Tile Rd | SW Scholls Ferry Rd | UGB - north boundary of South Cooper Mountain | Interim 3-lane improvement w/urban side ped/bike | FC/MSTIP Bonding/SCM | - | Planning Level | $3.0M | UR/Regional | County |
| 11892 | SW Barrows Rd Extension | SW Tile Flat Rd | SW Loon Dr | New 3-lane collector | FC/SCM | - | Planning Level | $22.8M | Regional | Beaverton |
| 11893 | New North-South Collector Rd (Mountainside Way) | SW Scolls Ferry Rd | UGB (between South Cooper Mtn and Cooper Mtn) | New 3-lane collector | FC/MSTIP/ MSTIP Bonding | - | Planning Level | 11.0M | UR/Regional | Beaverton |
| TSP | SW Grabhorn Rd | South UR Boundary | North UR Boundary | Improve to 2/3-lane collector | TSP | 7,850 | $2,500 | $24.0M | UR/Regional | County |
| Metro UGR | Mountainside Way extension | South UR Boundary | SW Grabhorn Rd | Extend as 2/3-lane collector roadway | New | 3,900 | $2,500 | $10.0M | TBD | Beaverton |
| Metro UGR/ TSP | 175th Ave | South UR Boundary | North UR Boundary | Improve to 3-lane arterial standard, including realignment | TSP | - | Planning Level | $16.4M | UR/Regional | County |
| Metro UGR/ TSP | 185th Ave Extension | SW Gassner Rd | SW Kemmer Rd | Extend 185th Ave as 3-lane arterial | TSP Refinement Area | - | Planning Level | $13.7M | Regional | County |
| **Total** | | | | | | | | **$160.3M** | | |
| **Total UR** | | | | | | | | **$10.0M** | | |
| **Total Regional** | | | | | | | | **$59.9M** | | |
| **Total UR/Regional** | | | | | | | | **$90.40M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# RIVER TERRACE SOUTH AND BEEF BEND SOUTH

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| River Terrace South | 190 | 1,235 | 1,389 |
| Beef Bend South | 493 | 3,576 | 391 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Coordinated area planning efforts are needed to control access onto SW Roy Rogers Road and SW Beef Bend Road, including the provision of parallel routes.
- King City completed a concept plan for the Beef Bend South urban reserve and Metro brought this area into the UGB in December 2018. There are a number of conditions of approval placed on the area, including:
  - At least 3,300 homes must be planned for, unless the market analysis indicates this target is infeasible.
  - The City must complete a transportation system plan and conduct a market analysis on the feasibility of creating a new mixed-use town center.
- The concept plan proposes several distinct residential neighborhoods. The western area is proposed as a main street/town center in that it is expected to include retail, campus-style employment, institutional, and/or hospitality uses as well as residential uses.

## BEEF BEND ROAD REALIGNMENT DESIGN CONSIDERATIONS

- The SW Beef Bend Road Realignment Project identifies two alignments for SW Beef Bend Road to improve safety
  - Option 1 – existing intersection with SW Roy Rogers Road is realigned north of its current location and SW Beef Bend Road is re-aligned approaching the intersection.
  - Option 2 – the intersection of SW Beef Bend and SW Roy Rogers roads is realigned further north, about 900 feet, at the existing intersection of SW Roy Rogers Road and SW Lasich Lane. This shifts SW Beef Bend Road further north for a greater portion of its alignment.
- No significant congestion changes are expected as a result of either realignment.
- These realignments are intended to avoid impacts to the adjacent Tualatin River National Wildlife Refuge and Option 2 would improve existing horizontal and vertical curves to improve safety while allowing the roadway to be widened consistent with Washington County urban arterial standards.
- Sidewalks and bike lanes are included in both options.
- Option 2 requires a longer section of new roadway and is expected to impact at least eight properties, and more likely to impact small wetlands or other environmentally sensitive areas identified in the Bull Mountain Community Plan. There are also sight distance challenges at this proposed intersection location due to vertical curves on SW Roy Rogers Road.
- Option 1 requires a short section of new roadway and is expected to impact one or two properties, with an estimated 1.13 acres of ROW in the right-of-way (ROW) to be required.
- To build this project as designed, it is estimated that 1.13 acres of ROW would need to be acquired. Exact ROW and property impact needs will need to be determined later if this option moves forward.

## BEEF BEND REALIGNMENT EVALUATION SUMMARY

Two realignment options were identified for Beef Bend Road. One option realigns the existing intersection immediately north of its current location, and another option realigns SW Beef Bend Road and SW Roy Rogers Road further north, at the intersection of SW Roy Rogers Road and Lasich Lane.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | No Impact to SW Beef Bend Road |
| Right-of-Way Impacts | Large disadvantage from Option 2 that impacts at least eight properties |
| Cost | Large disadvantage for Option 2 due to right-of-way costs and higher construction costs due to a longer section of new roadway |
| Environment | Large benefit from minimizing impacts to the Tualatin River National Wildlife Refuge |

# RIVER TERRACE SOUTH AND BEEF BEND SOUTH

## BEEF BEND SOUTH PARALLEL ROUTE EVALUATION SUMMARY

Removing the SW Fisher Road extension restricts local access between existing King City, including the commercial center, and the new Beef Bend South URA. Without the extension in place, future development must use SW Beef Bend Road to access these areas, adding 4,800 vehicles to SW Beef Bend Road each day along with other key local access roads, such as 131st Avenue. The SW Fisher Road extension allows for local traffic to circulate through the city without having to use SW Beef Bend Road, leaving the arterial capacity for through traffic from SW Roy Rogers Road to OR 99W.

These volume shifts will increase congestion on SW Beef Bend Road between SW 131st Avenue and SW 150th Avenue and on SW Roy Rogers Road between SW Elsner Road and SW Beef Bend Road. Without the Fisher Road extension, westbound Beef Bend Road between SW 131st Avenue and SW 150th Avenue and northbound SW Roy Rogers Road between SW Elsner Road and SW Beef Bend Road will exceed their capacity. Northbound SW 131st Avenue is also expected to exceed the Washington County mobility standard without the SW Fisher Road extension.

## RIVER TERRACE SOUTH PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/ WWS | - | Planning Level | $0.0M | UR/Regional | County |
| 11903 | | | | | | - | Planning Level | $11.0M | | |
| 11914 | | | | | | - | Planning Level | $25.0M | | |
| 11577 | SW Beef Bend Rd | SW Roy Rogers Rd | OR 99W | Improve to 3-lane arterial standards | FC | - | Planning Level[4] | $41.9M | UR/Regional | County |
| Metro UGR | River Terrace Blvd | North UR Boundary | Beef Bend Rd (extends further south into Beef Bend South UR) | Extend as 2/3-lane collector roadway | New | 2,700 | $2,500 | $7.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$84.9M** |
| **Total UR** | **$7.0M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$77.9M** |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, WWS = Willamette Water Supply Project
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# RIVER TERRACE SOUTH AND BEEF BEND SOUTH

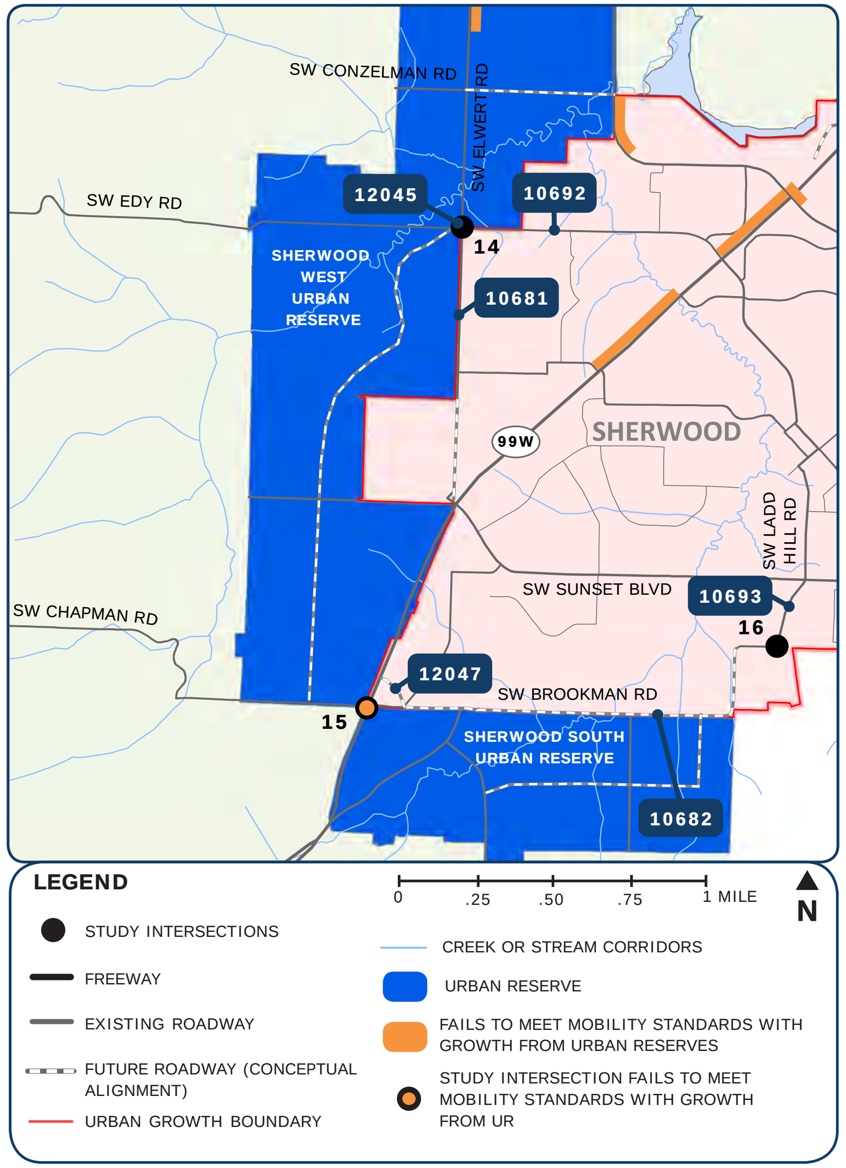
**BEEF BEND SOUTH PROJECTS**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/MSTIP Bonding/WWS | - | Planning Level | $0.0M | UR/Regional | County |
| 11903 | | | | | | - | | $11.0M | | |
| 11914 | | | | | | - | | $25.0M | | |
| 11577 | SW Beef Bend Rd | SW Roy Rogers Rd | OR 99W | Improve to 3-lane arterial standards | FC | - | Planning Level[4] | $41.9M | UR/Regional | County |
| Metro UGR | SW River Terrace Blvd | SW Beef Bend Rd (extends further north into River Terrace South UR) | East-West collector | Extend to 2/3-lane collector roadway | New | 1,500 | $2,500 | $4.0M | UR | TBD |
| Metro UGR | SW Fisher Rd extension | SW Fisher Rd existing terminus (west) | SW 150 Ave | Extend to 2/3-lane collector roadway | New | 3,400 | $2,500 | $8.5M | UR | County/TBD |
| Metro UGR | SW 150th Ave extension | SW Beef Bend Rd | SW Fisher Rd extension | Extend to 2/3-lane collector roadway | New | 1,400 | $2,500 | $3.5M | UR | Private/TBD |
| Metro UGR | East-west collector (parallel to, and south or, Beef Bend Rd) | SW 150th Ave extension | SW Roy Rogers Rd | Extend to 2/3-lane collector roadway | New | 5,700 | $2,500 | $14.5M | UR | TBD |
| TSP | SW Elsner Rd | SW Roy Rogers Rd | SW Beef Bend Rd | Improve to 2/3-lane collector standards | TSP | 5,700 | $2,500 | 14.5M | UR | County |
| Metro UGR | SW 137th Ave | SW Beef Bend Rd | SW Fisher Rd | Improve to 3-lane collector standards | New | 2,400 | $2,500 | $6.0M | UR | County |
| **Total** | | | | | | | | **$128.9M** | | |
| **Total UR** | | | | | | | | **$51.0M** | | |
| **Total Regional** | | | | | | | | **$0.0M** | | |
| **Total UR/Regional** | | | | | | | | **$77.9M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing
4 Cost Estimate from RTP, but Jacobs Feasibility Cost Estimate for intersection realignment ($2.3M - $4.9M) or more significant realignment ($4.9M - $20.1M) could increase total cost beyond $41.9M

# SHERWOOD WEST AND SHERWOOD SOUTH

## AREA MAP




## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Sherwood South URA has numerous stream corridors that may be impacted by development, and limit future east-west connections. The existing railroad alignment also poses a challenge to the connection to OR 99W.
- Future intersection improvements needed (signal or roundabout) at SW Elwert Road/SW Scholls-Sherwood Road.
- Future intersection improvements at OR 99W/SW Brookman Road needed, likely additional turn lanes or similar intersection-level capacity improvements.

## SW BROOKMAN ROAD EXTENSION EVALUATION SUMMARY

This project extends SW Brookman Road east from its current terminus at SW Ladd Hill Road to Basalt Creek Parkway, creating an arterial road connection between Sherwood and Wilsonville. A small portion of the SW Brookman Road Extension would travel through a rural undesignated area of Clackamas County. This will require multi-jurisdictional coordination for TSP amendments, right-of-way (ROW) acquisition, permitting, constructing, and long-term maintenance.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Large benefit to OR 99W and SW Tonquin Road |
| Cost | Large disadvantage from potential intersection control upgrades and potential environmental constraints |
| Access and Connectivity | Large benefit from improved access between Sherwood and I-5 |
| Active Transportation | Large benefit by providing bike lanes and sidewalks, which will reduce out of direction travel for people walking and riding bikes |
| Environment | Large disadvantage from potential wetlands and flooding potential - passing through the floodplain of Rock Creek, and a significant natural area to the north as identified in the Sherwood Community Plan |

## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Sherwood West | 1,159 | 6,495 | 544 |
| Sherwood South | 421 | 1,841 | 150 |

# SHERWOOD WEST AND SHERWOOD SOUTH

## SHERWOOD WEST AND SHERWOOD SOUTH PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/ WWS | - | Planning Level | $0.0M | UR/Regional | County |
| 11903 | | | | | | - | Planning Level | $11.0M | | |
| 11914 | | | | | | - | Planning Level | $25.0M | | |
| Metro UGR | SW Conzelmann Rd | West UR boundary | SW Roy Rogers Rd | Reconstruct and extend 2/3-lane collector roadway | New | 4,250 | $2,500 | $11.0M | UR/Local | County/TBD |
| 12045 | SW Elwert Rd | SW Elwert Rd | | Reconstruct intersection as roundabout or signalize | FC | - | Planning Level | $7.5M | UR/Local | County |
| 10692 | SW Edy Rd | SW Elwert Rd | Cherry Orchards Pl | Reconstruct to 3-lane collector standards | FC | - | Planning Level | $8.8M | Local | County/Sherwood |
| TSP | SW Edy Rd | West UR boundary | East UR boundary | Improve to collector standards | TSP | 5,250 | $2,500 | $13.5M | UR | County |
| 10681 | SW Elwert Rd | SW Handley Rd | SW Edy Rd | Reconstruct to arterial standards | FC | - | Planning Level | $7.5M | Local/Regional | County |
| TSP | SW Elwert Rd | SW Edy Rd | North UR boundary | Reconstruct to arterial standards | TSP | 5,300 | $2,500 | $13.5M | UR/Regional | County |
| 10680 | SW Elwert Rd | SW Handley Rd | OR 99W/Sunset Blvd | Relocate Kruger Rd intersection north at Elwert/Kruger/Cedar Brook as Roundabout, Reconstruct OR 99W intersection with new signal | FC/MSTIP/ Sherwood/ Private | - | Planning Level | $12.0M | Local/Regional | County |
| Metro UGR | New Collector | West of Elwert Rd/ Edy Rd Intersection | SW Chapman Rd | New 2/3-lane collector roadway | New | 10,250 | $2,500 | $26.0M | UR | TBD |
| Metro UGR | SW Kruger Rd | West UR boundary | SW Elwert Rd | Improve to collector standards | New | 3,800 | $2,500 | $9.5M | UR | Country |
| 12047 | SW Brookman Rd | OR 99W | OR 99W | Realigns and relocates Brookman Rd/OR 99W intersection | FC | - | Planning Level | $15.5M | UR/Regional | County |
| 10682 | SW Brookman Rd | OR 99W | SW Ladd Hill Rd | Reconstruct to arterial standards, ROW to accommodate up to 5-lane roadway | FC | - | Planning Level | $15.3M | UR/Regional | County |
| 10683 | SW Ladd Hill Rd | SW Sunset Blvd | SW Brookman Rd | Improve to 3-lane collector roadway | FC | - | Planning Level | $6.3M | Local | Sherwood |
| TSP | SW Chapman Rd | West UR boundary | OR 99W | Improve to collector standards | TSP | 2,400 | $2,500 | $6.0M | UR | Country |

# SHERWOOD WEST AND SHERWOOD SOUTH

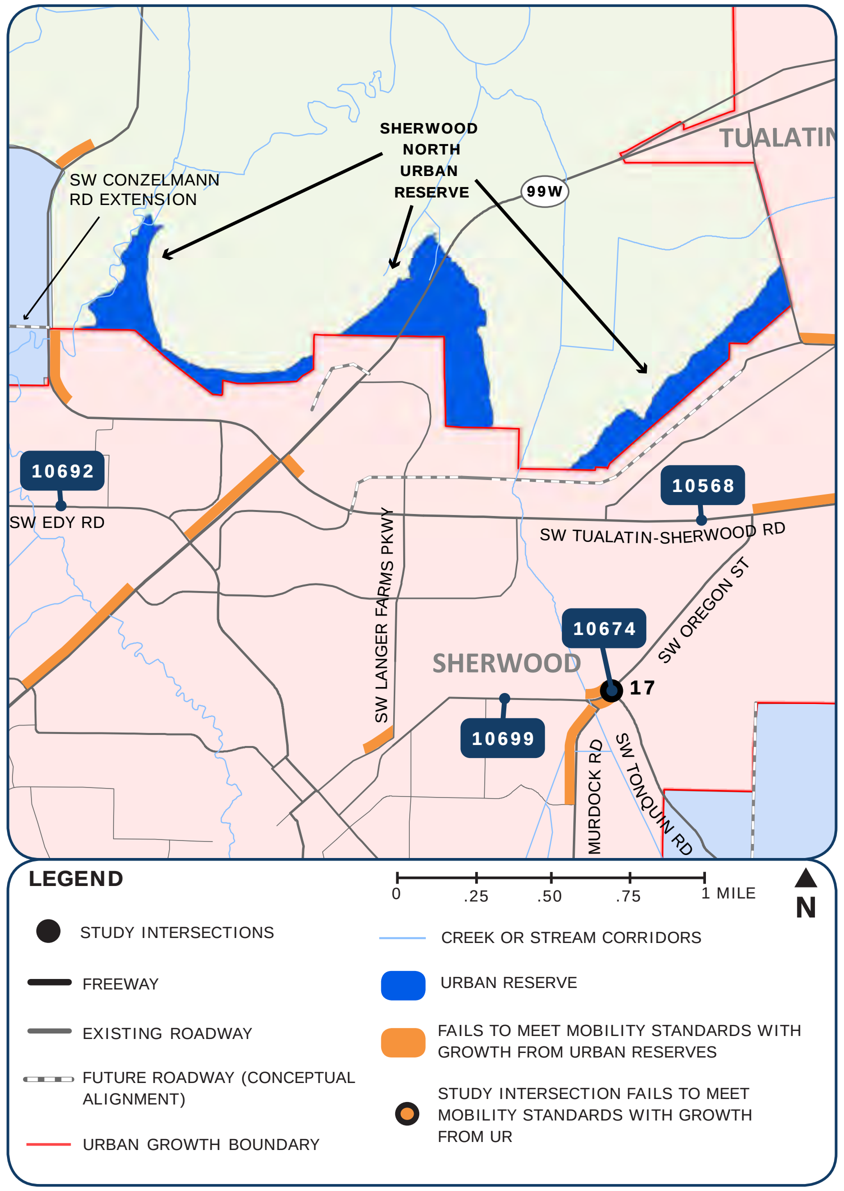
## SHERWOOD WEST AND SHERWOOD SOUTH PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| TSP | SW Middleton Rd | OR 99W | SW Brookman Rd | Improve to collector standards | New | 4,350 | $2,500 | $11.0M | UR | County |
| Metro UGR | SW Labrouse Rd | SE Middleton Rd | South UR boundary | Improve to collector standards | New | 2,350 | $2,500 | $6.0M | UR | County |
| Metro UGR | SW Oberst Rd | SW Brookman Rd | South UR boundary | Improve to collector standards | New | 2,450 | $2,500 | $6.5M | UR | County |
| Metro UGR | New Collector Roadway | SW Labrouse Rd | SW Brookman Rd | New 2/3-lane collector roadway, includes 90-degree turn/curve | New | 5,000 | $2,500 | $14.0M | UR | TBD |
| **Total** | | | | | | | | **$225.9M** | | |
| **Total Local** | | | | | | | | **$15.1M** | | |
| **Total Regional** | | | | | | | | **$0.0M** | | |
| **Total UR** | | | | | | | | **$111.0M** | | |
| **Total UR/Regional** | | | | | | | | **$99.8M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# SHERWOOD NORTH

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Sherwood North | 111 | 503 | 140 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Future intersection improvements needed on SW Roy Rogers Road at SW Scholls-Sherwood Road and the future extension of SW Conzelmann Road. Improvement would include capacity improvements (that is, additional turn lanes) on the Roy Rogers Road legs of each intersection.
- Future intersection capacity improvements needed (turn lanes) at SW Cipole/SW Herman Road and SW Langer Farms Parkway/SW Oregon Street.
- Due to increasing congestion on the corridor, additional capacity, TSMO, and/or access management strategies should be considered on OR 99W from SW Tualatin Sherwood Road to SW Meinecke Road, as well as transit-supportive development along the corridor.

## SHERWOOD NORTH PROJECTS

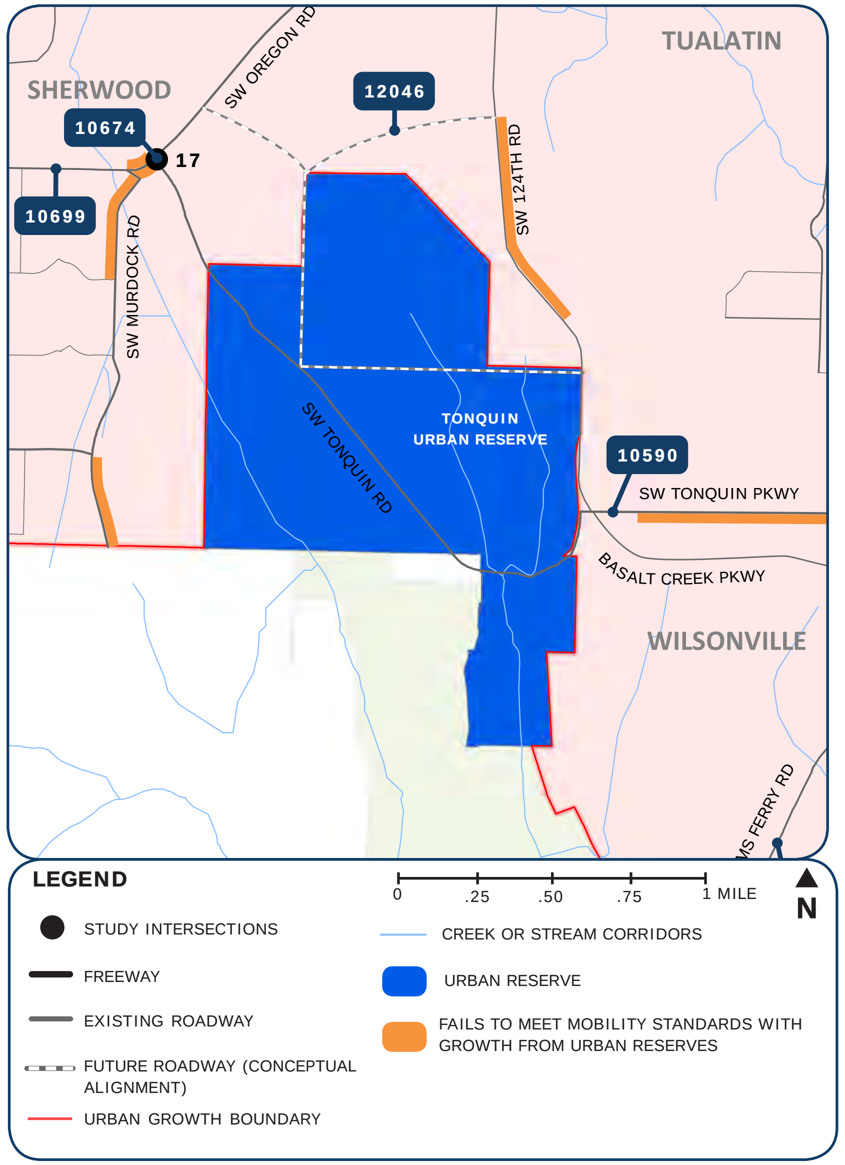
| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | Cost Estimate | UR/ Regional[2] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|
| 11486 | SW Roy Rogers Rd | SW Scholls Ferry Rd | SW Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/ WWS | $0.0M | UR/Regional | County |
| 11903 | | | | | | $11.0M | | |
| 11914 | | | | | | $25.0M | | |
| 10692 | SW Edy Rd | SW Elwert Rd | SW Cherry Orchards Pl | Improve to 3-lane arterial standards | FC | $8.8M | Regional/ Local | County/Sherwood |
| 10700 | SW Arrow St | SW Langer Farms Pkwy | SW Gerda Ln | New 2/3-lane collector roadway (incorporates existing portion) | Sherwood TSP | $8.2M | Local | TBD |
| 12044 | SW Langer Farms Rd extension | OR 99W | Toward SW Roy Rogers Rd (not connecting) | Extends 2/3-lane collector west across OR99W, likely looping back to OR 99W due to environmental constraints to Roy Rogers | Sherwood TSP | $3.2M | Local | TBD |
| 11404 | SW Baler Wy extension | SW Tualatin Sherwood Rd | SW Langer Farms Pkwy | Extend 3-lane collector roadway | FC | $3.8M | Local | TBD |

| | |
|---|---|
| **Total** | **$60.0M** |
| **Total Local** | **$15.2M** |
| **Total Regional** | **$0.0M** |
| **Total UR** | **$0.0M** |
| **Total UR/Regional** | **$44.8M** |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Based on expected roadway use, could be used for cost sharing

# TONQUIN

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Tonquin (Washington County portion) | 559 | 0 | 2,518 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Existing land uses within the URA may conflict with future urban development. These uses include quarry sites, a private gun club, protected open space, a Tualatin Valley Fire Department training facility, and rural residences.
- Additional capacity, TSMO, and/or access management needs on SW Tualatin-Sherwood Road from SW Oregon Street to SW 120th Avenue should be considered.
- Future intersection improvements at SW Murdock Road/SW Oregon Street needed in coordination with improvements at SW Tonquin Road/ SW Oregon Street. Further corridor study needed on SW Murdock Road from SW Oregon Street to SW Willamette Street to identify where turn lanes could improve capacity.

## SW 124TH AVENUE WIDENING EVALUATION SUMMARY

This project widens SW 124th Avenue to five lanes between SW Tualatin-Sherwood Road and SW Tonquin Road and is expected to be completed in coordination with new development along SW 124th Avenue.

| Evaluation | Benefits and Challenges |
|---|---|
| Roadway Congestion and Volume Shift | Small benefit for Sherwood; small disadvantage for regional traffic due to the widening creating an increase in vehicles on SW 124th and SW Tualatin-Sherwood Rd. |
| Active Transportation | Small benefit from improvement over existing wide shoulder and connecting to existing sidewalks and bike lanes along SW Tualatin-Sherwood Rd. |

# TONQUIN

## TONQUIN PROJECTS

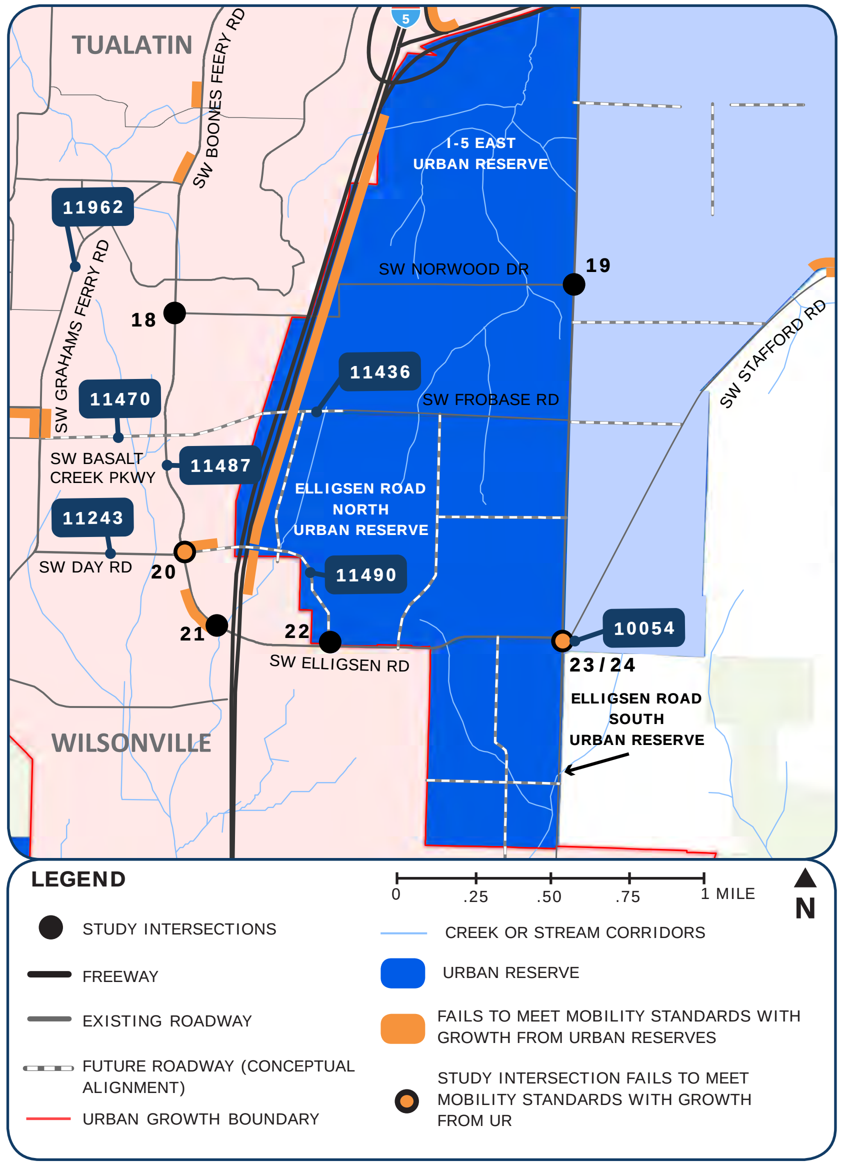
| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 12046 | Tonquin area east-west collector | SW Oregon St | OR 99W | Construct 3-lane collector roadway | FC | - | Planning Level | $10.5M | Regional | TBD |
| 10674 | SW Oregon/Tonquin Intersection | | | Reconstruct and realign as roundabout (partial 2-lane) | FC | - | Planning Level | $7.0M | Local/Regional | County |
| TSP | SW Tonquin Rd | West UR boundary | East UR boundary | Improve to arterial standards | TSP | 7,000 | $3,500 | $24.5M | UR | County |
| Metro UGR | New north-south collector | SW Tonquin Rd | North UR boundary | Construct new 2/3-lane collector roadway | New | 2,750 | $2,500 | $7.0M | UR | TBD |
| Metro UGR | New east-west collector | SW Tonquin Rd | SW 124th Ave | Construct new 2/3-lane collector roadway | New | 3,950 | $2,500 | $10.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$59.0M** |
| **Total UR** | **$41.5M** |
| **Total Regional** | **$10.5M** |
| **Total UR/Regional** | **$7.0M** |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# ELLIGSEN ROAD NORTH, ELLIGSEN ROAD SOUTH, AND I-5 EAST

## AREA MAP




## ASSUMED LAND USES

| Location | Acreage | Households | Employees |
|---|---|---|---|
| Elligsen Road North | 588 | 2,400 | 1,678 |
| Elligsen Road South (Washington County portion) | 252 | 592 | 119 |
| I-5 East | 746 | 1,458 | 3,128 |

## LAND USE AND TRANSPORTATION CONSIDERATIONS FOR CONCEPT PLANNING

- Future connectivity will need to be balanced with environmental protection around the SW Boeckman Rd and Saum Creek corridors and their tributaries, which impact all three URAs.
- The Frog Pond and Advance Road areas to the south were created with an eye to future development of the Elligsen URAs and established roadways parallel to Stafford Road. Where possible, this street network should be extended into the Elligsen North and Elligsen South URAs. The Frog Pond effort also identified the possibility of locally serving commercial uses in the Elligsen South URA, which could help reduce trips through congested intersections elsewhere in the city.
- Intersection control (signal or roundabout) at SW 65th Avenue/SW Stafford Road should be upgraded and realigned with SW Elligsen Road/SW 65th Avenue.
- Future intersection improvements are needed (that is, additional turn lanes) at the following intersections: SW Grahams Ferry Road/Basalt Creek Parkway, SW Boones Ferry Road/SW Ibach Road, SW Boones Ferry Road/SW Avery Street, and SW Tualatin-Sherwood Road/SW Avery Street.
- Additional capacity, TSMO, and/or access management needs on SW 65th Avenue from the I-205 overcrossing to the I-5 interchange should be considered.
- Future development will put increased demand on the SW Nyberg Road/I-5 interchange. Future studies (Interchange Area Management Plans) will be needed to identify solutions at this location.
- Future development will put increased demand on I-5. Washington County could pursue TSMO opportunities in coordination with ODOT.

## OVERCROSSINGS EVALUATION SUMMARY

### Basalt Creek and Day Road I-5 Overcrossings

This study analyzed the need for the SW Basalt Creek Parkway and SW Day Road Overcrossings to be completed by 2040 to accommodate future growth and alleviate congestion in the Stafford Road interchange area.Removing one or both I-5 overcrossings primarily shifts traffic to one of the adjacent overcrossings (i.e. Norwood Road overcrossing, Stafford Road interchange) with relatively little impact to regional traffic patterns. The analysis results showed the need for the Day Road overcrossing to be completed by 2040 (with development of the urban reserve areas) to alleviate congestion in the Stafford Road interchange area. The Basalt Creek Parkway overcrossing will likely be needed further in the future, beyond 2040, to accommodate future growth within the greater Stafford urban reserve areas. The scenarios analyzed to reach these conclusions include the following:

- **Only Basalt Creek Parkway Overcrossing (No Day Road Overcrossing), Complete by 2040**
  Without construction of the Day Road Overcrossing by 2040, 7,500 more vehicles are expected to travel through the SW Stafford Road interchange and 4,800 more vehicles are expected to use the SW Basalt Creek overcrossing each day. The Day Road Overcrossing will mitigate most impacts in the SW Stafford Road interchange area, including the SW Basalt Creek Parkway, and reduce congestion on most segments of SW Boones Ferry Road.

- **Only Day Road Overcrossing (No Basalt Creek Parkway Overcrossing), Complete by 2040**
  Without construction of the Basalt Creek Parkway Overcrossing by 2040, 1,000 more vehicles are expected to travel through the SW Stafford Road interchange area daily, 2,300 more vehicles per day through the Day Road Overcrossing, and 3,000 more vehicles through the Norwood Road overcrossing by 2040. Even with increased use of the Norwood overcrossing it is not expected to exceed capacity. However, additional traffic on the Day Road overcrossing is expected to push the westbound approach to the SW Boones Ferry Road intersection over capacity.

- **Neither Day Road nor Basalt Creek Parkway Overcrossing, Complete by 2040**
  Without either overcrossing, over 11,000 more vehicles are expected to travel through the SW Stafford Road interchange each day and 7,000 more vehicles are expected to use the SW Norwood Road overcrossing. The additional traffic on eastbound SW Elligsen Road will push segments approaching the northbound and southbound I-5 on-ramps over capacity. Northbound SW Boones Ferry Road between SW Day Road and the I-5 southbound ramps is also expected to exceed capacity, and southbound Boones Ferry Road is expected to approach or exceed capacity in the same segment.

# ELLIGSEN ROAD NORTH, ELLIGSEN ROAD SOUTH, AND I-5 EAST

### ELLIGSEN ROAD NORTH AND ELLIGSEN SOUTH PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11436 | East-West Arterial Overcrossing (Basalt Creek Pkwy) | SW Boones Ferry Rd | East of I-5 | Extend new 4-lane overcrossing over I-5 | Strategic | - | Planning Level | $40.0M | UR/Regional | TBD |
| 11490 | Day Rd Overcrossing | SW Boones Ferry Rd | SW Elligsen Rd | Extend new 4-lane overcrossing over I5 | Strategic | - | Planning Level | $46.9M | UR/Regional | TBD |
| 10054 | 65th/Elligsen/ Stafford Intersection | | | Reconstruct intersection as roundabout | FC | - | Planning Level | $5.8M | UR/Regional | County/Clackamas County |
| TSP | SW Elligsen Rd | West UR boundary | SW 65th Ave | Improve to 2/3-lane arterial standards (TSP shows as 4/5 lanes) | FC | - | Planning Level | $6.0M | UR/Regional | Wilsonville/County |
| Metro UGR | SW Frobase Rd | East-West Arterial Overcrossing | SW 65th Ave | Extend/improve Frobase Rd to 2/3-lane collector roadway | New | 6,100 | $2,500 | $15.5M | UR | County |
| TSP | SW 65th Ave | SW Elligsen Rd | SW Frobase Rd | Improve to arterial standards | TSP | 4,550 | $2,500 | $11.5M | UR/Regional | County/Clackamas County |
| Metro UGR | New north-south collector 1 | Day Rd overcrossing | SW Frobase Rd | New 2/3-lane collector roadway | New | 3,100 | $2,500 | $8.0M | UR | TBD |
| Metro UGR | New north-south collector 2 | SW Elligsen Rd | SW Frobase Rd | New 2/3-lane collector roadway | New | 4,950 | $2,500 | $12.5M | UR | TBD |
| Metro UGR | New east-west collector | New north-south collector 2 | SW 65th Ave | New 2/3-lane collector roadway | New | 2,600 | $2,500 | $6.5M | UR | TBD |
| Metro UGR | SW Stafford Rd | Washington/Clackamas County Line | SW Elligsen Rd | Improve to arterial standards | New | 1,500 | $2,500 | $4.0M | UR/Regional | County/Clackamas County |
| Metro UGR | New north-south collector 3 | Washington/Clackamas County Line | SW Elligsen Rd | New 2/3-lane collector roadway | New | 1,500 | $2,500 | $4.0M | UR | TBD |
| **Total** | | | | | | | | **$106.1M** | | |
| **Total UR** | | | | | | | | **$46.5M** | | |
| **Total Regional** | | | | | | | | **$0.0M** | | |
| **Total UR/Regional** | | | | | | | | **$114.6M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# ELLIGSEN ROAD NORTH, ELLIGSEN ROAD SOUTH, AND I-5 EAST

## I-5 EAST PROJECTS

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| Metro UGR | SW Frobase Rd | East-West Arterial Overcrossing | SW 65th Ave | Extend/improve Frobase Rd to 2/3-lane collector roadway | New | 6,100 | $2,500 | $15.5M | UR | County |
| Metro UGR | SW 82nd Ave | SW Frobase Rd | SW Norwood Rd | Improve to collector standards | New | 2,600 | $2,500 | $6.5M | UR | County |
| TSP | SW Norwood Rd | I-5 overcrossing | SW 82nd Ave | Improve to collector standards | FC | 500 | $2,500 | $1.5M | UR | County/ODOT |
| TSP | SW Norwood Rd | SW 82nd Ave | SW 65th Ave | Improve to collector standards | TSP | 5,350 | $2,500 | $13.5M | UR | County |
| TSP | SW 65th Ave | SW Frobase Rd | I-205 | Improve to 3-lane arterial standards | TSP | 8,600 | $2,500 | $21.5M | UR/Regional | County/Clackamas County |
| **Total** | | | | | | | | **$58.5M** | | |
| **Total UR** | | | | | | | | **$37.0M** | | |
| **Total Regional** | | | | | | | | **$0.0M** | | |
| **Total UR/Regional** | | | | | | | | **$21.5M** | | |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified
2 Assume $2,500/LF based on previous County roadway projects (e.g., Springville, Cornelius Pass, Brookwood, Roy Rogers)
3 Based on expected roadway use, could be used for cost sharing

# **Appendix A:** Proposed Urban Reserves Land Use Assumptions Memo (Revised)

# LAND USE & TRANSPORTATION MEMORANDUM

Planning and Development Services

Date: September 11, 2019

To: Urban Reserves Transportation Study Technical Advisory Committee

From: URTS Project Team

**Subject: Proposed Urban Reserves Land Use Assumptions (Revised based on city meetings)**

The project team sent out preliminary land use assumptions for the Washington County urban reserves to the cities on July 3, 2019 for their review. Some cities gave feedback based on preliminary work done for concept planning certain urban reserve areas and/or desired land use assumptions for the future prior to the August 1, 2019 TAC meeting. Since then, Washington County staff has met with several jurisdictions and worked with Angelo Planning Group to develop revised housing and employment estimates based on the cities' expectations and potential land suitability. Generally, changes from the assumptions presented at the TAC include the following:

- Addition of employment areas in I-5 East and Elligsen Road North urban reserves
- Modification of residential and employment assumptions in River Terrace West and River Terrace South urban reserves
- Addition of employment in David Hill urban reserve (small commercial node)
- Slight reduction of residential in Rosa urban reserve (previously called South urban reserve)

The table on the following page has been updated to reflect the most recent land use assumptions, and contains the following information:

- Preliminary assumptions based on the 2018 Metro BLI for dwelling units and the Metro 2040 model inputs for employment
- Adjusted (green) dwelling units and employment as provided at the August 1, 2019 TAC meeting
- Revised (blue) dwelling units and employment based on follow-up meetings and discussions with city staff

The TAZ maps have been revised to reflect the most current future household and employment assumptions and are included for your review.

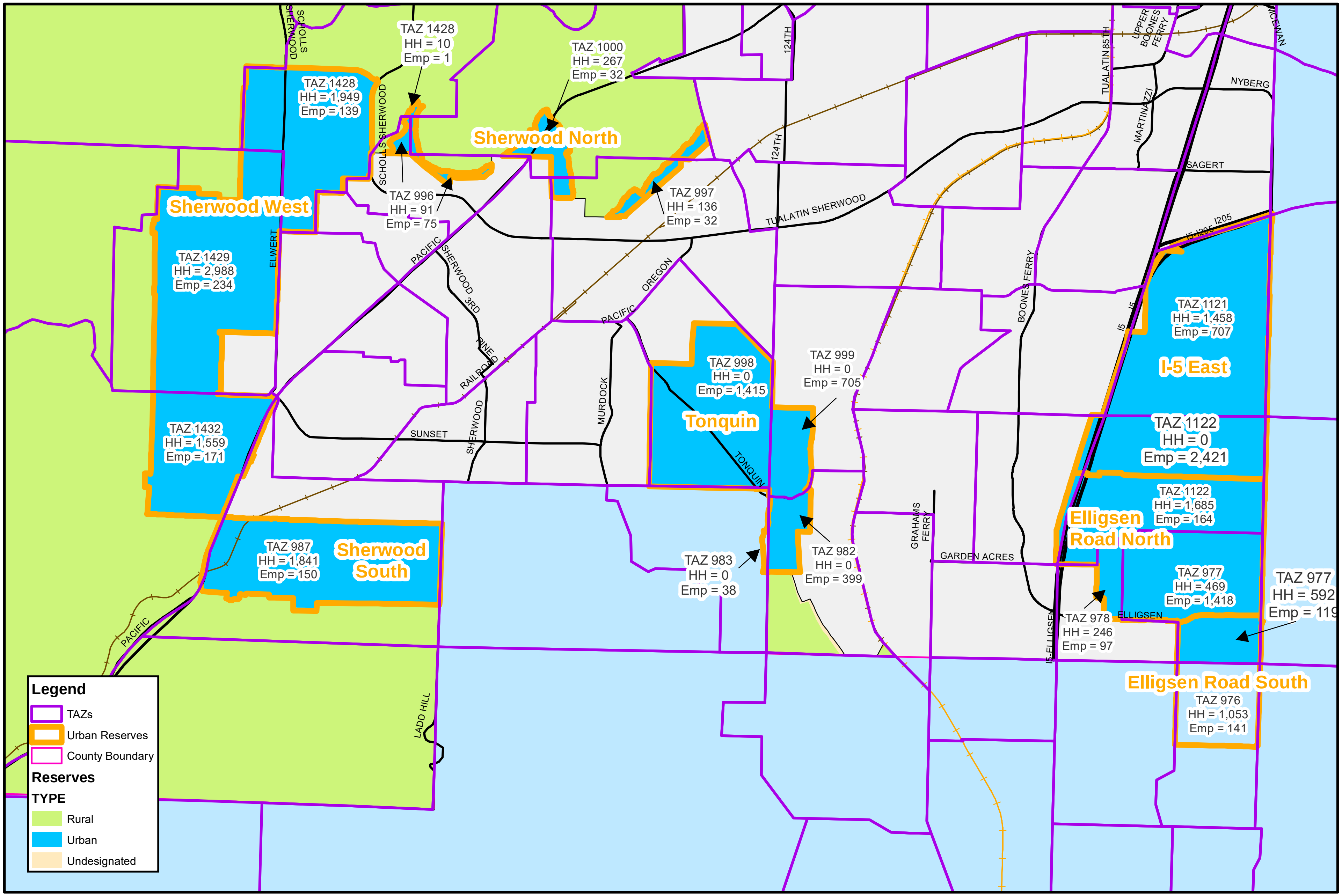
**Please provide feedback on any of these updated land use assumptions to Washington County staff by Friday, September 20, 2019.** These assumptions are the basis of the travel demand modeling that will begin once we have consensus on the land use assumptions for all urban reserve areas.

**Table 1: Washington County Urban Reserve Land Use Assumptions**

| Urban Reserve Area | Total Acreage | Constrained/ Partially Constrained Acreage | Metro BLI Dwelling Units | August Adjusted Dwelling Units | REVISED Dwelling Units | Metro 2040 Model Land Use - Employment | August Adjusted Employment | REVISED Adjusted Employment |
|---|---|---|---|---|---|---|---|---|
| I-5 East | 746 | 86/175 | 4,078 | 4,078 | **1,458** | 195 | 195 | **3,128** |
| Elligsen Road North | 588 | 41/120 | 3,511 | 3,511 | **2,400** | 621 | 621 | **1,678** |
| Elligsen Road South (Wash Co portion) | 252 | 24/24 | 1,645 (592)* | 1,645 (592)* | 1,645 (592)* | 260 (119)* | 260 (119)* | 260 (119)* |
| Tonquin (Wash Co portion) | 559 | 276/155 | 978 | **0** | **0** | 690 (641)* | **2,556 (2518)*** | **2,556 (2518)*** |
| Sherwood South | 421 | 100/111 | 1,841 | 1,841 | 1,841 | 150 | 150 | 150 |
| Sherwood West | 1,159 | 142/229 | 6,495 | 6,495 | 6,495 | 544 | 544 | 544 |
| Sherwood North | 111 | 24/29 | 503 | 503 | 503 | 140 | 140 | 140 |
| Beef Bend South | 493 | 138/74 | 2,304 | **3,576** | **3,576** | 147 | **391** | **391** |
| River Terrace South | 190 | 6/29 | 1,235 | **1,528** | **1,235** | 22 | **1,528** | **1,389** |
| River Terrace West | 301 | 29/92 | 1,574 | **1,916** | **1,574** | 81 | **1,916** | **1,771** |
| Cooper Mountain | 1,210 | 311/506 | 4,116 | **3,760** | **3,760** | 304 | 304 | 304 |
| Rosa | 914 | 399/228 | 2,691 | **3,834** | **3,413** | 481 | 481 | 481 |
| David Hill | 321 | 99/46 | 1,435 | 1,435 | 1,435 | 43 | 43 | **93** |
| Brookwood Parkway | 39 | 7/0 | 242 | 242 | 242 | 99 | 99 | 99 |
| Bendemeer | 535 | 178/92 | 2,221 | 2,221 | 2,221 | 301 | 301 | 301 |
| Bethany West | 166 | 62/7 | 462 | 462 | 462 | 63 | 63 | 63 |
| **Total (Wash Co)** | **8,005** | **1,922/1,917** | **34,278** | **35,994** | **31,207** | **3,951** | **9,413** | **13,169** |

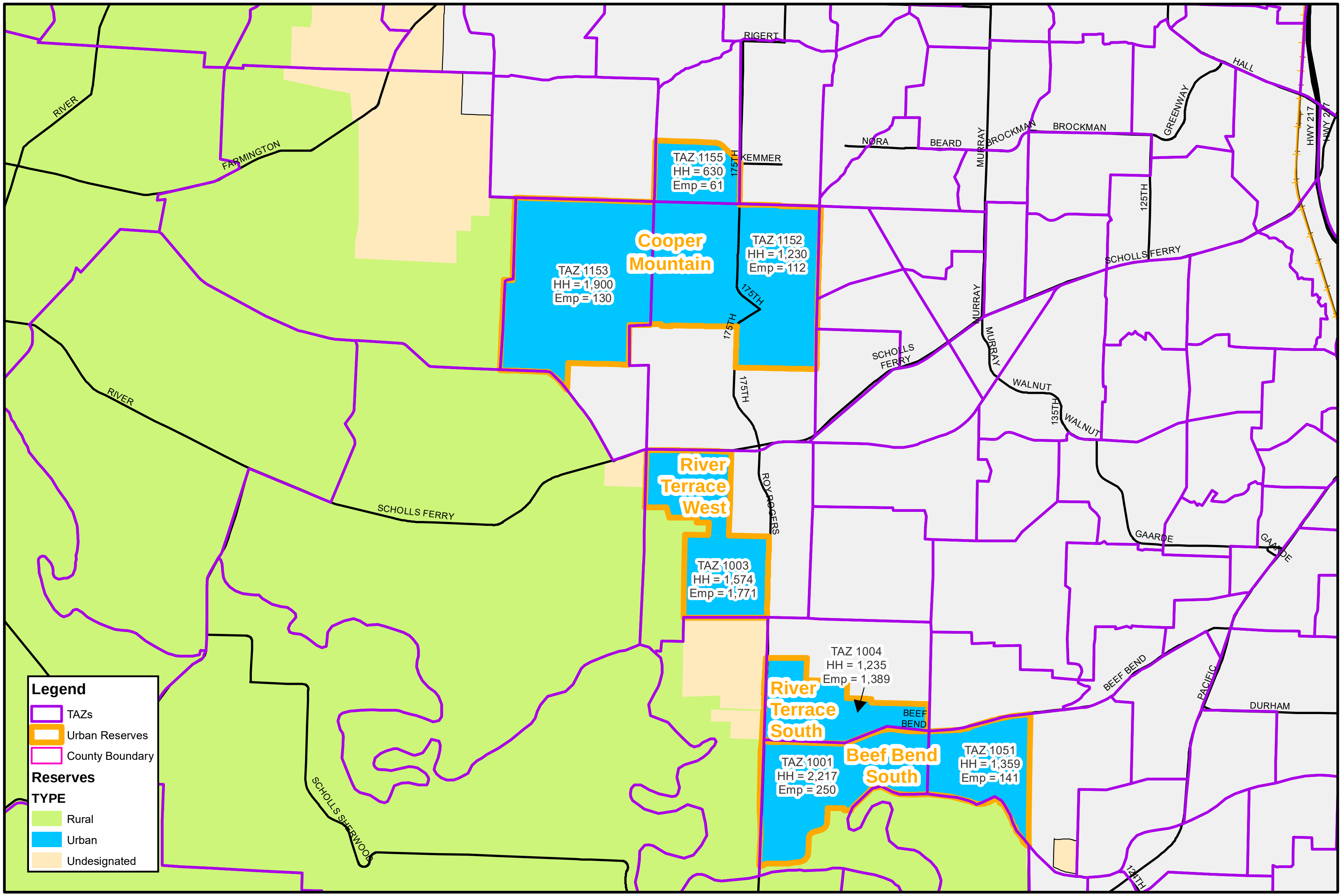
* Washington County portion of reserve

## Proposed Urban Reserve Buildout Land Use



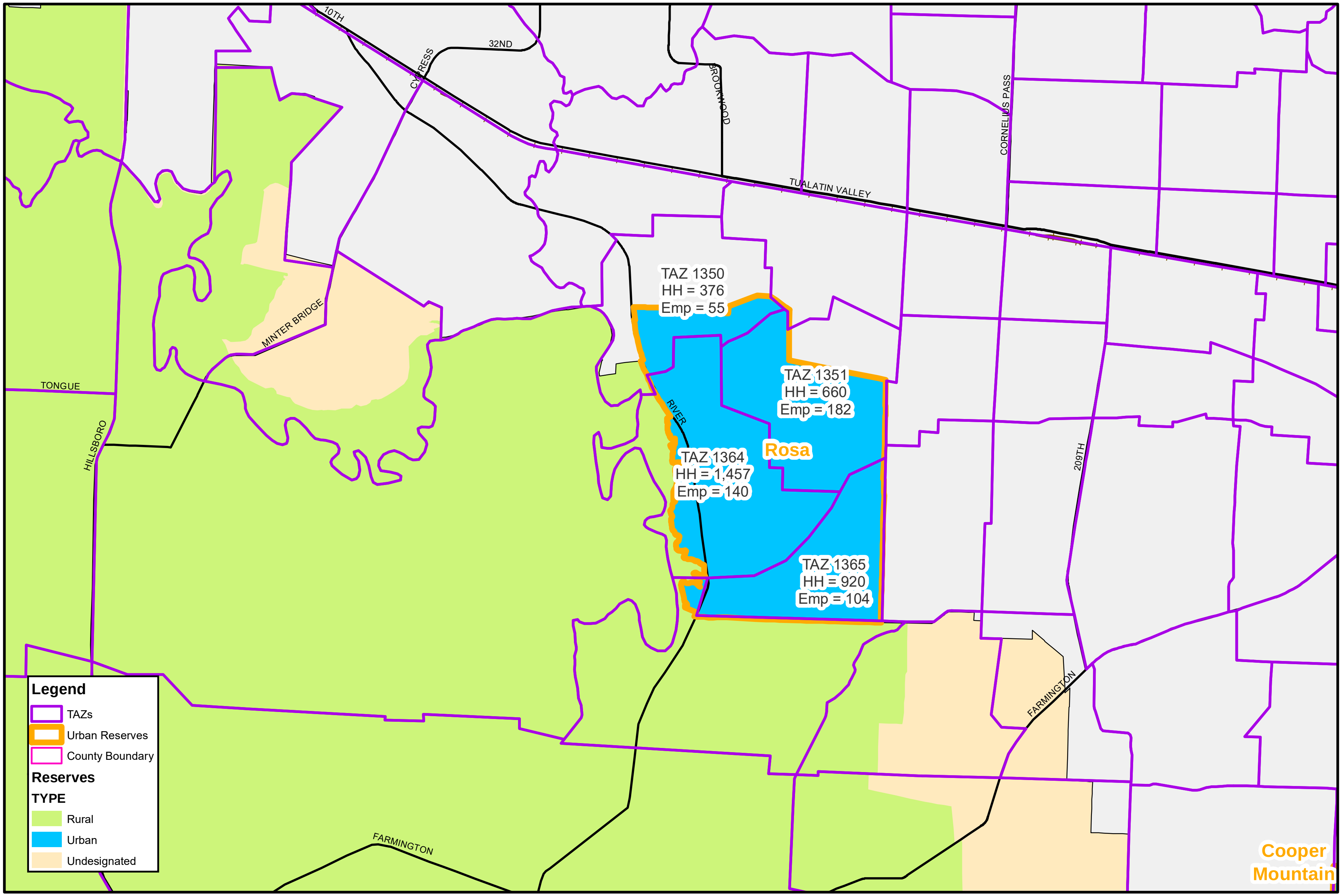

September 11, 2019

# Proposed Urban Reserve Buildout Land Use



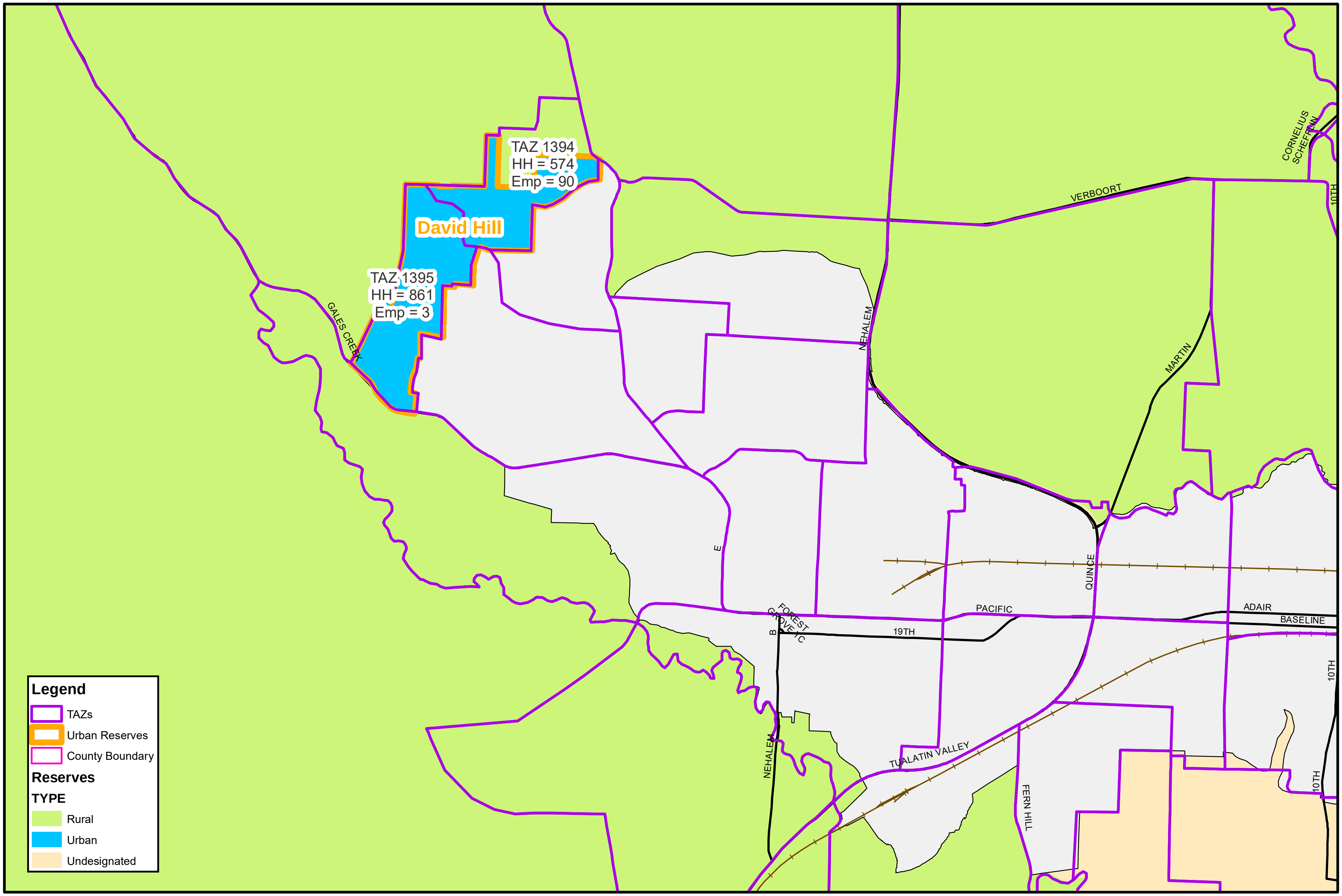

September 11, 2019

# Proposed Urban Reserve Buildout Land Use



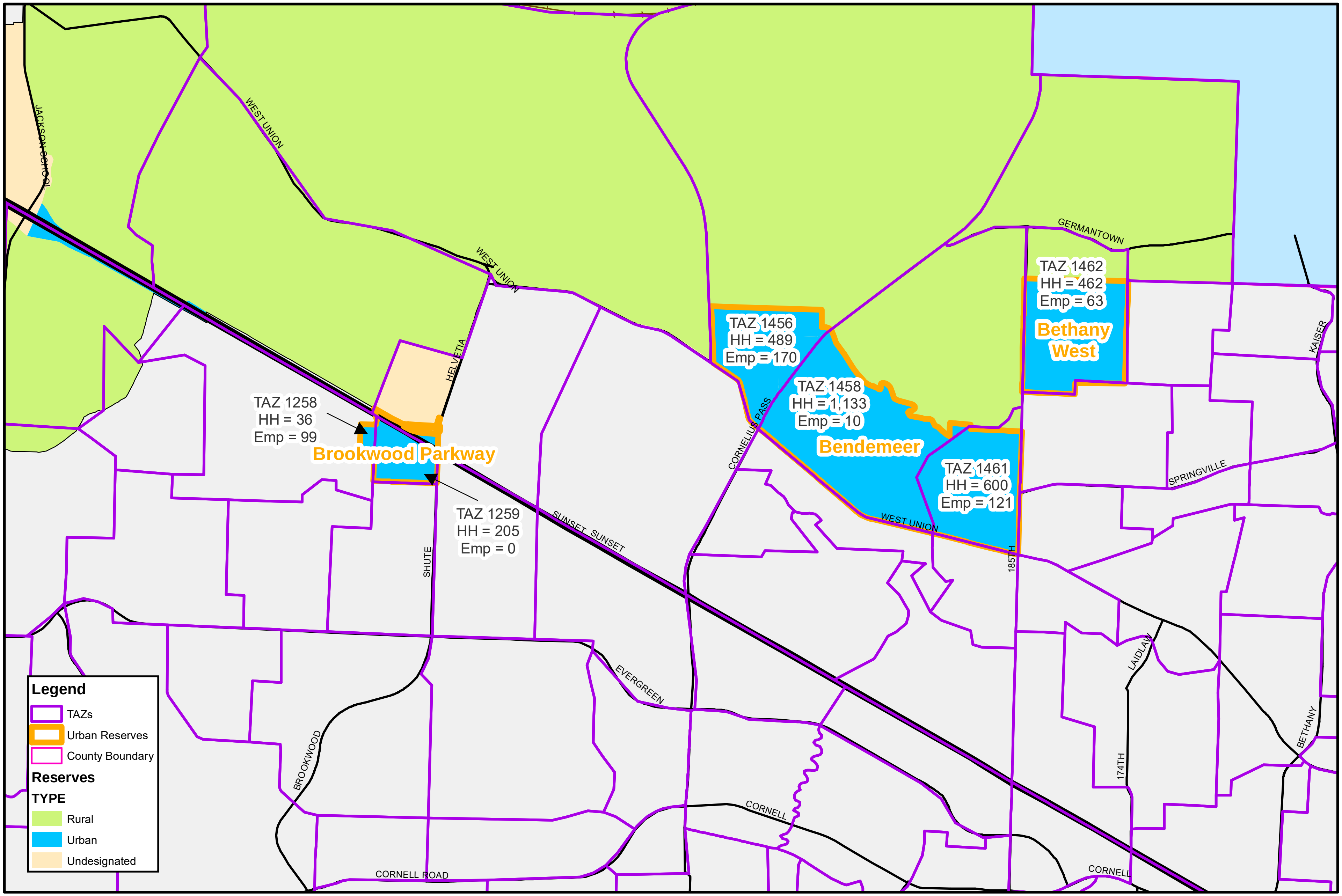

September 11, 2019

# Proposed Urban Reserve Buildout Land Use




September 11, 2019

# Proposed Urban Reserve Buildout Land Use




September 11, 2019

# **Appendix B:** Methods and Assumptions Memo

720 SW Washington St
Suite 500
Portland, OR 97205
dksassociates.com

# MEMORANDUM

DATE: November 6, 2019

TO: Washington County Urban Reserves Transportation Study Project Team

FROM: Carl Springer, Dock Rosenthal | DKS Associates

SUBJECT: Task 2.1 Methods and Assumptions

P19123-000

This memorandum describes the technical methods and assumptions that will be used to evaluate the system impacts of forecasted traffic volumes on the existing and committed transportation networks related to growth within Washington County's Urban Reserve Areas.

## Travel Forecasts

Washington County will provide travel forecasts for all scenarios in this study using the County's Visum travel demand model. The travel forecasts will provide link level traffic volumes, intersection turning movement volumes for the following scenarios, at a minimum:

- Existing base year model
- 2040 future baseline, without new development in the designated Urban Reserve Areas
- 2040 future scenario with Urban Reserve Area development

DKS will develop a limited number of additional scenarios to test addition or removal of potential new network connections. Examples of connections that are anticipated include, but are not limited to, the following:

- Cornelius Pass Road extension from Rosedale Road to Farmington Road
- Tile Flat Road extension south from Scholls Ferry Road to Bull Mountain and/or Beef Bend Road
- Other projects identified in the Cooper Mountain Transportation Study (e.g. Kitchen Sink alternative)
- Brookman Road alternatives (and/or Southern Arterial)
- Day Road overcrossing

- Basalt Creek Parkway overcrossing
- Others, as identified in the course of the study

**Land Use Assumptions** – Washington County staff worked with local cities and Metro to develop land use growth assumptions for the 2040 scenarios, as described in two Urban Reserve Transportation Study (URTS) Land Use Assumptions Memoranda (attached in Appendix) and summarized below. As needed, Washington County will provide supplemental information to the consultant team for their performance analysis.

The County has obtained preliminary land use assumptions from Metro's Goal 14 analysis for the 2018 Urban Growth Report and from previously completed concept plans for some of the urban reserves. In some areas, TAZs contain a mix of land types – e.g. urban, urban reserve, urban unincorporated, rural reserve – and in these areas the County has attempted to separate out the land use assumptions for only the area of the TAZ within the urban reserve for review purposes.

Metro assumed an average of 10 dwelling units per acre for most of the urban reserve areas (with environmentally constrained and other lands removed), and that is the starting point for this analysis. However, many cities have completed some level of concept planning for their adjacent urban reserve areas. Where more detailed forecasts were available, the County has adjusted the base number of units per urban reserve area to reflect these more refined forecasts. Tables provided in the Appendix list the urban reserve areas by name (identified by Metro) along with the jurisdiction primarily responsible for review and the associated TAZ numbers. The preliminary land use assumptions are further described in these memos, including maps showing the future household and job projections.

**Network Improvement Assumptions** – Network improvement assumptions for the 2040 scenarios will include the financially constrained roadway and transit projects listed in the latest Regional Transportation Plan (see Appendix), subject to further preliminary feasibility evaluation to be conducted by others on the Project Team. These assumptions also include planned and proposed roadway connections within the urban reserves as identified by Metro in the 2018 Urban Growth Report.

Additionally, the model includes the Day Road and Basalt Creek Parkway overcrossing projects, even though they are on the strategic list, because they will be significant for the region. The County has requested an additional analysis scenario where the overcrossings are removed from the model to measure their impact.

## Transportation Assessment

Transportation performance of the 2040 scenarios will be assessed for the County's arterial roadway system and at selected major study intersections. Intersection turning movement traffic forecasts will be developed for both future scenarios to evaluate the impact of development in the Urban Reserve areas. County arterials and major intersections in proximity to the Urban Reserve areas were reviewed, and a list of locations were developed for this study, as described in the following sections.

A map of the study intersections and roadway segments is posted here:

https://bit.ly/30LhBiQ

### Study Intersections

Detailed evaluations will be made at up to 25 intersections. 23 of these intersections are listed below leaving the option to add two additional intersections over the course of the analysis.

**North County**

- NW David Hill Rd & NW Thatcher Rd
- NW Gales Creek Rd & NW Thatcher Rd
- NW Cornelius Pass Rd & NW West Union Rd
- NW 185th Ave & NW Springville Rd
- SE Cornelius Pass Rd & SW Rosedale Rd (future)
- SW River Rd & SW Rosedale Rd

**Cooper Mountain**

- SW 170th Ave & SW Rigert Rd
- SW Clark Hill Rd & SW Tile Flat Rd
- SW Tile Flat Rd & SW Scholls Ferry Rd
- SW River Terrace Blvd & SW Beef Bend Rd (future)
- SW Roy Rogers Rd & SW Beef Bend Rd

**South County**

- Hwy 219 & Scholls Ferry Rd & SW Seiffert Rd
- SW Elwert Rd & SW Scholls-Sherwood Rd
- SW Elwert Rd & SW Edy Rd
- OR 99W & SW Brookman Rd
- SW Brookman Rd & SW Ladd Hill Rd
- SW Oregon St & SW Tonquin Rd
- SW Boones Ferry Rd & SW Norwood Rd
- SW Norwood Rd & SW 65th Ave
- SW Day Rd & SW Boones Ferry Rd
- I-5 southbound ramps & SW Boones Ferry Rd
- SW Elligsen Rd & SW Day Rd (future)
- SW 65th Ave & SW Elligsen Rd & SW Stafford Rd

### Arterial Study Segments

In addition to the intersections listed above, arterial segments will be included in the analysis. These segments have yet to be identified. Selection will be made based on regional model plots of volume-to-capacity ratios and/or volume difference between the existing and future year models. The future network also includes additional roadway segments that new trips from Urban Reserves and background trips will use. These connections are expected to distribute the volume throughout the surrounding network but could also be included as study segments.

## Transportation Performance Measures

### Intersection Operations

Intersection operations will be evaluated using Synchro based on HCM 6 for all intersection types. Future intersection volumes will be post processed based on NCHRP 765 using existing turning movement counts. Post processing will be based on model plots for the base, future and future urban reserve scenario models. Intersection volumes are assumed to be consistent year-round and a seasonal adjustment will not be applied. Volume to capacity ratios will be used to inform evaluation of approaches and/or movements where operations are critical. Washington County Performance Measures will provide a starting point but will not be the only indication of performance, some level of engineering judgement will be applied to identify potentially problematic locations. Other flags for potential improvement include: high growth movements, closely spaced intersections that all are approaching capacity. At intersections with congestion, geometric and control modifications will be tested.

### Segment Operations

Segment volume to capacity graphics and volume difference plots will inform operations at the link level. Along segments near a study intersection, the assigned volumes will be validated against the existing counts. At locations that have a higher assignment in the travel demand model than the existing counts the volume difference at that location will provide an indication of potential growth. Volume to capacity results may be mitigated by the resulting shift in link volumes. If counted values are not available, the scale of volume difference will be used to validate the volume to capacity results. Higher growth segments could be mitigated by future local network connectivity not included in the model. Lower growth locations (with critical v/c ratios) are likely more constrained and are more likely to generate the modeled volumes.

### Alternative Development

Results from the above Performance Measures will inform the development of potential solutions. Intersection alternatives will be developed based on lane group results from the HCM 6 analysis in Synchro. Lane groups at or above capacity will provide initial recommendations for geometric and/or control type improvements.

Segments will be evaluated based on a geometric characteristic inventory from a review of aerial photos. Capacity benefits from geometric changes will provide initial recommendations for segment improvements.

# Appendix

**Land Use Memos**

**List of RTP Projects**

# Land Use Memos

Date: July 3, 2019

To: Washington County Cities

From: Julie Sosnovske, Transportation Planner
Jessica Pelz, Senior Planner

**Subject: City Review of Urban Reserve Transportation Study (URTS) Land Use Assumptions**

The County's Urban Reserves Transportation Study (URTS) will work with cities and Metro to gain an understanding of future land use and development assumptions in the urban reserve areas and their impacts on the transportation system. The County has obtained preliminary land use assumptions from Metro's Goal 14 analysis for the 2018 Urban Growth Report and from previously completed concept plans for some of the urban reserves. The land use assumptions inform the travel demand modeling with the level of development density we might expect to see in the urban reserve areas in the future. The land use assumptions are based on the projected number of households and jobs for each TAZ within an urban reserve area. In some areas, TAZs contain a mix of land types – e.g. urban, urban reserve, urban unincorporated, rural reserve – and in these areas we have attempted to separate out the land use assumptions for only the area of the TAZ within the urban reserve for review purposes.

Metro assumed an average of 10 dwelling units per acre for most of the urban reserve areas (with environmentally constrained and other lands removed), and that is the starting point for our analysis. However, many cities have completed some level of concept planning for their adjacent urban reserve areas. Where more detailed forecasts were available, we have adjusted the base number of units per urban reserve area to reflect these more refined forecasts. The table below lists the urban reserve areas by name (identified by Metro) along with the jurisdiction primarily responsible for review and the associated TAZ numbers. The preliminary land use assumptions are further described in this memo, and maps showing the future household and job projections are included for your review.

**Washington County Urban Reserves Land Use Assumptions**

This study focuses on Washington County's urban reserve areas (URAs). However, the county's southeastern URAs are adjacent to the larger Stafford Basin URAs, which need to be addressed in the modeling. The following sections address the methodology for the Stafford Basin and the Washington County URAs.

**Urban Reserve Area Land Use Assumptions Review**

| Urban Reserve Area | Jurisdiction(s) Responsible for Review | TAZ Numbers |
|---|---|---|
| I-5 East | Wilsonville/Tualatin | 1121, 1122 |
| Elligsen Road North | Wilsonville/Tualatin | 1122, 977, 978 |
| Elligsen Road South | Wilsonville/Tualatin | 977, 976 |
| Tonquin | Sherwood/Tualatin | 982, 998, 999 |
| Sherwood South | Sherwood | 987 |
| Sherwood West | Sherwood | 1428, 1429, 1432 |
| Sherwood North | Sherwood | 996, 997, 1000, 1428 |
| Beef Bend South | King City | 1001, 1051 |
| Roy Rogers East | Tigard | 1004 |
| Roy Rogers West | Tigard | 1003 |
| Cooper Mountain | Beaverton | 1152, 1153, 1155 |
| South | Hillsboro | 1350, 1351, 1364, 1365 |
| David Hill | Forest Grove | 1394, 1395 |
| Brookwood Parkway | Hillsboro | 1258, 1259 |
| Bendemeer | Hillsboro | 1456, 1458, 1461 |
| Bethany West | Washington County | 1462 |

***Stafford Basin Urban Reserves:***
Land use assumptions from recent (2035) and current (2040) Metro Models and Washington County Transportation Futures Study (WCTFS) scenarios were compared within the Stafford Basin. Washington County and Clackamas County geographies were broken out separately.

**Stafford Area Land Use Assumptions**

| | Households | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|
| County | Metro 2035 | Metro 2040 | WCTFS – Scenario 1 | WCTFS – Scenario 2 | Metro 2035 | Metro 2040 | WCTFS – Scenario 1 | WCTFS – Scenario 2 |
| Washington | 192 | 845 | 4,409 | 6,239 | 141 | 834 | 4,573 | 5,640 |
| Clackamas | 1,409 | 1,824 | 13,562 | 16,021 | 1,253 | 1,616 | 10,061 | 11,576 |
| **Total** | **1,601** | **2,669** | **17,971** | **22,260** | **3,429** | **4,490** | **14,634** | **17,216** |

The WCTFS was intended to take a long-term look at buildout land use in all Urban Reserves and other potential infill development (e.g. intensification of employment land uses within the existing UGB). Due to the long-term infrastructure issues and planning agreements in the Stafford Basin area, Washington County's approach for this study is to maintain Metro's 2040 land use and trip generation assumptions for the Clackamas County portion of the Stafford URAs. As shown in the table above, these assumptions are higher than they were in 2035, but significantly lower than what was estimated for the WCTFS. Assumed growth in the Washington County portion of the Stafford Urban Reserves will be addressed in the same manner as the rest of Washington County's Urban Reserves, which is discussed in the next section.

***Washington County Urban Reserves:***
As part of Metro's 2018 Urban Growth Report, Metro conducted a Buildable Lands Inventory (BLI) analysis for the 16 Urban Reserve Areas (URAs) within Washington County. This analysis assumed 10 residential units per acre after removing schools, parks, and organizations. For partially constrained areas (with Title 13 impacts), 3 residential units per acre were assumed. This BLI was used as a starting point for each URA, except where previous concept planning work had been completed. Refinements from work conducted in the Cooper Mountain (South Cooper Mountain Concept Plan), Beef Bend South (King City Concept Plan), Sherwood West (Sherwood West Concept Plan), David Hill (preliminary concept plan work), and South (South Urban Reserve Analysis and Witch Hazel Village Study) urban reserves were substituted where sufficient detail was available.

Metro's BLI assumed that all areas would develop primarily as residential. However, previous consideration of the Tonquin URA indicated that it would likely be employment land. A separate analysis was conducted for this area based on assumptions for nearby employment lands to the north.
These preliminary estimates (Metro BLI or Concept Plan refinements) were compared to other available Transportation Analysis Zone (TAZ) level data for the URA's as follows:

1. The portion (by area) of each TAZ within the Washington County URA's was estimated.

2. Since the WCTFS assumed buildout, it was further assumed that development within each TAZ was equally likely to be located within the URA portion or within the previous UGB. In other words, development was assumed to be spread evenly throughout the TAZ.

3. The proportion of development estimated within the urban reserves for each TAZ was multiplied by previous estimates of development within the TAZ for the following scenarios:
   - Metro 2015 Land Use (Metro 2018 RTP)
   - Metro 2040 Land Use (Metro 2018 RTP)
   - WCTFS Scenario 1
   - WCTFS Scenario 2

4. For each URA, these development estimates were summed and compared with the preliminary URA land use estimates.

5. The Total Dwelling Units (Households) for all Washington County URAs were estimated and compared with previous analyses as follows:

| Total URA Households (Preliminary) | Metro 2015 Households | Metro 2040 Households | WCTFS Scenario 1 | WCTFS Scenario 2 |
|---|---|---|---|---|
| 35,361 | 2,020 | 15,846 | 26,954 | 32,892 |

***Observations:***

- Metro 2015 households represents (approximately) existing development levels, which is expected to be much lower than buildout
- Metro 2040 households represents (approximately) 20 years of development, and would be expected to be lower than buildout
- Total URA households is significantly higher than both WCTFS scenarios – however, this is reasonable since both WCTFS scenarios assumed significant employment that is currently planned to shift to residential for these areas

6. The Total Employment for all Washington County URAs were estimated and compared with previous analyses as follows:

| Total URA Employment (Preliminary) | Metro 2015 Employment | Metro 2040 Employment | WCTFS Scenario 1 | WCTFS Scenario 2 |
|---|---|---|---|---|
| 6,189 | 1,853 | 4,915 | 11,255 | 13,781 |

***Observations:***

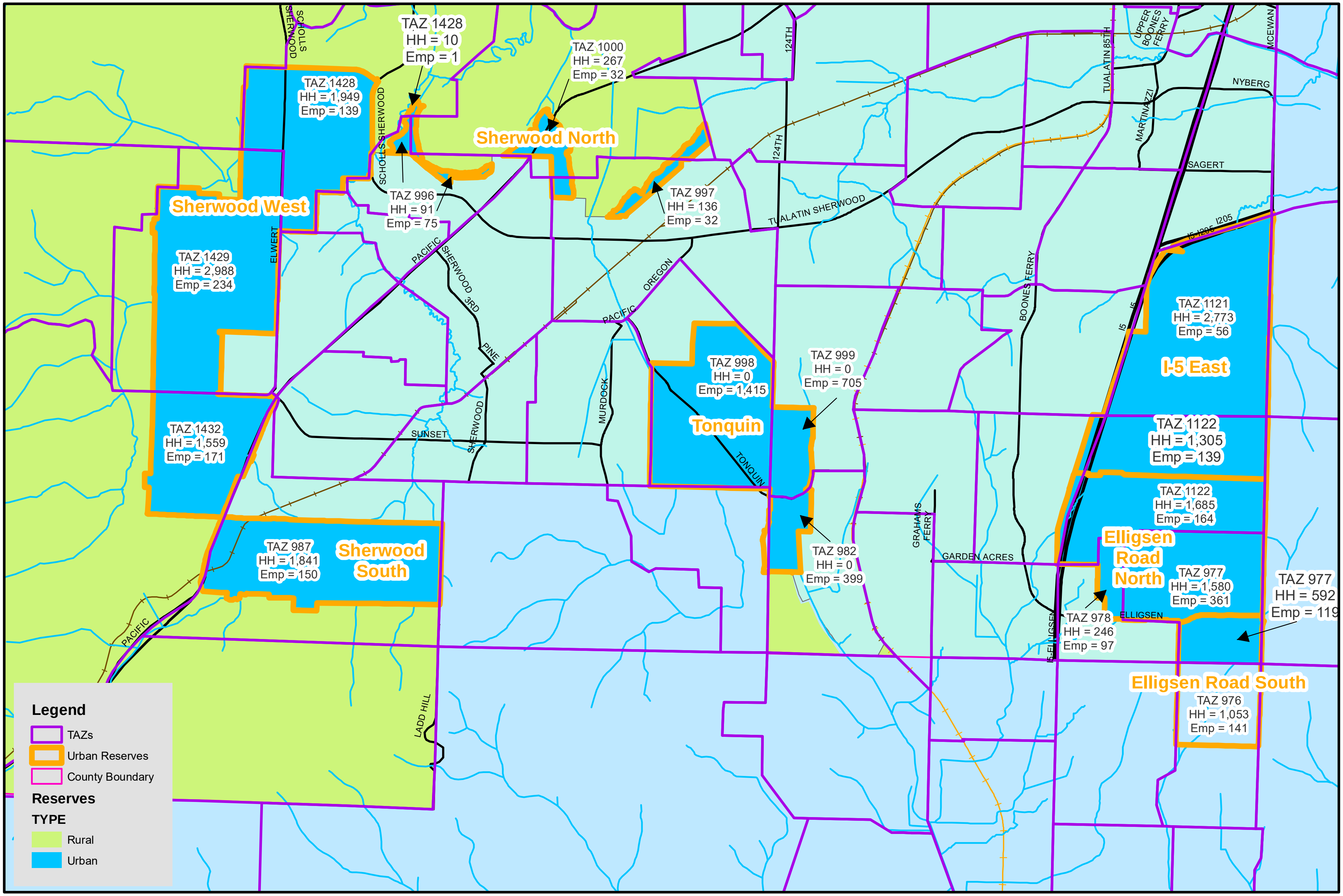
- Metro 2015 employment represents (approximately) existing development levels, which is expected to be much lower than buildout
- Metro 2040 employment represents (approximately) 20 years of development, and would be expected to be lower than buildout
- Total preliminary employment is significantly lower than both WCTFS scenarios – however, this is reasonable since both WCTFS scenarios assumed significant employment that is currently planned to shift to residential for these areas

7. Preliminary Households were allocated to each TAZ based on the portion of the corresponding URA that falls within it.

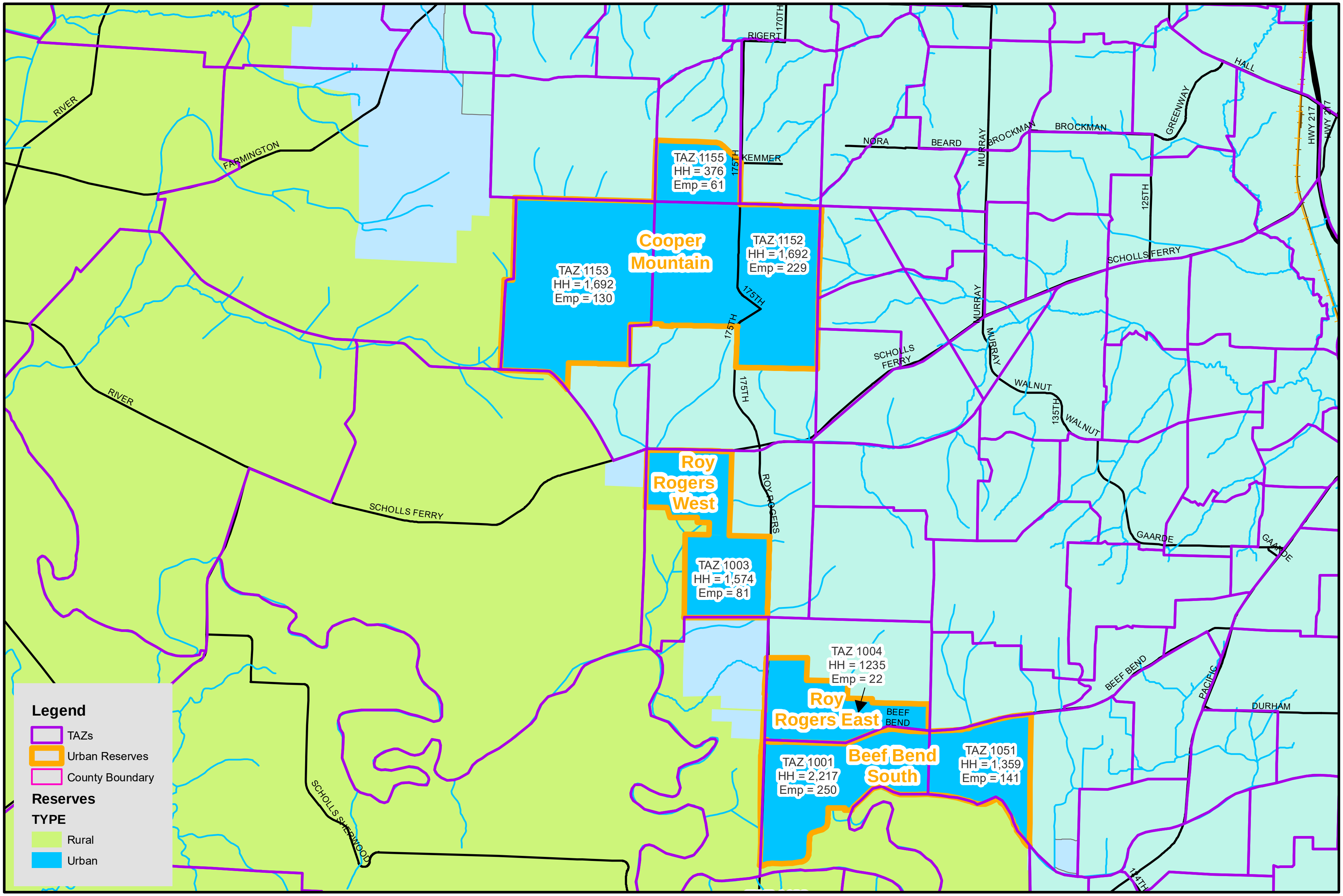
8. Preliminary Employment was retained from Metro's 2040 assumptions and allocated based on the URA proportion of the corresponding TAZ. Some employment distributions were adjusted where existing UGB areas are expected to contain a higher (or lower) proportion of the overall employment for the TAZ. Key examples of this are in Wilsonville (TAZ 978) near the I-5/Stafford Interchange and in Sherwood north of significant commercial areas (TAZs 997 and 1000).

9. Employment for the Tonquin URA was estimated with a separate BLI based on assumptions previously developed for the adjacent Tonquin Employment Area just to the north. No housing was assumed in the URA.

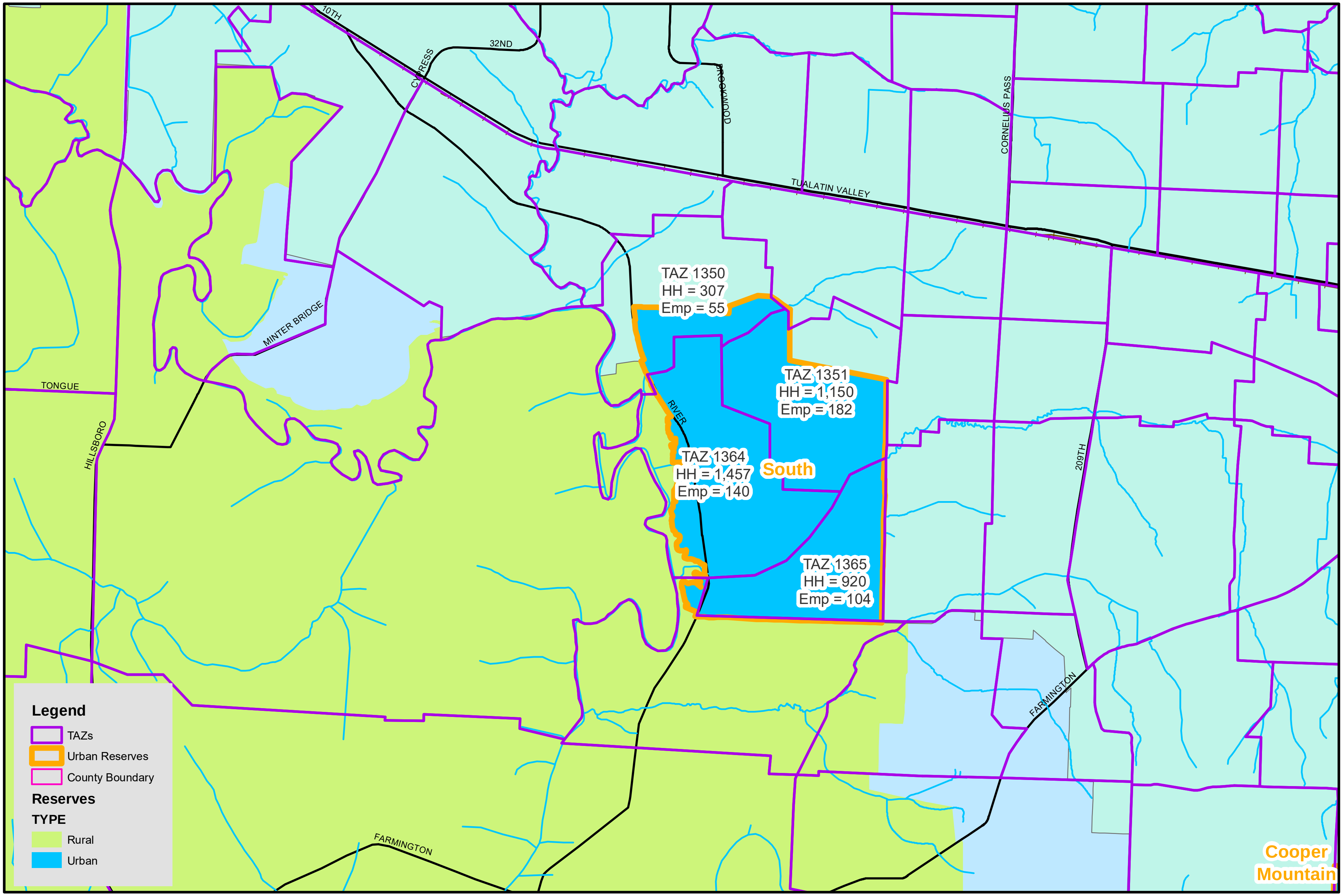
# Preliminary Urban Reserve Buildout Land Use



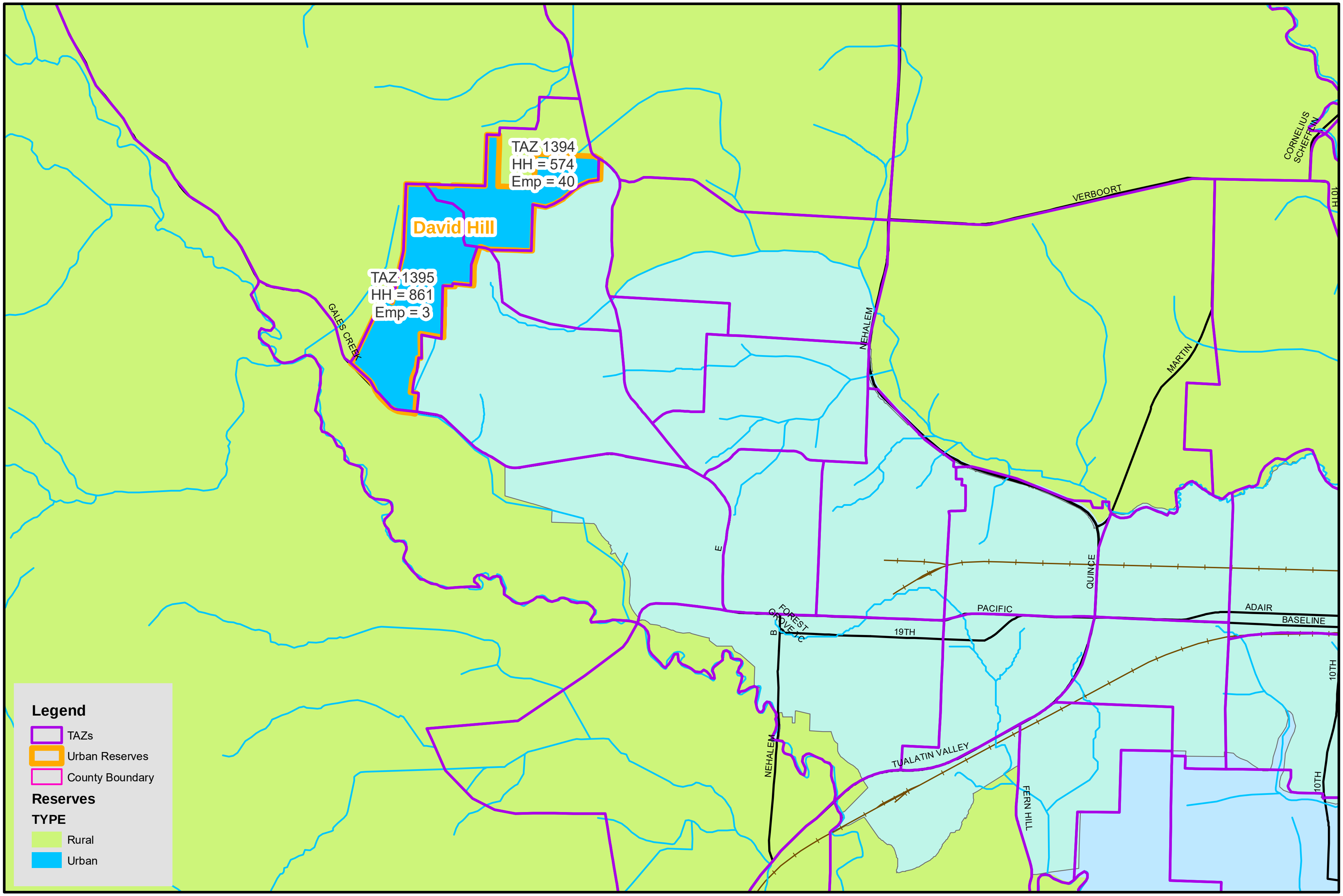
# Preliminary Urban Reserve Buildout Land Use



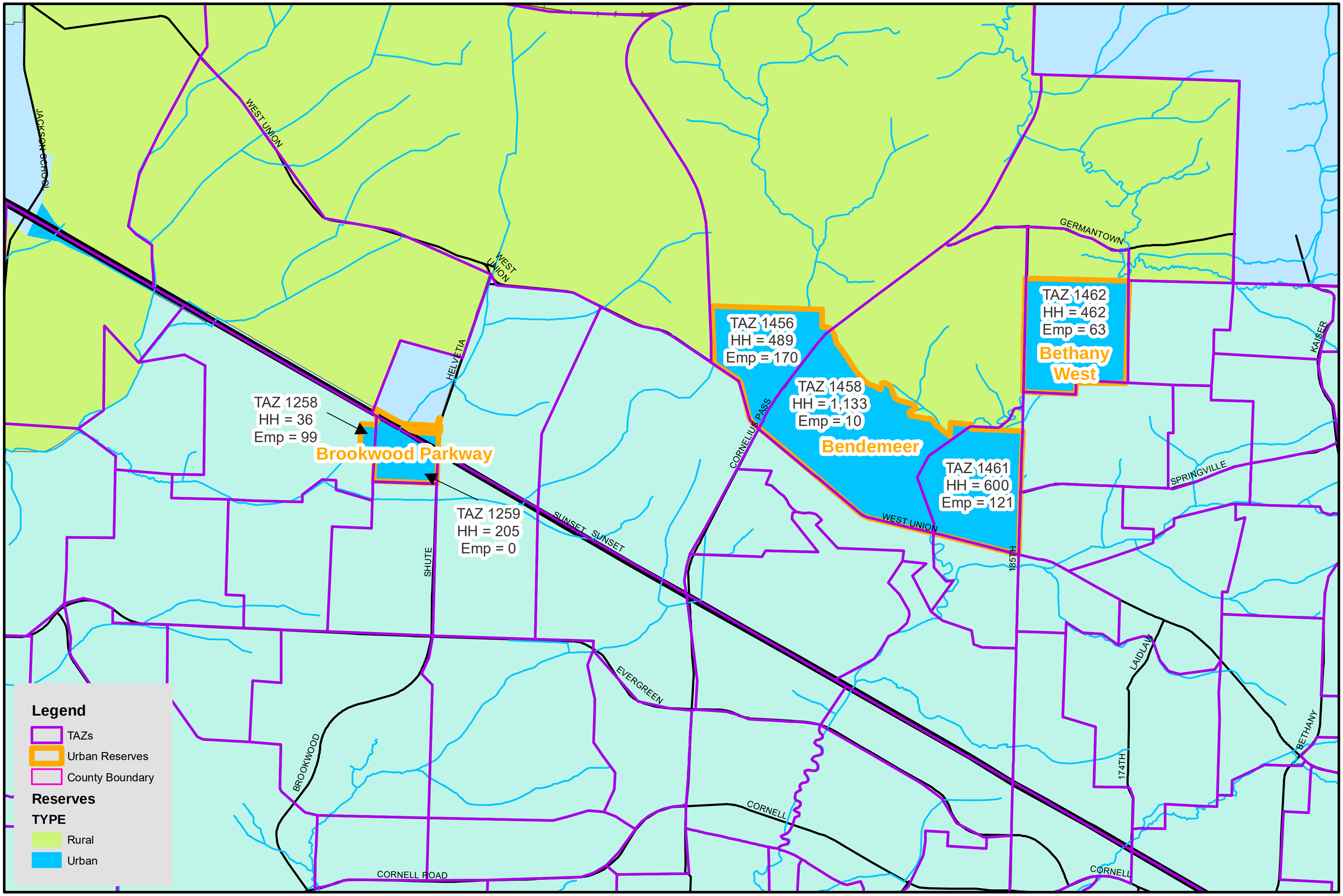
# Preliminary Urban Reserve Buildout Land Use



# Preliminary Urban Reserve Buildout Land Use



# Preliminary Urban Reserve Buildout Land Use



Date: September 11, 2019

To: Urban Reserves Transportation Study Technical Advisory Committee

From: URTS Project Team

**Subject: Proposed Urban Reserves Land Use Assumptions (Revised based on city meetings)**

The project team sent out preliminary land use assumptions for the Washington County urban reserves to the cities on July 3, 2019 for their review. Some cities gave feedback based on preliminary work done for concept planning certain urban reserve areas and/or desired land use assumptions for the future prior to the August 1, 2019 TAC meeting. Since then, Washington County staff has met with several jurisdictions and worked with Angelo Planning Group to develop revised housing and employment estimates based on the cities' expectations and potential land suitability. Generally, changes from the assumptions presented at the TAC include the following:

- Addition of employment areas in I-5 East and Elligsen Road North urban reserves
- Modification of residential and employment assumptions in River Terrace West and River Terrace South urban reserves
- Addition of employment in David Hill urban reserve (small commercial node)
- Slight reduction of residential in Rosa urban reserve (previously called South urban reserve)

The table on the following page has been updated to reflect the most recent land use assumptions, and contains the following information:

- Preliminary assumptions based on the 2018 Metro BLI for dwelling units and the Metro 2040 model inputs for employment
- Adjusted (green) dwelling units and employment as provided at the August 1, 2019 TAC meeting
- Revised (blue) dwelling units and employment based on follow-up meetings and discussions with city staff

The TAZ maps have been revised to reflect the most current future household and employment assumptions and are included for your review.

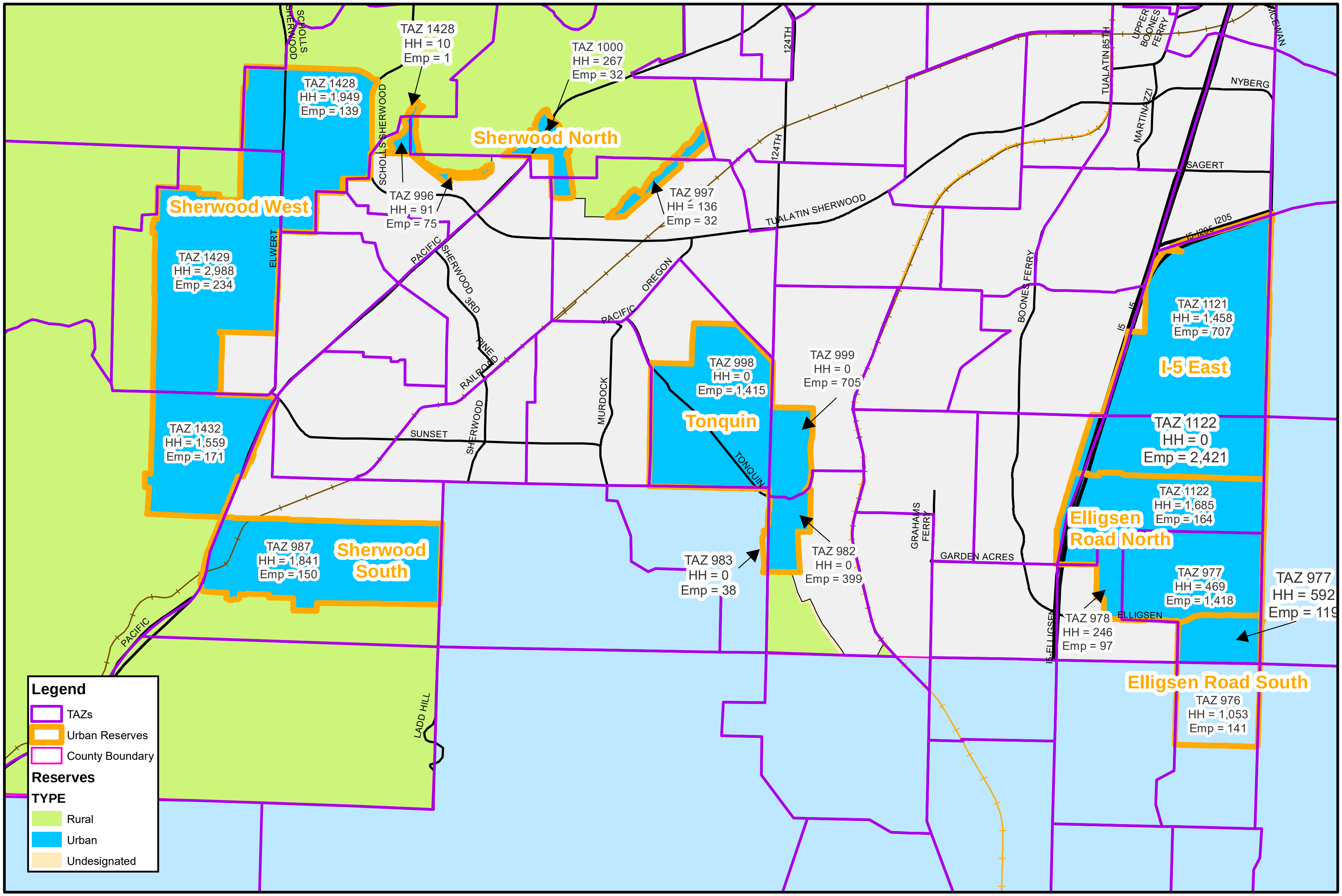
**Please provide feedback on any of these updated land use assumptions to Washington County staff by Friday, September 20, 2019.** These assumptions are the basis of the travel demand modeling that will begin once we have consensus on the land use assumptions for all urban reserve areas.

**Table 1: Washington County Urban Reserve Land Use Assumptions**

| Urban Reserve Area | Total Acreage | Constrained/ Partially Constrained Acreage | Metro BLI Dwelling Units | August Adjusted Dwelling Units | REVISED Dwelling Units | Metro 2040 Model Land Use - Employment | August Adjusted Employment | REVISED Adjusted Employment |
|---|---|---|---|---|---|---|---|---|
| I-5 East | 746 | 86/175 | 4,078 | 4,078 | **1,458** | 195 | 195 | **3,128** |
| Elligsen Road North | 588 | 41/120 | 3,511 | 3,511 | **2,400** | 621 | 621 | **1,678** |
| Elligsen Road South (Wash Co portion) | 252 | 24/24 | 1,645 (592)* | 1,645 (592)* | 1,645 (592)* | 260 (119)* | 260 (119)* | 260 (119)* |
| Tonquin (Wash Co portion) | 559 | 276/155 | 978 | **0** | **0** | 690 (641)* | **2,556 (2518)*** | **2,556 (2518)*** |
| Sherwood South | 421 | 100/111 | 1,841 | 1,841 | 1,841 | 150 | 150 | 150 |
| Sherwood West | 1,159 | 142/229 | 6,495 | 6,495 | 6,495 | 544 | 544 | 544 |
| Sherwood North | 111 | 24/29 | 503 | 503 | 503 | 140 | 140 | 140 |
| Beef Bend South | 493 | 138/74 | 2,304 | **3,576** | **3,576** | 147 | **391** | **391** |
| River Terrace South | 190 | 6/29 | 1,235 | **1,528** | **1,235** | 22 | **1,528** | **1,389** |
| River Terrace West | 301 | 29/92 | 1,574 | **1,916** | **1,574** | 81 | **1,916** | **1,771** |
| Cooper Mountain | 1,210 | 311/506 | 4,116 | **3,760** | **3,760** | 304 | 304 | 304 |
| Rosa | 914 | 399/228 | 2,691 | **3,834** | **3,413** | 481 | 481 | 481 |
| David Hill | 321 | 99/46 | 1,435 | 1,435 | 1,435 | 43 | 43 | **93** |
| Brookwood Parkway | 39 | 7/0 | 242 | 242 | 242 | 99 | 99 | 99 |
| Bendemeer | 535 | 178/92 | 2,221 | 2,221 | 2,221 | 301 | 301 | 301 |
| Bethany West | 166 | 62/7 | 462 | 462 | 462 | 63 | 63 | 63 |
| **Total (Wash Co)** | **8,005** | **1,922/1,917** | **34,278** | **35,994** | **31,207** | **3,951** | **9,413** | **13,169** |

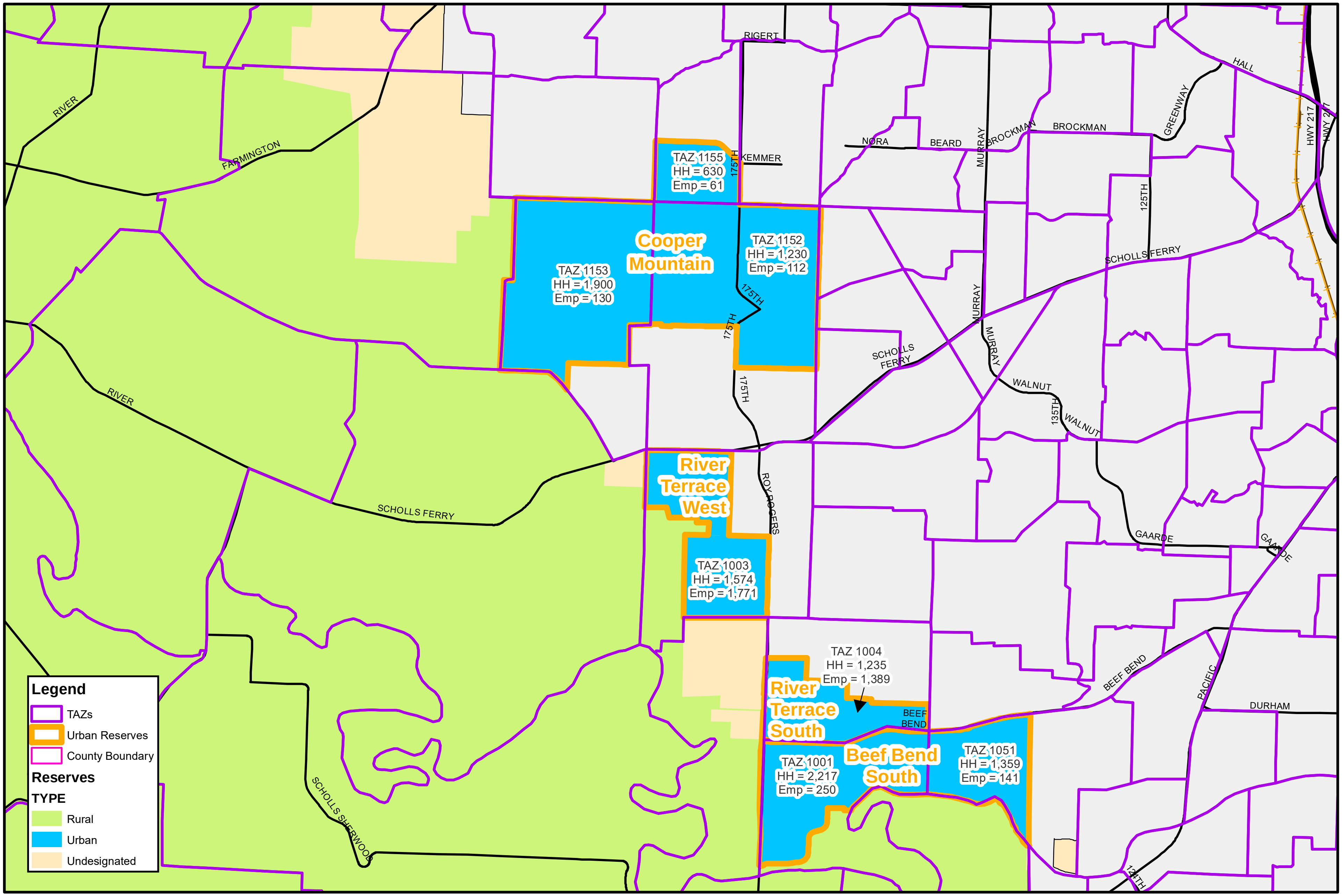
* Washington County portion of reserve

# Proposed Urban Reserve Buildout Land Use



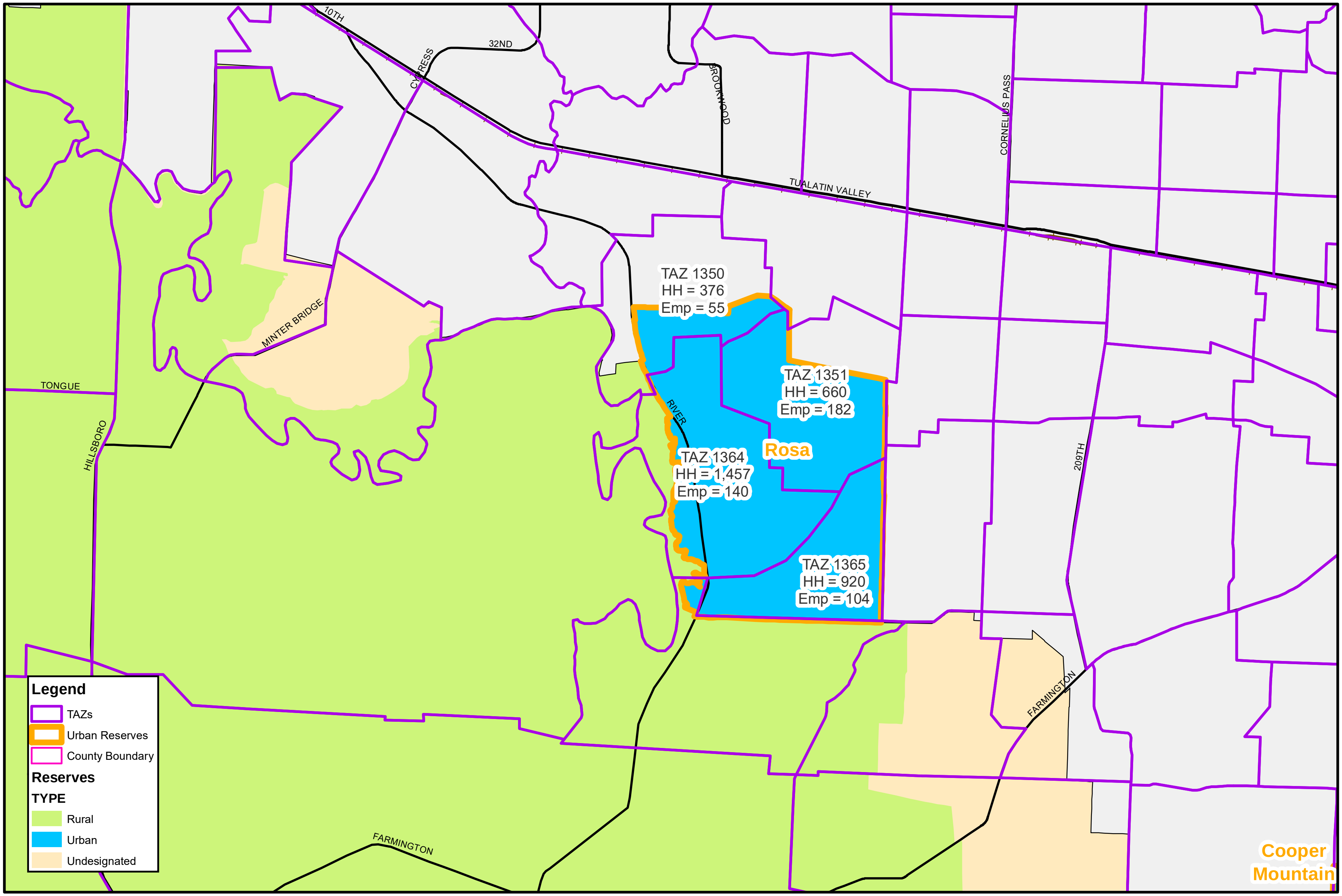

September 11, 2019

## Proposed Urban Reserve Buildout Land Use



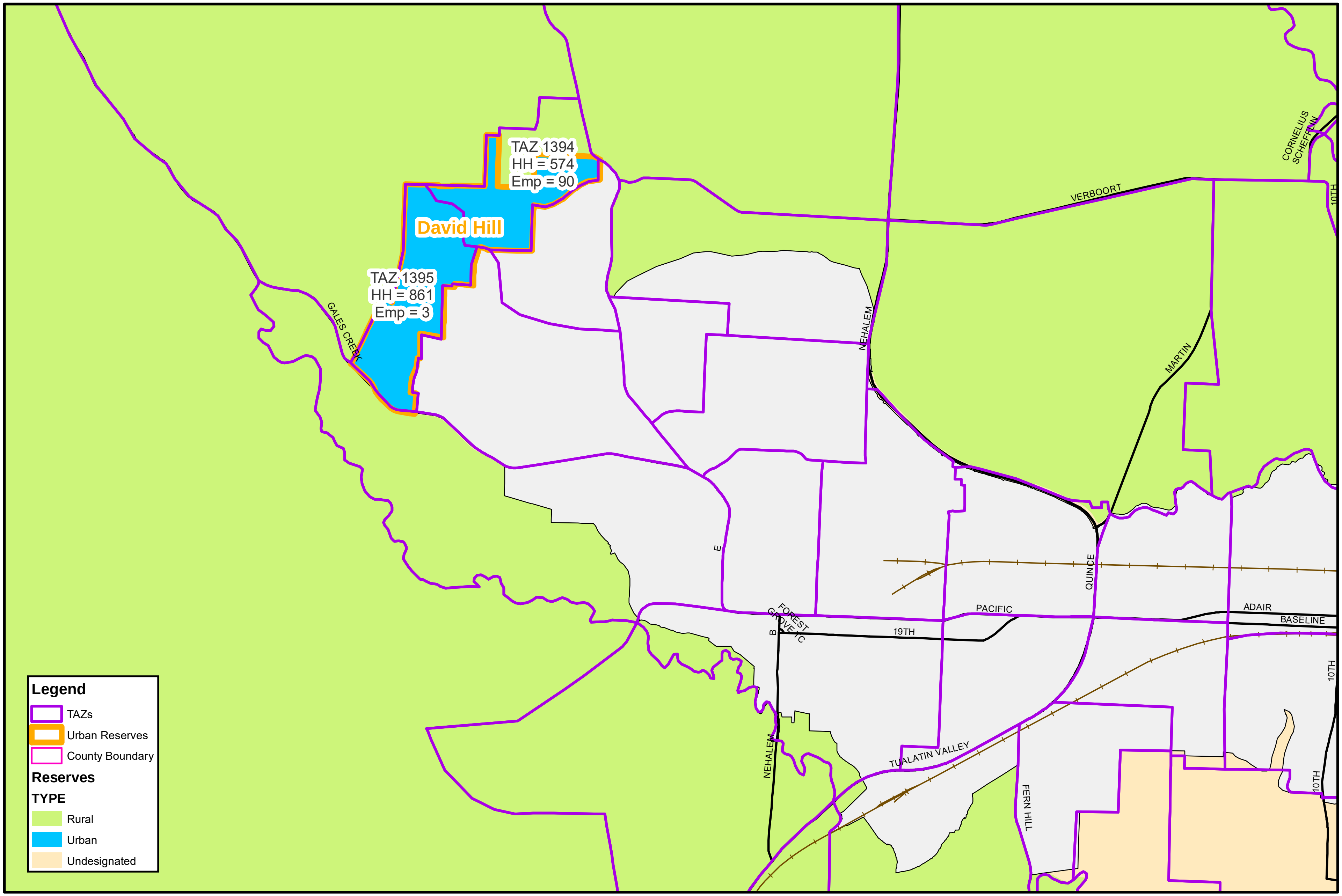

September 11, 2019

# Proposed Urban Reserve Buildout Land Use



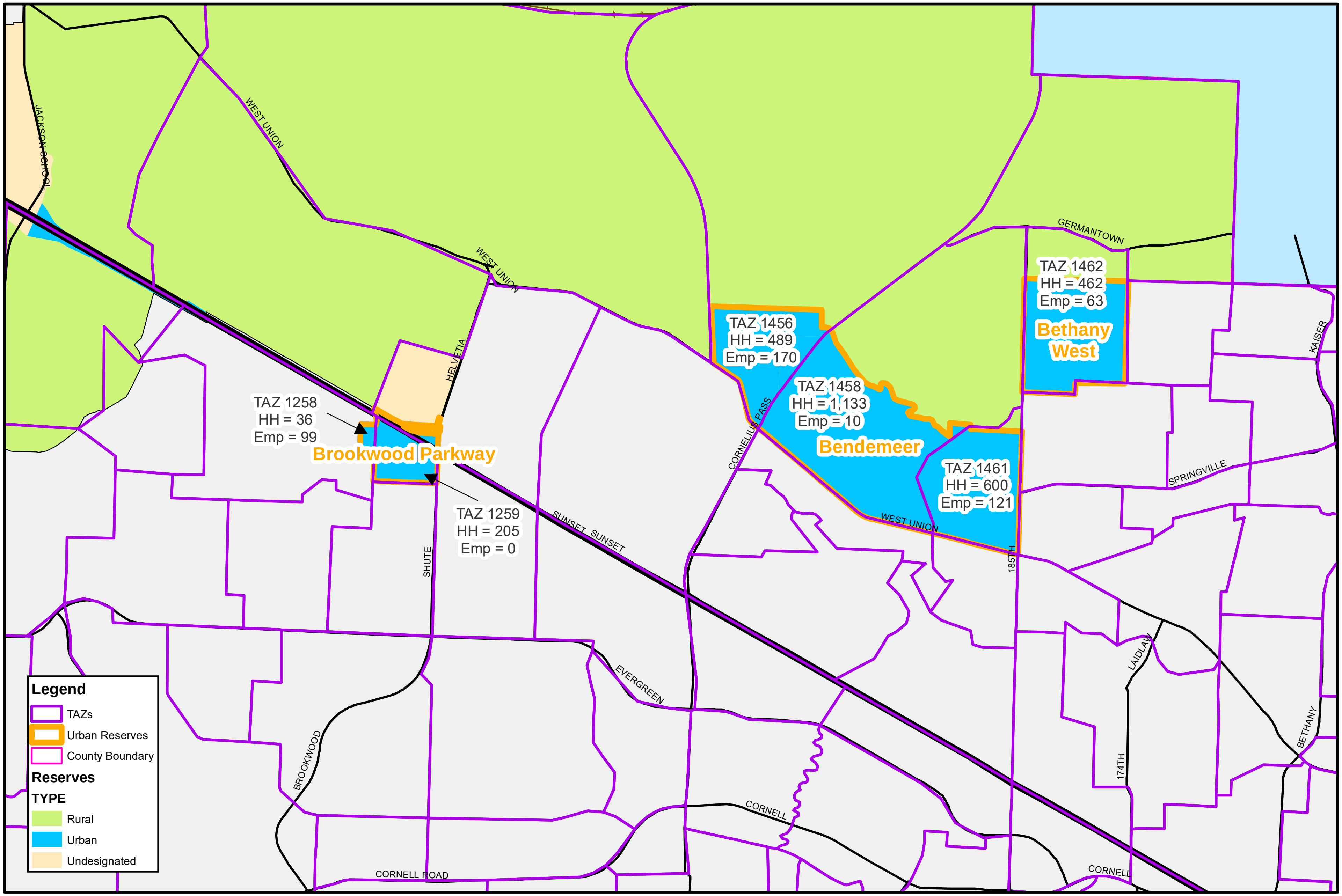

September 11, 2019

# Proposed Urban Reserve Buildout Land Use




September 11, 2019

## Proposed Urban Reserve Buildout Land Use




September 11, 2019

# List of RTP Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10054 | Clackamas County | 65th/Elligsen/Stafford Intersection Roundabout | 2028-2040 | 65th, Elligsen, Stafford Rd. intersections | 65th, Elligsen, Stafford Rd. intersections | $ 5,846,500 | Implement proven safety counter measure, a roundabout, at a high crash intersection identified in the county adopted TSAP. |
| 10568 | Washington County | Tualatin-Sherwood Rd. Improvements | 2018-2027 | Langer Farms Pkwy. | Teton Ave. | $ 35,000,000 | Widen from three to five lanes with bike lanes and sidewalks. |
| 10590 | Washington County | Tonquin Rd. Improvements | 2018-2027 | Grahams Ferry Rd. | 124th | $ 11,400,000 | Realign and widen to three lanes with bike lanes and sidewalks and street lighting. |
| 11470 | Washington County | Basalt Creek Parkway | 2018-2027 | Grahams Ferry Rd. | Boones Ferry Rd | $ 31,700,000 | Extend new 5 lane Arterial with bike lanes, sidewalks and street lighting. |
| 11487 | Washington County | Boones Ferry Improvements | 2028-2040 | Basalt Creek East-West Arterial | Day Rd. | $ 1,200,000 | Widen from 3 lanes to 5 lanes with bike lanes, sidewalks and street lighting |
| 11903 | Washington County | Roy Rogers Rd. | 2018-2027 | Chicken Creek Bridge | Borchers Rd | $ 11,000,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes |
| 11914 | Washington County | Roy Rogers Rd | 2018-2027 | UGB | Chicken Creek Bridge | $ 25,000,000 | Widen roadway to 4-5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11587 | TriMet | HCT: Southwest Corridor: Capital Construction | 2018-2027 | Bridgeport Village, Tualatin | Downtown Portland | $ 2,300,000,000 | Capital Construction of High Capacity Transit project between Portland and Tualatin via Tigard. |
| 10674 | Sherwood | Oregon-Tonquin Intersection Improvements | 2018-2027 | SW Oregon Street | SW Tonquin Rd | $ 2,400,000 | Reconstruct and realign three leg intersection with a roundabout (partial two-lane roundabout) approx 400 feet northeast of existing roundabout at SW Oregon St & Murdock Rd. ROW, PE, design & construction. Potential for signal in-lieu of dual-roundabout system if better for development and once SW 124th Ave project is completed. If roundabout, project will include rapid flashing beacons at new roundabout and retrofit of adjacent roundabout to meet MUTCD suggestions for pedestrian crossings at roundabouts. This is currently a Washington County facility but would likely become Sherwood's upon completion of project to TSP standards. |
| 10699 | Sherwood | Oregon Street Improvements | 2018-2027 | SW Murdock Rd | SW Langer Farms Pkwy | $ 5,700,000 | Widen existing substandard 2-lane road (no sidewalks, no median) to a 3-lane collector meeting current TSP standards (8' sidewalks, 5' landscape strip, 12' travel, 14' median, 12' travel, 5' landscape, 8' sidewalks, plus 2 on-street bike lanes or 4' added to each 8' sidewalk). On-street bike lanes vs. 2 multi-use paths TBD with future development. |
| 10693 | Sherwood | Ladd Hill Road Improvements | 2028-2040 | SW Sunset Blvd | UGB Southern Boundary (SW Brookman Rd) | $ 6,300,000 | Widen SW Ladd Hill Road to 3-lane collector street standards between SW Sunset Blvd and UGB southern boundary, potentially between SW Brookman Rd improvements. |
| 10680 | Sherwood | Elwert-99W-Sunset Intersection Improvements | 2018-2027 | SW Sunset Blvd. | SW Handley St | $ 12,000,000 | Relocate Kruger Rd intersection 600' northeast along Elwert Rd. Construct roundabout at Elwert-Kruger-Cedar Brook. Widen Sunset Blvd approach. Reconstruct 99W intersection and replace signal. PE, design, ROW acquisition, and construction. Reconstruct widen SW Elwert Rd north to SW Hadley St.. Final alignment and signals vs. roundabouts to be determined soon with pending Sherwood High School relocation and required annexation. |
| 10691 | Sherwood | Sherwood Blvd Improvements | 2028-2040 | SW Century Dr. | SW 3rd St. | $ 2,100,000 | Reonstruct road to 3-lane arterial standards. Median/turn lane, landscape strip, ADA compliant sidewalks. Reconstruct intersection at 3rd St to increase capacity. Assume SW Century Drive improved by development and/or local funds. Cost estimate assumes utilities already underground and existing ROW widths are adequate for low-speed road. Note two public schools along this stretch of SW Sherwood Blvd. Adds bike lanes to existing road w/ 2 14' wide lanes and 14' median-turn lane. |
| 10682 | Sherwood | Brookman Road Improvements | 2018-2027 | SW Pacific Highway | SW Ladd Hill Rd. | $ 15,300,000 | Construct new arterial status roadway between OR 99W and SW Ladd Hill Road. Project development, ROW, PE, design & construction. ROW width to accommodate either 5-lane arterial w/ bike lanes or 3-lane arterial w/ multi-use path integrated with landscaping and sidewalks on both sides. Multi-use path may be widened to 16' or 20' for to accommodate both bicycles & pedestrians with no on-street bike lanes. |

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10681 | Sherwood | Elwert Road Improvements | 2018-2027 | SW Handley St | SW Edy Rd | $ 7,500,000 | Construct arterial status roadway between new roundabout (~800' NW of Pacific Hwy) and SW Edy Rd. |
| 10702 | Sherwood | Edy-Borchers Intersection Improvements | 2018-2027 | SW Borchers Drive | SW Cherry Orchards Place | $ 1,600,000 | Improve intersection capacity and safety. Possible roundabout 400' west of Borchers. Flashing beacons will be added at roundabout crosswalks or ped signals will be added if traffic signal is deemed better treatment as area develops. Project will restrict Borchers movements to right-in/right-out. Can be combined with east end of RTP project no. 10692. |
| 10692 | Sherwood | Edy Rd Improvments | 2018-2027 | SW Elwert Rd | SW Cherry Orchards Pl. | $ 8,800,000 | Reconstruct road to 3-lane collector standards w/ sidewalks and bike lanes. Partial Washington County jurisdictions and assumed to become City's jurisdiction upon completion of project. |
| 11404 | Sherwood | Baler Way Extension | 2018-2027 | SW Langer Farms Parkway | SW Tualatin-Sherwood Road | $ 3,800,000 | Extend SW Baler Way (3-lane collector) between SW Tualatin-Sherwood Road and SW Langer Farms Parkway, possibly SW Pacific Highway depending upon results of widening of SW Tualatin-Sherwood Road project by Washington County. |
| 12045 | Sherwood | Edy-Elwert Intersection Improvements | 2028-2040 | SW Elwert Road | SW Edy Road | $ 2,600,000 | Reconstruct Edy/Elwert intersection and approach roads to arterial standards (roundabout or signal, elevate roadway to increase site distance, etc.) |
| 12046 | Sherwood | Tonquin Area East-West Collector | 2028-2040 | SW 124th Avenue | SW Tonquin Road | $ 10,500,000 | Construct 3-lane collector status road between SW 124th Avenue and SW Tonquin Road through the Tonquin employment area to serve recent UGB annexation area. |
| 12047 | Sherwood | Brookman Road Intersection Realignment | 2028-2040 | SW Pacific Highway | SW Brookman Road | $ 15,500,000 | Realigns and relocates the SW Brookman Road intersection with SW Pacific Highway (OR 99W) to accommodate the expansion of SW Brookman Road for future development |
| 11419 | Tualatin | Boones Ferry Road | 2028-2040 | Ibach | Norwood | $ 1,600,000 | Uprgrade to urban standards and add sidewalks |
| 11431 | Tualatin | Norwood Street Sidewalks and Bike Lanes | 2028-2040 | Boones Ferry Road | East City Limits | $ 5,000,000 | Add sidewalks and bike lanes, upgrade to urban standards. |
| 10716 | Tualatin | Myslony | 2018-2027 | 112th | 124th Ave | $ 10,000,000 | Reconstruct/widen from 112th to 124th to fill system, includes bridge. Improve the intersection of 124th and Myslony. |
| 11417 | Tualatin | Blake Street Extension | 2018-2027 | 115th | 124th Ave | $ 17,000,000 | Extend Blake Street to create an east-west connection between 115th and 124th. Install signal at Blake and 124th. New road section will provide an alternative route for industrial traffic on the high injury corridor: Tualatin/Sherwood Road. |
| 11430 | Tualatin | Helenius | 2018-2027 | 109th | Grahams Ferry Road | $ 1,491,389 | Uprgrade to urban standards |
| 11962 | Tualatin | Grahams Ferry Road | 2028-2040 | SW Ibach Road | Helenius Road | $ 5,048,800 | Upgrade SW Grahams Ferry Road to roadway standards betweeen SW Ibach Road and Helenius Road. |
| 11489 | Wilsonville | Boones Ferry / I-5 off ramp improvements | 2028-2040 | SB I-5 off ramp | Boones Ferry Rd | $ 1,063,000 | construct second right-turn lane |
| 10853 | Wilsonville | Garden Acres Road Extension | 2018-2027 | Day Road | Ridder Road | $ 14,260,000 | Construct three lane road extension with sidewalks and cycle track and reconstruct/reorient Day Road/Grahams Ferry Road/Garden Acres Road intersection. |
| 10588 | Wilsonville | Grahams Ferry Road Improvements | 2028-2040 | Day Road | Washington/ Clackamas County line | $ 13,200,000 | Widen Grahams Ferry Road to 3 lanes, add bike/pedestrian connections to regional trail system and fix (project development only) undersized railroad overcrossing. |
| 11243 | Wilsonville | Day Road Improvements | 2028-2040 | Grahams Ferry Rd. | Boones Ferry Rd. | $ 10,560,000 | Widen street from 3 to 5 lanes with buffered bike lanes, sidewalks and street lighting. Improve structural integrity for increased freight traffic and provide congestion relief. Sidewalk infill and creation of Tonquin Trail multi-use path spur will reduce pedestrian and vehicle conflicts. Bike buffers will reduce bicycle and freight conflicts. |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 11577 | Washington County | Beef Bend Rd | 2028-2040 | Roy Rogers | HWY 99W | $ 41,900,000 | Widen to three lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 11452 | Washington County | Scholls Ferry Rd. Improvements | 2028-2040 | West of Tile Flat Rd. | | $ 4,600,000 | Realign curves to improve safety and reduce crashes. This project or a portion of the project is located outside the urban growth boundary. |
| 11486 | Washington County | Roy Rogers Rd. | 2018-2027 | Scholls Ferry Rd. | UGB | $ 21,300,000 | Widen to five lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 11903 | Washington County | Roy Rogers Rd. | 2018-2027 | Chicken Creek Bridge | Borchers Rd | $ 11,000,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes |
| 11914 | Washington County | Roy Rogers Rd | 2018-2027 | UGB | Chicken Creek Bridge | $ 25,000,000 | Widen roadway to 4-5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11915 | Washington County | Scholls Ferry Rd | 2018-2027 | Tile Flat Rd. | Roy Rogers Rd. | $ 8,300,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11919 | Washington County | Tile Flat Rd | 2018-2027 | UGB | Scholls Ferry Rd. | $ 3,000,000 | Interim 3-lane and north side pedestrian/bicycle improvements. This project or a portion of the project is located outside the urban growth boundary. |
| 12061 | Washington County | 185th Ave (Farmington to Gassner) | 2028-2040 | Farmington Rd. | Gassner Rd. | $ 16,000,000 | Add bike lanes, sidewalks, and turn lanes where appropriate. |
| 12066 | Washington County | 175th Ave (Kemmer Rd to Rigert Rd) | 2028-2040 | Kemmer Rd | Rigert Rd | $ 10,500,000 | Add bike lanes, sidewalks and turn lanes where appropriate. |
| 11892 | Beaverton | Barrows Road Extension at South Cooper Mountain | 2018-2027 | Tile Flat Road | Loon Drive | $ 22,800,000 | Construct new three lane collector street with bike lanes, sidewalks, street trees, and lighting. |
| 11893 | Beaverton | New North-South Collector Road at South Cooper Mountain | 2018-2027 | Scholls Ferry Road (between Tile Flat Road and 175th Avenue) | Urban Growth Boundary | $ 11,000,000 | Construct three lane collector road with bike lanes, sidewalk, street trees and lighting. |
| 11899 | Beaverton | Nora Road/Beard Road Extension and Multimodal Improvements | 2028-2040 | 170th Avenue | Murray Boulevard | $ 11,500,000 | Construct new two lane collector from 170th Avenue to Moonstone Street with bike lanes, sidewalks, street trees, lighting, and turn lanes where needed. Construct turn lanes, bike lanes, and sidewalks where needed from Moonstone Street to Murray Boulevard. |
| 11285 | Hillsboro | Farmington Rd Widening and Bike/Ped Improvements, Phase 2 | 2028-2040 | 198th Ave | 209th Ave | $ 7,000,000 | Widen roadway to five lanes with bike/ped facilities; new signal at 209th Ave |
| 11384 | Hillsboro | Murphy Rd Construction | 2028-2040 | Century Blvd | 209th Ave | $ 8,822,900 | Construct new three-lane roadway with bike/ped facilities; new signals at Cornelius Pass Rd and at 209th Ave |
| 10553 | Hillsboro | 209th Ave Widening and Improvements, Phase 1 | 2018-2027 | TV Hwy | Kinnaman Rd | $ 22,327,000 | Widen roadway from two/three lanes to five lanes; improve from rural to urban standard with bike facilities and sidewalks; improve intersections and railroad crossing; new signals at Blanton and Kinnaman; project to serve South Hillsboro UGB area |
| 11997 | Tigard | River Terrace Blvd | 2018-2027 | Scholls Ferry Rd | south UGB | $ 25,000,000 | New street and trail through new River Terrace Development. |
| 11911 | Hillsboro | Rosedale Rd Turn Lanes and Bike/Ped Improvements | 2028-2040 | Century Blvd (229th Ave) | 209th Ave | $ 10,000,000 | Widen to three lanes with bike/ped facilities; intersection improvements including new roundabout at Cornelius Pass Rd and new signal at 209th Ave; box culverts at Rosedale Creek east and west crossings |
| 11920 | Hillsboro | Cornelius Pass Rd Extension, Phase 2 | 2018-2027 | Blanton St | Vermont St | $ 19,718,650 | Construct five-lane extension with bike/ped facilities; intersection improvements; new signals at Blanton, Kinnaman, McInnis, Butternut Creek, Deline, and Vermont; bridge at Butternut Creek; creek crossings at Gordon Creek and south tributary of Butternut Creek |
| 11921 | Hillsboro | Cornelius Pass Rd Extension, Phase 3 | 2028-2040 | Vermont St | Rosedale Rd | $ 8,450,850 | Construct five-lane extension with bike/ped facilites; signal at Murphy; roundabout at Rosedale |
| | **Not Financially Constrained - Identified in Washington County TSP** | | | | | | |
| | Washington County | 175th "Kink" | TSP | UGB | UGB | | Realign "kink" in 175th Avenue in rural portion (between UGB lines) |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| | Washington County | 175th Avenue | TSP | UGB | Kemmer | | Widen 175th Avenue to 3-lanes north of South Cooper Mountain to Kemmer |
| | Washington County | Grabhorn Road | TSP | UGB | Farmington Road | | Widen Grabhorn Road (including improvement of curves) north of UGB to Farmington Rd. |
| | Washington County | Farmington Road | TSP | 185th Avenue | 209th Ave | | Widen Farmington Road to 5-lanes between 185th Avenue and 209th Avenue |
| | Washington County | 209th Avenue | TSP | Kinnaman Road | Farmington Road | | Widen 209th Avenue to 5-lanes between Kinnaman Road and Farmington Road |
| | Washington County | Kinnaman Road | TSP | 198th Avenue | Farmington Road | | Widen Kinnaman Road to 3-lanes between 198th Avenue and Farmington Road |
| | **Not Financially Constrained - Identified in Cooper Mountain Transportation Study** | | | | | | |
| | Tigard | Jean Louise Road | CMTS | Roy Rogers Road | Roshak Road | | Construct Jean-Louise Road as 3-lanes between Roy Rogers and Roshak |
| | Washington County | Tile Flat Rd Extension | CMTS | Scholls Ferry Road | Bull Mountain Road | | Extend Tile Flat Road from Scholls Ferry Road to Bull Mountain Road (requires land use goal exception) |
| | Washington County | Tile Flat Rd Extension | CMTS | Bull Mountain Road | Beef Bend Road | | Extend Tile Flat Road from Bull Mountain Road to Beef Bend Road (requires land use goal exception) |
| | Washington County | 185th Avenue Extension | CMTS | Gassner Road | Kemmer Road | | Extend 185th Avenue south from Gassner Road to Kemmer Road |
| | Washington County | 185th Avenue Extension | CMTS | Kemmer Road | Weir Road | | Extend 185th Avenue south from Kemmer Road to Weir Road |
| | Washington County | Clark Hill Road | CMTS | Farmington Road | Tile Flat Road | | Improve Clark Hill Road from Farmington Road to Tile Flat Road |
| | Washington County | Cornelius Pass Rd Extension | CMTS | Rosedale Road | Farmington Road | | Extend Cornelius Pass Road from Rosedale Road to Farmington Road (requires land use goal exception) |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10575 | Washington County | West Union Rd. | 2018-2027 | Cornelius Pass Rd. | 185th Ave. | $ 22,000,000 | Widen from two to five lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 10587 | Washington County | Cornelius Pass Rd. Improvements | 2018-2027 | Frances St. | T.V. Hwy. | $ 16,000,000 | Widen to five lanes with bike lanes and sidewalks |
| 10565 | Washington County | Springville Rd. Improvements | 2018-2027 | 185th Ave. | Joss St. | $ 11,800,000 | Widen from 2 to five lanes with bike lanes and sidewalks. |
| 11458 | Washington County | Shackelford Rd | 2018-2027 | West property line of Sato Elementary | Kaiser Rd. | $ 10,000,000 | Build new 3 lane road with bike/ped facilities, storm drainage, street lighting to serve North Bethany. |
| 10566 | Washington County | Springville Rd. Improvements | 2018-2027 | Joss St. | Kaiser Rd. | $ 3,800,000 | Widen from two to three lanes with bike lanes and sidewalks. |
| 11448 | Washington County | 198th Ave. Improvements - South | 2018-2027 | T.V. Hwy. | Farmington Rd. | $ 29,700,000 | Add sidewalks, bike lanes, lighting, turn lanes at major intersections. |
| 10571 | Washington County | West Union Rd. Improvements | 2028-2040 | 185th Ave. | 143rd Ave. | $ 29,000,000 | Widen to five lanes from 185th to Laidlaw and from two to three lanes from Laidlaw to 143rd Ave, with bike lanes and sidewalks. |
| 10550 | Washington County | 185th Avenue Improvement | 2018-2027 | Springville Rd. | West Union Rd. | $ 6,000,000 | Widen 185th Ave from two to five lanes with bike lanes and sidewalks to address congestion and address safety. This project or a portion of the project is located outside the urban growth boundary. |
| 12053 | Washington County | Blanton (198th to 209th) | 2018-2027 | 198th Ave | 209th Ave | $ 3,300,000 | Add sidewalks and turn lanes as needed. |
| 10922 | TriMet | HCT: MAX Red Line Improvements Project: Capital Construction | 2018-2027 | Fairplex/Hillsboro Airport MAX | Portland Airport MAX | $ 160,000,000 | Capital construction to enable extension of Red Line service to the Hillsboro Airport/Fair Complex Station and improve reliability of the entire MAX light rail system. Project includes double-tracking and a new inbound Red Line station at Gateway Transit Center, double-tracking at Portland Airport, upgrades to signals and switches along the alignment, and purchase of new light rail vehicles needed to operate the extension and needed storage capacity at Ruby Junction to house the new vehicles. |
| 10784 | Forest Grove | David Hill Road Improvement | 2018-2027 | Thatcher Road | West UGB | $ 10,000,000 | Improve David Hill Road west of Thatcher Road to collector road standards to improve pedestrian and bicycle safety and improve multimodal access from nearby neighborhoods to community park. |
| 10773 | Forest Grove | Thatcher Road Improvement | 2028-2040 | Purden Road | Gales Creek Road | $ 18,800,000 | Improve Thatcher Road to arterial design standards and improve intersection with Gales Creek Road. |
| 11973 | Forest Grove | Gales Creek Road Improvement | 2028-2040 | Thatcher Road | Forest Gale Drive/Willamina Avenue | $ 1,000,000 | To enhance the pedestrian safety by connecting gaps, improve bike lane safety, some storm drainage and road improvements. |
| 11273 | Hillsboro | Blanton Street Extension | 2018-2027 | 67th Ave & Alexander St intersection | 209th Ave & Blanton St intersection | $ 7,441,000 | Construct three-lane east-west roadway extension with bike/ped facilities through future South Hillsboro development including new signals at Cornelius Pass Rd, 209th Ave, and three intersecting streets through South Hillsboro town center |
| 11387 | Hillsboro | Meek Rd Improvements, Phase 1 | 2028-2040 | Sewell Rd | Starr Blvd | $ 6,909,500 | Widen and improve roadway to three lanes with bike/ped facilities |
| 11385 | Hillsboro | 67th Ave Railroad Crossing Closure, Turn Lanes and Bike/Ped Improvements | 2018-2027 | Alexander St | Century Blvd & Kinnaman Rd (future intersection) | $ 5,600,000 | Improve roadway to urban collector standard with turn lanes, bike lanes, and sidewalks from Alexander to new Century/Kinnaman intersection; close off intersection with TV Hwy and railroad, reclassify segment from Alexander to dead-end at TV Hwy as local street |
| 11384 | Hillsboro | Murphy Rd Construction | 2028-2040 | Century Blvd | 209th Ave | $ 8,822,900 | Construct new three-lane roadway with bike/ped facilities; new signals at Cornelius Pass Rd and at 209th Ave |
| 11388 | Hillsboro | 30th Ave Construction | 2028-2040 | Evergreen Rd | Meek Rd | $ 10,500,000 | Construct three-lane industrial collector with bike/ped facilities |
| 11147 | Hillsboro | Schaaf Rd Reconstruction | 2018-2027 | Helvetia Rd | New north-south collector | $ 4,252,000 | Reconstruct rural gravel road to three-lane roadway with bike/ped facilities |
| 10820 | Hillsboro | Brookwood Ave Improvements | 2018-2027 | Alexander St | Oakhurst St | $ 1,807,100 | Widen to two lanes with onstreet parking and sidewalks from Alexander to Davis; widen to three lanes with bike/ped facilities from Davis to Oakhurst (UGB) |
| 11383 | Hillsboro | New North-South Collector (North Hillsboro) | 2018-2027 | Jacobsen Rd | Schaaf Rd | $ 2,657,500 | Construct three-lane roadway with bike/ped facilities |

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10839 | Hillsboro | Century Blvd Turn Lanes and Bike Lanes (Witch Hazel) | 2018-2027 | Alexander Rd | Davis Rd | $ 4,252,000 | Widen roadway to add center turn lane and bike lanes |
| 11364 | Hillsboro | Starr Blvd Reconstruction and Improvements, Phase 2 | 2018-2027 | Huffman St (future extension) | Meek Rd | $ 4,252,000 | Construct three-lane road with bike/ped facilities |
| 10818 | Hillsboro | Century Blvd Extension and Improvements (Baseline to Lois) | 2018-2027 | Baseline Rd | Lois St | $ 14,111,000 | Construct and widen roadway including bridge across Rock Creek to three lanes with bike/ped facilities; realign north leg of intersection at Lois to match south leg |
| 10553 | Hillsboro | 209th Ave Widening and Improvements, Phase 1 | 2018-2027 | TV Hwy | Kinnaman Rd | $ 22,327,000 | Widen roadway from two/three lanes to five lanes; improve from rural to urban standard with bike facilities and sidewalks; improve intersections and railroad crossing; new signals at Blanton and Kinnaman; project to serve South Hillsboro UGB area |
| 11272 | Hillsboro | Kinnaman Rd Extension | 2018-2027 | Century Blvd & 67th Ave (future intersection) | 209th Ave & Kinnaman intersection | $ 8,397,700 | Construct three-lane roadway extension with bike/ped facilities through future South Hillsboro development; include new roundabout at Century and new signals at Cornelius Pass Rd, 209th Ave, and two intersecting future neighborhood streets |
| 11274 | Hillsboro | Century Blvd Extension (South Hillsboro) | 2018-2027 | Davis Rd | Kinnaman Rd | $ 3,189,000 | Construct three-lane roadway with bike/ped facilities |
| 10838 | Hillsboro | Davis Rd Turn Lanes and Bike/Ped Improvements | 2018-2027 | Brookwood Ave | Century Blvd | $ 2,870,100 | Widen roadway to add center turn lane and bike/ped facilities |
| 11137 | Hillsboro | TV Hwy & Century Blvd Intersection Improvements | 2018-2027 | Alexander St | Johnson St | $ 10,473,000 | Add second northbound and southbound through lane (maintain northbound and southbound left-turn lane); add eastbound bus bay; improve rail crossing; add bike facilities on Century Blvd from TV Hwy to Alexander |
| 11394 | Hillsboro | Century Blvd Turn Lanes and Bike/Ped Improvements (South Hillsboro) | 2028-2040 | Kinnaman Rd | Rosedale Rd | $ 9,779,600 | Widen roadway to three lanes with bike/ped facilities, include roundabout at Kinnaman, and crossing at Butternut Creek and culvert south of Rosa |
| 10831 | Hillsboro | Century Blvd Extension and Over-Crossing (North Hillsboro) | 2028-2040 | Bennett St | Wagon Wy | $ 13,733,960 | Construct three-lane road including US 26 overpass with bike/ped facilites; connect existing segments to provide new north-south connectivity |
| 10821 | Hillsboro | Huffman St Extension, Phase 1 | 2018-2027 | Brookwood Pkwy | Sewell Rd | $ 8,387,070 | Construct five-lane road with bike/ped facilites |
| 11393 | Hillsboro | US 26 Widening - Brookwood to Cornelius Pass | 2028-2040 | Brookwood Pkwy/Helvetia Rd | Cornelius Pass Rd | $ 26,575,000 | Widen US 26 from four to six lanes |
| 11907 | Hillsboro | Jackson School Rd Improvements | 2028-2040 | Evergreen Rd | Storey Creek (UGB) | $ 11,400,000 | Improve roadway from rural to urban standard and widen to three lanes with bike/ped facilities. This project or a portion of the project is located outside the urban growth boundary. |
| 11909 | Hillsboro | Hidden Creek Dr Extension | 2018-2027 | 47th Ave | 53rd Ave | $ 8,000,000 | Construct two-lane roadway extension with bike/ped facilities |
| 11910 | Hillsboro | Meek Rd Improvements, Phase 2 | 2028-2040 | Jackson School Rd | Sewell Rd | $ 3,000,000 | Improve Meek Rd to address safety for industrial access to/from Jackson School Rd. This project or a portion of the project is located outside the urban growth boundary. |
| 11911 | Hillsboro | Rosedale Rd Turn Lanes and Bike/Ped Improvements | 2028-2040 | Century Blvd (229th Ave) | 209th Ave | $ 10,000,000 | Widen to three lanes with bike/ped facilities; intersection improvements including new roundabout at Cornelius Pass Rd and new signal at 209th Ave; box culverts at Rosedale Creek east and west crossings |
| 11920 | Hillsboro | Cornelius Pass Rd Extension, Phase 2 | 2018-2027 | Blanton St | Vermont St | $ 19,718,650 | Construct five-lane extension with bike/ped facilities; intersection improvements; new signals at Blanton, Kinnaman, McInnis, Butternut Creek, Deline, and Vermont; bridge at Butternut Creek; creek crossings at Gordon Creek and south tributary of Butternut Creek |
| 11921 | Hillsboro | Cornelius Pass Rd Extension, Phase 3 | 2028-2040 | Vermont St | Rosedale Rd | $ 8,450,850 | Construct five-lane extension with bike/ped facilites; signal at Murphy; roundabout at Rosedale |

# **Appendix C:** Transportation Needs Assessment Memo

720 SW Washington St
Suite 500
Portland, OR 97205
dksassociates.com

# TRANSPORTATION NEEDS ASSESSMENT

DATE: March 31, 2020

TO: Washington County URTS Project Team

FROM: Carl Springer, PE | DKS Associates
Kelly White and Rochelle Starrett, EIT | DKS Associates

SUBJECT: Urban Reserves Transportation Study –Task 2.4: Needs Assessment P#19123-000

## INTRODUCTION

This memorandum summarizes the results of the travel demand modeling performed to understand the impacts of urban reserve area development on the Washington County transportation network. The County prepared the 2040 Westside Travel Demand Forecast Model for DKS by inputting the land use and transportation assumptions for the urban reserves as previously agreed upon by the URTS Technical Advisory Committee (see memos in Appendix). DKS refined the model and used it to identify areas of expected congestion both for arterial roadway segments and intersections; these are areas expected to be congested even with many financially constrained and other projects assumed to be built in the future. This memorandum includes a cut sheet for each urban reserve area that includes:

- Map of the urban reserve that includes assumed future arterial or collector roadways within each reserve and shows expected congestion areas
- Assumed Regional Transportation System Plan and other identified improvements
- Assumed land use for the urban reserve
- PM Peak Hour operations results
- Key points/further considerations for concept/comprehensive planning

The purpose of this analysis is to evaluate the cumulative transportation impacts of development scenarios in Washington County's urban reserves and to identify areas of expected future capacity needs for the County and cities to consider in their future planning efforts. This analysis is intended to spotlight where additional parallel capacity or intersection improvements will be needed as development occurs within specific urban reserve areas. Note that this will likely not be an exhaustive list, particularly due to limitations with using a regional model, and future improvement needs will not be limited to those identified in this study.

Other elements of the transportation system needs in these rural areas will be considered as part of the land use actions to include them within the Urban Growth Boundary. As specific land development concepts are evaluated, any new projects will be designed to comply with local agency standards for multimodal travel. In addition, it will be important to define primary routes within the concept planning area, and to seek out opportunities to connect externally to the existing systems that support future pedestrian, bicycle and transit services. However, these investigations will not be addressed within this memorandum.

## Study Area

Figure 1 shows an overview of the study area and the locations of the urban reserve areas. Washington County planning and engineering staff selected major intersections that were close to locations where significant growth in traffic is expected from development of the urban reserves. Several intersections in the growth influence area were excluded from this list because they were either recently improved, fully built, or not expected to experience significant growth in traffic volumes related specifically to development within the urban reserve areas. Figure 2 shows the study intersection locations.

**Figure 1. Washington County Study Area**

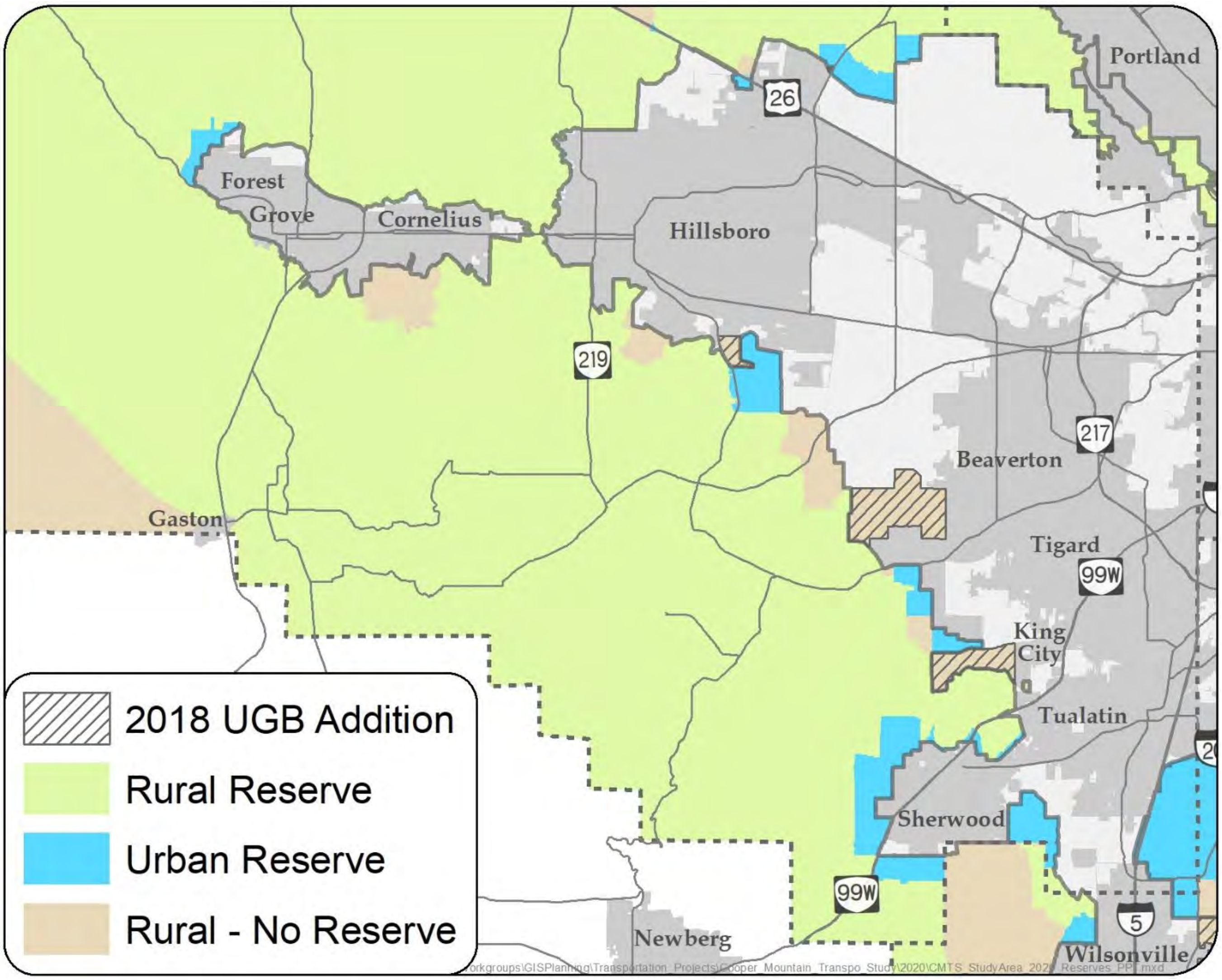
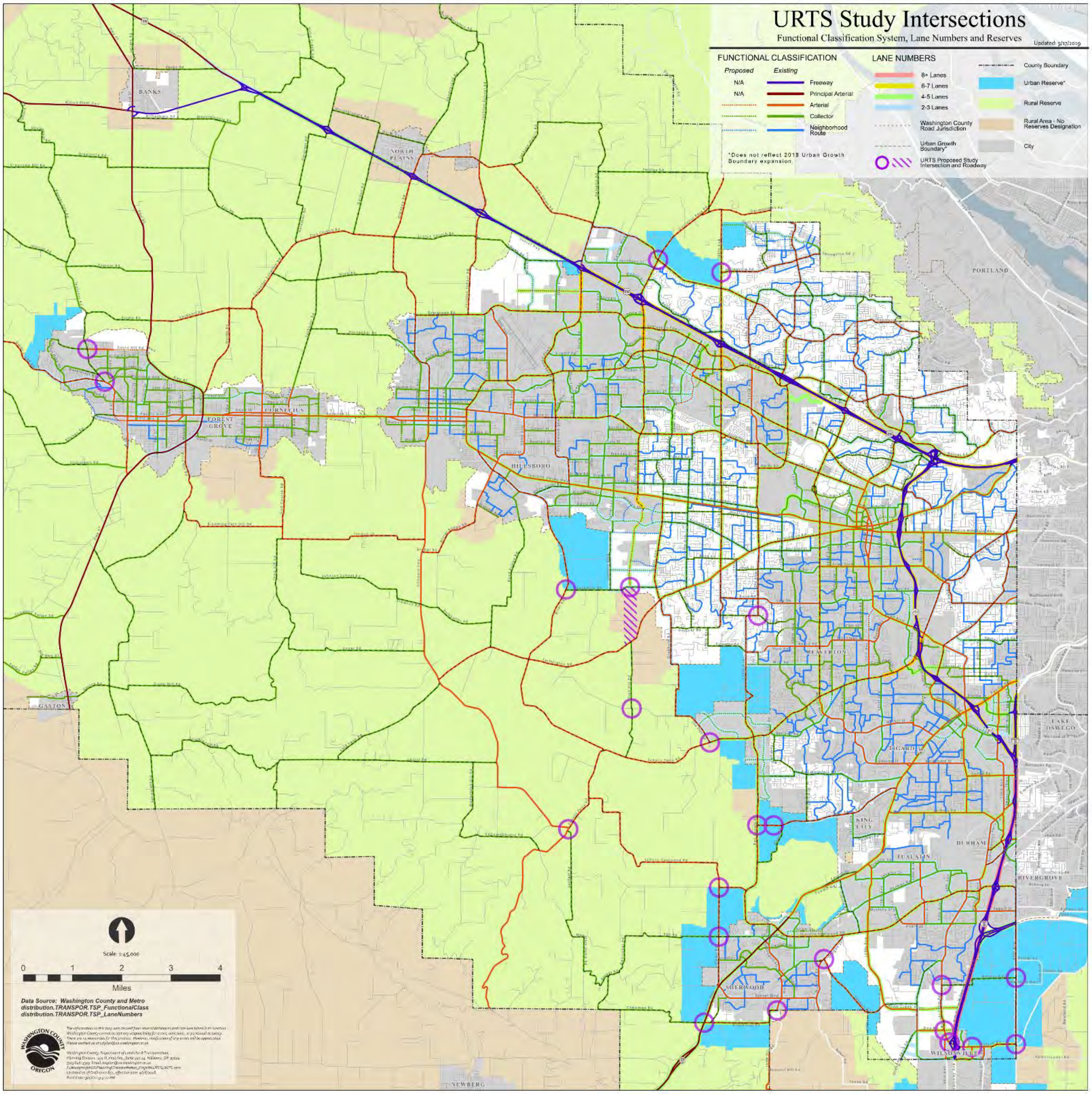


**Figure 2. Study Intersections**



# TRAFFIC VOLUMES

## Existing Volumes (2019)

Base year traffic operations were assessed at the study intersections to provide a baseline for comparison of the future growth within the Urban Reserve Areas. Traffic counts were collected in Fall 2019 at all locations.[1]

## Future Volumes (2040)

Washington County's Westside Regional Travel Demand Model was used to develop future traffic volumes for study intersections and assess segment performance with development of the urban reserves. The existing regional model was refined to include updated land use and transportation network assumptions, detailed in the next section, to provide a better estimate of future travel demand.

# FUTURE LAND USE

The 2040 Urban Reserve Buildout Scenario uses Metro's 2040 land use scenario and assumes each Washington County urban reserve is added to the Urban Growth Boundary (UGB) and then fully built out with housing and employment. Washington County staff worked with local cities and Metro to develop land use assumptions for the 2040 Urban Reserve Buildout Scenario, summarized below in Table 1. In total, the urban reserves may add over 35,000 households and 13,000 jobs with full development, using current density assumptions as detailed in Table 1. Several urban reserve areas were added to the UGB in 2018 but are not fully built out. These areas are included in Table 1 and the attached cut sheets, and their estimated household and employment totals were included in all land use scenarios. Additional details on the proposed urban reserve land use assumptions can be found in the Appendix in memos dated September 11, 2019, July 26, 2019, and July 3, 2019.

It should be noted that Washington County staff included some development within the Stafford Basin for modeling purposes. For the urban reserves within the Stafford Basin that are within Washington County, staff formulated land use assumptions in coordination with the cities and Angelo Planning Group; these assumptions are included in Table 1. Because Washington County's southeastern urban reserve areas are directly adjacent to the larger Stafford Basin urban reserve areas, a certain amount of future density needed to be allocated to those areas. Washington County's approach was to maintain Metro's 2040 land use and trip generation assumptions for the Clackamas County portion of the Stafford Basin urban reserve areas, as detailed in a memo dated July 3, 2019.

[1] Traffic volume collected in September and October 2019.

**Table 1. 2040 Potential Growth Scenario For Urban Reserve Area (Households and Employment)**

| Urban Reserve Area | Households | Employment |
|---|---|---|
| I-5 East | 1,458 | 3,128 |
| Elligsen Road North | 2,400 | 1,678 |
| Elligsen Road South (Washington County Portion) | 1,645 (592) | 260 (119) |
| Tonquin (Washington County Portion) | 0 | 2,556 (2,518) |
| Sherwood South | 1,841 | 150 |
| Sherwood West | 6,495 | 544 |
| Sherwood North | 503 | 140 |
| Beef Bend South* | 3,576 | 391 |
| River Terrace South | 1,235 | 1,389 |
| River Terrace West | 1,574 | 1,771 |
| Cooper Mountain* | 3,760 | 304 |
| Witch Hazel South* | 2,989 | 282 |
| Rosa | 3,413 | 481 |
| David Hill | 1,435 | 93 |
| Brookwood Parkway | 242 | 99 |
| Bendemeer | 2,221 | 301 |
| Bethany West | 462 | 63 |
| **Total (Washington County)** | **35,249** | **13,630** |

* Indicates Urban Reserve Areas that were added to the Urban Growth Boundary in 2018.

Notably, the growth assumed within the County's urban reserves are illustrative of faster growth than what would realistically occur by 2040; the 2040 Urban Reserve Buildout Scenario is only intended to help the County better understand its transportation network needs through 2040 and beyond. By identifying the needed transportation improvements now, Washington County is better positioned to work with the cities to appropriately size existing urban roadways and refine future investment needs.

## Future Transportation Network

The modeling included many transportation network assumptions, which are documented in the appendix, including:

- All 2040 financially constrained roadway and transit projects from the 2018 Metro Regional Transportation System Plan[2]
- Planned roadway connections within the urban reserve areas as identified by Metro in the 2018 Urban Growth Report[3]
- Regionally significant roadway connections such as the Day Road and Basalt Creek Parkway overcrossings of Interstate 5
- Projects included in the Washington County Transportation System Plan[4] considered relevant to these urban reserve areas, such as Grabhorn Road widening
- Projects identified and carried forward from the Cooper Mountain Transportation Study (see Appendix), such as the Tile Flat Road extension

Though roadway projects within the urban reserves are assumed to be completed for the 2040 Urban Reserve Buildout Scenario, realistic completion of the roadway network would occur concurrently with development and would be dependent on available funding sources.

# MOBILITY STANDARDS

Transportation performance of the existing year and future year scenarios were assessed for the County's arterial roadway system and at the study intersections. Operations were evaluated using *Synchro 10 software*[5] and compared against Washington County and ODOT Performance Measures as shown in Table 2. As a conservative approach, roadway segments were determined to be deficient when the V/C ratio was greater than 0.90, which meets the County's mobility "targets" and exceeds ODOT's targets for all location conditions.

The mobility standards listed include the following performance measures:

- **Level of Service (LOS)**: A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity.
- **Volume-to-Capacity (V/C) ratio**: A decimal representation (typically between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases, and performance is reduced. If the ratio is greater than 1.00, the turn

[2] 2018 Regional Transportation Plan, Metro, published June 2018.
[3] 2018 Growth Management Decision Urban Growth Report, Metro, published December 2018.
[4] Washington County Transportation System Plan, published September 2019.
[5] Synchro 10 software used with Highway Capacity Manual 6th Edition methodologies.

movement, approach leg, or intersection is oversaturated which usually results in excessive queues and long delays. These measures provided a starting point for identifying future needs throughout the transportation network.

**Table 2. Jurisdictional Mobility Standards**

| Jurisdiction | Location | AM/PM Peak Hour Mobility Standards [a] | |
|---|---|---|---|
| | | **Target** | **Acceptable** |
| Washington County [b] | Regional Centers<br>Town Centers<br>Main Streets<br>Station Communities | 0.99 / 0.9<br>E / D | 0.99<br>E |
| | Other Urban Areas | 0.9<br>D | 0.99 / 0.9<br>E / D |
| | Rural Areas | 0.9<br>D | |
| ODOT [c] | Central City<br>Regional Centers<br>Town Centers<br>Main Streets<br>Station Communities | 1.1 / 0.99 | |
| | *Corridors:*<br>99W<br>Beaverton-Hillsdale Highway<br>Farmington Road<br>Canyon Road<br>Tualatin Valley Highway<br>Scholls Ferry Road | 0.99 | |
| | *Areas of Special Concern:*<br>OR 99W (I-5 to Tualatin Road) | 0.95 | |

[a] Washington County Motor Vehicle Performance Measures are identified for both the first hour (highest hour of the day), as well as the second hour (the hour following the first hour). The standards are listed in the table as *First Hour / Second Hour*.
[b] Washington County Motor Vehicle Performance Measures, Washington County Transportation System Plan, Effective September 2019.
[c] Maximum volume to capacity ratios for two-hour peak hour operating conditions through a 20-year horizon for state highways sections within the Portland metropolitan area urban growth boundary, Table 7 Oregon Highway Plan – December 2000 amendment. Applicable mobility standards for this memorandum were reported. Where applicable, standards are listed in the table as *First Hour / Second Hour*.

# IDENTIFYING TRANSPORTATION NEEDS IN 2040

System performance measures and intersection conditions for the 2040 Urban Reserve Buildout Scenario on both Washington County and ODOT facilities adjacent to each urban reserve were compared to their existing operations to highlight significant changes and potential adverse impacts to planned facilities. Table 3 on the next page lists the urban reserves and nearby study intersections.

A separate cut sheet was prepared for each urban reserve area to highlight the system needs and related planning issues that should be addressed as these locations are considered for urban development. Each cut sheet shows the following information:

- A map of the urban reserve boundary, nearby streets, and relevant study intersections
- A summary of peak hour intersection performance conditions
- The assumed land use growth associated with each urban reserve area
- The assumed transportation improvements near each urban reserve area
- A list of key findings for system needs
- A list of possible issues for further study through the concept and comprehensive planning process

Please refer to the following sections for the urban reserve cut sheets and summary of transportation system needs. Note that these are high level analyses intended to identify major capacity issues from urban reserve development; concept and comprehensive planning at the city level will expand on this analysis with detailed traffic analysis for affected roadways and intersections. In addition, the model includes assumed parallel routes within many urban reserves; the absence of these facilities may result in increased congestion requiring upsizing of existing roadways. Required improvements may not be limited to those identified in this study.

**Table 3. Urban Reserves and Study Intersections**

| Urban Reserve/Study Area | Study Intersection # | Study Intersection Name |
|---|---|---|
| Bendemeer<br>Bethany West | 3<br>4 | NW Cornelius Pass Rd/NW West Union Rd<br>NW 185th Ave/NW Springville Rd |
| Brookwood Parkway | - | |
| Rosa<br>Witch Hazel South | 5<br>6 | SW Cornelius Pass Rd/SW Rosedale Rd<br>SW River Rd/SW Rosedale Rd |
| David Hill | 1<br>2 | NW David Hill Rd/NW Thatcher Rd<br>NW Gales Creek Rd/NW Thatcher Rd |
| River Terrace West<br>Cooper Mountain | 7<br>8<br>9<br>10 | SW 170th Ave/SW Rigert Rd<br>SW Clark Hill Rd/SW Tile Flat Rd<br>SW Tile Flat Rd/SW Scholls Ferry Rd<br>SW Roy Rogers Rd/SW Beef Bend Rd |
| River Terrace South<br>Beef Bend South | 10 | SW Roy Rogers Rd/SW Beef Bend Rd |
| Sherwood North | 13<br>17 | SW Elwert Rd/SW Scholls-Sherwood Rd<br>SW Oregon St/SW Tonquin Rd |
| Sherwood West<br>Sherwood South | 13<br>14<br>15<br>16 | SW Elwert Rd/SW Scholls-Sherwood Rd<br>SW Elwert Rd/SW Edy Rd<br>OR 99W/SW Brookman Rd<br>SW Brookman Rd/SW Ladd Hill Rd |
| Tonquin | 17 | SW Oregon St/SW Tonquin Rd |
| Elligsen Road North<br>Elligsen Road South<br>I-5 East | 18<br>19<br>20<br>21<br>22<br>23<br>24 | SW Boones Ferry Rd/SW Norwood Rd<br>SW Norwood Rd/SW 65th Ave<br>SW Day Rd/SW Boones Ferry Rd<br>I-5 SB Ramps/SW Boones Ferry Rd<br>SW Elligsen Rd/SW Parkway Center Dr<br>SW 65th Ave/SW Elligsen Rd<br>SW 65th Ave/SW Stafford Rd |
| Scholls (study area)- | 11<br>12 | OR 219/SW Scholls Ferry Rd<br>OR 219/SW Seiffert Rd |

# KEY FINDINGS

Future growth within Washington County's urban reserve areas will impact the planned transportation network, although the magnitude of that impact depends on the location. To accommodate future growth, improvements will be needed beyond what is currently planned in 2040, including:

- Several study intersections are expected to need additional turn lanes or other capacity improvements to accommodate growth within the urban reserve areas. These improvements would complement planned improvements previously identified by the County and other planning organizations (i.e. Metro):
  - NW Cornelius Pass Road / NW West Union Road
  - OR 99W / SW Brookman Road
- Significant intersection upgrades (i.e. realignment or intersection control upgrades) are expected to be needed at the following intersections:
  - SW 170th Avenue / SW Rigert Road
  - SW Elwert Road / SW Scholls-Sherwood Road
  - SW Clark Hill Road / SW Tile Flat Road
  - OR 219 / SW Scholls Ferry Road and OR 219 / SW Seiffert Road

The travel demand modeling also indicated several locations with increased congestion and capacity issues in 2040 related more to an increase in overall regional growth than specifically to growth in a nearby urban reserve area. These are important to point out for future city, county, and state project identification and funding prioritization. These regional transportation needs include:

- Multiple interchanges will experience a significant increase in demand with growth. Future studies (Interchange Area Management Plans) will be needed to identify solutions in these areas:
  - Brookwood Parkway / US-26 Interchange
  - SW Nyberg Road / I-5 Interchange
- Several corridors will need further study throughout the County as growth occurs. In the future year, the corridors listed below are assumed to be widened significantly (from identified projects), yet they will still experience excessive congestion. Therefore, alternative solutions will need to be identified. These corridors include:
  - SW Scholls Ferry Road (east of Roy Rogers Road)
  - OR 99W (SW Tualatin-Sherwood Road to SW Meinecke Road)
  - SW Boones Ferry Road (SW Tualatin Road to SW Bridgeport Road)

# BENDEMEER AND BETHANY WEST URBAN RESERVES


## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 11478 | Widen NW 185th Ave to 3 lanes | Springville to Shackelford |
| 10565 | Widen NW Springville Rd to 5 lanes | 185th to Joss |
| 10571 | Widen NW West Union Rd to 5 lanes | 185th to Laidlaw |
| 10575 | Widen NW West Union Rd to 5 lanes | Cornelius Pass to 185th |
| 11457 | Extend NW Shackelford Rd | Bridge to 185th |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Bendemeer | 535 | 2,221 | 301 |
| Bethany West | 126 | 462 | 63 |

## PM PEAK HOUR OPERATIONS

| # | STUDY INTERSECTION | EXISTING V/C | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 3 | NW Cornelius Pass Rd & NW West Union Rd | 0.87 | ***1.22*** | 1,403 |
| 4 | NW 185th Ave & NW Springville Rd | 0.60 | 0.73 | 1,142 |

*Increase in total entering vehicles to intersection

## KEY POINTS / FURTHER CONSIDERATION THROUGH CONCEPT / COMPREHENSIVE PLANNING PROCESS

- Consider additional capacity, TSMO, and/or access management needs on NW Cornelius Pass Road from US-26 to NW Germantown Road.
- Consider parallel routes to NW Cornelius Pass Road to improve congestion.
- Through concept plan/comprehensive planning, review intersection capacity on NW West Union Road at the intersections with NW 185th Avenue and NE Century Boulevard.
- Congestion south of US-26 is primarily caused by urban development south of the highway.

# BROOKWOOD PARKWAY URBAN RESERVE


## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 11393 | Widen US-26 to 6 lanes | Brookwood to Cornelius Pass |

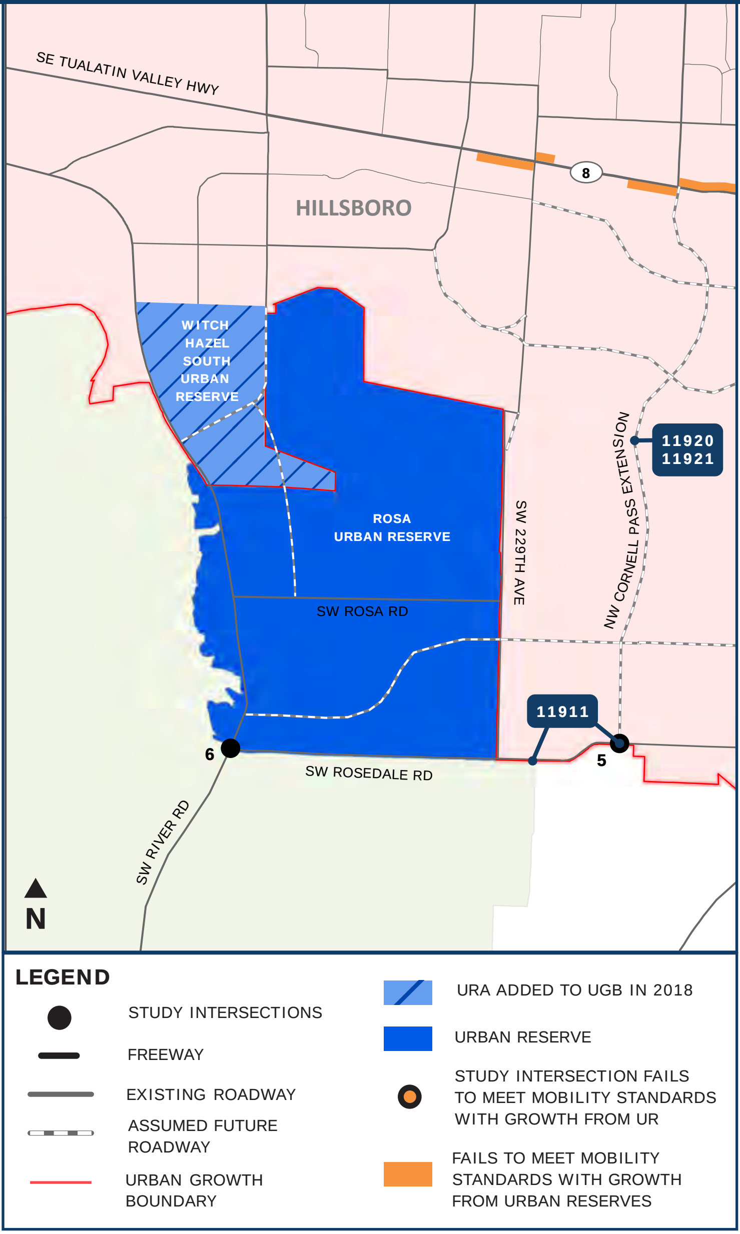
## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Brookwood Parkway | 39 | 242 | 99 |

## KEY POINTS / FURTHER CONSIDERATION THROUGH CONCEPT / COMPREHENSIVE PLANNING PROCESS

- This area has limited development potential and does not have direct access to Brookwood interchange.

# ROSA / WITCH HAZEL SOUTH URBAN RESERVES




## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 11911 | Widen SW Rosedale Rd to 3 lanes | Century (229th) to 209th |
| | Upgrade SW Rosedale Rd/future Cornelius Pass Rd extension to a roundabout | –– |
| 11920 11921 | Construct 5 lane extension of Cornelius Pass Rd | Blanton to Rosedale |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Rosa | 914 | 3,413 | 481 |
| Witch Hazel South | 402 | 2,989 | 282 |

## PM PEAK HOUR OPERATIONS

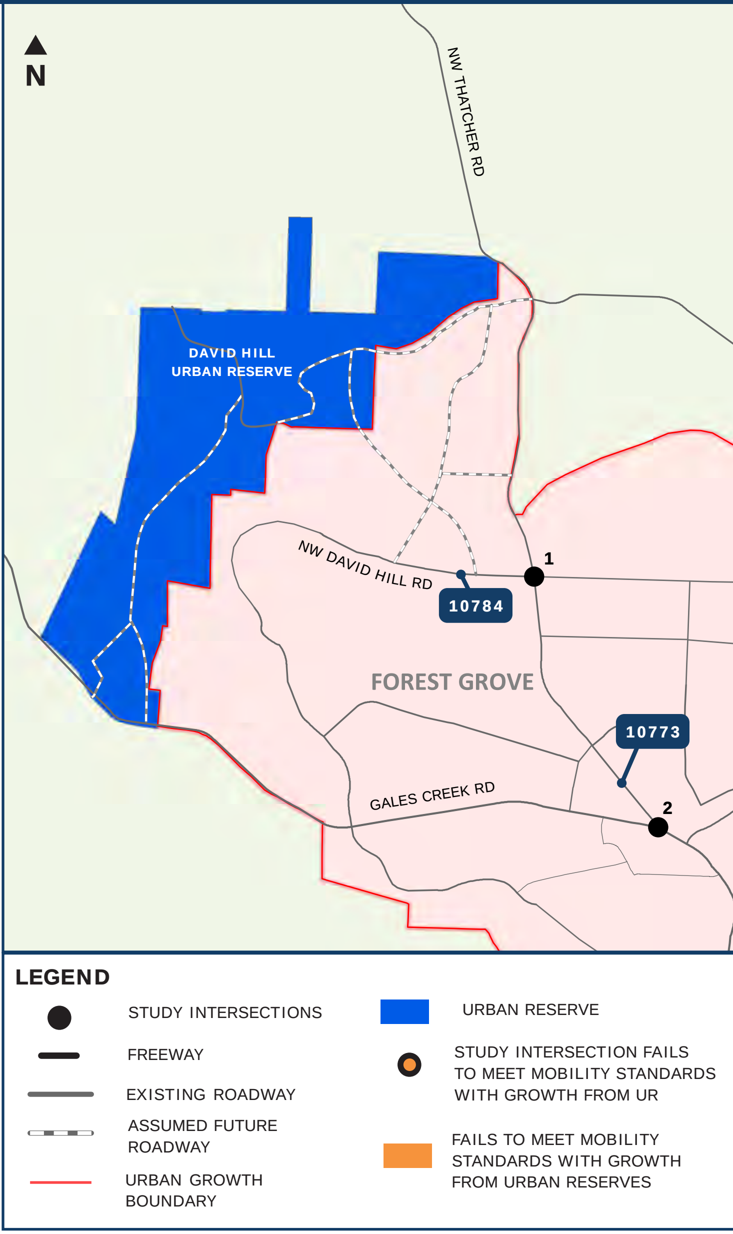
| # | STUDY INTERSECTION | EXISTING V/C | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 5 | SW Cornelius Pass Road/SW Rosedale Road | –– | 0.35 | –– |
| 6 | SW River Road/SW Rosedale Road | 0.27/0.37 | 0.39/0.35 | 504 |

*Increase in total entering vehicles to intersection

## KEY POINTS / FURTHER CONSIDERATION THROUGH CONCEPT / COMPREHENSIVE PLANNING PROCESS

- All study intersections and adjacent roadways accommodate the potential growth within the Rosa urban reserve area.
- No additional improvements likely needed beyond those already assumed.

# DAVID HILL URBAN RESERVES




## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 10784 | Upgrade NW David Hill Rd to collector standards (3 lanes) | Thatcher to UGB |
| 10773 | Upgrade NW Thatcher Rd to arterial standards (3 lanes) | Purden to Gales Creek |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| David Hill | 321 | 1,435 | 93 |

## PM PEAK HOUR OPERATIONS

| # | STUDY INTERSECTION | EXISTING V/C** | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 1 | NW David Hill Rd/ NW Thatcher Road | 0.14/0.11 | 0.18/0.50 | 488 |
| 2 | NW Gales Creek Rd/NW Thatcher Rd | 0.16/0.44 | 0.26/0.35 | 466 |

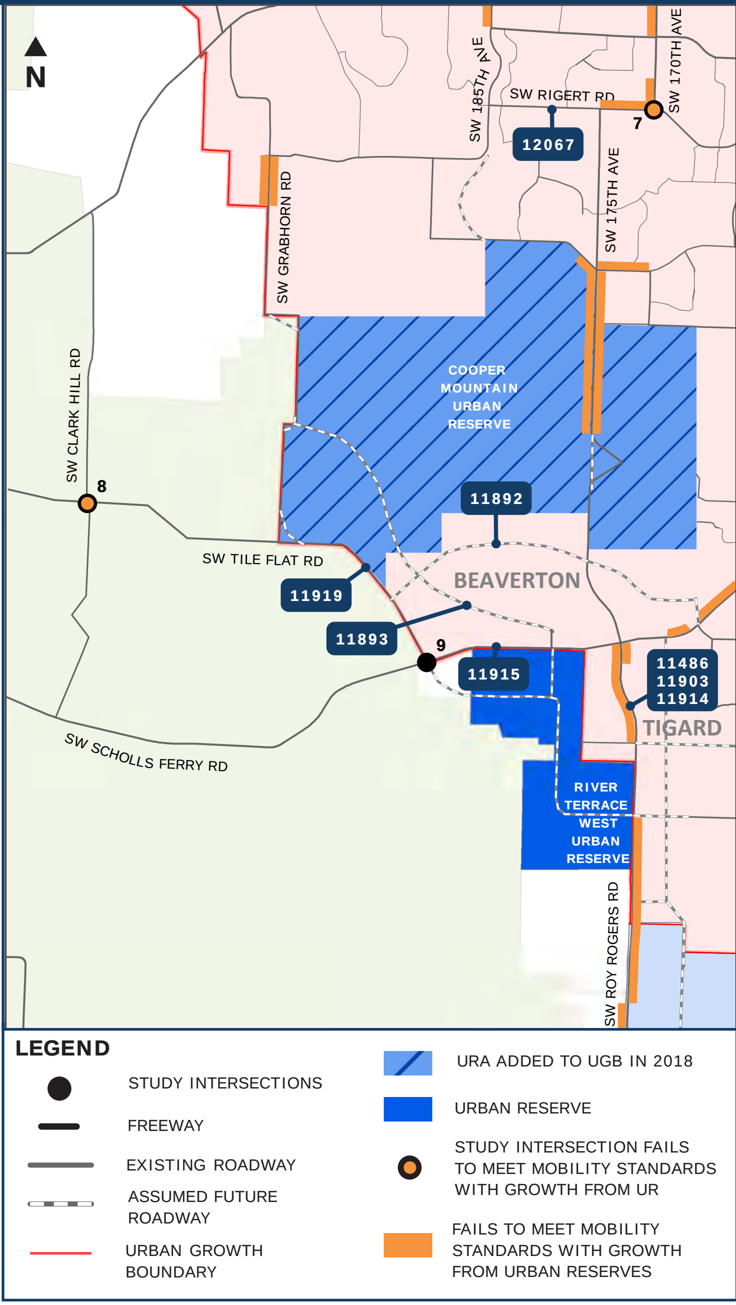
*Increase in total entering vehicles to intersection

**Two-way stop-controlled intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- All study intersections and adjacent roadways accommodate the potential growth within the David Hill urban reserve area.
- No additional improvements likely needed.

# RIVER TERRACE WEST / COOPER MOUNTAIN URBAN RESERVES




## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 12067 | Add turn lanes where appropriate on SW Rigert Rd | 185th to 170th |
| 11486 11903 11914 | Widen SW Roy Rogers Rd to 5 lanes | Scholls Ferry to UGB Borchers |
| 11915 | Widen SW Scholls Ferry Rd to 5 lanes | Tile Flat to Roy Rogers |
| 11919 | Widen SW Tile Flat Rd to 3 lanes | Scholls Ferry to UGB |
| 11892 | Extend SW Barrows Rd as a 3 lane collector | Tile Flat to Loon |
| 11893 | Construct 3 lane collector (Mountainside Way) | Scholls Ferry to UGB |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| River Terrace West | 301 | 1,574 | 1,771 |
| Cooper Mountain | 1,210 | 3,760 | 304 |

## PM PEAK HOUR OPERATIONS

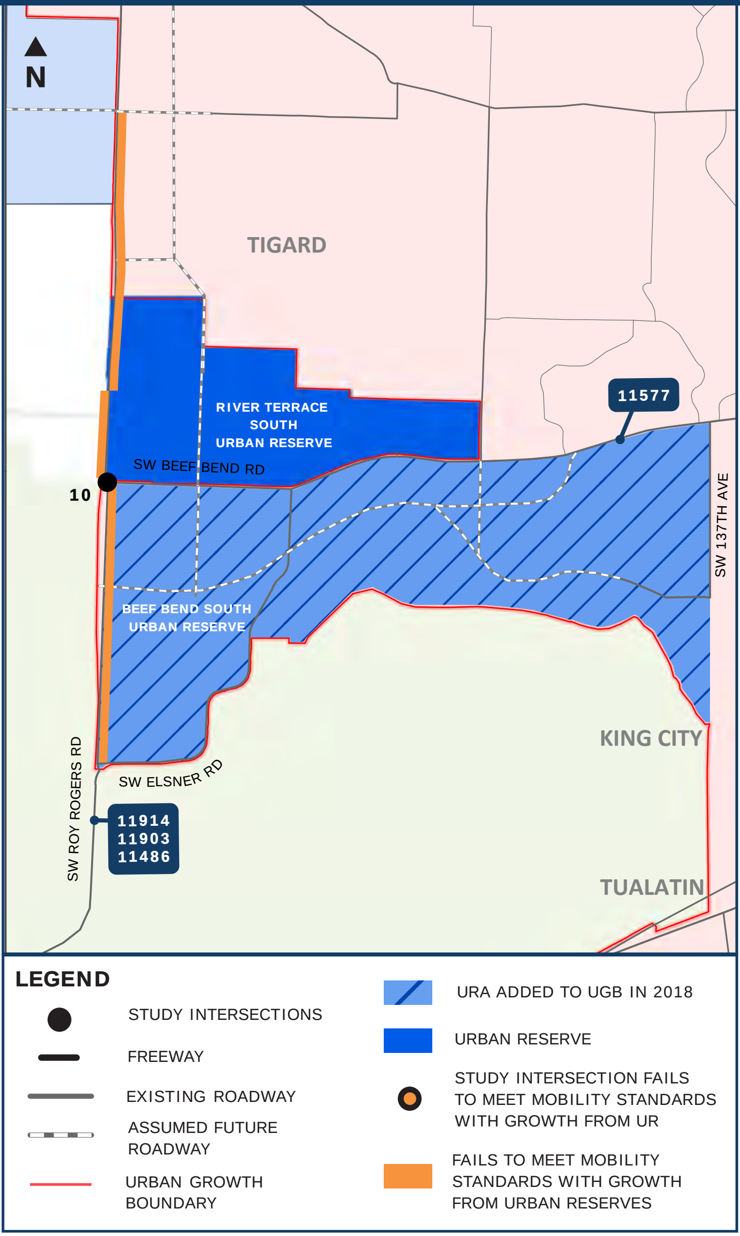
| # | STUDY INTERSECTION | EXISTING V/C | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 7 | SW 170th Ave/SW Rigert Rd | ***0.98*** | ***1.70*** | 618 |
| 8 | SW Clark Hill Rd/ SW Tile Flat Rd | 0.45 | ***0.96*** | 1,082 |
| 9 | SW Tile Flat Road/ SW Scholls Ferry Road | 0.83 | 0.68 | 411 |
| 10 | SW Roy Rogers Road/SW Beef Bend Road | 0.64 | 0.68 | 1505 |

*Increase in total entering vehicles to intersection

## KEY POINTS / FURTHER CONSIDERATION THROUGH CONCEPT / COMPREHENSIVE PLANNING PROCESS

- Future intersection improvement needed (signal or roundabout), at both SW 170th Avenue/SW Rigert Road and SW Clark Hill Road/SW Tile Flat Road.
- Consider extension of SW Tile Flat Road to SW Beef Bend Road.
- Consider additional capacity, TSMO, and/or access management needs on SW Roy Rogers Road from SW Scholls Ferry Road to SW Beef Bend Road. Coordinated area planning efforts are needed to control access onto Roy Rogers Road, including parallel routes within the urban reserves.
- Future intersection evaluations needed at SW Scholls Ferry Road/SW Clark Hill Road, SW Clark Hill Road/SW Farmington Road, SW 185th Avenue/SW Bany Road, and SW Tile Flat Road/future extension of SW Barrows Road.
- Consider additional capacity, TSMO, and/or access management needs on SW Grabhorn Road from SW Farmington Road to SW Stonecreek Drive or widening from two-lane existing cross-section needed.
- Consider improving Tile Flat Road between Grabhorn Road and Clark Hill Road.

# RIVER TERRACE SOUTH / BEEF BEND SOUTH URBAN RESERVES




## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 11577 | Widen SW Beef Bend Rd to 3 lanes | Roy Rogers to OR-99W |
| 11914<br>11903<br>11486 | Widen SW Roy Rogers Rd to 4-5 lanes | Scholls Ferry to Borchers |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| River Terrace South | 190 | 1,235 | 1,389 |
| Beef Bend South | 493 | 3,576 | 391 |

## PM PEAK HOUR OPERATIONS

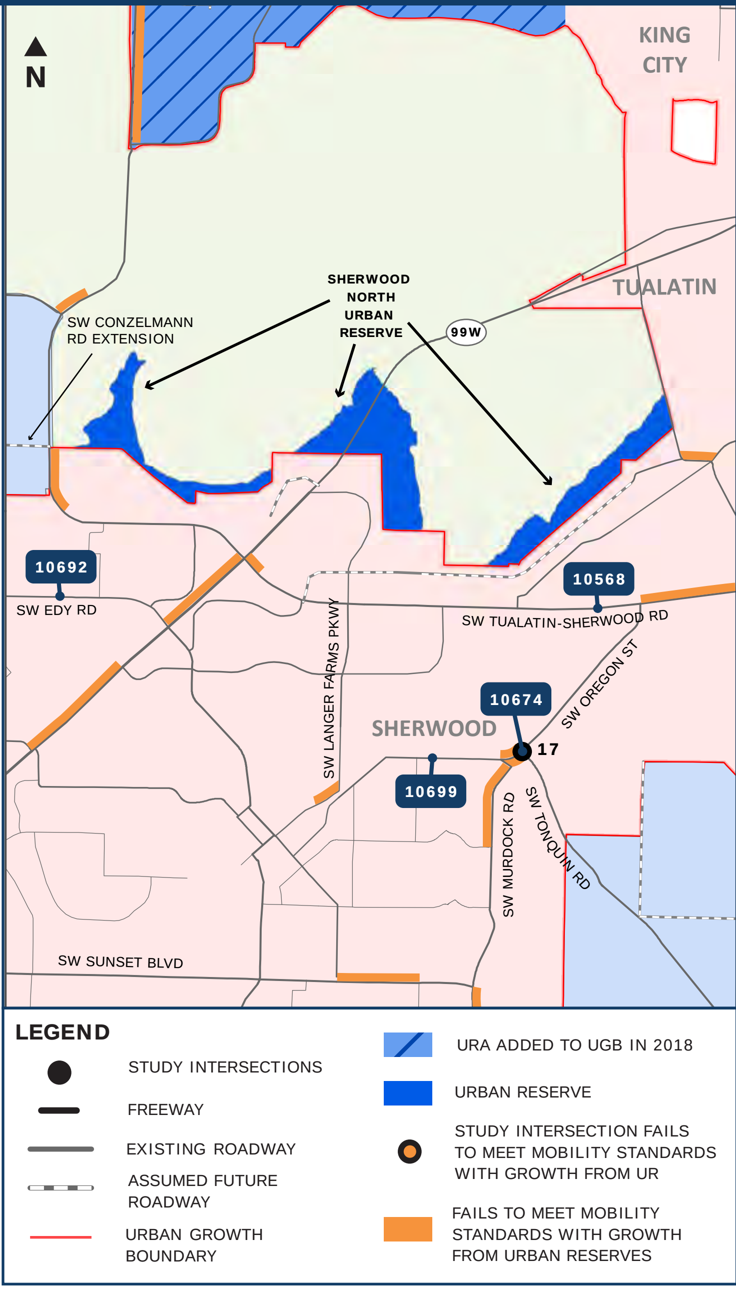
| # | STUDY INTERSECTION | EXISTING V/C | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 10 | SW Roy Rogers Rd/SW Beef Bend Rd | 0.64 | 0.68 | 1,535 |

*Increase in total entering vehicles to intersection

## KEY POINTS / FURTHER CONSIDERATION THROUGH CONCEPT / COMPREHENSIVE PLANNING PROCESS

- Consider extension of SW Tile Flat Road to SW Beef Bend Road.
- Coordinated area planning efforts are needed to control access onto Roy Rogers Road and Beef Bend Road, including provision of parallel routes within the urban reserves.

# SHERWOOD NORTH URBAN RESERVE




## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 10674 | Reconstruct and realign SW Oregon St/SW Tonquin Rd as a roundabout | -- |
| 10692 | Upgrade Edy Road to a 3 lane collector | Elwert to Cherry Orchards |
| 10699 | Widen SW Oregon St to a 3 lane collector | Murdock to Langer Farms |
| 10568 | Widen SW Tualatin-Sherwood Rd to 5 lanes | Langer Farms to Teton |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Sherwood North | 111 | 503 | 140 |

## PM PEAK HOUR OPERATIONS

| # | STUDY INTERSECTION | EXISTING V/C** | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 17 | SW Oregon Street / SW Tonquin Road | 0.25/***1.06*** | 0.79 | 807 |

*Increase in total entering vehicles to intersection
**Two-way stop controlled intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- Future intersection improvements needed on SW Roy Rogers Road at SW Scholls-Sherwood Road and the future extension of SW Conzelmann Road. Improvements would include capacity improvements (i.e. additional turn lanes) on the Roy Rogers legs of each intersection.
- Future intersection capacity improvements needed (turn lanes) at SW Cipole/SW Herman Road and SW Langer Farms Parkway/SW Oregon Street.
- Consider additional capacity, TSMO, and/or access management needs on OR 99W from SW Tualatin Sherwood Road to SW Meinecke Road.
- Additional needs identified in the "Tonquin" figure.

# SHERWOOD WEST AND SOUTH URBAN RESERVES


## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 10682 | Construct SW Brookman Rd to arterial status with 3 lanes | OR-99W to Ladd Hill |
| 12047 | Realign and relocate SW Brookman Rd/OR-99W | –– |
| 10693 | Widen SW Ladd Hill Rd to 3 lanes | Sunset to Brookman |
| 10681 | Construct SW Elwert Rd to arterial status | Handley to Edy |
| 10692 | Widen SW Edy Rd to 3 lanes | Elwert to Cherry Orchard |
| 12045 | Reconstruct SW Elwert Rd/SW Edy Rd to roundabout or signal | –– |

## ASSUMED LAND USE

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Sherwood West | 1,159 | 6,495 | 544 |
| Sherwood South | 421 | 1,841 | 150 |

## PM PEAK HOUR OPERATIONS

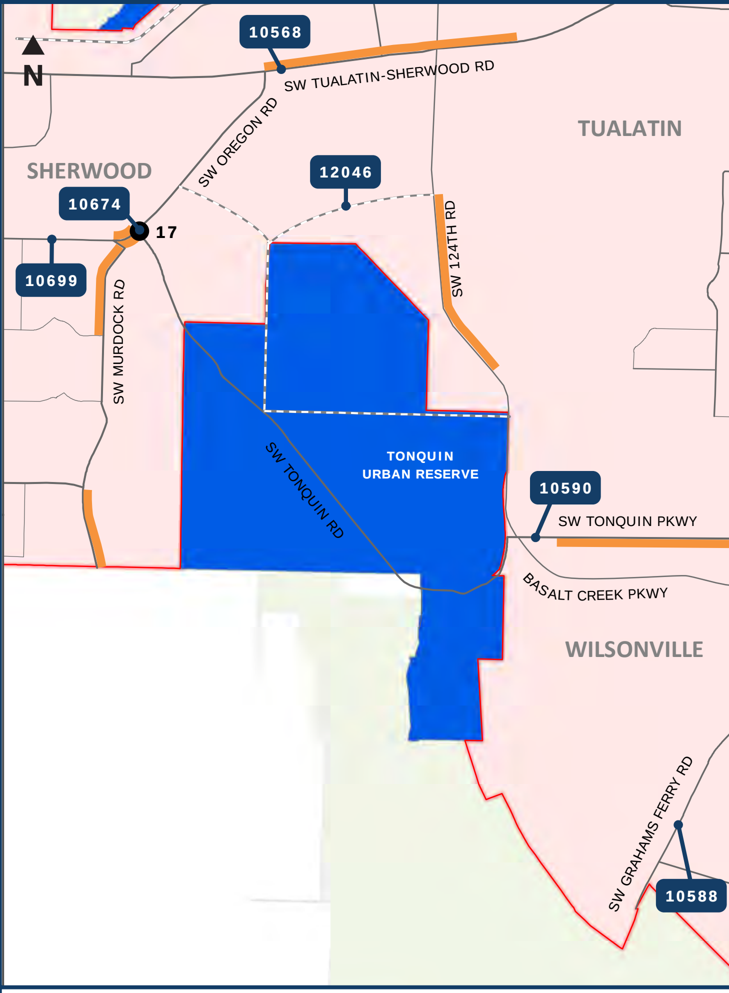
| # | STUDY INTERSECTION | EXISTING V/C** | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 13 | SW Elwert Rd/SW Scholls-Sherwood Rd | 0.89 | ***1.76*** | 961 |
| 14 | SW Elwert Rd/SW Edy Rd | 0.9 | 0.88 | 1,281 |
| 15 | OR 99W/SW Brookman Rd | 0.42/0.54 | ***1.00*** | 605 |
| 16 | SW Brookman Rd/ SW Ladd Hill Rd | 0.11/0.09 | 0.24/0.40 | 1142 |

*Increase in total entering vehicles to intersection
**Two-way stop-controlled intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- Future intersection improvements needed (signal or roundabout) at SW Elwert Road/SW Scholls-Sherwood Road needed.
- Future intersection improvements at OR 99W/SW Brookman Road needed, likely additional turn lanes or similar intersection-level capacity improvements.
- Additional needs identified in the “Sherwood North” figure.

# TONQUIN URBAN RESERVE




**LEGEND**

- STUDY INTERSECTIONS
- FREEWAY
- EXISTING ROADWAY
- ASSUMED FUTURE ROADWAY
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- STUDY INTERSECTION FAILS TO MEET MOBILITY STANDARDS WITH GROWTH FROM UR
- FAILS TO MEET MOBILITY STANDARDS WITH GROWTH FROM URBAN RESERVES

## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 10568 | Widen SW Tualatin-Sherwood Rd to 5 lanes | Langer Farms to Teton |
| 10588 | Widen SW Grahams Ferry Rd to 3 lanes | Day to County Line |
| 10590 | Realign and widen SW Tonquin Rd to 3 lanes | Grahams Ferry to 124th |
| 10674 | Reconstruct and realign SW Oregon St/SW Tonquin Rd as a roundabout | –– |
| 10699 | Widen SW Oregon St to a 3 lane collector | Murdock to Langer Farms |
| 12046 | Tonquin Area East-West Collector | 124th to Tonquin |

## ASSUMED LAND USE (WASHINGTON COUNTY PORTION)

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Tonquin | 559 | 0 | 2,518 |

## PM PEAK HOUR OPERATIONS

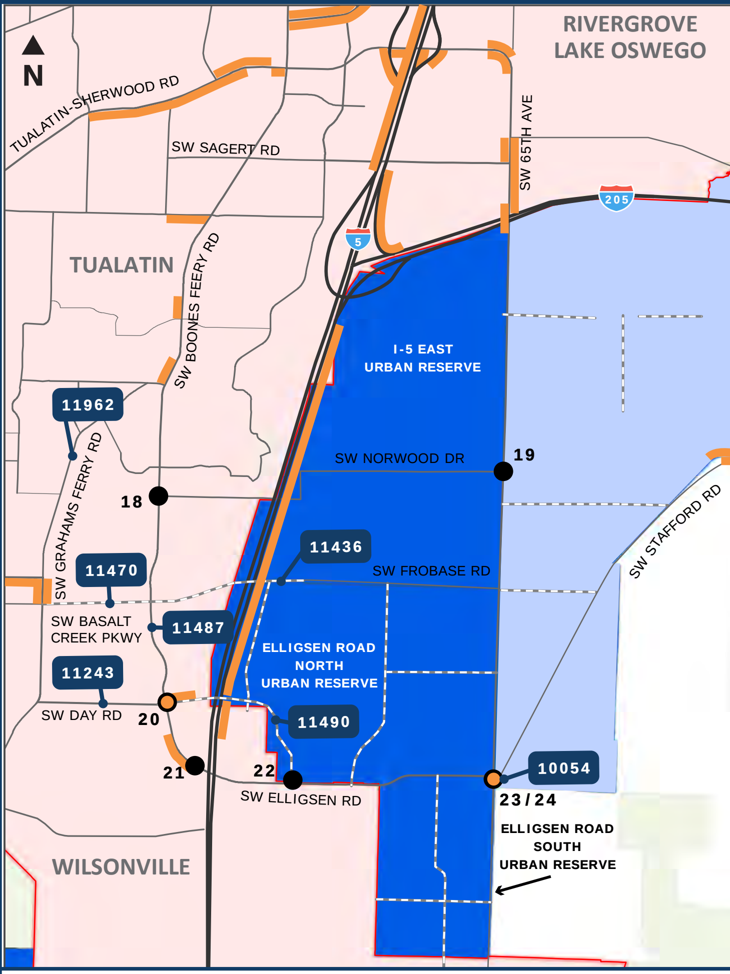
| # | STUDY INTERSECTION | EXISTING V/C** | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 17 | SW Oregon Street/ SW Tonquin Road | 0.25/***1.06*** | .79 | 807 |

*Increase in total entering vehicles to intersection
**Two way stop control intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- Consider additional capacity, TSMO, and/or access management needs on SW Tualatin-Sherwood Road from SW Oregon Street to SW 120th Avenue.
- Future intersection improvements at SW Murdock Road/SW Oregon Street needed in coordination with improvements at SW Tonquin Road/SW Oregon Street. Further corridor study needed on SW Murdock Road from SW Oregon Street to SW Willamette Street to identify where turn lanes could improve capacity.

# ELLIGSEN ROAD NORTH AND SOUTH, I-5 EAST URBAN RESERVES




**LEGEND**

- STUDY INTERSECTIONS
- FREEWAY
- EXISTING ROADWAY
- ASSUMED FUTURE ROADWAY
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- STUDY INTERSECTION FAILS TO MEET MOBILITY STANDARDS WITH GROWTH FROM UR
- FAILS TO MEET MOBILITY STANDARDS WITH GROWTH FROM URBAN RESERVES

## ASSUMED REGIONAL TRANSPORTATION PLAN IMPROVEMENTS

| PROJECT | DESCRIPTION | EXTENT |
|---|---|---|
| 11962 | Upgrade SW Grahams Ferry Rd (exact cross-section unclear) | Ibach to Helenius |
| 11470 | Extend new 5 lane arterial (Basalt Creek Parkway) | Grahams Ferry to Boones Ferry |
| 11487 | Widen SW Boones Ferry Rd to 5 lanes | Basalt Creek to Day |
| 11243 | Widen SW Day Rd to 5 lanes | Grahams Ferry to Boones Ferry |
| 11436* | Extend a 4 lane over crossing of I-5 | Boones Ferry to 65th |
| 11490* | Construct a new 4 lane over crossing of I-5 | Boones Ferry to Elligsen |
| 10054 | SW 65th Ave/Elligsen Rd/Stafford Rd intersection roundabout | |

*Not included in financially constrained project list

## ASSUMED LAND USE (WASHINGTON COUNTY PORTION)

| URBAN RESERVE | ACREAGE | HOUSEHOLDS | EMPLOYEES |
|---|---|---|---|
| Elligsen Rd N | 588 | 2400 | 1678 |
| Elligsen Rd S | 252 | 592 | 119 |
| I-5 East | 746 | 1,458 | 3,128 |

## PM PEAK HOUR OPERATIONS

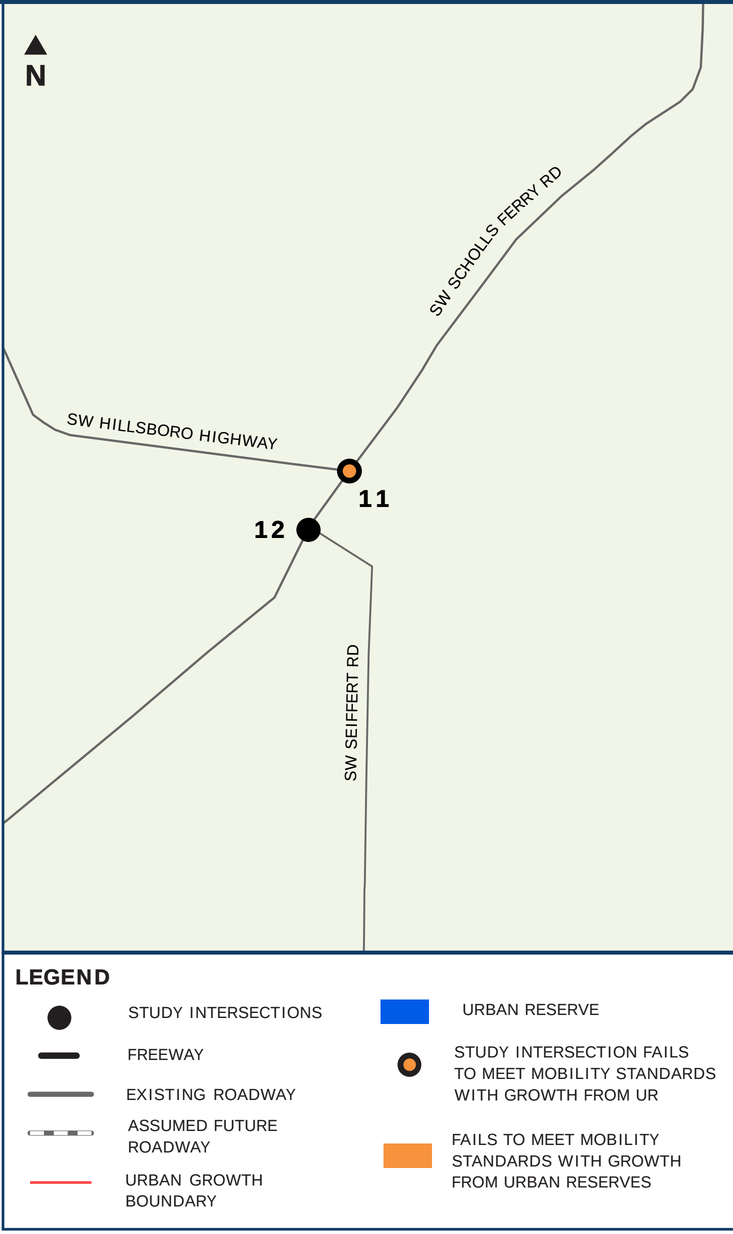
| # | STUDY INTERSECTION | EXISTING V/C | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 18 | SW Boones Ferry Rd/ SW Norwood Rd | 0.32/0.51 | 0.47/0.84 | 704 |
| 19 | SW Norwood Rd/ SW 65th Ave | 0.29/0.44 | 0.41/0.77 | 692 |
| 20 | SW Day Rd/SW Boones Ferry Rd | 0.83 | ***1.19*** | 1,496 |
| 21 | I-5 SB Ramps/SW Boones Ferry Road | 0.96 | 0.83 | 890 |
| 22 | SW Elligsen Rd/SW Parkway Center Dr | 0.57 | 0.88 | 815 |
| 23 | SW 65th Ave/ SW Elligsen Rd | 0.24/0.91 | 0.81 | –– |
| 24 | SW 65th Avenue/SW Stafford Road | 0.38/***1.50*** | | |

*Increase in total entering vehicles to intersection
**Two-way stop control intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- Upgrade intersection control (signal or roundabout) at SW 65th Avenue/ SW Stafford Road and realign with SW Elligsen Road/SW 65th Avenue.
- Future intersection improvements needed (i.e. additional turn lanes) at the following intersections: SW Grahams Ferry Road/Basalt Creek Parkway, SW Boones Ferry Road/SW Ibach Road, SW Boones Ferry Road/ SW Avery Street, and SW Tualatin-Sherwood Road/SW Avery Street.
- Consider additional capacity, TSMO, and/or access management needs on SW 65th Avenue from the I-205 over crossing to the I-5 Interchange.
- Future development will put increased demand on the SW Nyberg Road/I-5 Interchange. Future studies (IAMP) will be needed to identify solutions at this location.
- Future development will put increased demand on I-5. The County could pursue TSMO opportunities in coordination with ODOT.

# SCHOLLS STUDY AREA




## PM PEAK HOUR OPERATIONS

| # | STUDY INTERSECTION | EXISTING V/C** | GROWTH WITH UR V/C | INCREASE IN VEHICLES* |
|---|---|---|---|---|
| 11 | OR 219/SW Scholls Ferry Road | 0.39/0.88 | 0.48/***1.96*** | 407 |
| 12 | OR 219/SW Seiffert Road | 0.31/0.08 | 0.34/0.19 | 191 |

*Increase in total entering vehicles to intersection
**Two-way stop-controlled intersections reported as major/minor

## KEY POINTS/FURTHER CONSIDERATION THROUGH CONCEPT/COMPREHENSIVE PLANNING PROCESS

- Upgrade intersection control at SW Scholls Ferry Road/SW Hillsboro Highway (OR-219) and realign with the SW Seiffert Road intersection. Given that the intersection is well outside of the UGB, improvements here are would be driven by safety needs, rather than capacity needs.

# Appendix

**Land Use Memos**

**List of RTP Projects**

**Transportation Modeling Assumptions**

**Washington County Roadway Design Standards**

**Existing (2019) Intersection Operations**

**Future (2040) Potential Growth Scenario Intersection Operations**

**Tualatin Area Volume Difference Plot (Base vs. Potential Growth)**

**Cooper Mountain Transportation Study Recommended Improvements**

# Land Use Memos

# LAND USE & TRANSPORTATION MEMORANDUM

Planning and Development Services

Date: July 3, 2019

To: Washington County Cities

From: Julie Sosnovske, Transportation Planner
Jessica Pelz, Senior Planner

**Subject: City Review of Urban Reserve Transportation Study (URTS) Land Use Assumptions**

The County's Urban Reserves Transportation Study (URTS) will work with cities and Metro to gain an understanding of future land use and development assumptions in the urban reserve areas and their impacts on the transportation system. The County has obtained preliminary land use assumptions from Metro's Goal 14 analysis for the 2018 Urban Growth Report and from previously completed concept plans for some of the urban reserves. The land use assumptions inform the travel demand modeling with the level of development density we might expect to see in the urban reserve areas in the future. The land use assumptions are based on the projected number of households and jobs for each TAZ within an urban reserve area. In some areas, TAZs contain a mix of land types – e.g. urban, urban reserve, urban unincorporated, rural reserve – and in these areas we have attempted to separate out the land use assumptions for only the area of the TAZ within the urban reserve for review purposes.

Metro assumed an average of 10 dwelling units per acre for most of the urban reserve areas (with environmentally constrained and other lands removed), and that is the starting point for our analysis. However, many cities have completed some level of concept planning for their adjacent urban reserve areas. Where more detailed forecasts were available, we have adjusted the base number of units per urban reserve area to reflect these more refined forecasts. The table below lists the urban reserve areas by name (identified by Metro) along with the jurisdiction primarily responsible for review and the associated TAZ numbers. The preliminary land use assumptions are further described in this memo, and maps showing the future household and job projections are included for your review.

**Washington County Urban Reserves Land Use Assumptions**

This study focuses on Washington County's urban reserve areas (URAs). However, the county's southeastern URAs are adjacent to the larger Stafford Basin URAs, which need to be addressed in the modeling. The following sections address the methodology for the Stafford Basin and the Washington County URAs.

**Urban Reserve Area Land Use Assumptions Review**

| Urban Reserve Area | Jurisdiction(s) Responsible for Review | TAZ Numbers |
|---|---|---|
| I-5 East | Wilsonville/Tualatin | 1121, 1122 |
| Elligsen Road North | Wilsonville/Tualatin | 1122, 977, 978 |
| Elligsen Road South | Wilsonville/Tualatin | 977, 976 |
| Tonquin | Sherwood/Tualatin | 982, 998, 999 |
| Sherwood South | Sherwood | 987 |
| Sherwood West | Sherwood | 1428, 1429, 1432 |
| Sherwood North | Sherwood | 996, 997, 1000, 1428 |
| Beef Bend South | King City | 1001, 1051 |
| Roy Rogers East | Tigard | 1004 |
| Roy Rogers West | Tigard | 1003 |
| Cooper Mountain | Beaverton | 1152, 1153, 1155 |
| South | Hillsboro | 1350, 1351, 1364, 1365 |
| David Hill | Forest Grove | 1394, 1395 |
| Brookwood Parkway | Hillsboro | 1258, 1259 |
| Bendemeer | Hillsboro | 1456, 1458, 1461 |
| Bethany West | Washington County | 1462 |

***Stafford Basin Urban Reserves:***

Land use assumptions from recent (2035) and current (2040) Metro Models and Washington County Transportation Futures Study (WCTFS) scenarios were compared within the Stafford Basin. Washington County and Clackamas County geographies were broken out separately.

**Stafford Area Land Use Assumptions**

| | Households | | | | Employment | | | |
|---|---|---|---|---|---|---|---|---|
| **County** | **Metro 2035** | **Metro 2040** | **WCTFS – Scenario 1** | **WCTFS – Scenario 2** | **Metro 2035** | **Metro 2040** | **WCTFS – Scenario 1** | **WCTFS – Scenario 2** |
| Washington | 192 | 845 | 4,409 | 6,239 | 141 | 834 | 4,573 | 5,640 |
| Clackamas | 1,409 | 1,824 | 13,562 | 16,021 | 1,253 | 1,616 | 10,061 | 11,576 |
| **Total** | **1,601** | **2,669** | **17,971** | **22,260** | **3,429** | **4,490** | **14,634** | **17,216** |

The WCTFS was intended to take a long-term look at buildout land use in all Urban Reserves and other potential infill development (e.g. intensification of employment land uses within the existing UGB). Due to the long-term infrastructure issues and planning agreements in the Stafford Basin area, Washington County's approach for this study is to maintain Metro's 2040 land use and trip generation assumptions for the Clackamas County portion of the Stafford URAs. As shown in the table above, these assumptions are higher than they were in 2035, but significantly lower than what was estimated for the WCTFS. Assumed growth in the Washington County portion of the Stafford Urban Reserves will be addressed in the same manner as the rest of Washington County's Urban Reserves, which is discussed in the next section.

***Washington County Urban Reserves:***
As part of Metro's 2018 Urban Growth Report, Metro conducted a Buildable Lands Inventory (BLI) analysis for the 16 Urban Reserve Areas (URAs) within Washington County. This analysis assumed 10 residential units per acre after removing schools, parks, and organizations. For partially constrained areas (with Title 13 impacts), 3 residential units per acre were assumed. This BLI was used as a starting point for each URA, except where previous concept planning work had been completed. Refinements from work conducted in the Cooper Mountain (South Cooper Mountain Concept Plan), Beef Bend South (King City Concept Plan), Sherwood West (Sherwood West Concept Plan), David Hill (preliminary concept plan work), and South (South Urban Reserve Analysis and Witch Hazel Village Study) urban reserves were substituted where sufficient detail was available.

Metro's BLI assumed that all areas would develop primarily as residential. However, previous consideration of the Tonquin URA indicated that it would likely be employment land. A separate analysis was conducted for this area based on assumptions for nearby employment lands to the north.
These preliminary estimates (Metro BLI or Concept Plan refinements) were compared to other available Transportation Analysis Zone (TAZ) level data for the URA's as follows:

1. The portion (by area) of each TAZ within the Washington County URA's was estimated.

2. Since the WCTFS assumed buildout, it was further assumed that development within each TAZ was equally likely to be located within the URA portion or within the previous UGB. In other words, development was assumed to be spread evenly throughout the TAZ.

3. The proportion of development estimated within the urban reserves for each TAZ was multiplied by previous estimates of development within the TAZ for the following scenarios:
    - Metro 2015 Land Use (Metro 2018 RTP)
    - Metro 2040 Land Use (Metro 2018 RTP)
    - WCTFS Scenario 1
    - WCTFS Scenario 2

4. For each URA, these development estimates were summed and compared with the preliminary URA land use estimates.

5. The Total Dwelling Units (Households) for all Washington County URAs were estimated and compared with previous analyses as follows:

| Total URA Households (Preliminary) | Metro 2015 Households | Metro 2040 Households | WCTFS Scenario 1 | WCTFS Scenario 2 |
|---|---|---|---|---|
| 35,361 | 2,020 | 15,846 | 26,954 | 32,892 |

***Observations:***

- Metro 2015 households represents (approximately) existing development levels, which is expected to be much lower than buildout
- Metro 2040 households represents (approximately) 20 years of development, and would be expected to be lower than buildout
- Total URA households is significantly higher than both WCTFS scenarios – however, this is reasonable since both WCTFS scenarios assumed significant employment that is currently planned to shift to residential for these areas

6. The Total Employment for all Washington County URAs were estimated and compared with previous analyses as follows:

| Total URA Employment (Preliminary) | Metro 2015 Employment | Metro 2040 Employment | WCTFS Scenario 1 | WCTFS Scenario 2 |
|---|---|---|---|---|
| 6,189 | 1,853 | 4,915 | 11,255 | 13,781 |

***Observations:***

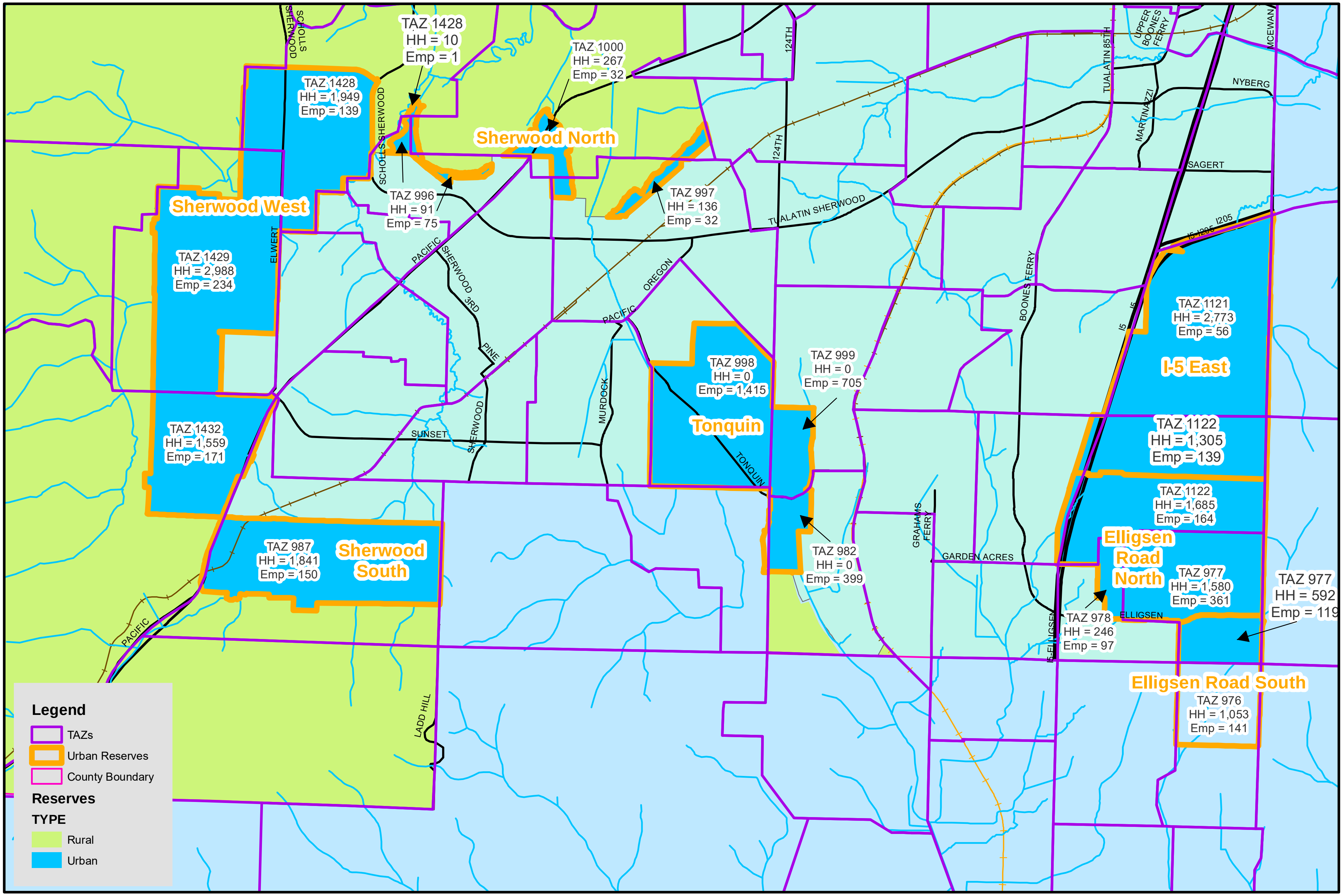
- Metro 2015 employment represents (approximately) existing development levels, which is expected to be much lower than buildout
- Metro 2040 employment represents (approximately) 20 years of development, and would be expected to be lower than buildout
- Total preliminary employment is significantly lower than both WCTFS scenarios – however, this is reasonable since both WCTFS scenarios assumed significant employment that is currently planned to shift to residential for these areas

7. Preliminary Households were allocated to each TAZ based on the portion of the corresponding URA that falls within it.

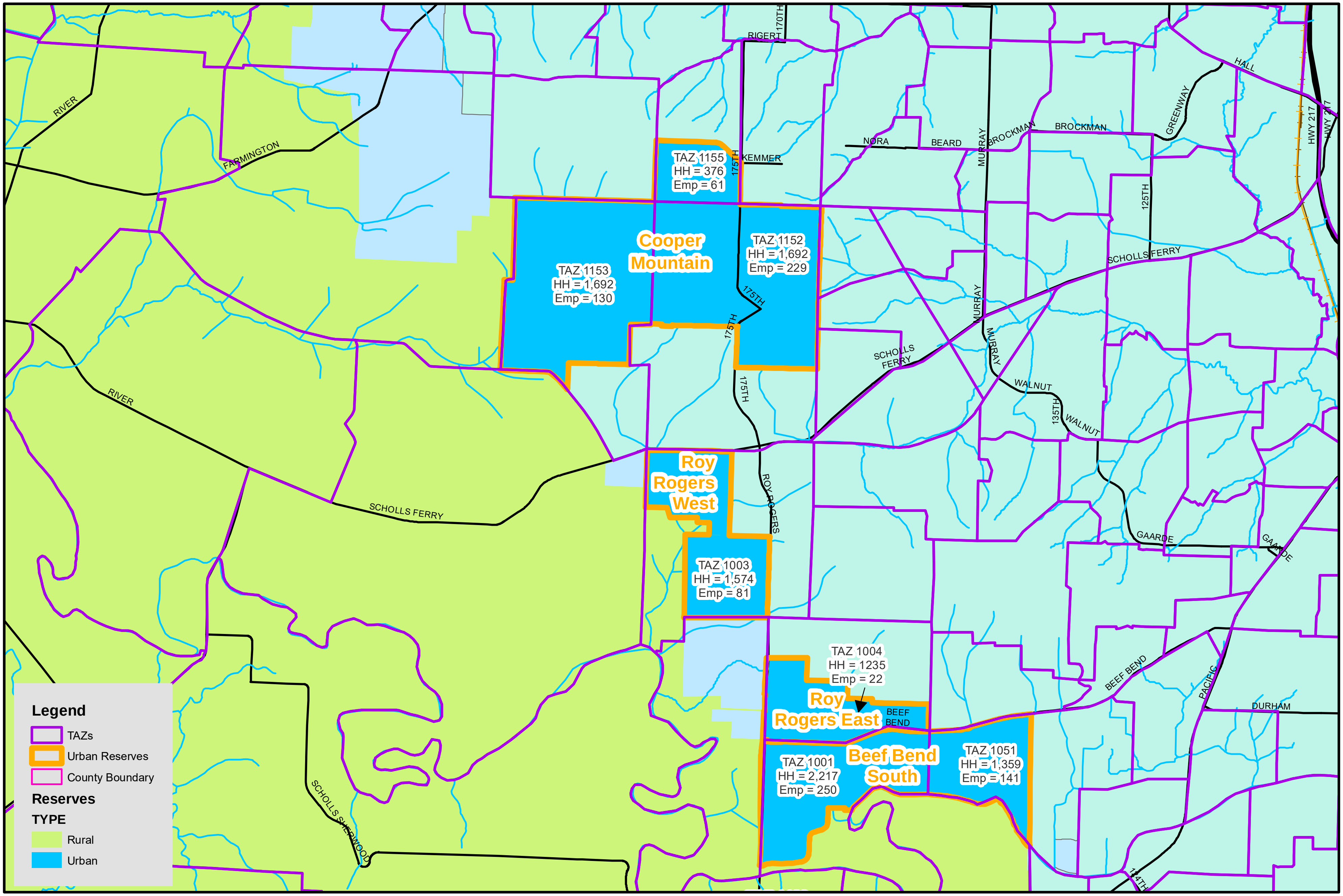
8. Preliminary Employment was retained from Metro's 2040 assumptions and allocated based on the URA proportion of the corresponding TAZ. Some employment distributions were adjusted where existing UGB areas are expected to contain a higher (or lower) proportion of the overall employment for the TAZ. Key examples of this are in Wilsonville (TAZ 978) near the I-5/Stafford Interchange and in Sherwood north of significant commercial areas (TAZs 997 and 1000).

9. Employment for the Tonquin URA was estimated with a separate BLI based on assumptions previously developed for the adjacent Tonquin Employment Area just to the north. No housing was assumed in the URA.

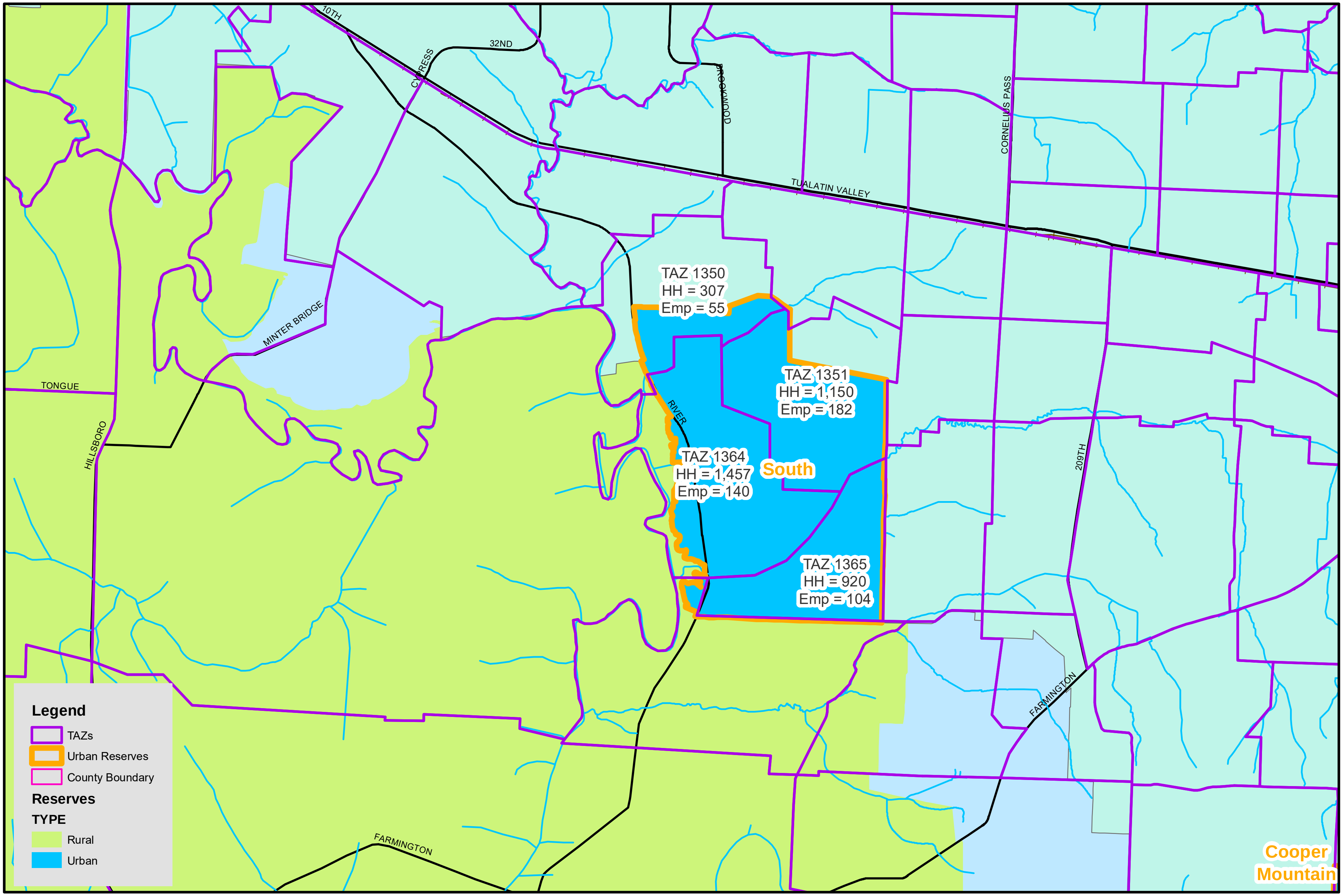
# Preliminary Urban Reserve Buildout Land Use



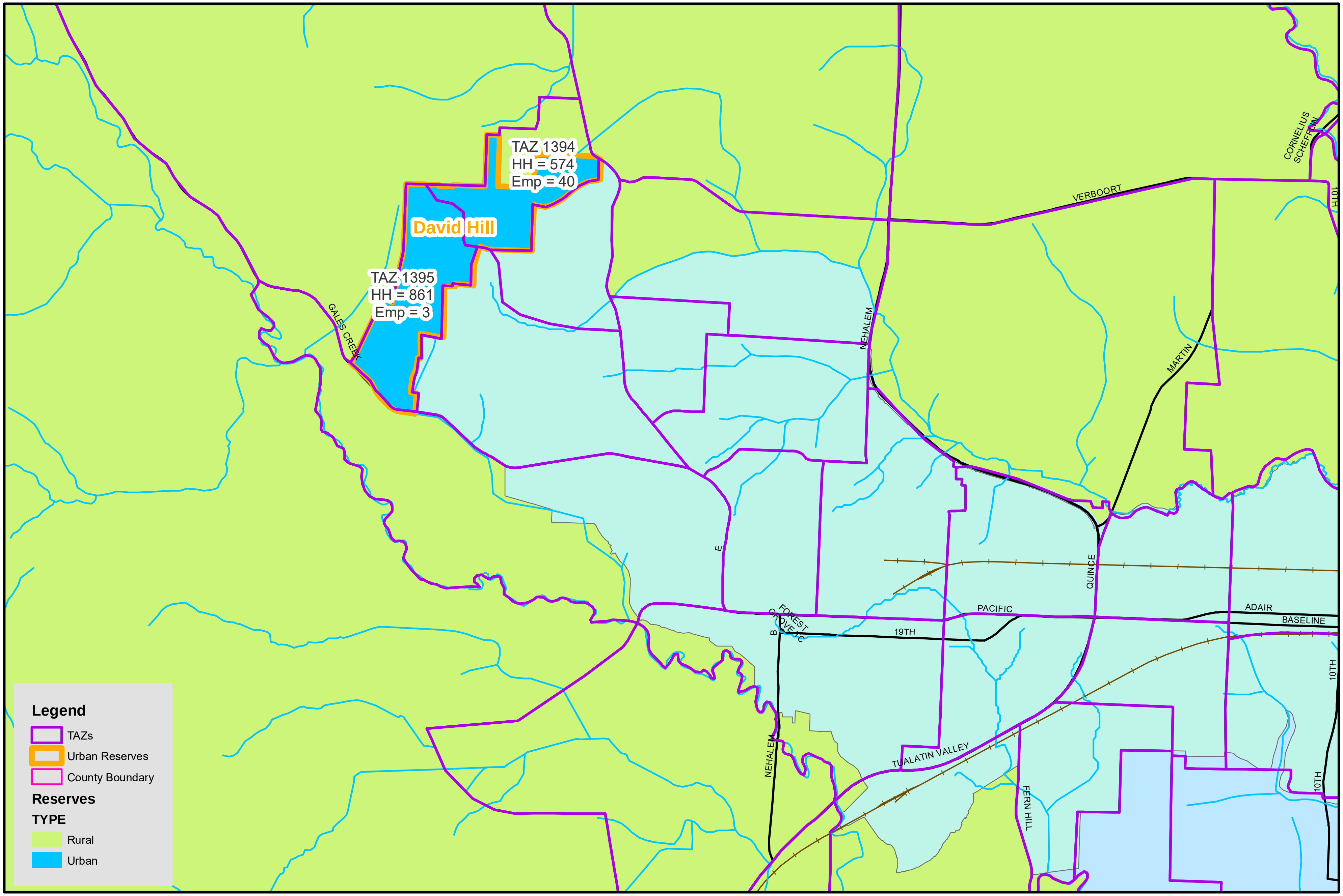
# Preliminary Urban Reserve Buildout Land Use



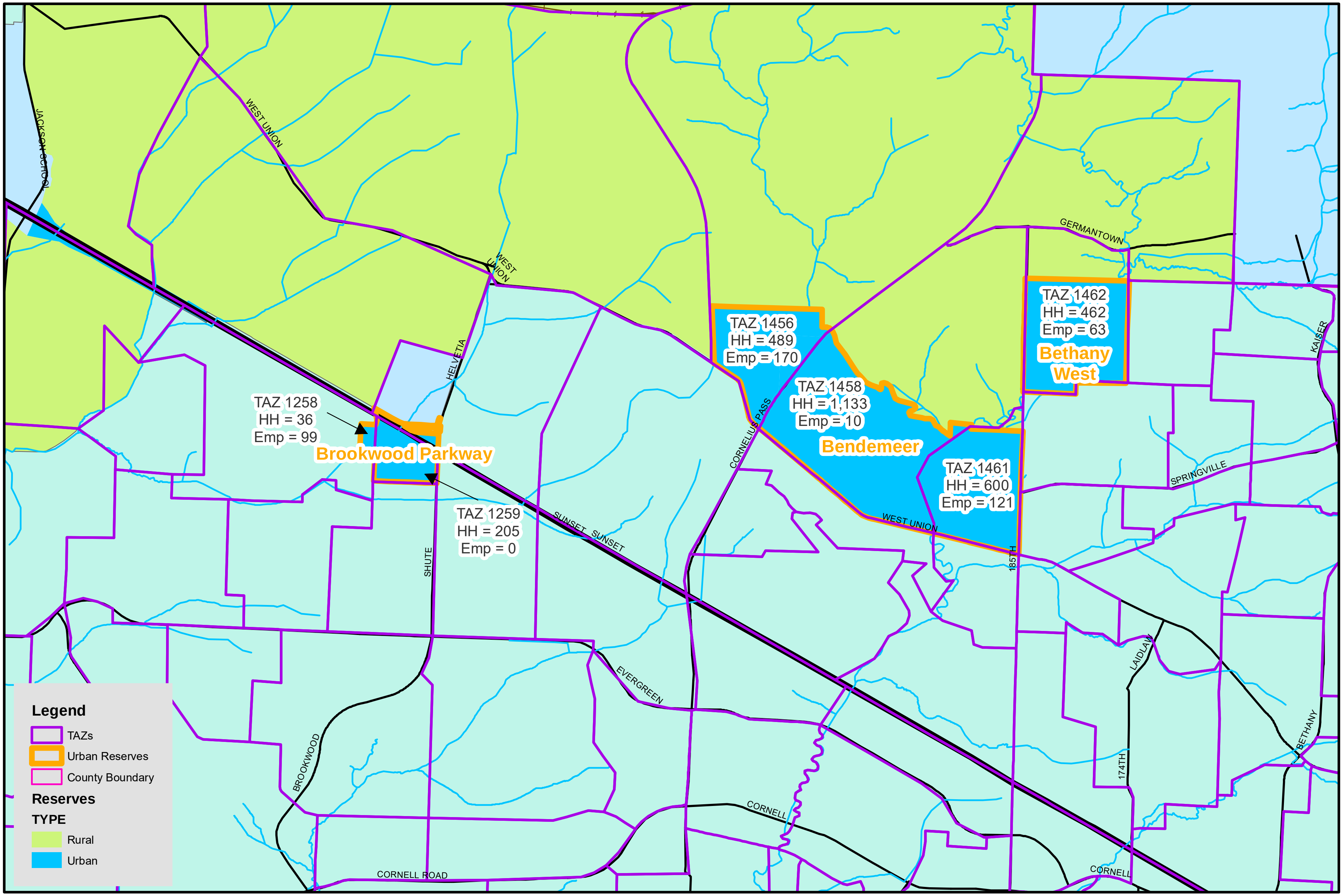
# Preliminary Urban Reserve Buildout Land Use



# Preliminary Urban Reserve Buildout Land Use



# Preliminary Urban Reserve Buildout Land Use



Date: September 11, 2019

To: Urban Reserves Transportation Study Technical Advisory Committee

From: URTS Project Team

**Subject: Proposed Urban Reserves Land Use Assumptions (Revised based on city meetings)**

The project team sent out preliminary land use assumptions for the Washington County urban reserves to the cities on July 3, 2019 for their review. Some cities gave feedback based on preliminary work done for concept planning certain urban reserve areas and/or desired land use assumptions for the future prior to the August 1, 2019 TAC meeting. Since then, Washington County staff has met with several jurisdictions and worked with Angelo Planning Group to develop revised housing and employment estimates based on the cities' expectations and potential land suitability. Generally, changes from the assumptions presented at the TAC include the following:

- Addition of employment areas in I-5 East and Elligsen Road North urban reserves
- Modification of residential and employment assumptions in River Terrace West and River Terrace South urban reserves
- Addition of employment in David Hill urban reserve (small commercial node)
- Slight reduction of residential in Rosa urban reserve (previously called South urban reserve)

The table on the following page has been updated to reflect the most recent land use assumptions, and contains the following information:

- Preliminary assumptions based on the 2018 Metro BLI for dwelling units and the Metro 2040 model inputs for employment
- Adjusted (green) dwelling units and employment as provided at the August 1, 2019 TAC meeting
- Revised (blue) dwelling units and employment based on follow-up meetings and discussions with city staff

The TAZ maps have been revised to reflect the most current future household and employment assumptions and are included for your review.

**Please provide feedback on any of these updated land use assumptions to Washington County staff by Friday, September 20, 2019.** These assumptions are the basis of the travel demand modeling that will begin once we have consensus on the land use assumptions for all urban reserve areas.

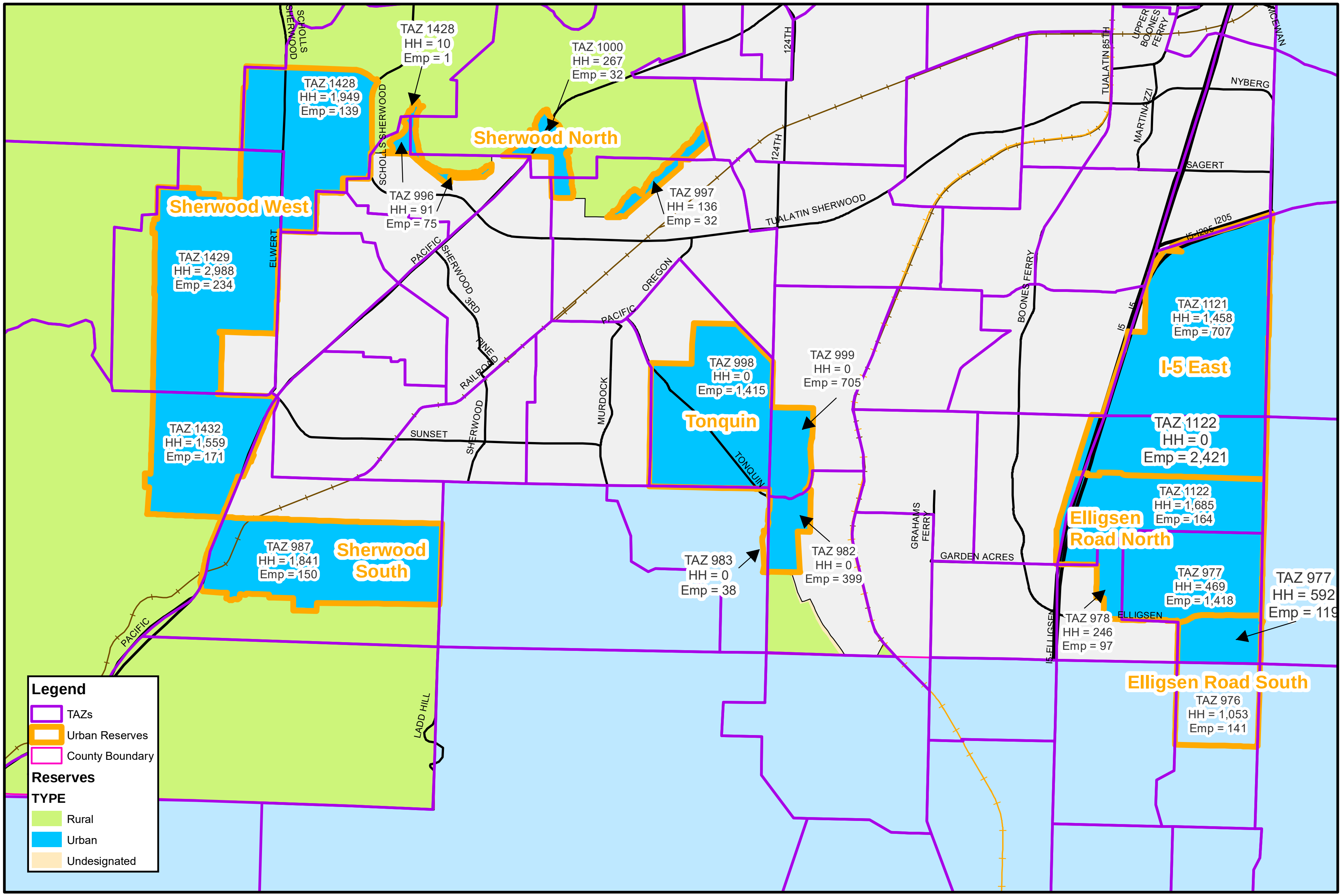
155 N First Avenue, Suite 350, MS 14, Hillsboro, OR 97124-3072 • phone: 503-846-3519 • fax: 503-846-4412
www.co.washington.or.us/lut • lutdev@co.washington.or.us

**Table 1: Washington County Urban Reserve Land Use Assumptions**

| Urban Reserve Area | Total Acreage | Constrained/ Partially Constrained Acreage | Metro BLI Dwelling Units | August Adjusted Dwelling Units | REVISED Dwelling Units | Metro 2040 Model Land Use - Employment | August Adjusted Employment | REVISED Adjusted Employment |
|---|---|---|---|---|---|---|---|---|
| I-5 East | 746 | 86/175 | 4,078 | 4,078 | **1,458** | 195 | 195 | **3,128** |
| Elligsen Road North | 588 | 41/120 | 3,511 | 3,511 | **2,400** | 621 | 621 | **1,678** |
| Elligsen Road South (Wash Co portion) | 252 | 24/24 | 1,645 (592)* | 1,645 (592)* | 1,645 (592)* | 260 (119)* | 260 (119)* | 260 (119)* |
| Tonquin (Wash Co portion) | 559 | 276/155 | 978 | **0** | **0** | 690 (641)* | **2,556 (2518)*** | **2,556 (2518)*** |
| Sherwood South | 421 | 100/111 | 1,841 | 1,841 | 1,841 | 150 | 150 | 150 |
| Sherwood West | 1,159 | 142/229 | 6,495 | 6,495 | 6,495 | 544 | 544 | 544 |
| Sherwood North | 111 | 24/29 | 503 | 503 | 503 | 140 | 140 | 140 |
| Beef Bend South | 493 | 138/74 | 2,304 | **3,576** | **3,576** | 147 | **391** | **391** |
| River Terrace South | 190 | 6/29 | 1,235 | **1,528** | **1,235** | 22 | **1,528** | **1,389** |
| River Terrace West | 301 | 29/92 | 1,574 | **1,916** | **1,574** | 81 | **1,916** | **1,771** |
| Cooper Mountain | 1,210 | 311/506 | 4,116 | **3,760** | **3,760** | 304 | 304 | 304 |
| Rosa | 914 | 399/228 | 2,691 | **3,834** | **3,413** | 481 | 481 | 481 |
| David Hill | 321 | 99/46 | 1,435 | 1,435 | 1,435 | 43 | 43 | **93** |
| Brookwood Parkway | 39 | 7/0 | 242 | 242 | 242 | 99 | 99 | 99 |
| Bendemeer | 535 | 178/92 | 2,221 | 2,221 | 2,221 | 301 | 301 | 301 |
| Bethany West | 166 | 62/7 | 462 | 462 | 462 | 63 | 63 | 63 |
| **Total (Wash Co)** | **8,005** | **1,922/1,917** | **34,278** | **35,994** | **31,207** | **3,951** | **9,413** | **13,169** |

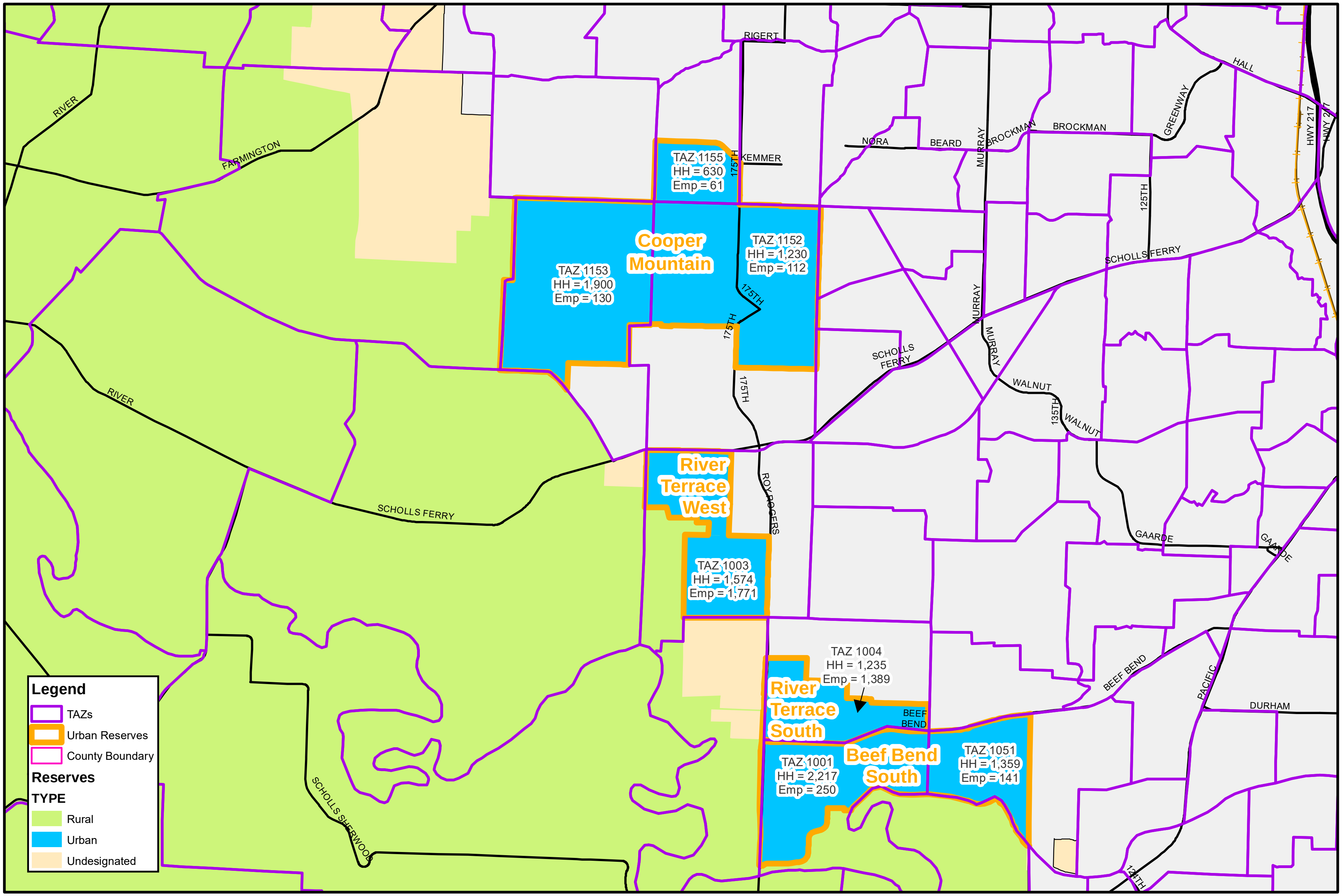
* Washington County portion of reserve

# Proposed Urban Reserve Buildout Land Use



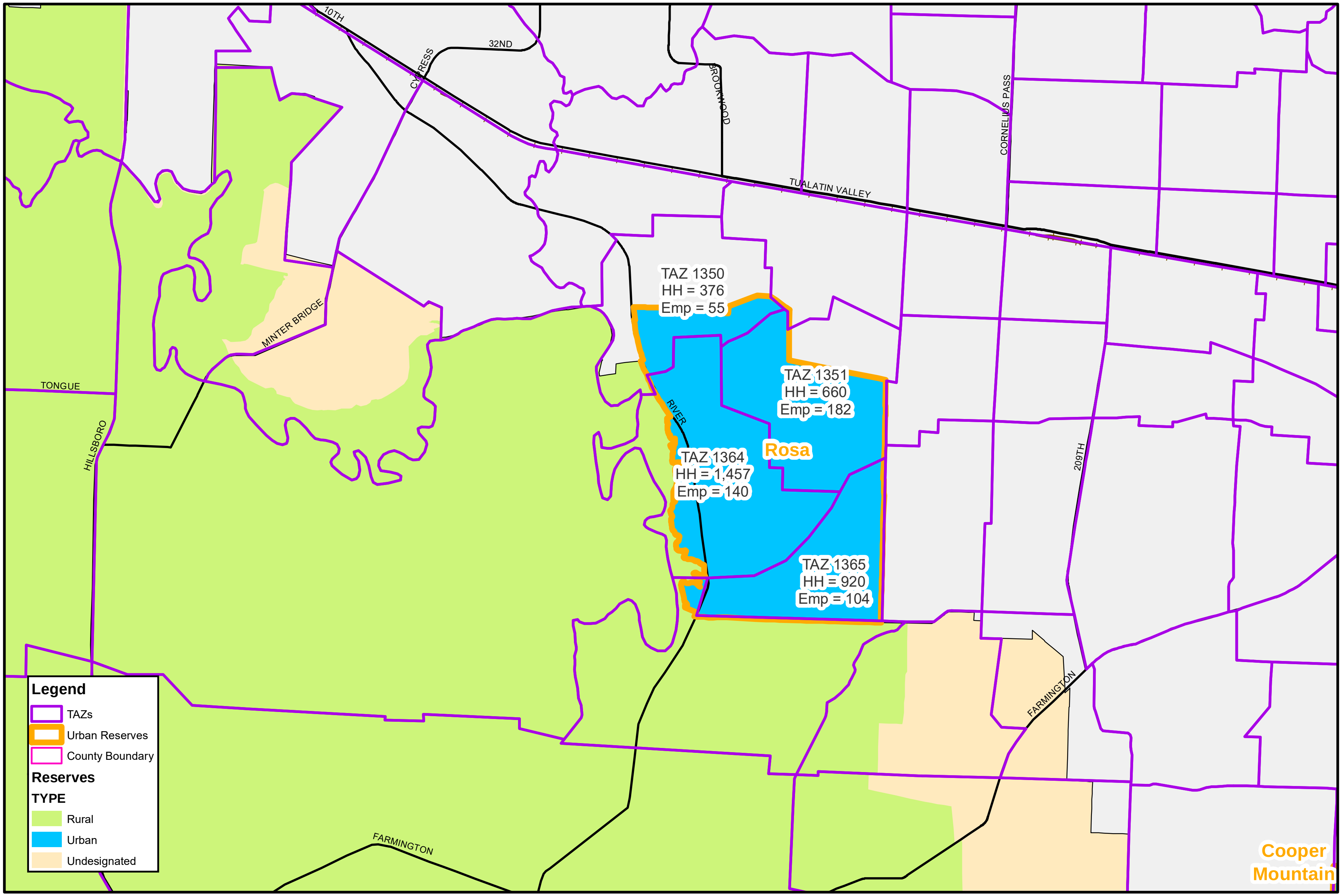

September 11, 2019

# Proposed Urban Reserve Buildout Land Use



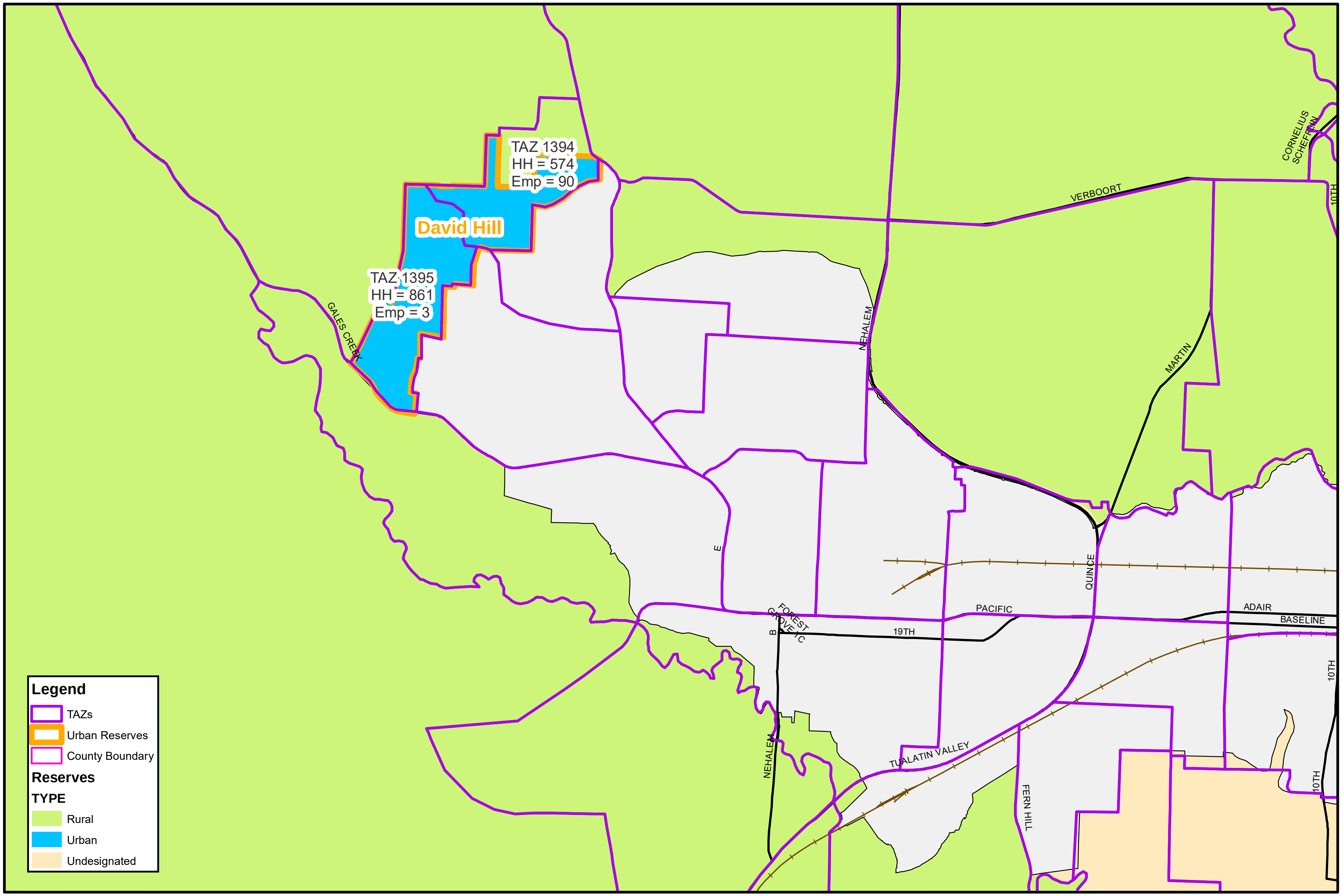

September 11, 2019

# Proposed Urban Reserve Buildout Land Use



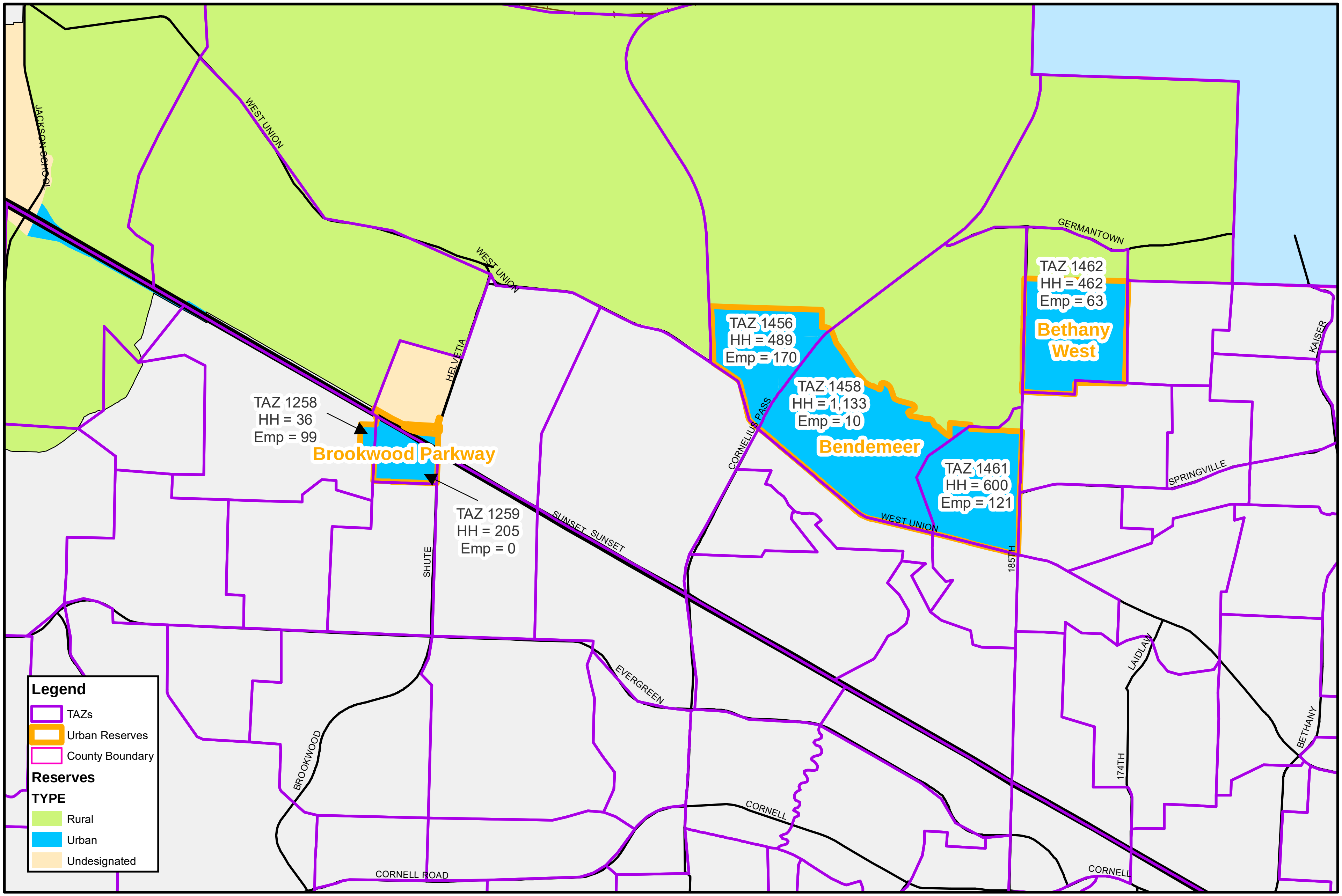

September 11, 2019

# Proposed Urban Reserve Buildout Land Use




September 11, 2019

# Proposed Urban Reserve Buildout Land Use




September 11, 2019

DKS

# List of RTP Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10054 | Clackamas County | 65th/Elligsen/Stafford Intersection Roundabout | 2028-2040 | 65th, Elligsen, Stafford Rd. intersections | 65th, Elligsen, Stafford Rd. intersections | $ 5,846,500 | Implement proven safety counter measure, a roundabout, at a high crash intersection identified in the county adopted TSAP. |
| 10568 | Washington County | Tualatin-Sherwood Rd. Improvements | 2018-2027 | Langer Farms Pkwy. | Teton Ave. | $ 35,000,000 | Widen from three to five lanes with bike lanes and sidewalks. |
| 10590 | Washington County | Tonquin Rd. Improvements | 2018-2027 | Grahams Ferry Rd. | 124th | $ 11,400,000 | Realign and widen to three lanes with bike lanes and sidewalks and street lighting. |
| 11470 | Washington County | Basalt Creek Parkway | 2018-2027 | Grahams Ferry Rd. | Boones Ferry Rd | $ 31,700,000 | Extend new 5 lane Arterial with bike lanes, sidewalks and street lighting. |
| 11487 | Washington County | Boones Ferry Improvements | 2028-2040 | Basalt Creek East-West Arterial | Day Rd. | $ 1,200,000 | Widen from 3 lanes to 5 lanes with bike lanes, sidewalks and street lighting |
| 11903 | Washington County | Roy Rogers Rd. | 2018-2027 | Chicken Creek Bridge | Borchers Rd | $ 11,000,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes |
| 11914 | Washington County | Roy Rogers Rd | 2018-2027 | UGB | Chicken Creek Bridge | $ 25,000,000 | Widen roadway to 4-5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11587 | TriMet | HCT: Southwest Corridor: Capital Construction | 2018-2027 | Bridgeport Village, Tualatin | Downtown Portland | $ 2,300,000,000 | Capital Construction of High Capacity Transit project between Portland and Tualatin via Tigard. |
| 10674 | Sherwood | Oregon-Tonquin Intersection Improvements | 2018-2027 | SW Oregon Street | SW Tonquin Rd | $ 2,400,000 | Reconstruct and realign three leg intersection with a roundabout (partial two-lane roundabout) approx 400 feet northeast of existing roundabout at SW Oregon St & Murdock Rd. ROW, PE, design & construction. Potential for signal in-lieu of dual-roundabout system if better for development and once SW 124th Ave project is completed. If roundabout, project will include rapid flashing beacons at new roundabout and retrofit of adjacent roundabout to meet MUTCD suggestions for pedestrian crossings at roundabouts. This is currently a Washington County facility but would likely become Sherwood's upon completion of project to TSP standards. |
| 10699 | Sherwood | Oregon Street Improvements | 2018-2027 | SW Murdock Rd | SW Langer Farms Pkwy | $ 5,700,000 | Widen existing substandard 2-lane road (no sidewalks, no median) to a 3-lane collector meeting current TSP standards (8' sidewalks, 5' landscape strip, 12' travel, 14' median, 12' travel, 5' landscape, 8' sidewalks, plus 2 on-street bike lanes or 4' added to each 8' sidewalk). On-street bike lanes vs. 2 multi-use paths TBD with future development. |
| 10693 | Sherwood | Ladd Hill Road Improvements | 2028-2040 | SW Sunset Blvd | UGB Southern Boundary (SW Brookman Rd) | $ 6,300,000 | Widen SW Ladd Hill Road to 3-lane collector street standards between SW Sunset Blvd and UGB southern boundary, potentially between SW Brookman Rd improvements. |
| 10680 | Sherwood | Elwert-99W-Sunset Intersection Improvements | 2018-2027 | SW Sunset Blvd. | SW Handley St | $ 12,000,000 | Relocate Kruger Rd intersection 600' northeast along Elwert Rd. Construct roundabout at Elwert-Kruger-Cedar Brook. Widen Sunset Blvd approach. Reconstruct 99W intersection and replace signal. PE, design, ROW acquisition, and construction. Reconstruct widen SW Elwert Rd north to SW Hadley St.. Final alignment and signals vs. roundabouts to be determined soon with pending Sherwood High School relocation and required annexation. |
| 10691 | Sherwood | Sherwood Blvd Improvements | 2028-2040 | SW Century Dr. | SW 3rd St. | $ 2,100,000 | Reonstruct road to 3-lane arterial standards. Median/turn lane, landscape strip, ADA compliant sidewalks. Reconstruct intersection at 3rd St to increase capacity. Assume SW Century Drive improved by development and/or local funds. Cost estimate assumes utilities already underground and existing ROW widths are adequate for low-speed road. Note two public schools along this stretch of SW Sherwood Blvd. Adds bike lanes to existing road w/ 2 14' wide lanes and 14' median-turn lane. |
| 10682 | Sherwood | Brookman Road Improvements | 2018-2027 | SW Pacific Highway | SW Ladd Hill Rd. | $ 15,300,000 | Construct new arterial status roadway between OR 99W and SW Ladd Hill Road. Project development, ROW, PE, design & construction. ROW width to accommodate either 5-lane arterial w/ bike lanes or 3-lane arterial w/ multi-use path integrated with landscaping and sidewalks on both sides. Multi-use path may be widened to 16' or 20' for to accommodate both bicycles & pedestrians with no on-street bike lanes. |

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10681 | Sherwood | Elwert Road Improvements | 2018-2027 | SW Handley St | SW Edy Rd | $ 7,500,000 | Construct arterial status roadway between new roundabout (~800' NW of Pacific Hwy) and SW Edy Rd. |
| 10702 | Sherwood | Edy-Borchers Intersection Improvements | 2018-2027 | SW Borchers Drive | SW Cherry Orchards Place | $ 1,600,000 | Improve intersection capacity and safety. Possible roundabout 400' west of Borchers. Flashing beacons will be added at roundabout crosswalks or ped signals will be added if traffic signal is deemed better treatment as area develops. Project will restrict Borchers movements to right-in/right-out. Can be combined with east end of RTP project no. 10692. |
| 10692 | Sherwood | Edy Rd Improvments | 2018-2027 | SW Elwert Rd | SW Cherry Orchards Pl. | $ 8,800,000 | Reconstruct road to 3-lane collector standards w/ sidewalks and bike lanes. Partial Washington County jurisdictions and assumed to become City's jurisdiction upon completion of project. |
| 11404 | Sherwood | Baler Way Extension | 2018-2027 | SW Langer Farms Parkway | SW Tualatin-Sherwood Road | $ 3,800,000 | Extend SW Baler Way (3-lane collector) between SW Tualatin-Sherwood Road and SW Langer Farms Parkway, possibly SW Pacific Highway depending upon results of widening of SW Tualatin-Sherwood Road project by Washington County. |
| 12045 | Sherwood | Edy-Elwert Intersection Improvements | 2028-2040 | SW Elwert Road | SW Edy Road | $ 2,600,000 | Reconstruct Edy/Elwert intersection and approach roads to arterial standards (roundabout or signal, elevate roadway to increase site distance, etc.) |
| 12046 | Sherwood | Tonquin Area East-West Collector | 2028-2040 | SW 124th Avenue | SW Tonquin Road | $ 10,500,000 | Construct 3-lane collector status road between SW 124th Avenue and SW Tonquin Road through the Tonquin employment area to serve recent UGB annexation area. |
| 12047 | Sherwood | Brookman Road Intersection Realignment | 2028-2040 | SW Pacific Highway | SW Brookman Road | $ 15,500,000 | Realigns and relocates the SW Brookman Road intersection with SW Pacific Highway (OR 99W) to accommodate the expansion of SW Brookman Road for future development |
| 11419 | Tualatin | Boones Ferry Road | 2028-2040 | Ibach | Norwood | $ 1,600,000 | Uprgrade to urban standards and add sidewalks |
| 11431 | Tualatin | Norwood Street Sidewalks and Bike Lanes | 2028-2040 | Boones Ferry Road | East City Limits | $ 5,000,000 | Add sidewalks and bike lanes, upgrade to urban standards. |
| 10716 | Tualatin | Myslony | 2018-2027 | 112th | 124th Ave | $ 10,000,000 | Reconstruct/widen from 112th to 124th to fill system, includes bridge. Improve the intersection of 124th and Myslony. |
| 11417 | Tualatin | Blake Street Extension | 2018-2027 | 115th | 124th Ave | $ 17,000,000 | Extend Blake Street to create an east-west connection between 115th and 124th. Install signal at Blake and 124th. New road section will provide an alternative route for industrial traffic on the high injury corridor: Tualatin/Sherwood Road. |
| 11430 | Tualatin | Helenius | 2018-2027 | 109th | Grahams Ferry Road | $ 1,491,389 | Uprgrade to urban standards |
| 11962 | Tualatin | Grahams Ferry Road | 2028-2040 | SW Ibach Road | Helenius Road | $ 5,048,800 | Upgrade SW Grahams Ferry Road to roadway standards betweeen SW Ibach Road and Helenius Road. |
| 11489 | Wilsonville | Boones Ferry / I-5 off ramp improvements | 2028-2040 | SB I-5 off ramp | Boones Ferry Rd | $ 1,063,000 | construct second right-turn lane |
| 10853 | Wilsonville | Garden Acres Road Extension | 2018-2027 | Day Road | Ridder Road | $ 14,260,000 | Construct three lane road extension with sidewalks and cycle track and reconstruct/reorient Day Road/Grahams Ferry Road/Garden Acres Road intersection. |
| 10588 | Wilsonville | Grahams Ferry Road Improvements | 2028-2040 | Day Road | Washington/ Clackamas County line | $ 13,200,000 | Widen Grahams Ferry Road to 3 lanes, add bike/pedestrian connections to regional trail system and fix (project development only) undersized railroad overcrossing. |
| 11243 | Wilsonville | Day Road Improvements | 2028-2040 | Grahams Ferry Rd. | Boones Ferry Rd. | $ 10,560,000 | Widen street from 3 to 5 lanes with buffered bike lanes, sidewalks and street lighting. Improve structural integrity for increased freight traffic and provide congestion relief. Sidewalk infill and creation of Tonquin Trail multi-use path spur will reduce pedestrian and vehicle conflicts.  Bike buffers will reduce bicycle and freight conflicts. |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 11577 | Washington County | Beef Bend Rd | 2028-2040 | Roy Rogers | HWY 99W | $ 41,900,000 | Widen to three lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 11452 | Washington County | Scholls Ferry Rd. Improvements | 2028-2040 | West of Tile Flat Rd. | | $ 4,600,000 | Realign curves to improve safety and reduce crashes. This project or a portion of the project is located outside the urban growth boundary. |
| 11486 | Washington County | Roy Rogers Rd. | 2018-2027 | Scholls Ferry Rd. | UGB | $ 21,300,000 | Widen to five lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 11903 | Washington County | Roy Rogers Rd. | 2018-2027 | Chicken Creek Bridge | Borchers Rd | $ 11,000,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes |
| 11914 | Washington County | Roy Rogers Rd | 2018-2027 | UGB | Chicken Creek Bridge | $ 25,000,000 | Widen roadway to 4-5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11915 | Washington County | Scholls Ferry Rd | 2018-2027 | Tile Flat Rd. | Roy Rogers Rd. | $ 8,300,000 | Widen roadway to 5 lanes, includes sidewalks and bike lanes. This project or a portion of the project is located outside the urban growth boundary. |
| 11919 | Washington County | Tile Flat Rd | 2018-2027 | UGB | Scholls Ferry Rd. | $ 3,000,000 | Interim 3-lane and north side pedestrian/bicycle improvements. This project or a portion of the project is located outside the urban growth boundary. |
| 12061 | Washington County | 185th Ave (Farmington to Gassner) | 2028-2040 | Farmington Rd. | Gassner Rd. | $ 16,000,000 | Add bike lanes, sidewalks, and turn lanes where appropriate. |
| 12066 | Washington County | 175th Ave (Kemmer Rd to Rigert Rd) | 2028-2040 | Kemmer Rd | Rigert Rd | $ 10,500,000 | Add bike lanes, sidewalks and turn lanes where appropriate. |
| 11892 | Beaverton | Barrows Road Extension at South Cooper Mountain | 2018-2027 | Tile Flat Road | Loon Drive | $ 22,800,000 | Construct new three lane collector street with bike lanes, sidewalks, street trees, and lighting. |
| 11893 | Beaverton | New North-South Collector Road at South Cooper Mountain | 2018-2027 | Scholls Ferry Road (between Tile Flat Road and 175th Avenue) | Urban Growth Boundary | $ 11,000,000 | Construct three lane collector road with bike lanes, sidewalk, street trees and lighting. |
| 11899 | Beaverton | Nora Road/Beard Road Extension and Multimodal Improvements | 2028-2040 | 170th Avenue | Murray Boulevard | $ 11,500,000 | Construct new two lane collector from 170th Avenue to Moonstone Street with bike lanes, sidewalks, street trees, lighting, and turn lanes where needed. Construct turn lanes, bike lanes, and sidewalks where needed from Moonstone Street to Murray Boulevard. |
| 11285 | Hillsboro | Farmington Rd Widening and Bike/Ped Improvements, Phase 2 | 2028-2040 | 198th Ave | 209th Ave | $ 7,000,000 | Widen roadway to five lanes with bike/ped facilities; new signal at 209th Ave |
| 11384 | Hillsboro | Murphy Rd Construction | 2028-2040 | Century Blvd | 209th Ave | $ 8,822,900 | Construct new three-lane roadway with bike/ped facilities; new signals at Cornelius Pass Rd and at 209th Ave |
| 10553 | Hillsboro | 209th Ave Widening and Improvements, Phase 1 | 2018-2027 | TV Hwy | Kinnaman Rd | $ 22,327,000 | Widen roadway from two/three lanes to five lanes; improve from rural to urban standard with bike facilities and sidewalks; improve intersections and railroad crossing; new signals at Blanton and Kinnaman; project to serve South Hillsboro UGB area |
| 11997 | Tigard | River Terrace Blvd | 2018-2027 | Scholls Ferry Rd | south UGB | $ 25,000,000 | New street and trail through new River Terrace Development. |
| 11911 | Hillsboro | Rosedale Rd Turn Lanes and Bike/Ped Improvements | 2028-2040 | Century Blvd (229th Ave) | 209th Ave | $ 10,000,000 | Widen to three lanes with bike/ped facilities; intersection improvements including new roundabout at Cornelius Pass Rd and new signal at 209th Ave; box culverts at Rosedale Creek east and west crossings |
| 11920 | Hillsboro | Cornelius Pass Rd Extension, Phase 2 | 2018-2027 | Blanton St | Vermont St | $ 19,718,650 | Construct five-lane extension with bike/ped facilities; intersection improvements; new signals at Blanton, Kinnaman, McInnis, Butternut Creek, Deline, and Vermont; bridge at Butternut Creek; creek crossings at Gordon Creek and south tributary of Butternut Creek |
| 11921 | Hillsboro | Cornelius Pass Rd Extension, Phase 3 | 2028-2040 | Vermont St | Rosedale Rd | $ 8,450,850 | Construct five-lane extension with bike/ped facilites; signal at Murphy; roundabout at Rosedale |
| | **Not Financially Constrained - Identified in Washington County TSP** | | | | | | |
| | Washington County | 175th "Kink" | TSP | UGB | UGB | | Realign "kink" in 175th Avenue in rural portion (between UGB lines) |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| | Washington County | 175th Avenue | TSP | UGB | Kemmer | | Widen 175th Avenue to 3-lanes north of South Cooper Mountain to Kemmer |
| | Washington County | Grabhorn Road | TSP | UGB | Farmington Road | | Widen Grabhorn Road (including improvement of curves) north of UGB to Farmington Rd. |
| | Washington County | Farmington Road | TSP | 185th Avenue | 209th Ave | | Widen Farmington Road to 5-lanes between 185th Avenue and 209th Avenue |
| | Washington County | 209th Avenue | TSP | Kinnaman Road | Farmington Road | | Widen 209th Avenue to 5-lanes between Kinnaman Road and Farmington Road |
| | Washington County | Kinnaman Road | TSP | 198th Avenue | Farmington Road | | Widen Kinnaman Road to 3-lanes between 198th Avenue and Farmington Road |
| | **Not Financially Constrained - Identified in Cooper Mountain Transportation Study** | | | | | | |
| | Tigard | Jean Louise Road | CMTS | Roy Rogers Road | Roshak Road | | Construct Jean-Louise Road as 3-lanes between Roy Rogers and Roshak |
| | Washington County | Tile Flat Rd Extension | CMTS | Scholls Ferry Road | Bull Mountain Road | | Extend Tile Flat Road from Scholls Ferry Road to Bull Mountain Road (requires land use goal exception) |
| | Washington County | Tile Flat Rd Extension | CMTS | Bull Mountain Road | Beef Bend Road | | Extend Tile Flat Road from Bull Mountain Road to Beef Bend Road (requires land use goal exception) |
| | Washington County | 185th Avenue Extension | CMTS | Gassner Road | Kemmer Road | | Extend 185th Avenue south from Gassner Road to Kemmer Road |
| | Washington County | 185th Avenue Extension | CMTS | Kemmer Road | Weir Road | | Extend 185th Avenue south from Kemmer Road to Weir Road |
| | Washington County | Clark Hill Road | CMTS | Farmington Road | Tile Flat Road | | Improve Clark Hill Road from Farmington Road to Tile Flat Road |
| | Washington County | Cornelius Pass Rd Extension | CMTS | Rosedale Road | Farmington Road | | Extend Cornelius Pass Road from Rosedale Road to Farmington Road (requires land use goal exception) |

# 2018 Metro RTP - 2040 Financially Constrained Roadway Projects

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10575 | Washington County | West Union Rd. | 2018-2027 | Cornelius Pass Rd. | 185th Ave. | $ 22,000,000 | Widen from two to five lanes with bike lanes and sidewalks. This project or a portion of the project is located outside the urban growth boundary. |
| 10587 | Washington County | Cornelius Pass Rd. Improvements | 2018-2027 | Frances St. | T.V. Hwy. | $ 16,000,000 | Widen to five lanes with bike lanes and sidewalks |
| 10565 | Washington County | Springville Rd. Improvements | 2018-2027 | 185th Ave. | Joss St. | $ 11,800,000 | Widen from 2 to five lanes with bike lanes and sidewalks. |
| 11458 | Washington County | Shackelford Rd | 2018-2027 | West property line of Sato Elementary | Kaiser Rd. | $ 10,000,000 | Build new 3 lane road with bike/ped facilities, storm drainage, street lighting to serve North Bethany. |
| 10566 | Washington County | Springville Rd. Improvements | 2018-2027 | Joss St. | Kaiser Rd. | $ 3,800,000 | Widen from two to three lanes with bike lanes and sidewalks. |
| 11448 | Washington County | 198th Ave. Improvements - South | 2018-2027 | T.V. Hwy. | Farmington Rd. | $ 29,700,000 | Add sidewalks, bike lanes, lighting, turn lanes at major intersections. |
| 10571 | Washington County | West Union Rd. Improvements | 2028-2040 | 185th Ave. | 143rd Ave. | $ 29,000,000 | Widen to five lanes from 185th to Laidlaw and from two to three lanes from Laidlaw to 143rd Ave, with bike lanes and sidewalks. |
| 10550 | Washington County | 185th Avenue Improvement | 2018-2027 | Springville Rd. | West Union Rd. | $ 6,000,000 | Widen 185th Ave from two to five lanes with bike lanes and sidewalks to address congestion and address safety. This project or a portion of the project is located outside the urban growth boundary. |
| 12053 | Washington County | Blanton (198th to 209th) | 2018-2027 | 198th Ave | 209th Ave | $ 3,300,000 | Add sidewalks and turn lanes as needed. |
| 10922 | TriMet | HCT: MAX Red Line Improvements Project: Capital Construction | 2018-2027 | Fairplex/Hillsboro Airport MAX | Portland Airport MAX | $ 160,000,000 | Capital construction to enable extension of Red Line service to the Hillsboro Airport/Fair Complex Station and improve reliability of the entire MAX light rail system. Project includes double-tracking and a new inbound Red Line station at Gateway Transit Center, double-tracking at Portland Airport, upgrades to signals and switches along the alignment, and purchase of new light rail vehicles needed to operate the extension and needed storage capacity at Ruby Junction to house the new vehicles. |
| 10784 | Forest Grove | David Hill Road Improvement | 2018-2027 | Thatcher Road | West UGB | $ 10,000,000 | Improve David Hill Road west of Thatcher Road to collector road standards to improve pedestrian and bicycle safety and improve multimodal access from nearby neighborhoods to community park. |
| 10773 | Forest Grove | Thatcher Road Improvement | 2028-2040 | Purden Road | Gales Creek Road | $ 18,800,000 | Improve Thatcher Road to arterial design standards and improve intersection with Gales Creek Road. |
| 11973 | Forest Grove | Gales Creek Road Improvement | 2028-2040 | Thatcher Road | Forest Gale Drive/Willamina Avenue | $ 1,000,000 | To enhance the pedestrian safety by connecting gaps, improve bike lane safety, some storm drainage and road improvements. |
| 11273 | Hillsboro | Blanton Street Extension | 2018-2027 | 67th Ave & Alexander St intersection | 209th Ave & Blanton St intersection | $ 7,441,000 | Construct three-lane east-west roadway extension with bike/ped facilities through future South Hillsboro development including new signals at Cornelius Pass Rd, 209th Ave, and three intersecting streets through South Hillsboro town center |
| 11387 | Hillsboro | Meek Rd Improvements, Phase 1 | 2028-2040 | Sewell Rd | Starr Blvd | $ 6,909,500 | Widen and improve roadway to three lanes with bike/ped facilities |
| 11385 | Hillsboro | 67th Ave Railroad Crossing Closure, Turn Lanes and Bike/Ped Improvements | 2018-2027 | Alexander St | Century Blvd & Kinnaman Rd (future intersection) | $ 5,600,000 | Improve roadway to urban collector standard with turn lanes, bike lanes, and sidewalks from Alexander to new Century/Kinnaman intersection; close off intersection with TV Hwy and railroad, reclassify segment from Alexander to dead-end at TV Hwy as local street |
| 11384 | Hillsboro | Murphy Rd Construction | 2028-2040 | Century Blvd | 209th Ave | $ 8,822,900 | Construct new three-lane roadway with bike/ped facilities; new signals at Cornelius Pass Rd and at 209th Ave |
| 11388 | Hillsboro | 30th Ave Construction | 2028-2040 | Evergreen Rd | Meek Rd | $ 10,500,000 | Construct three-lane industrial collector with bike/ped facilities |
| 11147 | Hillsboro | Schaaf Rd Reconstruction | 2018-2027 | Helvetia Rd | New north-south collector | $ 4,252,000 | Reconstruct rural gravel road to three-lane roadway with bike/ped facilities |
| 10820 | Hillsboro | Brookwood Ave Improvements | 2018-2027 | Alexander St | Oakhurst St | $ 1,807,100 | Widen to two lanes with onstreet parking and sidewalks from Alexander to Davis; widen to three lanes with bike/ped facilities from Davis to Oakhurst (UGB) |
| 11383 | Hillsboro | New North-South Collector (North Hillsboro) | 2018-2027 | Jacobsen Rd | Schaaf Rd | $ 2,657,500 | Construct three-lane roadway with bike/ped facilities |

| RTP ID | Nominating Agency | Project | Time Period | Project Start Location | Project End Location | Estimated Cost | Description |
|---|---|---|---|---|---|---|---|
| 10839 | Hillsboro | Century Blvd Turn Lanes and Bike Lanes (Witch Hazel) | 2018-2027 | Alexander Rd | Davis Rd | $ 4,252,000 | Widen roadway to add center turn lane and bike lanes |
| 11364 | Hillsboro | Starr Blvd Reconstruction and Improvements, Phase 2 | 2018-2027 | Huffman St (future extension) | Meek Rd | $ 4,252,000 | Construct three-lane road with bike/ped facilities |
| 10818 | Hillsboro | Century Blvd Extension and Improvements (Baseline to Lois) | 2018-2027 | Baseline Rd | Lois St | $ 14,111,000 | Construct and widen roadway including bridge across Rock Creek to three lanes with bike/ped facilities; realign north leg of intersection at Lois to match south leg |
| 10553 | Hillsboro | 209th Ave Widening and Improvements, Phase 1 | 2018-2027 | TV Hwy | Kinnaman Rd | $ 22,327,000 | Widen roadway from two/three lanes to five lanes; improve from rural to urban standard with bike facilities and sidewalks; improve intersections and railroad crossing; new signals at Blanton and Kinnaman; project to serve South Hillsboro UGB area |
| 11272 | Hillsboro | Kinnaman Rd Extension | 2018-2027 | Century Blvd & 67th Ave (future intersection) | 209th Ave & Kinnaman intersection | $ 8,397,700 | Construct three-lane roadway extension with bike/ped facilities through future South Hillsboro development; include new roundabout at Century and new signals at Cornelius Pass Rd, 209th Ave, and two intersecting future neighborhood streets |
| 11274 | Hillsboro | Century Blvd Extension (South Hillsboro) | 2018-2027 | Davis Rd | Kinnaman Rd | $ 3,189,000 | Construct three-lane roadway with bike/ped facilities |
| 10838 | Hillsboro | Davis Rd Turn Lanes and Bike/Ped Improvements | 2018-2027 | Brookwood Ave | Century Blvd | $ 2,870,100 | Widen roadway to add center turn lane and bike/ped facilities |
| 11137 | Hillsboro | TV Hwy & Century Blvd Intersection Improvements | 2018-2027 | Alexander St | Johnson St | $ 10,473,000 | Add second northbound and southbound through lane (maintain northbound and southbound left-turn lane); add eastbound bus bay; improve rail crossing; add bike facilities on Century Blvd from TV Hwy to Alexander |
| 11394 | Hillsboro | Century Blvd Turn Lanes and Bike/Ped Improvements (South Hillsboro) | 2028-2040 | Kinnaman Rd | Rosedale Rd | $ 9,779,600 | Widen roadway to three lanes with bike/ped facilities, include roundabout at Kinnaman, and crossing at Butternut Creek and culvert south of Rosa |
| 10831 | Hillsboro | Century Blvd Extension and Over-Crossing (North Hillsboro) | 2028-2040 | Bennett St | Wagon Wy | $ 13,733,960 | Construct three-lane road including US 26 overpass with bike/ped facilites; connect existing segments to provide new north-south connectivity |
| 10821 | Hillsboro | Huffman St Extension, Phase 1 | 2018-2027 | Brookwood Pkwy | Sewell Rd | $ 8,387,070 | Construct five-lane road with bike/ped facilites |
| 11393 | Hillsboro | US 26 Widening - Brookwood to Cornelius Pass | 2028-2040 | Brookwood Pkwy/Helvetia Rd | Cornelius Pass Rd | $ 26,575,000 | Widen US 26 from four to six lanes |
| 11907 | Hillsboro | Jackson School Rd Improvements | 2028-2040 | Evergreen Rd | Storey Creek (UGB) | $ 11,400,000 | Improve roadway from rural to urban standard and widen to three lanes with bike/ped facilities. This project or a portion of the project is located outside the urban growth boundary. |
| 11909 | Hillsboro | Hidden Creek Dr Extension | 2018-2027 | 47th Ave | 53rd Ave | $ 8,000,000 | Construct two-lane roadway extension with bike/ped facilities |
| 11910 | Hillsboro | Meek Rd Improvements, Phase 2 | 2028-2040 | Jackson School Rd | Sewell Rd | $ 3,000,000 | Improve Meek Rd to address safety for industrial access to/from Jackson School Rd. This project or a portion of the project is located outside the urban growth boundary. |
| 11911 | Hillsboro | Rosedale Rd Turn Lanes and Bike/Ped Improvements | 2028-2040 | Century Blvd (229th Ave) | 209th Ave | $ 10,000,000 | Widen to three lanes with bike/ped facilities; intersection improvements including new roundabout at Cornelius Pass Rd and new signal at 209th Ave; box culverts at Rosedale Creek east and west crossings |
| 11920 | Hillsboro | Cornelius Pass Rd Extension, Phase 2 | 2018-2027 | Blanton St | Vermont St | $ 19,718,650 | Construct five-lane extension with bike/ped facilities; intersection improvements; new signals at Blanton, Kinnaman, McInnis, Butternut Creek, Deline, and Vermont; bridge at Butternut Creek; creek crossings at Gordon Creek and south tributary of Butternut Creek |
| 11921 | Hillsboro | Cornelius Pass Rd Extension, Phase 3 | 2028-2040 | Vermont St | Rosedale Rd | $ 8,450,850 | Construct five-lane extension with bike/ped facilites; signal at Murphy; roundabout at Rosedale |

## Additional Projects included in 2040 Build Model

| RTP ID | Project Name | Start Location | End Location | Description | DKS Assumptions for Synchro | Estimated Cost (2016 dollars) | Time Period | Financially Constrained project list |
|---|---|---|---|---|---|---|---|---|
| 11436 | East-West Arterial Overcrossing | Boones Ferry Rd | East of I-5 | Extend new 4-lane overcrossing over I-5 from Boones Ferry Rd to 65th and Stafford Rd. The project or a portion of the project is outside the designated urban growth boundary. | Modeled to meet with intersection of Century Drive/Ellingsen Road | $ 40,400,000 | 2028-2040 | No |
| 11456 | Shackelford Road | 185th Avenue | Bridge | Build 3 lane road with bike/ped facilities, storm drainage, street lighting to serve North Bethany. The project or a portion of the project is outside the designated urban growth boundary | | $ 12,800,000 | 2028-2040 | No |
| 11457 | Shackelford Road Bridge | | | Build 3 lane road with bike/ped facilities, storm drainage, street lighting to serve North Bethany. The project or a portion of the project is outside the designated urban growth boundary | | $ 15,600,000 | 2028-2040 | No |
| 11478 | 185th Avenue Improvements | Shackelford Rd. | Springville Rd. | Widen from two lanes to three lanes with bike lanes and sidewalks. The project or a portion of the project is outside the designated urban growth boundary. | | $ 60,600,000 | 2028-2040 | No |
| 11490 | Day Rd Overcrossing | Boones Ferry Rd | Elligsen Rd | Extend new 4-lane overcrossing over I-5 from Boones Ferry Rd to Elligsen Rd. The project or a portion of the project is outside the designated urban growth boundary. | Modeled to meet with intersection of Century Drive/Ellingsen Road | $ 46,900,000 | 2028-2040 | No |
| 12046 | Tonquin Area East-West Collector | SW 124th Avenue | SW Tonquin Road | Construct 3-lane collector status road between SW 124th Avenue and SW Tonquin Road through the Tonquin employment area to serve recent UGB annexation area. | | $ 10,500,000 | 2028-2040 | Yes |

# Transportation Modeling Assumptions

# URTS Transportation Modeling Assumptions

Global assumptions:

- New collectors – 30 mph, 1.5 lanes, 900 app cap
- New arterials – 35 mph, 1.5 lanes, 900 app cap

### Roadway Specific Modeling Assumptions

| Roadway Impacted | Previous Model Characteristics | URTS Assumptions<br>(consistent with global assumptions) |
|---|---|---|
| Rosedale Road | 45 mph<br>1 lane<br>500 veh capacity | 30 mph<br>1.5 lanes<br>900 veh capacity |
| Gales Creek Road | 45 mph<br>1 lane<br>700 veh capacity | 45 mph<br>1.5 lanes<br>900 veh capacity |
| 175th Avenue<br>(north of "kink") | 45 mph<br>1 lane<br>700 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |
| Jean-Louise Road | Not shown extended west to the Tile Flat extension | Connected to Tile Flat extension |
| Bull Mountain Road | 35 mph<br>1 lane<br>700 veh capacity | 30 mph<br>1.5 lanes<br>900 veh capacity |
| Elsner Road | 40 mph<br>1 lane<br>500 veh capacity | 30 mph<br>1.5 lanes<br>900 veh capacity |
| LeBeau Road | 40 mph<br>1 lane<br>700 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |
| Elwert Road | 40 mph<br>1 lane<br>500 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |
| 65th Avenue | 40 mph<br>1 lane<br>700 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |
| Elligsen Road | 40 mph<br>1 lane<br>700 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |
| Stafford Road | 45 mph<br>1 lane<br>700 veh capacity | 35 mph<br>1.5 lanes<br>900 veh capacity |

# Washington County Roadway Design Standards

**Table 3.9: Functional Classification Design Parameters**

| Roadway Classification | Lanes[1] | Bike Lanes[2] | Max ROW[3] | Max Paved Width[3] |
|---|---|---|---|---|
| Principal Arterials & Arterials[4,5] | 7 | Yes | 122 Feet | 98 Feet |
| | 5 | Yes | 98 Feet | 74 Feet |
| | 3 | Yes | 90 Feet | 50 Feet |
| | 2 | Yes | 90 Feet | 48 Feet |
| Arterials with Streetscape Overlay[4,5,6] | 5 | Yes | 102 Feet | 74 Feet |
| | 3 | Yes | 90 Feet | 50 Feet |
| Arterials with Enhanced Major Street Bikeway[4,5,7] | 5 | Yes | 102 Feet | 78 Feet |
| | 3 | Yes | 90 Feet | 54 Feet |
| Arterials w/ Streetscape Overlay and Enhanced Major St Bikeway[4,5,6,7] | 5 | Yes | 106 Feet | 78 Feet |
| | 3 | Yes | 90 Feet | 54 Feet |
| Collectors[4] | 5 | Yes | 98 Feet | 74 Feet |
| | 3 | Yes | 74 Feet | 50 Feet |
| | 2 | Yes | 74 Feet | 50 Feet |
| Collectors with Streetscape Overlay[4,6] | 5 | Yes | 102 Feet | 74 Feet |
| | 3 | Yes | 78 Feet | 50 Feet |
| Collectors with Enhanced Major Street Bikeway[4,7] | 5 | Yes | 102 Feet | 78 Feet |
| | 3 | Yes | 78 Feet | 54 Feet |
| Collectors w/ Streetscape Overlay & Enhanced Major St Bikeway[4,6,7] | 5 | Yes | 106 Feet | 78 Feet |
| | 3 | Yes | 82 Feet | 54 Feet |
| Special Area Collectors[5] | 3 | Yes | 52 Feet | 46 Feet |
| | 2 | Yes | 40 Feet | 34 Feet |
| Neighborhood Routes | 2 | No | 60 Feet | 36 Feet |
| Special Area Neighborhood Routes[5] | 2 | No** | 44 Feet | 38 Feet |
| Commercial/Industrial | 4 | No | 70 Feet | 50 Feet |
| | 3 | Yes | 64 Feet | 50 Feet |
| | 2 | No | 64 Feet | 34 Feet |
| Special Area Commercial Streets[5] | 4 | No** | 70 Feet | 64 Feet |
| | 3 | No** | 58 Feet | 52 Feet |
| | 2 | No** | 46 Feet | 40 Feet |
| Locals | 24’ Travel Way | No | 60 Feet | 32 Feet |
| Special Area Local Streets[5] | 16’ Travel Way | No | 38 Feet | 32 Feet |

**Consult the roadway freight map for additional design considerations.*
***While these facilities do not include bike lanes, they do include wide travel lanes of 14 feet due to constrained right-of-way width – see Footnotes 2 and 5.*

*Footnotes:*
*1. The maximum number of travel lanes that can be built without a plan amendment is identified on the “Road Lane Numbers” Map except for roads allowed to be built as provided by the Community Development Code (CDC). This plan-level decision establishes the transportation system capacity necessary to adequately serve future travel demand identified in the TSP. The number of lanes required to accommodate turning movements at intersections and interchanges will be determined through traffic analysis conducted during the transportation project development process. This project-level decision identifies physical improvements necessary at or near intersections and interchanges to safely and efficiently move toward attaining the system capacity identified in the TSP. Improvements may include turn lanes and auxiliary lanes adjoining the traveled roadway to accommodate weaving, merging, speed changes or other purposes supplementary to through traffic movement. Auxiliary lanes to address spot area capacity and safety needs may extend between intersections (including interchanges) and beyond an intersection. Opportunities for public participation are available as provided by the CDC.*

ADOPTED TEXT

*2. Bikeways or bicycle lanes are required on all urban Collectors and Arterials, including Special Area Collectors. A Six-foot wide, striped and stenciled bike lane or other appropriate bicycle treatments shall be constructed along these facilities except where special constraints exist, as determined by the County Engineer. In those areas, five-foot wide bike lanes, 14-foot wide outside travel lanes or other appropriate facilities may be used and transitioned back to the appropriate bicycle facility when the constraint ends. The Bicycle Facility Design Toolkit should be referenced during the design of urban Collectors and Arterials. Outside of the UGB, refer to the Bicycle System Map and the Rural Roadway Enhancement Study Corridors Map to determine which facilities are intended to have bikeways. Rural bikeways may be a minimum of six-foot wide paved shoulders.*

*3. Minimum right-of-way and maximum paved widths identified here are, as a rule, the maximum that can be built on roadway segments without an amendment to the TSP. However, plan amendments will not be required when it is determined by the County Engineer during the project development or development review processes that these maximums should be exceeded. The reasons to exceed the maximums may include accommodation or topography or other project-level refinements associated with safety and/or wider bicycle and/or pedestrian facilities; transit facilities ; on-street parking; project impact mitigation measures; and intersection, interchange or other project features identified as necessary for safe, efficient operation of the planned transportation system. All intersections along Arterials and Collectors shall be planned to include right-of-way necessary for turn lanes within 1,000 feet of intersections based on a 20year analysis of intersection needs. Actual right-of-way requirements may be less than the maximums specified in the table based on roadway characteristics and surrounding land uses, as determined by the County Engineer. On two and three lane urban Collectors, right-of-way may by reduced to 60 feet and maximum paved width may be reduced to 36 feet through the land development or project development processes. Such a determination can be made when there is a finding that a turn lane is reasonably unlikely to be needed based on anticipated future development and traffic analysis, and after consideration of other related transportation facilities including storm water quality facilities. Acquiring adequate right-of-way is important to avoid unnecessary and costly future improvement impacts. In all circumstances, Arterial, Collector and Neighborhood Route right-of-way shall be no less than the roadway width (curb to curb or back of shoulder to back of shoulder) plus 24 feet. In rural areas, the maximum right-of-way for Collectors shall be 60-feet. Article VII of the CDC identifies land use standards, public notice and involvement provisions and appeal opportunities that are provided in the land use permitting process.*

*4. On those roadways designated on the Pedestrian System Map as 'Pedestrian Parkway', 'Streetscape Overlay', or located within identified 'Pedestrian Districts', sidewalks widths and other design features such as planter areas and crosswalks should be determined based on the Washington County Pedestrian Enhancements Design Guidelines and/or applicable standards in the Community Plans and/or the CDC, as determined by the County Engineer. On those roadways designated on the Bicycle System Map as 'Enhanced Major Street Bikeway', buffered bike lanes and other bicycle treatments shall be determined based on the Bicycle Facility Design Toolkit and/or other applicable standards in the Community Plans and/or CDC, as determined by the County Engineer.*

*5. 'Special Area' streets (Collector, Neighborhood, Commercial or Local classifications) are shown on the 'Special Area Street Overlay' maps. Special Area Local Streets may also be designated in the appropriate Community Plans and/or by the CDC. Additional Special Area Neighborhood Routes and Special Area Local Streets may be designated using the development review process. Special Area Street designs will be determined via the development review process. While Special Area Commercial Streets do not include striped bicycle lanes, they shall include wide travel lanes of 14 feet to accommodate bicycle use. For Special Area Collectors, in addition to the right-of-way, a nine-foot minimum utility/sidewalk easement shall be dedicated on each side of the right-of-way. For Special Area Local streets, in addition to the right-of-way, a ten-foot minimum utility/sidewalk easement shall be dedicated on each side of the right-of-way. For Special Area Alleys, additional right-of-way may be required as part of development review. The right-of-way determination may include special consideration of other related transportation and water quality facilities, such as (but not limited to): low impact water quality treatment, parking, intersection bump outs, mid-block crossings and/or trail extensions.*

*6. Consult the Pedestrian System Map for the Streetscape Overlay definition and location.*

*7. Consult the Bicycle System Map for the Enhanced Major Street Bikeway definition and location.*

ADOPTED TEXT

## Interim Functional Classification Designations

Some roadways in Washington County have an interim Functional Classification designation. These are roadways where the designation is expected to change once planned elements of the system have been completed. These roadways/locations are described below.

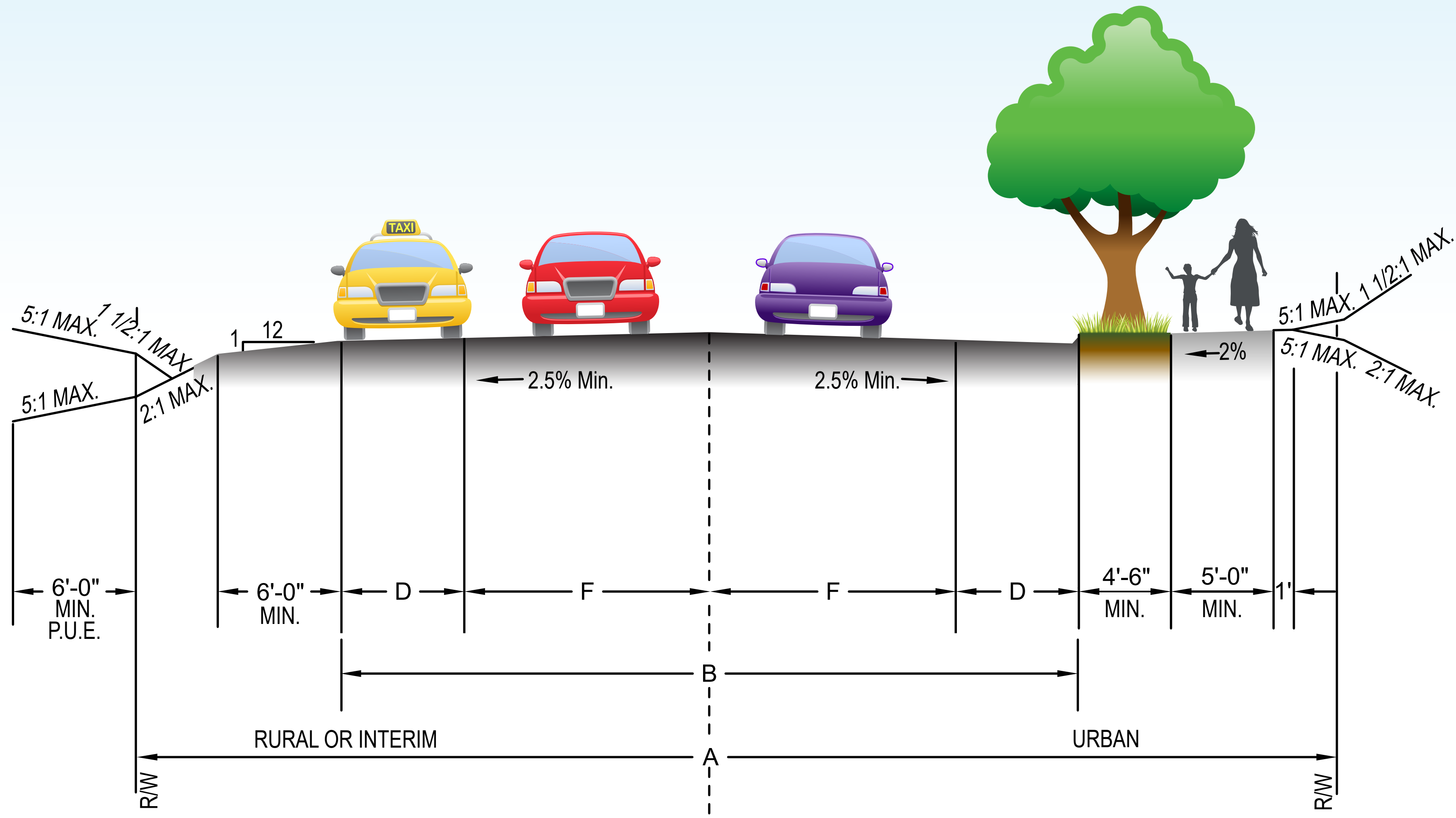
### Joss Avenue

NW Joss Avenue is designated as an Interim Collector on the Functional Classification Map. It is anticipated that NW Joss Avenue ultimately will be reclassified to its expected function as a Neighborhood Route after the construction of Shackelford Road to NW 185th Avenue. See the *Bethany Community Plan* (Chapter 2: North Bethany Subarea Plan) for additional details.

### Saltzman Road

The segment of NW Saltzman Road between NW Laidlaw Road and NW Bayonne Lane is anticipated to be realigned west of its current alignment, to the intersection of NW Laidlaw Road at NW 130th Avenue. The realigned segment of Saltzman Road is designated on the Functional Classification Map as a Proposed Collector. Interim improvements to the existing alignment may be implemented to enhance the operation of the facility until the realignment has been completed. After the realignment of Saltzman Road is in place, it is anticipated that the current alignment of Saltzman will be reclassified consistent with its new function as either a Neighborhood Route or a Local Street. The appropriate classification will be determined based upon observed traffic operations and needs after the realignment is complete.

# Neighborhood Route Section




NOT DRAWN TO SCALE

*DESIGN SPEED 25 MILES PER HOUR*

| Road Clasification | Washington County Designation | Right of Way (Feet) | Paved Width (Feet) | Number of Lanes | Bike Lane | Parking Lane | Travel Lane(s) | Parking Allowed |
|---|---|---|---|---|---|---|---|---|
| Neighborhood Routes | | A | B | | D | D | F | |
| | NR-1 | 60 | 28*‡~ | 2 | 0 | 0 | 14 | NONE |
| | NR-2 | 60 | 32*‡~ | 2 | 0 | 8 | 12 | ONE SIDE |
| | NR-3 | 60 | 36 | 2 | 0 | 8 | 10 | BOTH SIDES |
| | NR-4 | 60 | 36 | 2 | 6 | 0 | 12 | NONE |
| | NR-5 | 50 ~ | 28 | 2 | 0 | 0 | 14 | NONE |
| | NR-6 | 50 ~ | 32 | 2 | 0 | 8 | 12 | ONE SIDE |

*GRAVEL SHOULDERS AND DITCHES ALLOWED FOR THESE WIDTHS ONLY. STANDARD INTERIM SECTION.
‡ P.U.E.'S REQUIRED OUTSIDE OF R/W IF SHOULDERS AND DITCHES USED.
~ FOR THESE SECTIONS, 60 FEET OF R/W FOR 200 FEET FROM THE INTERSECTIONS WITH ALL COLLECTOR OR ARTERIALS SHALL BE DEDICATED AND A 36 FOOT SECTION BUILT AT SUBJECT INTERSECTIONS.

*The applied "Washington County Designation" is determined by the county's transportation plan and the land use decision.*

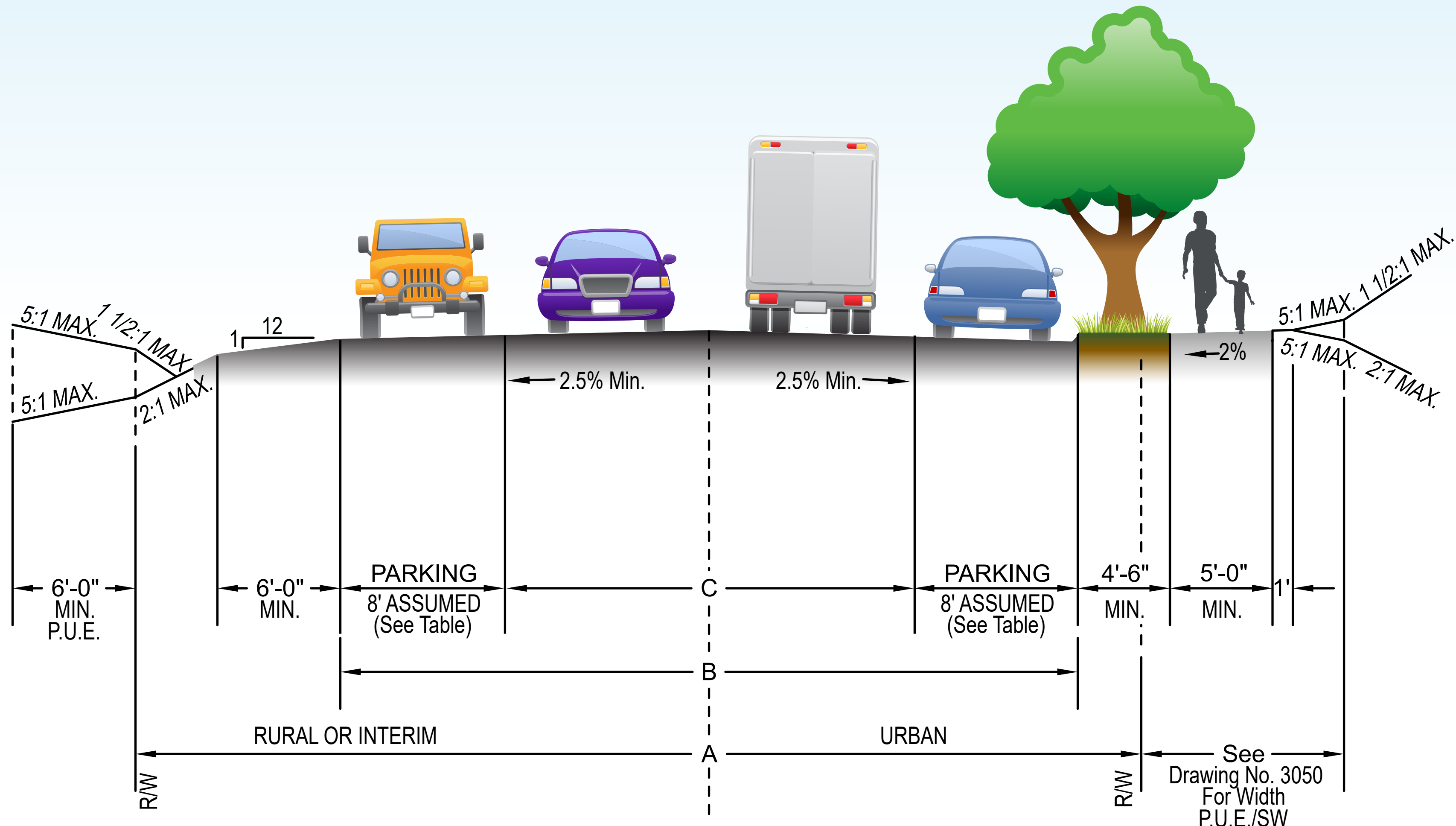
**Neighborhood Route Road Section**

Washington County Exhibit #: 3

Effective Date:

Washington County
Department of Land Use
& Transporation
Engineering Section

# Local Road Section (Minimum)




*DESIGN SPEED 25 MILES PER HOUR*

| Road Classification | Washington County Designation | Right of Way (Feet) | Paved Width (Feet) | Traveled Way | Parking Allowed |
|---|---|---|---|---|---|
| Local Roads(Standard) | | A | B | C | |
| | L-1 | 50 | 24* | 24 | NONE |
| | L-2 | 38 | 32 | 16 | BOTH SIDES |
| | L-3 | 34 | 28*** | 12 | BOTH SIDES |
| | L-4 | 30 | 24 | 16 | ONE SIDE |
| Local Roads (Alternate)[1] | L-5 | 26 | 20 | 20 | NONE |

* GRAVEL SHOULDERS AND DITCHES ALLOWED FOR THESE WIDTHS ONLY. STANDARD INTERIM SECTION.

*** PARKING SHALL BE PROHIBITED WITHIN 50' OF A PUBLIC STREET INTERSECTION.

1) USE OF THE DESIGN STANDARDS FOR ALTERNATE LOCAL ROADS REQUIRES APPROVAL THROUGH THE LAND USE PROCESS.
USE OF NEIGHBORHOOD TRAFFIC MANAGEMENT DEVICES ARE PERMITTED ON THE MODIFIED LOCAL ROADS AND SHALL BE PLACED AS DETERMINED THROUGH THE LAND USE PROCESS AND SHALL MEET THE STANDARDS FOR NEIGHBORHOOD TRAFFIC MANAGEMENT DEVICES AS SPECIFIED HEREIN.

*The applied "Washington County Designation" is determined by the county's transportation plan and the land use decision.*

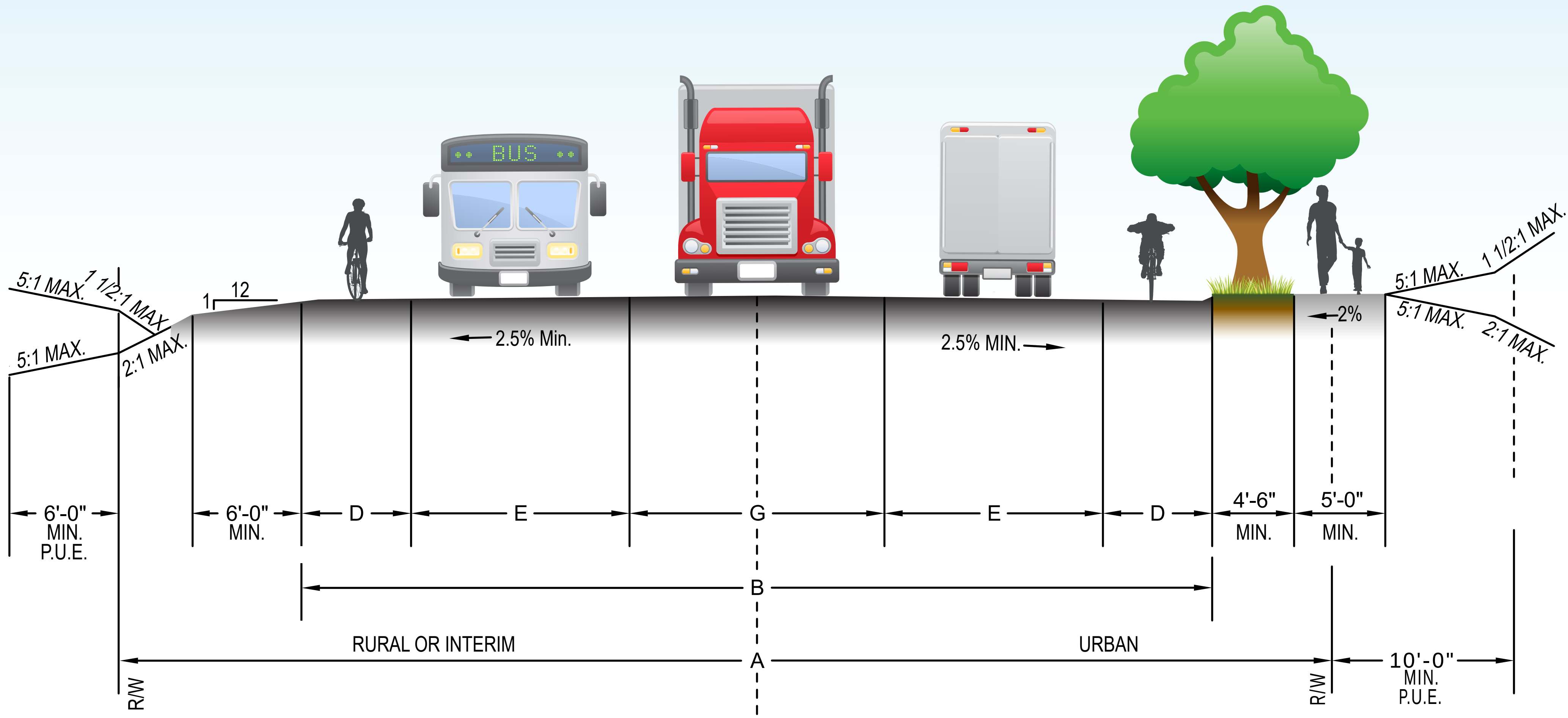
**Local Road Section**

Washington County Exhibit #: 4

Effective Date:

Washington County Department of Land Use & Transporation Engineering Section

# Commercial and Industrial Road Section




NOT DRAWN TO SCALE

*DESIGN SPEED 25 MILES PER HOUR*

| Road Classification | Washington County Designation | Right of Way (Feet) | Paved Width (Feet) | Number of Lanes | Bike Lane / Paved Shoulder | Parking Lane | Travel Lane(s) | Center Turn Lane | Parking Allowed |
|---|---|---|---|---|---|---|---|---|---|
| Commercial or Industrial Roads | | A | B | | D | D | E | G | |
| | CI-1 | 54 | 40 | 2 | 0 | 8 | 12 | 0 | BOTH SIDES |
| | CI-2 | ** | 34* | 2 | 0 | 8 | 13 | 0 | ONE SIDE |
| | CI-3 | 56 | 42 | 3 | 0 | 0 | 14 | 14 | NONE |
| | CI-4 | 62 | 48 | 3 | 0 | 8 | 13 | 14 | ONE SIDE |
| | CI-5 | 64 | 50 | 3 | 6 | 0 | 12 | 14 | NONE |
| | CI-6 | 64 | 50 | 4 | 0 | 0 | 12 | 0 | NONE |

*GRAVEL SHOULDERS AND DITCHES ALLOWED FOR THESE WIDTHS ONLY. STANDARD INTERIM SECTION
** USE ULTIMATE RIGHT-OF-WAY FOR PAVED WIDTH IDENTIFIED IN THE TRANSPORTATION PLAN; IF NOT KNOWN USE 64 FOOT RIGHT-OF-WAY.

*The applied "Washington County Designation" is determined by the county's transportation plan and the land use decision.*

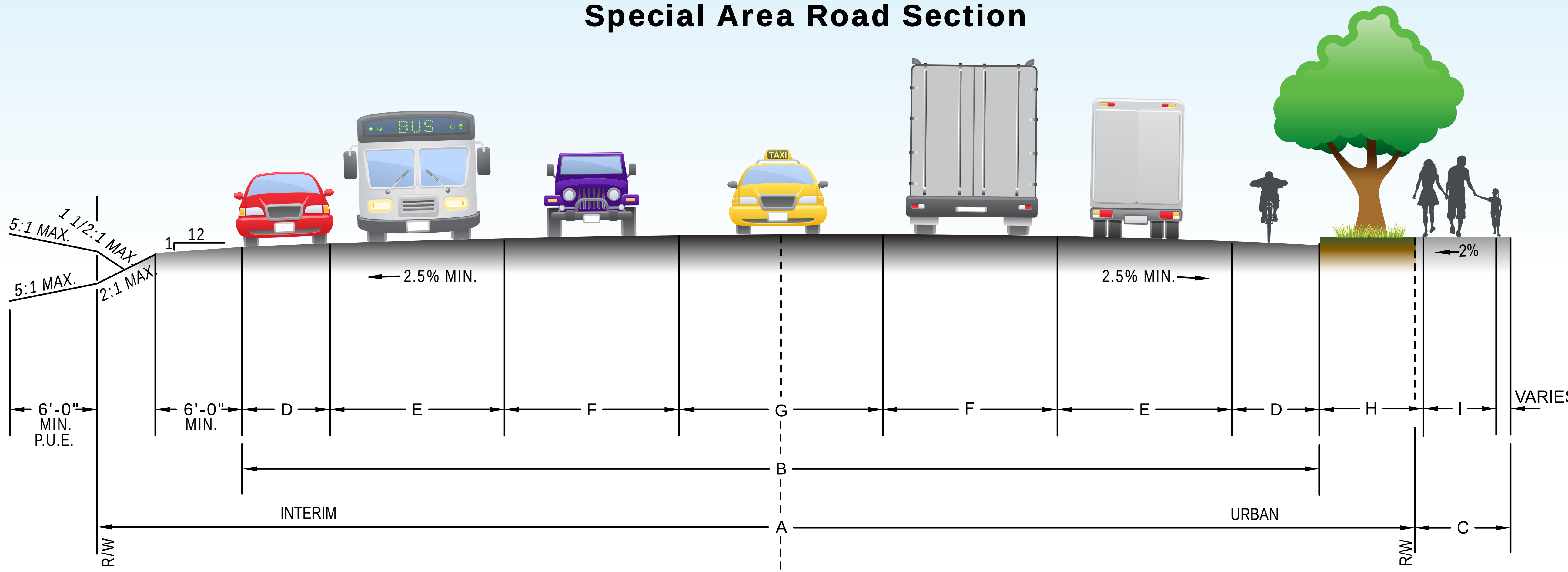
**Commercial and Industrial Road Section**

Washington County Exhibit #: 5

Effective Date:

Washington County Department of Land Use & Transporation Engineering Section

# Special Area Road Section




| Road Classification | Washington County Designation | Right of Way (Feet) | Easement Width (Feet) | Paved Width (Feet) | Number of Lanes | Bike Lane [5] | Parking Allowed | Parking Lane Width | Travel Lane (Way)[1] | Center Turn Lane | Design Speed | Planting Strip | Sidewalk Width | Area Traffic Management |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | C | B | | D | | D | E / F | G | | H | I | |
| S.A. Collector | SAC-1[5] | 40 | 9 | 34 | 2 | 5 | NONE | N/A | 12 | NONE | 35 MPH | 4.5 | 5 | ALLOWED |
| | SAC-2[5] | 52 | 9 | 46 | 3 | 5 | NONE | N/A | 12 | 12 | 35 MPH | 4.5 | 5 | ALLOWED |
| | SAC-3[5] | 40 | 9 | 34 | 2 | 5 | NONE | N/A | 12 | NONE | 35 MPH | 0 | 9 | ALLOWED |
| | SAC-4[5] | 52 | 9 | 46 | 3 | 5 | NONE | N/A | 12 | 12 | 35 MPH | 0 | 9 | ALLOWED |
| S.A. Neighborhood Route | SAMC-1 | 44 | 9 | 38 | 2 | SHARED | BOTH SIDES | 8 | 11 | NONE | 25 MPH | 4.5 | 5 | REQUIRED |
| | SAMC-2 | 44 | 9 | 38 | 2 | SHARED | BOTH SIDES | 8 | 11 | NONE | 25 MPH | 0 | 9 | REQUIRED |
| S.A. Commercial | SACM-1 | 46 | 9 | 40 | 2 | SHARED | BOTH SIDES | 8 | 12 | NONE | 25 MPH | 0 | 9 | ALLOWED |
| | SACM-2 | 58 | 9 | 52 | 3 | SHARED | BOTH SIDES | 8 | 12 | 12 | 25 MPH | 0 | 9 | ALLOWED |
| | SACM-3 | 70 | 9 | 64 | 4 | SHARED | BOTH SIDES | 8 | 12 | NONE | 25 MPH | 0 | 9 | ALLOWED |
| S.A. Local (Standard) | SAL-1 | 38 | 10 | 32 | N/A | SHARED | BOTH SIDES | 8 | (16) | NONE | 25 MPH | 4.5 | 5 | REQUIRED |
| | SAL-2[3] | 34 | 10 | 28 | N/A | SHARED | BOTH SIDES | 8 | (12) | NONE | 25 MPH | 4.5 | 5 | REQUIRED |
| | SAL-3 | 30 | 10 | 24 | N/A | SHARED | ONE SIDE | 8 | (16) | NONE | 25 MPH | 4.5 | 5 | REQUIRED |
| S.A. Local (Alternate) | SAL-4[2] | 26 | 10 | 20 | N/A | SHARED | ONE SIDE | 8 | (12) | NONE | 25 MPH | 4.5 | 5 | REQUIRED |
| | SAL-5[2,4] | 16 | 0 | 16 | N/A | SHARED | NONE | N/A | (16) | NONE | 15 MPH | 0 | 0 | NONE |

1) TRAVEL WAY WIDTH ( ) DENOTES THE TOTAL PAVED WIDTH AVAILABLE FOR TRAVEL AFTER ON-STREET PARKING.
2) USE OF THIS STANDARD REQUIRES PRIOR LAND USE APPROVAL.
3) FOR CUL-DE-SAC OR BLOCK LENGTH > 300 FT., PARKING SHALL BE PROHIBITED WITHIN 50 FT. OF AN INTERSECTION.
4) ALLEY
5) VERTICAL CURB (DWG NO. 2020) SHALL BE USED WITH A 5 FT. BIKE LANE.

*The applied "Washington County Designation" is determined by the county's transportation plan and the land use decision.*

**Special Area Road Section**

Washington County Exhibit #: 6

Effective Date:

Washington County Department of Land Use & Transporation Engineering Section

# Existing (2019) Intersection Operations

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 11 | 32 | 11 | 31 | 47 | 4 | 28 | 69 | 21 | 12 | 167 | 44 |
| Future Vol, veh/h | 11 | 32 | 11 | 31 | 47 | 4 | 28 | 69 | 21 | 12 | 167 | 44 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 0 | 0 | 10 | 2 | 0 | 0 | 0 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | 100 | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 0 | 0 | 0 | 13 | 0 | 25 | 0 | 0 | 0 | 8 | 0 | 0 |
| Mvmt Flow | 12 | 35 | 12 | 34 | 51 | 4 | 30 | 75 | 23 | 13 | 182 | 48 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 418 | 392 | 208 | 403 | 405 | 97 | 232 | 0 | 0 | 98 | 0 | 0 |
| Stage 1 | 234 | 234 | - | 147 | 147 | - | - | - | - | - | - | - |
| Stage 2 | 184 | 158 | - | 256 | 258 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.23 | 6.5 | 6.45 | 4.1 | - | - | 4.18 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.23 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.23 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.617 | 4 | 3.525 | 2.2 | - | - | 2.272 | - | - |
| Pot Cap-1 Maneuver | 549 | 547 | 837 | 539 | 538 | 900 | 1348 | - | - | 1458 | - | - |
| Stage 1 | 774 | 715 | - | 830 | 779 | - | - | - | - | - | - | - |
| Stage 2 | 822 | 771 | - | 725 | 698 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 487 | 527 | 835 | 492 | 519 | 891 | 1345 | - | - | 1458 | - | - |
| Mov Cap-2 Maneuver | 487 | 527 | - | 492 | 519 | - | - | - | - | - | - | - |
| Stage 1 | 754 | 706 | - | 810 | 760 | - | - | - | - | - | - | - |
| Stage 2 | 738 | 752 | - | 673 | 690 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 12.2 | 12.7 | 1.8 | 0.4 |
| HCM LOS | B | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | WBLn2 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1345 | - | - | 560 | 492 | 537 | 1458 | - | - |
| HCM Lane V/C Ratio | 0.023 | - | - | 0.105 | 0.068 | 0.103 | 0.009 | - | - |
| HCM Control Delay (s) | 7.7 | 0 | - | 12.2 | 12.9 | 12.5 | 7.5 | 0 | - |
| HCM Lane LOS | A | A | - | B | B | B | A | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0.3 | 0.2 | 0.3 | 0 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 5.7 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 55 | 199 | 257 | 141 | 113 | 119 |
| Future Vol, veh/h | 55 | 199 | 257 | 141 | 113 | 119 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 1 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Free | - | None |
| Storage Length | 100 | - | - | 50 | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, % | 0 | 3 | 6 | 1 | 3 | 3 |
| Mvmt Flow | 59 | 212 | 273 | 150 | 120 | 127 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 273 | 0 | - | 0 | 604 | 273 |
| Stage 1 | - | - | - | - | 273 | - |
| Stage 2 | - | - | - | - | 331 | - |
| Critical Hdwy | 4.1 | - | - | - | 6.43 | 6.23 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.43 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.43 | - |
| Follow-up Hdwy | 2.2 | - | - | - | 3.527 | 3.327 |
| Pot Cap-1 Maneuver | 1302 | - | - | 0 | 460 | 763 |
| Stage 1 | - | - | - | 0 | 771 | - |
| Stage 2 | - | - | - | 0 | 725 | - |
| Platoon blocked, % | | - | - | | | |
| Mov Cap-1 Maneuver | 1302 | - | - | - | 439 | 763 |
| Mov Cap-2 Maneuver | - | - | - | - | 439 | - |
| Stage 1 | - | - | - | - | 736 | - |
| Stage 2 | - | - | - | - | 725 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.7 | 0 | 16.4 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | SBLn1 |
|---|---|---|---|---|
| Capacity (veh/h) | 1302 | - | - | 561 |
| HCM Lane V/C Ratio | 0.045 | - | - | 0.44 |
| HCM Control Delay (s) | 7.9 | - | - | 16.4 |
| HCM Lane LOS | A | - | - | C |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 2.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 222 | 308 | 65 | 265 | 110 | 41 | 84 | 856 | 676 | 30 | 451 | 29 |
| Future Volume (veh/h) | 222 | 308 | 65 | 265 | 110 | 41 | 84 | 856 | 676 | 30 | 451 | 29 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.97 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1900 | 1826 | 1870 | 1826 | 1826 | 1648 | 1856 | 1900 | 1900 | 1841 | 1841 |
| Adj Flow Rate, veh/h | 234 | 324 | 68 | 279 | 116 | 43 | 88 | 901 | 712 | 32 | 475 | 31 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 1 | 0 | 5 | 2 | 5 | 5 | 17 | 3 | 0 | 0 | 4 | 4 |
| Cap, veh/h | 215 | 376 | 387 | 357 | 230 | 85 | 466 | 1009 | 872 | 138 | 1765 | 115 |
| Arrive On Green | 0.12 | 0.20 | 0.20 | 0.10 | 0.18 | 0.17 | 0.04 | 0.54 | 0.54 | 0.03 | 0.53 | 0.52 |
| Sat Flow, veh/h | 1795 | 1900 | 1545 | 3456 | 1269 | 470 | 1570 | 1856 | 1603 | 1810 | 3327 | 216 |
| Grp Volume(v), veh/h | 234 | 324 | 68 | 279 | 0 | 159 | 88 | 901 | 712 | 32 | 249 | 257 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1900 | 1545 | 1728 | 0 | 1740 | 1570 | 1856 | 1603 | 1810 | 1749 | 1795 |
| Q Serve(g_s), s | 15.0 | 20.6 | 4.3 | 9.8 | 0.0 | 10.3 | 3.3 | 53.8 | 45.6 | 1.0 | 9.7 | 9.8 |
| Cycle Q Clear(g_c), s | 15.0 | 20.6 | 4.3 | 9.8 | 0.0 | 10.3 | 3.3 | 53.8 | 45.6 | 1.0 | 9.7 | 9.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.27 | 1.00 | | 1.00 | 1.00 | | 0.12 |
| Lane Grp Cap(c), veh/h | 215 | 376 | 387 | 357 | 0 | 315 | 466 | 1009 | 872 | 138 | 927 | 952 |
| V/C Ratio(X) | 1.09 | 0.86 | 0.18 | 0.78 | 0.00 | 0.50 | 0.19 | 0.89 | 0.82 | 0.23 | 0.27 | 0.27 |
| Avail Cap(c_a), veh/h | 215 | 441 | 439 | 415 | 0 | 404 | 529 | 1009 | 872 | 235 | 927 | 952 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 55.0 | 48.5 | 36.7 | 54.7 | 0.0 | 46.3 | 13.3 | 25.3 | 23.4 | 25.2 | 16.1 | 16.1 |
| Incr Delay (d2), s/veh | 86.1 | 12.6 | 0.1 | 6.7 | 0.0 | 0.5 | 0.1 | 11.9 | 8.4 | 0.3 | 0.7 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 11.9 | 11.1 | 1.7 | 4.6 | 0.0 | 4.5 | 1.2 | 26.0 | 18.6 | 0.4 | 4.1 | 4.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 141.1 | 61.1 | 36.8 | 61.4 | 0.0 | 46.8 | 13.4 | 37.2 | 31.8 | 25.6 | 16.8 | 16.8 |
| LnGrp LOS | F | E | D | E | A | D | B | D | C | C | B | B |
| Approach Vol, veh/h | | 626 | | | 438 | | | 1701 | | | 538 | |
| Approach Delay, s/veh | | 88.4 | | | 56.1 | | | 33.7 | | | 17.3 | |
| Approach LOS | | F | | | E | | | C | | | B | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 9.0 | 70.3 | 19.0 | 26.7 | 7.4 | 72.0 | 16.9 | 28.8 |
| Change Period (Y+Rc), s | 4.0 | 5.5 | 4.0 | 5.5 | 4.0 | 5.5 | 5.0 | 5.5 |
| Max Green Setting (Gmax), s | 10.0 | 53.5 | 15.0 | 27.5 | 10.0 | 53.5 | 14.0 | 27.5 |
| Max Q Clear Time (g_c+I1), s | 5.3 | 11.8 | 17.0 | 12.3 | 3.0 | 55.8 | 11.8 | 22.6 |
| Green Ext Time (p_c), s | 0.0 | 3.7 | 0.0 | 0.4 | 0.0 | 0.0 | 0.1 | 0.5 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 44.4 |
| HCM 6th LOS | D |

Notes

User approved pedestrian interval to be less than phase max green.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 547 | 0 | 21 | 0 | 218 | 935 | 11 | 186 | 0 |
| Future Volume (veh/h) | 0 | 0 | 0 | 547 | 0 | 21 | 0 | 218 | 935 | 11 | 186 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.97 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1885 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 0 | 0 | 588 | 0 | 23 | 0 | 234 | 1005 | 12 | 200 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 0 | 4 | 0 | 1047 | 0 | 471 | 615 | 767 | 1996 | 326 | 974 | 0 |
| Arrive On Green | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.27 | 0.00 | 0.40 | 0.40 | 0.02 | 0.51 | 0.00 |
| Sat Flow, veh/h | 0 | 1900 | 0 | 3477 | 0 | 1564 | 1810 | 1900 | 2830 | 1810 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 0 | 0 | 588 | 0 | 23 | 0 | 234 | 1005 | 12 | 200 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1900 | 0 | 1739 | 0 | 1564 | 1810 | 1900 | 1415 | 1810 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 6.1 | 0.0 | 0.5 | 0.0 | 3.6 | 7.0 | 0.2 | 2.5 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 6.1 | 0.0 | 0.5 | 0.0 | 3.6 | 7.0 | 0.2 | 2.5 | 0.0 |
| Prop In Lane | 0.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 4 | 0 | 1047 | 0 | 471 | 615 | 767 | 1996 | 326 | 974 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.05 | 0.00 | 0.30 | 0.50 | 0.04 | 0.21 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 686 | 0 | 3768 | 0 | 1694 | 1243 | 1616 | 3260 | 1141 | 1837 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 12.6 | 0.0 | 11.2 | 0.0 | 8.7 | 2.9 | 7.4 | 5.7 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.1 | 0.0 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.1 | 0.0 | 1.2 | 3.3 | 0.0 | 0.7 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 | 0.0 | 13.2 | 0.0 | 11.2 | 0.0 | 8.9 | 3.1 | 7.4 | 5.7 | 0.0 |
| LnGrp LOS | A | A | A | B | A | B | A | A | A | A | A | A |
| Approach Vol, veh/h | | 0 | | | 611 | | | 1239 | | | 212 | |
| Approach Delay, s/veh | | 0.0 | | | 13.1 | | | 4.2 | | | 5.8 | |
| Approach LOS | | | | | B | | | A | | | A | |

| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 0.0 | 0.0 | 26.0 | | 16.9 | 4.7 | 21.3 |
| Change Period (Y+Rc), s | | 4.5 | 4.0 | 5.5 | | 5.5 | 4.0 | 5.5 |
| Max Green Setting (Gmax), s | | 15.0 | 15.0 | 40.0 | | 45.0 | 20.0 | 35.0 |
| Max Q Clear Time (g_c+I1), s | | 0.0 | 0.0 | 4.5 | | 8.1 | 2.2 | 9.0 |
| Green Ext Time (p_c), s | | 0.0 | 0.0 | 0.7 | | 3.2 | 0.0 | 6.6 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 7.0 |
| HCM 6th LOS | A |

Notes

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.6 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 33 | 109 | 372 | 25 | 167 | 445 |
| Future Vol, veh/h | 33 | 109 | 372 | 25 | 167 | 445 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | 100 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 3 | 1 | 2 | 0 | 1 | 1 |
| Mvmt Flow | 34 | 112 | 384 | 26 | 172 | 459 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1200 | 397 | 0 | 0 | 410 | 0 |
| Stage 1 | 397 | - | - | - | - | - |
| Stage 2 | 803 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.21 | - | - | 4.11 | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.309 | - | - | 2.209 | - |
| Pot Cap-1 Maneuver | 204 | 655 | - | - | 1154 | - |
| Stage 1 | 677 | - | - | - | - | - |
| Stage 2 | 439 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 174 | 655 | - | - | 1154 | - |
| Mov Cap-2 Maneuver | 174 | - | - | - | - | - |
| Stage 1 | 576 | - | - | - | - | - |
| Stage 2 | 439 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 19.2 | 0 | 2.4 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 399 | 1154 | - |
| HCM Lane V/C Ratio | - | - | 0.367 | 0.149 | - |
| HCM Control Delay (s) | - | - | 19.2 | 8.7 | - |
| HCM Lane LOS | - | - | C | A | - |
| HCM 95th %tile Q(veh) | - | - | 1.7 | 0.5 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 41.3 |
| Intersection LOS | E |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 380 | 49 | 76 | 79 | 123 | 530 |
| Future Vol, veh/h | 380 | 49 | 76 | 79 | 123 | 530 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Heavy Vehicles, % | 1 | 0 | 0 | 0 | 0 | 1 |
| Mvmt Flow | 427 | 55 | 85 | 89 | 138 | 596 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 2 | 2 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 2 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 2 |
| HCM Control Delay | 41.3 | 11.6 | 48.4 |
| HCM LOS | E | B | E |

| Lane | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 0% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 100% | 100% | 0% | 0% | 0% |
| Vol Right, % | 0% | 0% | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 380 | 49 | 76 | 79 | 123 | 530 |
| LT Vol | 380 | 0 | 0 | 0 | 123 | 0 |
| Through Vol | 0 | 49 | 76 | 0 | 0 | 0 |
| RT Vol | 0 | 0 | 0 | 79 | 0 | 530 |
| Lane Flow Rate | 427 | 55 | 85 | 89 | 138 | 596 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util (X) | 0.886 | 0.106 | 0.183 | 0.172 | 0.274 | 0.983 |
| Departure Headway (Hd) | 7.474 | 6.945 | 7.717 | 6.993 | 7.138 | 5.94 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 482 | 512 | 468 | 516 | 500 | 607 |
| Service Time | 5.27 | 4.741 | 5.417 | 4.693 | 4.934 | 3.735 |
| HCM Lane V/C Ratio | 0.886 | 0.107 | 0.182 | 0.172 | 0.276 | 0.982 |
| HCM Control Delay | 45.3 | 10.6 | 12.1 | 11.1 | 12.6 | 56.7 |
| HCM Lane LOS | E | B | B | B | B | F |
| HCM 95th-tile Q | 9.6 | 0.4 | 0.7 | 0.6 | 1.1 | 14.2 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 10.2 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✣ | | | ✣ | | | ✣ | | | ✣ | |
| Traffic Vol, veh/h | 1 | 48 | 4 | 3 | 105 | 35 | 7 | 80 | 8 | 39 | 275 | 3 |
| Future Vol, veh/h | 1 | 48 | 4 | 3 | 105 | 35 | 7 | 80 | 8 | 39 | 275 | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 5 | 0 | 0 | 5 | 0 |
| Mvmt Flow | 1 | 53 | 4 | 3 | 117 | 39 | 8 | 89 | 9 | 43 | 306 | 3 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.7 | 9.3 | 8.7 | 11.4 |
| HCM LOS | A | A | A | B |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 7% | 2% | 2% | 12% |
| Vol Thru, % | 84% | 91% | 73% | 87% |
| Vol Right, % | 8% | 8% | 24% | 1% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 95 | 53 | 143 | 317 |
| LT Vol | 7 | 1 | 3 | 39 |
| Through Vol | 80 | 48 | 105 | 275 |
| RT Vol | 8 | 4 | 35 | 3 |
| Lane Flow Rate | 106 | 59 | 159 | 352 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.141 | 0.084 | 0.216 | 0.449 |
| Departure Headway (Hd) | 4.817 | 5.147 | 4.904 | 4.586 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 739 | 691 | 728 | 782 |
| Service Time | 2.88 | 3.219 | 2.965 | 2.633 |
| HCM Lane V/C Ratio | 0.143 | 0.085 | 0.218 | 0.45 |
| HCM Control Delay | 8.7 | 8.7 | 9.3 | 11.4 |
| HCM Lane LOS | A | A | A | B |
| HCM 95th-tile Q | 0.5 | 0.3 | 0.8 | 2.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 4 | 526 | 0 | 0 | 487 | 309 | 0 | 0 | 0 | 361 | 0 | 7 |
| Future Volume (veh/h) | 4 | 526 | 0 | 0 | 487 | 309 | 0 | 0 | 0 | 361 | 0 | 7 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1870 | 1870 | 1870 | 1870 | 1870 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 4 | 554 | 0 | 0 | 513 | 325 | 0 | 0 | 0 | 380 | 0 | 7 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 211 | 1182 | 0 | 0 | 616 | 390 | 0 | 491 | 0 | 467 | 0 | 7 |
| Arrive On Green | 0.01 | 0.63 | 0.00 | 0.00 | 0.58 | 0.56 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 0.26 |
| Sat Flow, veh/h | 1810 | 1870 | 0 | 0 | 1070 | 678 | 0 | 1900 | 0 | 1417 | 0 | 26 |
| Grp Volume(v), veh/h | 4 | 554 | 0 | 0 | 0 | 838 | 0 | 0 | 0 | 387 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1870 | 0 | 0 | 0 | 1748 | 0 | 1900 | 0 | 1443 | 0 | 0 |
| Q Serve(g_s), s | 0.1 | 12.0 | 0.0 | 0.0 | 0.0 | 30.5 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.1 | 12.0 | 0.0 | 0.0 | 0.0 | 30.5 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 0.00 | 0.00 | | 0.39 | 0.00 | | 0.00 | 0.98 | | 0.02 |
| Lane Grp Cap(c), veh/h | 211 | 1182 | 0 | 0 | 0 | 1005 | 0 | 491 | 0 | 465 | 0 | 0 |
| V/C Ratio(X) | 0.02 | 0.47 | 0.00 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 435 | 2306 | 0 | 0 | 0 | 1840 | 0 | 503 | 0 | 465 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 13.5 | 7.4 | 0.0 | 0.0 | 0.0 | 13.7 | 0.0 | 0.0 | 0.0 | 28.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 | 10.9 | 0.0 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 13.5 | 7.8 | 0.0 | 0.0 | 0.0 | 16.0 | 0.0 | 0.0 | 0.0 | 40.5 | 0.0 | 0.0 |
| LnGrp LOS | B | A | A | A | A | B | A | A | A | D | A | A |
| Approach Vol, veh/h | | 558 | | | 838 | | | 0 | | | 387 | |
| Approach Delay, s/veh | | 7.8 | | | 16.0 | | | 0.0 | | | 40.5 | |
| Approach LOS | | A | | | B | | | | | | D | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 53.0 | | 24.5 | 4.4 | 48.5 | | 24.5 |
| Change Period (Y+Rc), s | | 5.5 | | 4.5 | 4.0 | 5.5 | | * 4.5 |
| Max Green Setting (Gmax), s | | 94.0 | | 20.0 | 10.0 | 80.0 | | * 21 |
| Max Q Clear Time (g_c+I1), s | | 14.0 | | 22.0 | 2.1 | 32.5 | | 0.0 |
| Green Ext Time (p_c), s | | 5.3 | | 0.0 | 0.0 | 10.6 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 18.8 |
| HCM 6th LOS | B |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 1 | 67 | 0 | 23 | 1 | 863 | 43 | 36 | 921 | 0 |
| Future Volume (veh/h) | 0 | 0 | 1 | 67 | 0 | 23 | 1 | 863 | 43 | 36 | 921 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1796 | 1900 | 1900 | 1885 | 1885 | 1900 | 1900 | 1856 | 1856 |
| Adj Flow Rate, veh/h | 0 | 0 | 1 | 71 | 0 | 24 | 1 | 918 | 46 | 38 | 980 | 0 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 1 | 0 | 0 | 3 | 3 |
| Cap, veh/h | 0 | 0 | 134 | 255 | 0 | 148 | 65 | 1228 | 1049 | 359 | 1417 | 0 |
| Arrive On Green | 0.00 | 0.00 | 0.08 | 0.09 | 0.00 | 0.08 | 0.62 | 0.65 | 0.65 | 0.04 | 0.76 | 0.00 |
| Sat Flow, veh/h | 0 | 0 | 1610 | 1360 | 0 | 1610 | 0 | 1885 | 1610 | 1810 | 1856 | 0 |
| Grp Volume(v), veh/h | 0 | 0 | 1 | 71 | 0 | 24 | 919 | 0 | 46 | 38 | 980 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 0 | 1610 | 1360 | 0 | 1610 | 1885 | 0 | 1610 | 1810 | 1856 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 2.8 | 0.0 | 0.8 | 0.0 | 0.0 | 0.6 | 0.4 | 14.7 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 2.8 | 0.0 | 0.8 | 19.5 | 0.0 | 0.6 | 0.4 | 14.7 | 0.0 |
| Prop In Lane | 0.00 | | 1.00 | 1.00 | | 1.00 | 0.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 0 | 134 | 255 | 0 | 148 | 1225 | 0 | 1049 | 359 | 1417 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 | 0.01 | 0.28 | 0.00 | 0.16 | 0.75 | 0.00 | 0.04 | 0.11 | 0.69 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 | 595 | 632 | 0 | 595 | 2782 | 0 | 2382 | 939 | 3548 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 23.3 | 24.1 | 0.0 | 23.4 | 6.8 | 0.0 | 3.5 | 7.1 | 3.3 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.2 | 1.1 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.3 | 5.8 | 0.0 | 0.1 | 0.1 | 1.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 | 23.3 | 24.3 | 0.0 | 23.6 | 7.9 | 0.0 | 3.5 | 7.2 | 4.0 | 0.0 |
| LnGrp LOS | A | A | C | C | A | C | A | A | A | A | A | A |
| Approach Vol, veh/h | | 1 | | | 95 | | | 965 | | | 1018 | |
| Approach Delay, s/veh | | 23.3 | | | 24.2 | | | 7.7 | | | 4.1 | |
| Approach LOS | | C | | | C | | | A | | | A | |

| Timer - Assigned Phs | 1 | 2 | | 4 | | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 6.2 | 40.1 | | 9.1 | | 46.3 | | 9.1 |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | * 4.5 | | 6.0 | | 4.5 |
| Max Green Setting (Gmax), s | 20.0 | 80.0 | | * 21 | | 104.0 | | 20.0 |
| Max Q Clear Time (g_c+I1), s | 2.4 | 21.5 | | 2.0 | | 16.7 | | 4.8 |
| Green Ext Time (p_c), s | 0.0 | 12.6 | | 0.0 | | 14.7 | | 0.1 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 6.7 |
| HCM 6th LOS | | | A |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Intersection | |
|---|---|
| Int Delay, s/veh | 15.3 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 232 | 61 | 58 | 158 | 368 | 256 |
| Future Vol, veh/h | 232 | 61 | 58 | 158 | 368 | 256 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 5 | 2 | 5 | 1 | 1 | 2 |
| Mvmt Flow | 244 | 64 | 61 | 166 | 387 | 269 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 810 | 522 | 656 | 0 | - | 0 |
| Stage 1 | 522 | - | - | - | - | - |
| Stage 2 | 288 | - | - | - | - | - |
| Critical Hdwy | 6.45 | 6.22 | 4.15 | - | - | - |
| Critical Hdwy Stg 1 | 5.45 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.45 | - | - | - | - | - |
| Follow-up Hdwy | 3.545 | 3.318 | 2.245 | - | - | - |
| Pot Cap-1 Maneuver | 345 | 555 | 917 | - | - | - |
| Stage 1 | 589 | - | - | - | - | - |
| Stage 2 | 754 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 320 | 555 | 917 | - | - | - |
| Mov Cap-2 Maneuver | 320 | - | - | - | - | - |
| Stage 1 | 546 | - | - | - | - | - |
| Stage 2 | 754 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 57.2 | 2.5 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 917 | - | 351 | - | - |
| HCM Lane V/C Ratio | 0.067 | - | 0.879 | - | - |
| HCM Control Delay (s) | 9.2 | 0 | 57.2 | - | - |
| HCM Lane LOS | A | A | F | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 8.4 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.8 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 1 | 58 | 172 | 4 | 81 | 353 |
| Future Vol, veh/h | 1 | 58 | 172 | 4 | 81 | 353 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 86 | 86 | 86 | 86 | 86 | 86 |
| Heavy Vehicles, % | 0 | 2 | 1 | 0 | 2 | 1 |
| Mvmt Flow | 1 | 67 | 200 | 5 | 94 | 410 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 801 | 203 | 0 | 0 | 205 | 0 |
| Stage 1 | 203 | - | - | - | - | - |
| Stage 2 | 598 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.22 | - | - | 4.12 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.318 | - | - | 2.218 | - |
| Pot Cap-1 Maneuver | 356 | 838 | - | - | 1366 | - |
| Stage 1 | 836 | - | - | - | - | - |
| Stage 2 | 553 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 324 | 838 | - | - | 1366 | - |
| Mov Cap-2 Maneuver | 324 | - | - | - | - | - |
| Stage 1 | 762 | - | - | - | - | - |
| Stage 2 | 553 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 9.8 | 0 | 1.5 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 816 | 1366 | - |
| HCM Lane V/C Ratio | - | - | 0.084 | 0.069 | - |
| HCM Control Delay (s) | - | - | 9.8 | 7.8 | 0 |
| HCM Lane LOS | - | - | A | A | A |
| HCM 95th %tile Q(veh) | - | - | 0.3 | 0.2 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 28.8 |
| Intersection LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 1 | 12 | 13 | 311 | 39 | 169 | 11 | 93 | 196 | 133 | 244 | 2 |
| Future Vol, veh/h | 1 | 12 | 13 | 311 | 39 | 169 | 11 | 93 | 196 | 133 | 244 | 2 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 2 | 0 | 2 | 0 | 0 |
| Mvmt Flow | 1 | 12 | 13 | 321 | 40 | 174 | 11 | 96 | 202 | 137 | 252 | 2 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 10.7 | 41 | 16.1 | 23.5 |
| HCM LOS | B | E | C | C |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 4% | 4% | 60% | 35% |
| Vol Thru, % | 31% | 46% | 8% | 64% |
| Vol Right, % | 65% | 50% | 33% | 1% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 300 | 26 | 519 | 379 |
| LT Vol | 11 | 1 | 311 | 133 |
| Through Vol | 93 | 12 | 39 | 244 |
| RT Vol | 196 | 13 | 169 | 2 |
| Lane Flow Rate | 309 | 27 | 535 | 391 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.532 | 0.054 | 0.899 | 0.703 |
| Departure Headway (Hd) | 6.19 | 7.222 | 6.05 | 6.473 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 581 | 493 | 599 | 559 |
| Service Time | 4.25 | 5.315 | 4.096 | 4.527 |
| HCM Lane V/C Ratio | 0.532 | 0.055 | 0.893 | 0.699 |
| HCM Control Delay | 16.1 | 10.7 | 41 | 23.5 |
| HCM Lane LOS | C | B | E | C |
| HCM 95th-tile Q | 3.1 | 0.2 | 10.9 | 5.6 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 25.8 |
| Intersection LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 6 | 81 | 16 | 30 | 89 | 57 | 7 | 229 | 30 | 154 | 393 | 17 |
| Future Vol, veh/h | 6 | 81 | 16 | 30 | 89 | 57 | 7 | 229 | 30 | 154 | 393 | 17 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| Mvmt Flow | 6 | 86 | 17 | 32 | 95 | 61 | 7 | 244 | 32 | 164 | 418 | 18 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 11.6 | 12.8 | 13.8 | 38.1 |
| HCM LOS | B | B | B | E |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 3% | 6% | 17% | 27% |
| Vol Thru, % | 86% | 79% | 51% | 70% |
| Vol Right, % | 11% | 16% | 32% | 3% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 266 | 103 | 176 | 564 |
| LT Vol | 7 | 6 | 30 | 154 |
| Through Vol | 229 | 81 | 89 | 393 |
| RT Vol | 30 | 16 | 57 | 17 |
| Lane Flow Rate | 283 | 110 | 187 | 600 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.462 | 0.207 | 0.337 | 0.899 |
| Departure Headway (Hd) | 5.877 | 6.785 | 6.473 | 5.498 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 617 | 530 | 558 | 666 |
| Service Time | 3.877 | 4.812 | 4.494 | 3.498 |
| HCM Lane V/C Ratio | 0.459 | 0.208 | 0.335 | 0.901 |
| HCM Control Delay | 13.8 | 11.6 | 12.8 | 38.1 |
| HCM Lane LOS | B | B | B | E |
| HCM 95th-tile Q | 2.4 | 0.8 | 1.5 | 11.3 |

| Intersection | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Int Delay, s/veh | 4.9 | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 0 | 21 | 6 | 60 | 4 | 0 | 0 | 0 | 0 | 28 | 2446 | 18 |
| Future Vol, veh/h | 0 | 21 | 6 | 60 | 4 | 0 | 0 | 0 | 0 | 28 | 2446 | 18 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | 260 | - | 260 |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 16974 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, % | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 |
| Mvmt Flow | 0 | 23 | 7 | 66 | 4 | 0 | 0 | 0 | 0 | 31 | 2688 | 20 |

| Major/Minor | Minor2 | | | Minor1 | | | | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | - | 2750 | 1344 | 1418 | 2770 | - | | | | 0 | 0 | 0 |
| Stage 1 | - | 2750 | - | 0 | 0 | - | | | | - | - | - |
| Stage 2 | - | 0 | - | 1418 | 2770 | - | | | | - | - | - |
| Critical Hdwy | - | 6.5 | 6.9 | 7.54 | 6.5 | - | | | | 4.18 | - | - |
| Critical Hdwy Stg 1 | - | 5.5 | - | - | - | - | | | | - | - | - |
| Critical Hdwy Stg 2 | - | - | - | 6.54 | 5.5 | - | | | | - | - | - |
| Follow-up Hdwy | - | 4 | 3.3 | 3.52 | 4 | - | | | | 2.24 | - | - |
| Pot Cap-1 Maneuver | 0 | ~ 20 | 144 | 97 | 20 | 0 | | | | - | - | - |
| Stage 1 | 0 | 43 | - | - | - | 0 | | | | - | - | - |
| Stage 2 | 0 | - | - | 144 | 42 | 0 | | | | - | - | - |
| Platoon blocked, % | | | | | | | | | | | - | - |
| Mov Cap-1 Maneuver | - | ~ 20 | 144 | - | 20 | - | | | | - | - | - |
| Mov Cap-2 Maneuver | - | ~ 20 | - | - | 20 | - | | | | - | - | - |
| Stage 1 | - | 43 | - | - | - | - | | | | - | - | - |
| Stage 2 | - | - | - | ~ 64 | 42 | - | | | | - | - | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 471.5 | | |
| HCM LOS | F | - | |

| Minor Lane/Major Mvmt | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 25 | - | - | - | - |
| HCM Lane V/C Ratio | 1.187 | - | - | - | - |
| HCM Control Delay (s) | $ 471.5 | - | - | - | - |
| HCM Lane LOS | F | - | - | - | - |
| HCM 95th %tile Q(veh) | 3.6 | - | - | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.4 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 47 | 10 | 17 | 68 | 100 | 61 |
| Future Vol, veh/h | 47 | 10 | 17 | 68 | 100 | 61 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 89 | 89 | 89 | 89 | 89 | 89 |
| Heavy Vehicles, % | 0 | 10 | 0 | 0 | 1 | 0 |
| Mvmt Flow | 53 | 11 | 19 | 76 | 112 | 69 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 261 | 147 | 181 | 0 | - | 0 |
| Stage 1 | 147 | - | - | - | - | - |
| Stage 2 | 114 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.3 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.39 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 732 | 879 | 1407 | - | - | - |
| Stage 1 | 885 | - | - | - | - | - |
| Stage 2 | 916 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 722 | 879 | 1407 | - | - | - |
| Mov Cap-2 Maneuver | 722 | - | - | - | - | - |
| Stage 1 | 873 | - | - | - | - | - |
| Stage 2 | 916 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 10.3 | 1.5 | 0 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1407 | - | 745 | - | - |
| HCM Lane V/C Ratio | 0.014 | - | 0.086 | - | - |
| HCM Control Delay (s) | 7.6 | 0 | 10.3 | - | - |
| HCM Lane LOS | A | A | B | - | - |
| HCM 95th %tile Q(veh) | 0 | - | 0.3 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 33.5 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 344 | 71 | 158 | 152 | 87 | 406 |
| Future Vol, veh/h | 344 | 71 | 158 | 152 | 87 | 406 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | Free | - | None |
| Storage Length | 210 | 0 | - | 210 | 190 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 1 | 10 | 2 | 2 | 3 | 2 |
| Mvmt Flow | 362 | 75 | 166 | 160 | 92 | 427 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 777 | 166 | 0 | - | 166 | 0 |
| Stage 1 | 166 | - | - | - | - | - |
| Stage 2 | 611 | - | - | - | - | - |
| Critical Hdwy | 6.41 | 6.3 | - | - | 4.13 | - |
| Critical Hdwy Stg 1 | 5.41 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.41 | - | - | - | - | - |
| Follow-up Hdwy | 3.509 | 3.39 | - | - | 2.227 | - |
| Pot Cap-1 Maneuver | 367 | 858 | - | 0 | 1406 | - |
| Stage 1 | 866 | - | - | 0 | - | - |
| Stage 2 | 544 | - | - | 0 | - | - |
| Platoon blocked, % | | | - | | | - |
| Mov Cap-1 Maneuver | ~ 343 | 858 | - | - | 1406 | - |
| Mov Cap-2 Maneuver | ~ 343 | - | - | - | - | - |
| Stage 1 | 810 | - | - | - | - | - |
| Stage 2 | 544 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 84.3 | 0 | 1.4 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBT | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | 343 | 858 | 1406 | - |
| HCM Lane V/C Ratio | - | 1.056 | 0.087 | 0.065 | - |
| HCM Control Delay (s) | - | 99.7 | 9.6 | 7.7 | - |
| HCM Lane LOS | - | F | A | A | - |
| HCM 95th %tile Q(veh) | - | 12.9 | 0.3 | 0.2 | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.9 | | | | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 38 | 137 | 506 | 63 | 98 | 474 |
| Future Vol, veh/h | 38 | 137 | 506 | 63 | 98 | 474 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | 70 | 290 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, % | 3 | 0 | 4 | 0 | 1 | 1 |
| Mvmt Flow | 40 | 146 | 538 | 67 | 104 | 504 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1252 | 538 | 0 | 0 | 605 | 0 |
| Stage 1 | 538 | - | - | - | - | - |
| Stage 2 | 714 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.2 | - | - | 4.11 | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.3 | - | - | 2.209 | - |
| Pot Cap-1 Maneuver | 189 | 547 | - | - | 978 | - |
| Stage 1 | 583 | - | - | - | - | - |
| Stage 2 | 483 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 169 | 547 | - | - | 978 | - |
| Mov Cap-2 Maneuver | 169 | - | - | - | - | - |
| Stage 1 | 521 | - | - | - | - | - |
| Stage 2 | 482 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 24.4 | 0 | 1.6 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 368 | 978 | - |
| HCM Lane V/C Ratio | - | - | 0.506 | 0.107 | - |
| HCM Control Delay (s) | - | - | 24.4 | 9.1 | - |
| HCM Lane LOS | - | - | C | A | - |
| HCM 95th %tile Q(veh) | - | - | 2.7 | 0.4 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 69 | 0 | 39 | 0 | 0 | 0 | 38 | 268 | 0 | 0 | 235 | 134 |
| Future Vol, veh/h | 69 | 0 | 39 | 0 | 0 | 0 | 38 | 268 | 0 | 0 | 235 | 134 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| Mvmt Flow | 93 | 0 | 53 | 0 | 0 | 0 | 51 | 362 | 0 | 0 | 318 | 181 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 873 | 873 | 409 | 899 | 963 | 362 | 499 | 0 | 0 | 362 | 0 | 0 |
| Stage 1 | 409 | 409 | - | 464 | 464 | - | - | - | - | - | - | - |
| Stage 2 | 464 | 464 | - | 435 | 499 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 273 | 291 | 647 | 262 | 258 | 687 | 1075 | - | - | 1208 | - | - |
| Stage 1 | 623 | 600 | - | 582 | 567 | - | - | - | - | - | - | - |
| Stage 2 | 582 | 567 | - | 604 | 547 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 261 | 274 | 647 | 230 | 243 | 687 | 1075 | - | - | 1208 | - | - |
| Mov Cap-2 Maneuver | 261 | 274 | - | 230 | 243 | - | - | - | - | - | - | - |
| Stage 1 | 586 | 600 | - | 548 | 534 | - | - | - | - | - | - | - |
| Stage 2 | 548 | 534 | - | 555 | 547 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 24 | 0 | 1.1 | 0 |
| HCM LOS | C | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1075 | - | - | 333 | - | 1208 | - | - |
| HCM Lane V/C Ratio | 0.048 | - | - | 0.438 | - | - | - | - |
| HCM Control Delay (s) | 8.5 | 0 | - | 24 | 0 | 0 | - | - |
| HCM Lane LOS | A | A | - | C | A | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 2.1 | - | 0 | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 10 | 0 | 546 | 0 | 0 | 0 | 622 | 575 | 0 | 0 | 481 | 30 |
| Future Volume (veh/h) | 10 | 0 | 546 | 0 | 0 | 0 | 622 | 575 | 0 | 0 | 481 | 30 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1870 | 1900 | 1900 | 1900 | 1841 | 1856 | 1856 | 1900 | 1885 | 1885 |
| Adj Flow Rate, veh/h | 11 | 0 | 607 | 0 | 0 | 0 | 691 | 639 | 0 | 0 | 534 | 33 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 0 | 2 | 0 | 0 | 0 | 4 | 3 | 3 | 0 | 1 | 1 |
| Cap, veh/h | 273 | 0 | 600 | 0 | 255 | 0 | 781 | 728 | 0 | 619 | 1758 | 108 |
| Arrive On Green | 0.13 | 0.00 | 0.14 | 0.00 | 0.00 | 0.00 | 0.38 | 0.66 | 0.00 | 0.00 | 0.51 | 0.50 |
| Sat Flow, veh/h | 1434 | 0 | 1558 | 0 | 1900 | 0 | 3401 | 1856 | 0 | 1810 | 3426 | 211 |
| Grp Volume(v), veh/h | 11 | 0 | 607 | 0 | 0 | 0 | 691 | 639 | 0 | 0 | 279 | 288 |
| Grp Sat Flow(s),veh/h/ln | 1434 | 0 | 1558 | 0 | 1900 | 0 | 1700 | 1856 | 0 | 1810 | 1791 | 1847 |
| Q Serve(g_s), s | 0.7 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 | 19.9 | 29.3 | 0.0 | 0.0 | 9.4 | 9.5 |
| Cycle Q Clear(g_c), s | 0.7 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 | 19.9 | 29.3 | 0.0 | 0.0 | 9.4 | 9.5 |
| Prop In Lane | 1.00 | | 1.00 | 0.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 254 | 0 | 600 | 0 | 255 | 0 | 781 | 728 | 0 | 619 | 919 | 948 |
| V/C Ratio(X) | 0.04 | 0.00 | 1.01 | 0.00 | 0.00 | 0.00 | 0.88 | 0.88 | 0.00 | 0.00 | 0.30 | 0.30 |
| Avail Cap(c_a), veh/h | 254 | 0 | 600 | 0 | 271 | 0 | 1393 | 1219 | 0 | 619 | 919 | 948 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.67 | 1.67 | 1.67 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.53 | 0.53 | 0.00 | 0.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 39.5 | 0.0 | 32.6 | 0.0 | 0.0 | 0.0 | 31.1 | 16.0 | 0.0 | 0.0 | 14.7 | 14.8 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 39.6 | 0.0 | 0.0 | 0.0 | 1.2 | 8.2 | 0.0 | 0.0 | 0.9 | 0.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.3 | 0.0 | 21.3 | 0.0 | 0.0 | 0.0 | 7.0 | 9.5 | 0.0 | 0.0 | 4.0 | 4.1 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 39.5 | 0.0 | 72.1 | 0.0 | 0.0 | 0.0 | 32.3 | 24.2 | 0.0 | 0.0 | 15.6 | 15.6 |
| LnGrp LOS | D | A | F | A | A | A | C | C | A | A | B | B |
| Approach Vol, veh/h | | 618 | | | 0 | | | 1330 | | | 567 | |
| Approach Delay, s/veh | | 71.6 | | | 0.0 | | | 28.4 | | | 15.6 | |
| Approach LOS | | E | | | | | | C | | | B | |
| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 28.1 | 57.9 | | 19.0 | 40.8 | 45.2 | | 19.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | * 5.4 | | * 5.4 | * 5.4 | * 5.4 | | * 5.4 | | | | |
| Max Green Setting (Gmax), s | 42.5 | * 34 | | * 15 | * 8.5 | * 68 | | * 14 | | | | |
| Max Q Clear Time (g_c+I1), s | 21.9 | 11.5 | | 0.0 | 0.0 | 31.3 | | 17.0 | | | | |
| Green Ext Time (p_c), s | 1.7 | 5.5 | | 0.0 | 0.0 | 8.5 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 36.1 | | | | | | | | | |
| HCM 6th LOS | | | D | | | | | | | | | |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1002 | 854 | 0 | 696 | 389 | 0 | 0 | 0 | 474 | 0 | 765 |
| Future Volume (veh/h) | 0 | 1002 | 854 | 0 | 696 | 389 | 0 | 0 | 0 | 474 | 0 | 765 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1841 | 1870 | 0 | 1841 | 1885 | | | | 1870 | 0 | 1767 |
| Adj Flow Rate, veh/h | 0 | 1077 | 0 | 0 | 748 | 0 | | | | 510 | 0 | 823 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | | | | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 0 | 4 | 1 | | | | 2 | 0 | 9 |
| Cap, veh/h | 0 | 2365 | | 0 | 2365 | | | | | 856 | 0 | 364 |
| Arrive On Green | 0.00 | 1.00 | 0.00 | 0.00 | 0.22 | 0.00 | | | | 0.25 | 0.00 | 0.24 |
| Sat Flow, veh/h | 0 | 3589 | 1585 | 0 | 3589 | 1598 | | | | 3456 | 0 | 1497 |
| Grp Volume(v), veh/h | 0 | 1077 | 0 | 0 | 748 | 0 | | | | 510 | 0 | 823 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1749 | 1585 | 0 | 1749 | 1598 | | | | 1728 | 0 | 1497 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.8 | 0.0 | | | | 13.7 | 0.0 | 25.5 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.8 | 0.0 | | | | 13.7 | 0.0 | 25.5 |
| Prop In Lane | 0.00 | | 1.00 | 0.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2365 | | 0 | 2365 | | | | | 856 | 0 | 364 |
| V/C Ratio(X) | 0.00 | 0.46 | | 0.00 | 0.32 | | | | | 0.60 | 0.00 | 2.26 |
| Avail Cap(c_a), veh/h | 0 | 2365 | | 0 | 2365 | | | | | 856 | 0 | 364 |
| HCM Platoon Ratio | 1.00 | 2.00 | 2.00 | 1.00 | 0.33 | 0.33 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.77 | 0.00 | 0.00 | 0.84 | 0.00 | | | | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 20.5 | 0.0 | | | | 34.9 | 0.0 | 39.8 |
| Incr Delay (d2), s/veh | 0.0 | 0.5 | 0.0 | 0.0 | 0.3 | 0.0 | | | | 0.9 | 0.0 | 577.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.2 | 0.0 | 0.0 | 8.8 | 0.0 | | | | 5.8 | 0.0 | 76.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.5 | 0.0 | 0.0 | 20.8 | 0.0 | | | | 35.8 | 0.0 | 617.1 |
| LnGrp LOS | A | A | | A | C | | | | | D | A | F |
| Approach Vol, veh/h | | 1077 | A | | 748 | A | | | | | 1333 | |
| Approach Delay, s/veh | | 0.5 | | | 20.8 | | | | | | 394.7 | |
| Approach LOS | | A | | | C | | | | | | F | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | | | | | |
| Phs Duration (G+Y+Rc), s | | 75.0 | | 30.0 | | 75.0 | | | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | | | | | |
| Max Green Setting (Gmax), s | | 70.0 | | 25.0 | | 42.0 | | | | | | |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | 27.5 | | 20.8 | | | | | | |
| Green Ext Time (p_c), s | | 17.2 | | 0.0 | | 7.4 | | | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 171.7 |
| HCM 6th LOS | | F |

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 17 | 446 | 209 | 51 | 360 | 3 | 461 | 5 | 63 | 2 | 8 | 15 |
| Future Volume (veh/h) | 17 | 446 | 209 | 51 | 360 | 3 | 461 | 5 | 63 | 2 | 8 | 15 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1811 | 1870 | 1826 | 1900 | 1885 | 1885 | 1870 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 20 | 513 | 240 | 59 | 414 | 3 | 530 | 6 | 72 | 2 | 9 | 17 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 6 | 2 | 5 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 60 | 1028 | 1129 | 130 | 2139 | 15 | 621 | 22 | 265 | 6 | 25 | 48 |
| Arrive On Green | 0.07 | 1.00 | 1.00 | 0.07 | 0.59 | 0.58 | 0.18 | 0.18 | 0.17 | 0.03 | 0.05 | 0.03 |
| Sat Flow, veh/h | 1725 | 1870 | 1547 | 1810 | 3645 | 26 | 3456 | 123 | 1473 | 122 | 549 | 1037 |
| Grp Volume(v), veh/h | 20 | 513 | 240 | 59 | 203 | 214 | 530 | 0 | 78 | 28 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1725 | 1870 | 1547 | 1810 | 1791 | 1880 | 1728 | 0 | 1595 | 1707 | 0 | 0 |
| Q Serve(g_s), s | 1.2 | 0.0 | 0.0 | 3.3 | 5.6 | 5.6 | 15.6 | 0.0 | 4.5 | 1.7 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.2 | 0.0 | 0.0 | 3.3 | 5.6 | 5.6 | 15.6 | 0.0 | 4.5 | 1.7 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.92 | 0.07 | | 0.61 |
| Lane Grp Cap(c), veh/h | 60 | 1028 | 1129 | 130 | 1051 | 1104 | 621 | 0 | 287 | 79 | 0 | 0 |
| V/C Ratio(X) | 0.33 | 0.50 | 0.21 | 0.45 | 0.19 | 0.19 | 0.85 | 0.00 | 0.27 | 0.36 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 164 | 1028 | 1129 | 172 | 1051 | 1104 | 1185 | 0 | 547 | 211 | 0 | 0 |
| HCM Platoon Ratio | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.83 | 0.83 | 0.83 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 47.7 | 0.0 | 0.0 | 46.7 | 10.1 | 10.1 | 41.7 | 0.0 | 37.6 | 49.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 1.0 | 1.4 | 0.4 | 0.9 | 0.4 | 0.4 | 1.3 | 0.0 | 0.2 | 1.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.4 | 0.1 | 1.5 | 2.2 | 2.3 | 6.7 | 0.0 | 1.8 | 0.7 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 48.7 | 1.4 | 0.4 | 47.6 | 10.5 | 10.5 | 43.0 | 0.0 | 37.7 | 50.1 | 0.0 | 0.0 |
| LnGrp LOS | D | A | A | D | B | B | D | A | D | D | A | A |
| Approach Vol, veh/h | | 773 | | | 476 | | | 608 | | | 28 | |
| Approach Delay, s/veh | | 2.3 | | | 15.1 | | | 42.4 | | | 50.1 | |
| Approach LOS | | A | | | B | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 11.6 | 61.7 | | 8.8 | 7.7 | 65.6 | | 22.9 |
| Change Period (Y+Rc), s | 5.0 | 5.0 | | 5.5 | 5.0 | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | 9.0 | 29.0 | | 11.5 | 9.0 | 29.0 | | 35.0 |
| Max Q Clear Time (g_c+I1), s | 5.3 | 2.0 | | 3.7 | 3.2 | 7.6 | | 17.6 |
| Green Ext Time (p_c), s | 0.0 | 1.2 | | 0.0 | 0.0 | 0.8 | | 0.3 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 19.2 |
| HCM 6th LOS | | B |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 22.5 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 165 | 177 | 168 | 118 | 134 | 103 |
| Future Vol, veh/h | 165 | 177 | 168 | 118 | 134 | 103 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 1 | 2 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 199 | 213 | 202 | 142 | 161 | 124 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 769 | 223 | 285 | 0 | - | 0 |
| Stage 1 | 223 | - | - | - | - | - |
| Stage 2 | 546 | - | - | - | - | - |
| Critical Hdwy | 6.41 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.41 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.41 | - | - | - | - | - |
| Follow-up Hdwy | 3.509 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 371 | 817 | 1277 | - | - | - |
| Stage 1 | 816 | - | - | - | - | - |
| Stage 2 | 582 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 307 | 817 | 1277 | - | - | - |
| Mov Cap-2 Maneuver | 307 | - | - | - | - | - |
| Stage 1 | 676 | - | - | - | - | - |
| Stage 2 | 582 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 52.7 | 4.9 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1277 | - | 454 | - | - |
| HCM Lane V/C Ratio | 0.159 | - | 0.908 | - | - |
| HCM Control Delay (s) | 8.3 | 0 | 52.7 | - | - |
| HCM Lane LOS | A | A | F | - | - |
| HCM 95th %tile Q(veh) | 0.6 | - | 10.1 | - | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 61.9 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 142 | 452 | 438 | 167 | 152 | 176 |
| Future Vol, veh/h | 142 | 452 | 438 | 167 | 152 | 176 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 160 | - | - | - | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, % | 1 | 1 | 2 | 8 | 3 | 1 |
| Mvmt Flow | 151 | 481 | 466 | 178 | 162 | 187 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 644 | 0 | - | 0 | 1338 | 555 |
| Stage 1 | - | - | - | - | 555 | - |
| Stage 2 | - | - | - | - | 783 | - |
| Critical Hdwy | 4.11 | - | - | - | 6.43 | 6.21 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.43 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.43 | - |
| Follow-up Hdwy | 2.209 | - | - | - | 3.527 | 3.309 |
| Pot Cap-1 Maneuver | 946 | - | - | - | 168 | 533 |
| Stage 1 | - | - | - | - | 573 | - |
| Stage 2 | - | - | - | - | 449 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 946 | - | - | - | ~ 141 | 533 |
| Mov Cap-2 Maneuver | - | - | - | - | ~ 141 | - |
| Stage 1 | - | - | - | - | 481 | - |
| Stage 2 | - | - | - | - | 449 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 2.3 | 0 | 283.9 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 946 | - | - | - | 233 |
| HCM Lane V/C Ratio | 0.16 | - | - | - | 1.498 |
| HCM Control Delay (s) | 9.5 | - | - | - | 283.9 |
| HCM Lane LOS | A | - | - | - | F |
| HCM 95th %tile Q(veh) | 0.6 | - | - | - | 20.8 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 18 | 31 | 0 | 0 | 59 | 21 | 4 | 1264 | 48 | 0 | 0 | 0 |
| Future Vol, veh/h | 18 | 31 | 0 | 0 | 59 | 21 | 4 | 1264 | 48 | 0 | 0 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 270 | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 16965 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, % | 0 | 2 | 0 | 0 | 0 | 5 | 0 | 3 | 2 | 0 | 0 | 0 |
| Mvmt Flow | 20 | 34 | 0 | 0 | 65 | 23 | 4 | 1389 | 53 | 0 | 0 | 0 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | |
|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 735 | 1450 | - | - | 1424 | 721 | 0 | 0 | 0 |
| Stage 1 | 0 | 0 | - | - | 1424 | - | - | - | - |
| Stage 2 | 735 | 1450 | - | - | 0 | - | - | - | - |
| Critical Hdwy | 7.5 | 6.54 | - | - | 6.5 | 7 | 4.1 | - | - |
| Critical Hdwy Stg 1 | - | - | - | - | 5.5 | - | - | - | - |
| Critical Hdwy Stg 2 | 6.5 | 5.54 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4.02 | - | - | 4 | 3.35 | 2.2 | - | - |
| Pot Cap-1 Maneuver | 311 | 130 | 0 | 0 | 137 | 363 | - | - | - |
| Stage 1 | - | - | 0 | 0 | 204 | - | - | - | - |
| Stage 2 | 382 | 194 | 0 | 0 | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - |
| Mov Cap-1 Maneuver | 183 | 130 | - | - | 137 | 363 | - | - | - |
| Mov Cap-2 Maneuver | 183 | 130 | - | - | 137 | - | - | - | - |
| Stage 1 | - | - | - | - | 204 | - | - | - | - |
| Stage 2 | 244 | 194 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 43.8 | 49.8 | |
| HCM LOS | E | E | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | - | 145 | 164 |
| HCM Lane V/C Ratio | - | - | - | 0.371 | 0.536 |
| HCM Control Delay (s) | - | - | - | 43.8 | 49.8 |
| HCM Lane LOS | - | - | - | E | E |
| HCM 95th %tile Q(veh) | - | - | - | 1.6 | 2.7 |

DKS

# Future (2040) Potential Growth Scenario Intersection Operations

**Urban Reserves *2040 Potential Growth Scenario* Intersection Operations**

| Intersection # | Intersection Name | Mobility Target | Traffic Control | LOS | Delay | V/C | Exceeds Target |
|---|---|---|---|---|---|---|---|
| 1 | NW David Hill Road & NW Thatcher Road | 0.9/0.9 | TWSC | A/D | 8/32 | 0.17/0.49 | |
| 2 | NW Gales Creek Road & NW Thatcher Road | 0.9/0.9 | TWSC | A/E | 8/36 | 0.25/0.65 | |
| 3 | NW Cornelius Pass Road & NW West Union Road | 0.9 | Signal | F | 156 | 1.22 | X |
| 4 | NW 185th Avenue & NW Springville Road | 0.9 | Signal | B | 11 | 0.73 | |
| 5 | NE Cornelius Pass Rd & NW Rosedale Rd | 0.9 | TWSC | A/F | 9/75 | 0.43/0.46 | |
| 6 | SW River Road and SW Rosedale Road | 0.9 | Roundabout[2] | A | 6.1 | 0.34 | |
| 7 | SW 170th Avenue & SW Rigert Road | 0.9 | AWSC | F | 140 | 1.22 | X |
| 8 | SW Clark Hill Road & SW Tile Flat Road | 0.9 | AWSC | F | 170 | 1.28 | X |
| 9 | SW Tile Flat Road & SW Scholls Ferry Road | 0.9 | Signal | C | 29 | 0.78 | |
| 10 | SW Roy Rogers Road & SW Beef Bend Road | 0.9 | Signal | B | 11 | 0.70 | |
| 11 | OR 219 & SW Scholls Ferry Road | 0.9/0.9 | TWSC | B/F | 10/454 | 0.49/1.9 | X |
| 12 | OR 219 & SW Seiffert Road | 0.9/0.9 | TWSC | A/B | 8/11 | 0.34/0.16 | |

[2] Roundabout operations are reported by worst approach of the intersection.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | SW Elwert Road & SW Scholls-Sherwood Road | 0.9 | AWSC | F | 464 | 2.04 | X |
| 14 | SW Elwert Road & SW Edy Road | 0.9 | ***Signal*** | D | 37 | 0.86 | |
| 15 | OR 99W & SW Brookman Road | 0.9/0.9 | ***Signal*** | E | 69 | 1.10 | X |
| 16 | SW Brookman Road & SW Ladd Hill Road | 0.9/0.9 | TWSC | A/C | 9/24 | 0.25/0.41 | |
| 17 | SW Oregon Street & SW Tonquin Road | 0.9/0.9 | Roundabout | C | 21.3 | 0.79 | |
| 18 | SW Boones Ferry Road & SW Norwood Road | 0.9/0.9 | TWSC | B/F | 11/210 | 0.47/0.84 | |
| 19 | SW Norwood Road & SW 65th Avenue | 0.9/0.9 | TWSC | A/F | 9/102 | 0.41/0.78 | |
| 20 | SW Day Road & SW Boones Ferry Road | 0.99 | Signal | F | 145 | 1.20 | X |
| 21 | I-5 SB Ramps & SW Boones Ferry Road | 0.99 | Signal | F | 172 | 0.84 | |
| 22 | SW Elligsen Road & SW Parkway Center Drive | 0.99 | Signal | E | 60 | 0.90 | |
| 23 | SW 65th Avenue & SW Elligsen Road | 0.9/0.9 | TWSC | A/D | 9/32 | 0.21/0.57 | |
| 24 | SW Elligsen Road & SW Stafford Road | 0.9/0.9 | TWSC | B/F | 11/254 | 0.5/1.38 | X |

| Intersection | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Int Delay, s/veh | 10.3 | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 45 | 80 | 45 | 50 | 140 | 5 | 115 | 150 | 30 | 15 | 180 | 100 |
| Future Vol, veh/h | 45 | 80 | 45 | 50 | 140 | 5 | 115 | 150 | 30 | 15 | 180 | 100 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 0 | 0 | 10 | 2 | 0 | 0 | 0 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 200 | - | - | 100 | - | - | 200 | - | - | 200 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 47 | 84 | 47 | 53 | 147 | 5 | 121 | 158 | 32 | 16 | 189 | 105 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 778 | 708 | 244 | 755 | 744 | 184 | 296 | 0 | 0 | 190 | 0 | 0 |
| Stage 1 | 276 | 276 | - | 416 | 416 | - | - | - | - | - | - | - |
| Stage 2 | 502 | 432 | - | 339 | 328 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 316 | 362 | 800 | 328 | 345 | 864 | 1277 | - | - | 1396 | - | - |
| Stage 1 | 735 | 685 | - | 618 | 595 | - | - | - | - | - | - | - |
| Stage 2 | 555 | 586 | - | 680 | 651 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 179 | 323 | 798 | 228 | 308 | 856 | 1275 | - | - | 1396 | - | - |
| Mov Cap-2 Maneuver | 179 | 323 | - | 228 | 308 | - | - | - | - | - | - | - |
| Stage 1 | 664 | 676 | - | 559 | 538 | - | - | - | - | - | - | - |
| Stage 2 | 359 | 530 | - | 554 | 643 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 21.6 | 26.4 | 3.2 | 0.4 |
| HCM LOS | C | D | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1275 | - | - | 179 | 411 | 228 | 315 | 1396 | - | - |
| HCM Lane V/C Ratio | 0.095 | - | - | 0.265 | 0.32 | 0.231 | 0.485 | 0.011 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 32.2 | 17.8 | 25.5 | 26.7 | 7.6 | - | - |
| HCM Lane LOS | A | - | - | D | C | D | D | A | - | - |
| HCM 95th %tile Q(veh) | 0.3 | - | - | 1 | 1.4 | 0.9 | 2.5 | 0 | - | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 8.3 | | | | | |
| **Movement** | **EBL** | **EBT** | **WBT** | **WBR** | **SBL** | **SBR** |
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 65 | 285 | 405 | 270 | 190 | 135 |
| Future Vol, veh/h | 65 | 285 | 405 | 270 | 190 | 135 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 1 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Free | - | None |
| Storage Length | 100 | - | - | 50 | 200 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 68 | 300 | 426 | 284 | 200 | 142 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 426 | 0 | - | 0 | 863 | 426 |
| Stage 1 | - | - | - | - | 426 | - |
| Stage 2 | - | - | - | - | 437 | - |
| Critical Hdwy | 4.1 | - | - | - | 6.4 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.4 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.4 | - |
| Follow-up Hdwy | 2.2 | - | - | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuver | 1144 | - | - | 0 | 328 | 633 |
| Stage 1 | - | - | - | 0 | 663 | - |
| Stage 2 | - | - | - | 0 | 655 | - |
| Platoon blocked, % | | - | - | | | |
| Mov Cap-1 Maneuver | 1144 | - | - | - | 309 | 633 |
| Mov Cap-2 Maneuver | - | - | - | - | 309 | - |
| Stage 1 | - | - | - | - | 624 | - |
| Stage 2 | - | - | - | - | 655 | - |
| **Approach** | **EB** | | **WB** | | **SB** | |
| HCM Control Delay, s | 1.6 | | 0 | | 26 | |
| HCM LOS | | | | | D | |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | SBLn1 | SBLn2 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1144 | - | - | 309 | 633 |
| HCM Lane V/C Ratio | 0.06 | - | - | 0.647 | 0.224 |
| HCM Control Delay (s) | 8.3 | - | - | 35.7 | 12.3 |
| HCM Lane LOS | A | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 4.2 | 0.9 |

HCM 6th Signalized Intersection Summary
3: Cornelius Pass Road & West Union Road 01/29/2020

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 340 | 495 | 105 | 355 | 125 | 50 | 105 | 1190 | 980 | 45 | 695 | 40 |
| Future Volume (veh/h) | 340 | 495 | 105 | 355 | 125 | 50 | 105 | 1190 | 980 | 45 | 695 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.97 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 358 | 521 | 111 | 374 | 132 | 53 | 111 | 1253 | 1032 | 47 | 732 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 275 | 540 | 553 | 365 | 304 | 122 | 337 | 858 | 723 | 116 | 1510 | 87 |
| Arrive On Green | 0.15 | 0.28 | 0.28 | 0.10 | 0.24 | 0.22 | 0.05 | 0.45 | 0.45 | 0.03 | 0.44 | 0.42 |
| Sat Flow, veh/h | 1810 | 1900 | 1608 | 3510 | 1288 | 517 | 1810 | 1900 | 1601 | 1810 | 3464 | 199 |
| Grp Volume(v), veh/h | 358 | 521 | 111 | 374 | 0 | 185 | 111 | 1253 | 1032 | 47 | 381 | 393 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1608 | 1755 | 0 | 1806 | 1810 | 1900 | 1601 | 1810 | 1805 | 1858 |
| Q Serve(g_s), s | 19.0 | 33.8 | 6.1 | 13.0 | 0.0 | 10.9 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Cycle Q Clear(g_c), s | 19.0 | 33.8 | 6.1 | 13.0 | 0.0 | 10.9 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.29 | 1.00 | | 1.00 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 275 | 540 | 553 | 365 | 0 | 426 | 337 | 858 | 723 | 116 | 787 | 810 |
| V/C Ratio(X) | 1.30 | 0.97 | 0.20 | 1.02 | 0.00 | 0.43 | 0.33 | 1.46 | 1.43 | 0.41 | 0.48 | 0.48 |
| Avail Cap(c_a), veh/h | 275 | 540 | 553 | 365 | 0 | 426 | 337 | 858 | 723 | 144 | 787 | 810 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 44.1 | 28.9 | 56.0 | 0.0 | 40.8 | 20.3 | 34.3 | 34.3 | 30.2 | 25.2 | 25.3 |
| Incr Delay (d2), s/veh | 159.7 | 29.9 | 0.1 | 53.5 | 0.0 | 0.3 | 0.2 | 213.3 | 199.9 | 0.8 | 2.1 | 2.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 20.8 | 20.2 | 2.4 | 8.5 | 0.0 | 4.9 | 1.8 | 76.2 | 61.5 | 0.8 | 8.5 | 8.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 212.7 | 74.0 | 29.0 | 109.5 | 0.0 | 41.1 | 20.5 | 247.5 | 234.1 | 31.1 | 27.3 | 27.3 |
| LnGrp LOS | F | E | C | F | A | D | C | F | F | C | C | C |
| Approach Vol, veh/h | | 990 | | | 559 | | | 2396 | | | 821 | |
| Approach Delay, s/veh | | 119.1 | | | 86.8 | | | 231.2 | | | 27.6 | |
| Approach LOS | | F | | | F | | | F | | | C | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.0 | 58.5 | 23.0 | 33.5 | 8.0 | 60.5 | 17.0 | 39.5 |
| Change Period (Y+Rc), s | 4.0 | 5.5 | 4.0 | 5.5 | 4.0 | 5.5 | 5.0 | 5.5 |
| Max Green Setting (Gmax), s | 6.0 | 53.0 | 19.0 | 28.0 | 6.0 | 53.0 | 12.0 | 34.0 |
| Max Q Clear Time (g_c+I1), s | 6.3 | 20.9 | 21.0 | 12.9 | 3.8 | 58.5 | 15.0 | 35.8 |
| Green Ext Time (p_c), s | 0.0 | 6.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 155.9 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 695 | 0 | 85 | 0 | 230 | 1580 | 100 | 370 | 0 |
| Future Volume (veh/h) | 0 | 0 | 0 | 695 | 0 | 85 | 0 | 230 | 1580 | 100 | 370 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.97 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 0 | 0 | 732 | 0 | 89 | 0 | 242 | 1663 | 105 | 389 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 0 | 3 | 0 | 1030 | 0 | 460 | 565 | 908 | 2185 | 302 | 1130 | 0 |
| Arrive On Green | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.27 | 0.00 | 0.48 | 0.48 | 0.06 | 0.59 | 0.00 |
| Sat Flow, veh/h | 0 | 1900 | 0 | 3505 | 0 | 1564 | 1810 | 1900 | 2831 | 1810 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 0 | 0 | 732 | 0 | 89 | 0 | 242 | 1663 | 105 | 389 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1900 | 0 | 1752 | 0 | 1564 | 1810 | 1900 | 1415 | 1810 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 13.4 | 0.0 | 3.1 | 0.0 | 5.5 | 23.3 | 2.0 | 7.5 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 13.4 | 0.0 | 3.1 | 0.0 | 5.5 | 23.3 | 2.0 | 7.5 | 0.0 |
| Prop In Lane | 0.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 3 | 0 | 1030 | 0 | 460 | 565 | 908 | 2185 | 302 | 1130 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 | 0.00 | 0.71 | 0.00 | 0.19 | 0.00 | 0.27 | 0.76 | 0.35 | 0.34 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 397 | 0 | 1710 | 0 | 763 | 1319 | 1020 | 2352 | 948 | 1130 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 22.6 | 0.0 | 19.6 | 0.0 | 11.2 | 4.5 | 8.5 | 7.4 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.2 | 0.0 | 0.2 | 1.4 | 0.3 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.0 | 5.3 | 0.0 | 1.1 | 0.0 | 2.1 | 14.6 | 0.7 | 2.6 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 | 0.0 | 23.7 | 0.0 | 19.8 | 0.0 | 11.4 | 5.9 | 8.8 | 7.5 | 0.0 |
| LnGrp LOS | A | A | A | C | A | B | A | B | A | A | A | A |
| Approach Vol, veh/h | | 0 | | | 821 | | | 1905 | | | 494 | |
| Approach Delay, s/veh | | 0.0 | | | 23.3 | | | 6.6 | | | 7.8 | |
| Approach LOS | | | | | C | | | A | | | A | |

| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 0.0 | 0.0 | 46.7 | | 25.1 | 8.4 | 38.3 |
| Change Period (Y+Rc), s | | 4.5 | 4.0 | 5.5 | | 5.5 | 4.0 | 5.5 |
| Max Green Setting (Gmax), s | | 14.5 | 30.0 | 37.0 | | 33.5 | 30.0 | 37.0 |
| Max Q Clear Time (g_c+I1), s | | 0.0 | 0.0 | 9.5 | | 15.4 | 4.0 | 25.3 |
| Green Ext Time (p_c), s | | 0.0 | 0.0 | 1.6 | | 4.1 | 0.1 | 7.4 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 11.0 |
| HCM 6th LOS | | | B |

Notes

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.8 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 40 | 110 | 535 | 30 | 170 | 715 |
| Future Vol, veh/h | 40 | 110 | 535 | 30 | 170 | 715 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | - | 100 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 41 | 113 | 552 | 31 | 175 | 737 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1655 | 568 | 0 | 0 | 583 | 0 |
| Stage 1 | 568 | - | - | - | - | - |
| Stage 2 | 1087 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 109 | 526 | - | - | 1001 | - |
| Stage 1 | 571 | - | - | - | - | - |
| Stage 2 | 326 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 90 | 526 | - | - | 1001 | - |
| Mov Cap-2 Maneuver | 90 | - | - | - | - | - |
| Stage 1 | 471 | - | - | - | - | - |
| Stage 2 | 326 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 30.1 | 0 | 1.8 |
| HCM LOS | D | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 90 | 526 | 1001 | - |
| HCM Lane V/C Ratio | - | - | 0.458 | 0.216 | 0.175 | - |
| HCM Control Delay (s) | - | - | 75.1 | 13.7 | 9.4 | - |
| HCM Lane LOS | - | - | F | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 1.9 | 0.8 | 0.6 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 80.6 |
| Intersection LOS | F |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↰ | ↑ | ↑ | ↱ | ↰ | ↱ |
| Traffic Vol, veh/h | 450 | 100 | 195 | 120 | 150 | 645 |
| Future Vol, veh/h | 450 | 100 | 195 | 120 | 150 | 645 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 474 | 105 | 205 | 126 | 158 | 679 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 2 | 2 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 2 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 2 |
| HCM Control Delay | 65.8 | 15.7 | 116.6 |
| HCM LOS | F | C | F |

| Lane | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 0% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 100% | 100% | 0% | 0% | 0% |
| Vol Right, % | 0% | 0% | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 450 | 100 | 195 | 120 | 150 | 645 |
| LT Vol | 450 | 0 | 0 | 0 | 150 | 0 |
| Through Vol | 0 | 100 | 195 | 0 | 0 | 0 |
| RT Vol | 0 | 0 | 0 | 120 | 0 | 645 |
| Lane Flow Rate | 474 | 105 | 205 | 126 | 158 | 679 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util (X) | 1.02 | 0.212 | 0.441 | 0.246 | 0.338 | 1.229 |
| Departure Headway (Hd) | 8.342 | 7.825 | 8.385 | 7.655 | 7.851 | 6.626 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 441 | 462 | 433 | 472 | 461 | 557 |
| Service Time | 6.042 | 5.525 | 6.085 | 5.355 | 5.551 | 4.326 |
| HCM Lane V/C Ratio | 1.075 | 0.227 | 0.473 | 0.267 | 0.343 | 1.219 |
| HCM Control Delay | 77.6 | 12.6 | 17.5 | 12.8 | 14.5 | 140.3 |
| HCM Lane LOS | F | B | C | B | B | F |
| HCM 95th-tile Q | 13.4 | 0.8 | 2.2 | 1 | 1.5 | 25.4 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 89 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 10 | 200 | 5 | 5 | 145 | 245 | 10 | 185 | 10 | 275 | 350 | 10 |
| Future Vol, veh/h | 10 | 200 | 5 | 5 | 145 | 245 | 10 | 185 | 10 | 275 | 350 | 10 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 11 | 211 | 5 | 5 | 153 | 258 | 11 | 195 | 11 | 289 | 368 | 11 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 19.7 | 34.1 | 18.4 | 169.5 |
| HCM LOS | C | D | C | F |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 5% | 5% | 1% | 43% |
| Vol Thru, % | 90% | 93% | 37% | 55% |
| Vol Right, % | 5% | 2% | 62% | 2% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 205 | 215 | 395 | 635 |
| LT Vol | 10 | 10 | 5 | 275 |
| Through Vol | 185 | 200 | 145 | 350 |
| RT Vol | 10 | 5 | 245 | 10 |
| Lane Flow Rate | 216 | 226 | 416 | 668 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.462 | 0.489 | 0.795 | 1.297 |
| Departure Headway (Hd) | 8.417 | 8.657 | 7.614 | 6.983 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 432 | 419 | 478 | 521 |
| Service Time | 6.417 | 6.657 | 5.614 | 5.043 |
| HCM Lane V/C Ratio | 0.5 | 0.539 | 0.87 | 1.282 |
| HCM Control Delay | 18.4 | 19.7 | 34.1 | 169.5 |
| HCM Lane LOS | C | C | D | F |
| HCM 95th-tile Q | 2.4 | 2.6 | 7.3 | 27.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 420 | 200 | 55 | 405 | 310 | 105 | 110 | 25 | 360 | 200 | 30 |
| Future Volume (veh/h) | 15 | 420 | 200 | 55 | 405 | 310 | 105 | 110 | 25 | 360 | 200 | 30 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 16 | 442 | 211 | 58 | 426 | 326 | 111 | 116 | 26 | 379 | 211 | 32 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 319 | 518 | 247 | 223 | 892 | 678 | 142 | 147 | 33 | 427 | 420 | 64 |
| Arrive On Green | 0.02 | 0.43 | 0.41 | 0.04 | 0.46 | 0.44 | 0.08 | 0.10 | 0.10 | 0.24 | 0.26 | 0.26 |
| Sat Flow, veh/h | 1810 | 1215 | 580 | 1810 | 1953 | 1485 | 1810 | 1503 | 337 | 1810 | 1612 | 244 |
| Grp Volume(v), veh/h | 16 | 0 | 653 | 58 | 393 | 359 | 111 | 0 | 142 | 379 | 0 | 243 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 0 | 1796 | 1810 | 1805 | 1633 | 1810 | 0 | 1839 | 1810 | 0 | 1856 |
| Q Serve(g_s), s | 0.5 | 0.0 | 29.2 | 1.6 | 13.4 | 13.8 | 5.3 | 0.0 | 6.7 | 18.0 | 0.0 | 9.9 |
| Cycle Q Clear(g_c), s | 0.5 | 0.0 | 29.2 | 1.6 | 13.4 | 13.8 | 5.3 | 0.0 | 6.7 | 18.0 | 0.0 | 9.9 |
| Prop In Lane | 1.00 | | 0.32 | 1.00 | | 0.91 | 1.00 | | 0.18 | 1.00 | | 0.13 |
| Lane Grp Cap(c), veh/h | 319 | 0 | 766 | 223 | 824 | 745 | 142 | 0 | 180 | 427 | 0 | 484 |
| V/C Ratio(X) | 0.05 | 0.00 | 0.85 | 0.26 | 0.48 | 0.48 | 0.78 | 0.00 | 0.79 | 0.89 | 0.00 | 0.50 |
| Avail Cap(c_a), veh/h | 408 | 0 | 1012 | 257 | 1017 | 920 | 255 | 0 | 394 | 663 | 0 | 816 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 15.4 | 0.0 | 23.2 | 18.9 | 16.8 | 17.3 | 40.1 | 0.0 | 39.1 | 32.8 | 0.0 | 27.9 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 6.0 | 0.6 | 0.5 | 0.6 | 9.0 | 0.0 | 2.9 | 9.3 | 0.0 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.0 | 12.9 | 0.7 | 5.4 | 5.1 | 2.7 | 0.0 | 3.1 | 8.8 | 0.0 | 4.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 15.4 | 0.0 | 29.1 | 19.5 | 17.3 | 17.9 | 49.1 | 0.0 | 42.1 | 42.0 | 0.0 | 28.2 |
| LnGrp LOS | B | A | C | B | B | B | D | A | D | D | A | C |
| Approach Vol, veh/h | | 669 | | | 810 | | | 253 | | | 622 | |
| Approach Delay, s/veh | | 28.8 | | | 17.7 | | | 45.2 | | | 36.7 | |
| Approach LOS | | C | | | B | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 8.3 | 41.8 | 11.5 | 27.1 | 5.6 | 44.5 | 25.4 | 13.2 |
| Change Period (Y+Rc), s | 4.5 | 5.5 | 4.5 | 4.5 | 4.0 | 5.5 | 4.5 | * 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 48.5 | 12.5 | 38.5 | 6.0 | 48.5 | 32.5 | * 19 |
| Max Q Clear Time (g_c+I1), s | 3.6 | 31.2 | 7.3 | 11.9 | 2.5 | 15.8 | 20.0 | 8.7 |
| Green Ext Time (p_c), s | 0.0 | 5.2 | 0.1 | 0.7 | 0.0 | 6.8 | 1.0 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 28.8 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 5 | 235 | 0 | 90 | 5 | 1350 | 130 | 125 | 1550 | 0 |
| Future Volume (veh/h) | 0 | 0 | 5 | 235 | 0 | 90 | 5 | 1350 | 130 | 125 | 1550 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 0 | 5 | 247 | 0 | 95 | 5 | 1421 | 137 | 132 | 1632 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 0 | 0 | 320 | 380 | 0 | 330 | 221 | 2118 | 945 | 295 | 2511 | 0 |
| Arrive On Green | 0.00 | 0.00 | 0.20 | 0.20 | 0.00 | 0.20 | 0.56 | 0.59 | 0.59 | 0.06 | 0.70 | 0.00 |
| Sat Flow, veh/h | 0 | 0 | 1610 | 1434 | 0 | 1610 | 313 | 3610 | 1610 | 1810 | 3705 | 0 |
| Grp Volume(v), veh/h | 0 | 0 | 5 | 247 | 0 | 95 | 5 | 1421 | 137 | 132 | 1632 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 0 | 1610 | 1434 | 0 | 1610 | 313 | 1805 | 1610 | 1810 | 1805 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.2 | 13.3 | 0.0 | 4.0 | 0.8 | 21.6 | 3.1 | 2.2 | 20.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.2 | 13.5 | 0.0 | 4.0 | 12.2 | 21.6 | 3.1 | 2.2 | 20.2 | 0.0 |
| Prop In Lane | 0.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 0 | 320 | 380 | 0 | 330 | 221 | 2118 | 945 | 295 | 2511 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 | 0.02 | 0.65 | 0.00 | 0.29 | 0.02 | 0.67 | 0.14 | 0.45 | 0.65 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 | 761 | 764 | 0 | 761 | 331 | 3391 | 1513 | 391 | 3975 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 25.9 | 30.9 | 0.0 | 27.2 | 13.8 | 11.3 | 7.5 | 11.1 | 6.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.2 | 0.0 | 0.5 | 0.1 | 0.4 | 0.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.1 | 4.5 | 0.0 | 1.5 | 0.1 | 7.6 | 1.0 | 0.8 | 5.9 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 | 25.9 | 31.6 | 0.0 | 27.4 | 13.8 | 11.8 | 7.6 | 11.5 | 7.1 | 0.0 |
| LnGrp LOS | A | A | C | C | A | C | B | B | A | B | A | A |
| Approach Vol, veh/h | | 5 | | | 342 | | | 1563 | | | 1764 | |
| Approach Delay, s/veh | | 25.9 | | | 30.4 | | | 11.4 | | | 7.5 | |
| Approach LOS | | C | | | C | | | B | | | A | |
| Timer - Assigned Phs | 1 | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 8.7 | 51.2 | | 20.5 | | 59.9 | | 20.5 | | | | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | * 4.5 | | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 9.0 | 73.5 | | * 38 | | 86.5 | | 37.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 4.2 | 23.6 | | 2.2 | | 22.2 | | 15.5 | | | | |
| Green Ext Time (p_c), s | 0.0 | 21.6 | | 0.0 | | 27.9 | | 0.4 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 11.3 |
| HCM 6th LOS | | B |

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Intersection | |
|---|---|
| Int Delay, s/veh | 134.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 355 | 95 | 95 | 200 | 415 | 370 |
| Future Vol, veh/h | 355 | 95 | 95 | 200 | 415 | 370 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 374 | 100 | 100 | 211 | 437 | 389 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1043 | 632 | 826 | 0 | - | 0 |
| Stage 1 | 632 | - | - | - | - | - |
| Stage 2 | 411 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | ~ 256 | 484 | 813 | - | - | - |
| Stage 1 | 534 | - | - | - | - | - |
| Stage 2 | 674 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 220 | 484 | 813 | - | - | - |
| Mov Cap-2 Maneuver | ~ 220 | - | - | - | - | - |
| Stage 1 | 460 | - | - | - | - | - |
| Stage 2 | 674 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 454 | 3.2 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 813 | - | 249 | - | - |
| HCM Lane V/C Ratio | 0.123 | - | 1.902 | - | - |
| HCM Control Delay (s) | 10 | 0 | $ 454 | - | - |
| HCM Lane LOS | B | A | F | - | - |
| HCM 95th %tile Q(veh) | 0.4 | - | 33.4 | - | - |

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2.8 | | | | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 105 | 210 | 5 | 145 | 365 |
| Future Vol, veh/h | 5 | 105 | 210 | 5 | 145 | 365 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 111 | 221 | 5 | 153 | 384 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 914 | 224 | 0 | 0 | 226 | 0 |
| Stage 1 | 224 | - | - | - | - | - |
| Stage 2 | 690 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 306 | 820 | - | - | 1354 | - |
| Stage 1 | 818 | - | - | - | - | - |
| Stage 2 | 502 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 262 | 820 | - | - | 1354 | - |
| Mov Cap-2 Maneuver | 262 | - | - | - | - | - |
| Stage 1 | 700 | - | - | - | - | - |
| Stage 2 | 502 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 10.7 | 0 | 2.3 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 748 | 1354 | - |
| HCM Lane V/C Ratio | - | - | 0.155 | 0.113 | - |
| HCM Control Delay (s) | - | - | 10.7 | 8 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 0.5 | 0.4 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 246.8 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 5 | 15 | 35 | 440 | 45 | 215 | 60 | 410 | 495 | 220 | 325 | 5 |
| Future Vol, veh/h | 5 | 15 | 35 | 440 | 45 | 215 | 60 | 410 | 495 | 220 | 325 | 5 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 15 | 36 | 454 | 46 | 222 | 62 | 423 | 510 | 227 | 335 | 5 |
| Number of Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 2 | 1 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 2 | 2 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 1 | 2 | 2 |
| HCM Control Delay | 16.3 | 67.5 | 435.7 | 166.8 |
| HCM LOS | C | F | F | F |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 |
|---|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 100% | 0% | 100% | 0% | 40% |
| Vol Thru, % | 0% | 45% | 0% | 30% | 0% | 17% | 59% |
| Vol Right, % | 0% | 55% | 0% | 70% | 0% | 83% | 1% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 60 | 905 | 5 | 50 | 440 | 260 | 550 |
| LT Vol | 60 | 0 | 5 | 0 | 440 | 0 | 220 |
| Through Vol | 0 | 410 | 0 | 15 | 0 | 45 | 325 |
| RT Vol | 0 | 495 | 0 | 35 | 0 | 215 | 5 |
| Lane Flow Rate | 62 | 933 | 5 | 52 | 454 | 268 | 567 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 | 6 |
| Degree of Util (X) | 0.146 | 1.971 | 0.015 | 0.131 | 1.053 | 0.542 | 1.265 |
| Departure Headway (Hd) | 9.037 | 8.118 | 12.88 | 11.811 | 10.033 | 8.889 | 9.507 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 400 | 457 | 280 | 306 | 367 | 410 | 386 |
| Service Time | 6.737 | 5.818 | 10.58 | 9.511 | 7.733 | 6.589 | 7.507 |
| HCM Lane V/C Ratio | 0.155 | 2.042 | 0.018 | 0.17 | 1.237 | 0.654 | 1.469 |
| HCM Control Delay | 13.3 | 463.7 | 15.8 | 16.3 | 94.6 | 21.6 | 166.8 |
| HCM Lane LOS | B | F | C | C | F | C | F |
| HCM 95th-tile Q | 0.5 | 59.3 | 0 | 0.4 | 13.2 | 3.1 | 21.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 55 | 235 | 30 | 30 | 460 | 195 | 20 | 285 | 30 | 295 | 430 | 195 |
| Future Volume (veh/h) | 55 | 235 | 30 | 30 | 460 | 195 | 20 | 285 | 30 | 295 | 430 | 195 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 58 | 247 | 32 | 32 | 484 | 205 | 21 | 300 | 32 | 311 | 453 | 205 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 79 | 644 | 83 | 385 | 495 | 210 | 244 | 618 | 66 | 546 | 580 | 263 |
| Arrive On Green | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.03 | 0.37 | 0.37 | 0.13 | 0.47 | 0.46 |
| Sat Flow, veh/h | 766 | 1648 | 214 | 1118 | 1267 | 537 | 1810 | 1688 | 180 | 1810 | 1239 | 561 |
| Grp Volume(v), veh/h | 58 | 0 | 279 | 32 | 0 | 689 | 21 | 0 | 332 | 311 | 0 | 658 |
| Grp Sat Flow(s),veh/h/ln | 766 | 0 | 1862 | 1118 | 0 | 1803 | 1810 | 0 | 1868 | 1810 | 0 | 1799 |
| Q Serve(g_s), s | 1.4 | 0.0 | 11.3 | 2.2 | 0.0 | 39.6 | 0.7 | 0.0 | 14.4 | 10.6 | 0.0 | 32.2 |
| Cycle Q Clear(g_c), s | 41.0 | 0.0 | 11.3 | 13.5 | 0.0 | 39.6 | 0.7 | 0.0 | 14.4 | 10.6 | 0.0 | 32.2 |
| Prop In Lane | 1.00 | | 0.11 | 1.00 | | 0.30 | 1.00 | | 0.10 | 1.00 | | 0.31 |
| Lane Grp Cap(c), veh/h | 79 | 0 | 727 | 385 | 0 | 704 | 244 | 0 | 683 | 546 | 0 | 843 |
| V/C Ratio(X) | 0.73 | 0.00 | 0.38 | 0.08 | 0.00 | 0.98 | 0.09 | 0.00 | 0.49 | 0.57 | 0.00 | 0.78 |
| Avail Cap(c_a), veh/h | 79 | 0 | 727 | 385 | 0 | 704 | 300 | 0 | 683 | 640 | 0 | 843 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 52.4 | 0.0 | 22.9 | 27.8 | 0.0 | 31.6 | 21.8 | 0.0 | 25.7 | 16.8 | 0.0 | 23.4 |
| Incr Delay (d2), s/veh | 29.5 | 0.0 | 0.3 | 0.1 | 0.0 | 28.5 | 0.1 | 0.0 | 2.5 | 0.9 | 0.0 | 7.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.2 | 0.0 | 4.9 | 0.6 | 0.0 | 22.2 | 0.3 | 0.0 | 6.8 | 4.4 | 0.0 | 14.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 81.8 | 0.0 | 23.3 | 27.9 | 0.0 | 60.1 | 22.0 | 0.0 | 28.1 | 17.7 | 0.0 | 30.5 |
| LnGrp LOS | F | A | C | C | A | E | C | A | C | B | A | C |
| Approach Vol, veh/h | | 337 | | | 721 | | | 353 | | | 969 | |
| Approach Delay, s/veh | | 33.4 | | | 58.7 | | | 27.8 | | | 26.4 | |
| Approach LOS | | C | | | E | | | C | | | C | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 17.6 | 42.4 | | 45.0 | 6.8 | 53.2 | | 45.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 |
| Max Green Setting (Gmax), s | 18.5 | 32.5 | | 40.5 | 5.5 | 45.5 | | 40.5 |
| Max Q Clear Time (g_c+I1), s | 12.6 | 16.4 | | 43.0 | 2.7 | 34.2 | | 41.6 |
| Green Ext Time (p_c), s | 0.5 | 1.8 | | 0.0 | 0.0 | 3.6 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 37.4 |
| HCM 6th LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 85 | 50 | 155 | 20 | 75 | 35 | 1325 | 75 | 55 | 2655 | 165 |
| Future Volume (veh/h) | 180 | 85 | 50 | 155 | 20 | 75 | 35 | 1325 | 75 | 55 | 2655 | 165 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1870 | 1900 | 1900 | 1900 | 1856 | 1856 | 1841 | 1885 | 1900 |
| Adj Flow Rate, veh/h | 198 | 93 | 55 | 163 | 21 | 79 | 37 | 1395 | 79 | 60 | 2918 | 181 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 3 | 4 | 1 | 0 |
| Cap, veh/h | 208 | 190 | 112 | 178 | 59 | 223 | 85 | 2311 | 131 | 105 | 2489 | 1096 |
| Arrive On Green | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.05 | 0.68 | 0.66 | 0.06 | 0.69 | 0.69 |
| Sat Flow, veh/h | 1315 | 1119 | 662 | 1240 | 349 | 1314 | 1810 | 3392 | 192 | 1753 | 3582 | 1577 |
| Grp Volume(v), veh/h | 198 | 0 | 148 | 163 | 0 | 100 | 37 | 723 | 751 | 60 | 2918 | 181 |
| Grp Sat Flow(s),veh/h/ln | 1315 | 0 | 1781 | 1240 | 0 | 1663 | 1810 | 1763 | 1821 | 1753 | 1791 | 1577 |
| Q Serve(g_s), s | 13.2 | 0.0 | 8.9 | 11.1 | 0.0 | 6.3 | 2.3 | 26.2 | 26.5 | 3.9 | 82.0 | 4.7 |
| Cycle Q Clear(g_c), s | 19.5 | 0.0 | 8.9 | 20.0 | 0.0 | 6.3 | 2.3 | 26.2 | 26.5 | 3.9 | 82.0 | 4.7 |
| Prop In Lane | 1.00 | | 0.37 | 1.00 | | 0.79 | 1.00 | | 0.11 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 208 | 0 | 302 | 178 | 0 | 282 | 85 | 1201 | 1241 | 105 | 2489 | 1096 |
| V/C Ratio(X) | 0.95 | 0.00 | 0.49 | 0.92 | 0.00 | 0.35 | 0.44 | 0.60 | 0.61 | 0.57 | 1.17 | 0.17 |
| Avail Cap(c_a), veh/h | 208 | 0 | 302 | 178 | 0 | 282 | 115 | 1225 | 1265 | 111 | 2489 | 1096 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 54.1 | 0.0 | 44.4 | 55.0 | 0.0 | 43.3 | 54.7 | 10.2 | 10.3 | 54.0 | 18.0 | 6.2 |
| Incr Delay (d2), s/veh | 48.1 | 0.0 | 1.2 | 44.4 | 0.0 | 0.8 | 3.5 | 0.8 | 0.8 | 6.0 | 82.2 | 0.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 8.7 | 0.0 | 4.0 | 7.1 | 0.0 | 2.7 | 1.2 | 9.6 | 10.0 | 1.9 | 57.5 | 1.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 102.1 | 0.0 | 45.6 | 99.4 | 0.0 | 44.1 | 58.3 | 11.0 | 11.1 | 60.0 | 100.3 | 6.3 |
| LnGrp LOS | F | A | D | F | A | D | E | B | B | E | F | A |
| Approach Vol, veh/h | | 346 | | | 263 | | | 1511 | | | 3159 | |
| Approach Delay, s/veh | | 78.0 | | | 78.4 | | | 12.2 | | | 94.1 | |
| Approach LOS | | E | | | E | | | B | | | F | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 9.6 | 84.4 | | 24.0 | 8.0 | 86.0 | | 24.0 |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 80.0 | | 19.5 | 5.5 | 80.0 | | 19.5 |
| Max Q Clear Time (g_c+I1), s | 5.9 | 28.5 | | 21.5 | 4.3 | 84.0 | | 22.0 |
| Green Ext Time (p_c), s | 0.0 | 16.3 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 68.8 |
| HCM 6th LOS | E |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.4 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 120 | 125 | 210 | 100 | 180 | 200 |
| Future Vol, veh/h | 120 | 125 | 210 | 100 | 180 | 200 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 200 | 0 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 126 | 132 | 221 | 105 | 189 | 211 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 736 | 189 | 400 | 0 | - | 0 |
| Stage 1 | 189 | - | - | - | - | - |
| Stage 2 | 547 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 389 | 858 | 1170 | - | - | - |
| Stage 1 | 848 | - | - | - | - | - |
| Stage 2 | 584 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 311 | 858 | 1170 | - | - | - |
| Mov Cap-2 Maneuver | 311 | - | - | - | - | - |
| Stage 1 | 678 | - | - | - | - | - |
| Stage 2 | 584 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 17 | 6 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1170 | - | 311 | 858 | - | - |
| HCM Lane V/C Ratio | 0.189 | - | 0.406 | 0.153 | - | - |
| HCM Control Delay (s) | 8.8 | 0 | 24.3 | 10 | - | - |
| HCM Lane LOS | A | A | C | B | - | - |
| HCM 95th %tile Q(veh) | 0.7 | - | 1.9 | 0.5 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.4 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 40 | 185 | 765 | 95 | 190 | 745 |
| Future Vol, veh/h | 40 | 185 | 765 | 95 | 190 | 745 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | 70 | 290 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 42 | 195 | 805 | 100 | 200 | 784 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1991 | 805 | 0 | 0 | 905 | 0 |
| Stage 1 | 805 | - | - | - | - | - |
| Stage 2 | 1186 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 68 | 386 | - | - | 760 | - |
| Stage 1 | 443 | - | - | - | - | - |
| Stage 2 | 293 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 50 | 386 | - | - | 760 | - |
| Mov Cap-2 Maneuver | 50 | - | - | - | - | - |
| Stage 1 | 326 | - | - | - | - | - |
| Stage 2 | 292 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 56.6 | 0 | 2.3 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 50 | 386 | 760 | - |
| HCM Lane V/C Ratio | - | - | 0.842 | 0.504 | 0.263 | - |
| HCM Control Delay (s) | - | - | 210.4 | 23.4 | 11.4 | - |
| HCM Lane LOS | - | - | F | C | B | - |
| HCM 95th %tile Q(veh) | - | - | 3.5 | 2.7 | 1.1 | - |

| Intersection | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.4 | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 660 | 0 | 0 | 520 | 140 |
| Future Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 660 | 0 | 0 | 520 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 100 | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 89 | 0 | 42 | 0 | 0 | 0 | 42 | 695 | 0 | 0 | 547 | 147 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1400 | 1400 | 621 | 1421 | 1473 | 695 | 694 | 0 | 0 | 695 | 0 | 0 |
| Stage 1 | 621 | 621 | - | 779 | 779 | - | - | - | - | - | - | - |
| Stage 2 | 779 | 779 | - | 642 | 694 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 119 | 142 | 491 | 115 | 128 | 446 | 911 | - | - | 910 | - | - |
| Stage 1 | 478 | 482 | - | 392 | 409 | - | - | - | - | - | - | - |
| Stage 2 | 392 | 409 | - | 466 | 447 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 115 | 135 | 491 | 101 | 122 | 446 | 911 | - | - | 910 | - | - |
| Mov Cap-2 Maneuver | 115 | 135 | - | 101 | 122 | - | - | - | - | - | - | - |
| Stage 1 | 456 | 482 | - | 374 | 390 | - | - | - | - | - | - | - |
| Stage 2 | 374 | 390 | - | 426 | 447 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 73.8 | 0 | 0.5 | 0 |
| HCM LOS | F | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 911 | - | - | 115 | 491 | - | 910 | - | - |
| HCM Lane V/C Ratio | 0.046 | - | - | 0.778 | 0.086 | - | - | - | - |
| HCM Control Delay (s) | 9.1 | - | - | 102.4 | 13 | 0 | 0 | - | - |
| HCM Lane LOS | A | - | - | F | B | A | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 4.4 | 0.3 | - | 0 | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 175 | 575 | 175 | 190 | 210 | 680 | 775 | 160 | 185 | 610 | 45 |
| Future Volume (veh/h) | 15 | 175 | 575 | 175 | 190 | 210 | 680 | 775 | 160 | 185 | 610 | 45 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 16 | 184 | 605 | 184 | 200 | 221 | 716 | 816 | 168 | 195 | 642 | 47 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 56 | 543 | 651 | 171 | 288 | 318 | 401 | 597 | 123 | 667 | 2228 | 163 |
| Arrive On Green | 0.03 | 0.29 | 0.29 | 0.09 | 0.35 | 0.34 | 0.11 | 0.39 | 0.38 | 0.37 | 0.65 | 0.64 |
| Sat Flow, veh/h | 1810 | 1900 | 1587 | 1810 | 824 | 911 | 3510 | 1528 | 315 | 1810 | 3410 | 249 |
| Grp Volume(v), veh/h | 16 | 184 | 605 | 184 | 0 | 421 | 716 | 0 | 984 | 195 | 339 | 350 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1587 | 1810 | 0 | 1735 | 1755 | 0 | 1842 | 1810 | 1805 | 1855 |
| Q Serve(g_s), s | 0.9 | 8.0 | 30.0 | 9.9 | 0.0 | 22.0 | 12.0 | 0.0 | 41.0 | 8.0 | 8.4 | 8.5 |
| Cycle Q Clear(g_c), s | 0.9 | 8.0 | 30.0 | 9.9 | 0.0 | 22.0 | 12.0 | 0.0 | 41.0 | 8.0 | 8.4 | 8.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.52 | 1.00 | | 0.17 | 1.00 | | 0.13 |
| Lane Grp Cap(c), veh/h | 56 | 543 | 651 | 171 | 0 | 605 | 401 | 0 | 719 | 667 | 1179 | 1212 |
| V/C Ratio(X) | 0.28 | 0.34 | 0.93 | 1.08 | 0.00 | 0.70 | 1.78 | 0.00 | 1.37 | 0.29 | 0.29 | 0.29 |
| Avail Cap(c_a), veh/h | 119 | 543 | 651 | 171 | 0 | 605 | 401 | 0 | 719 | 667 | 1179 | 1212 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.65 | 0.00 | 0.65 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 29.7 | 29.7 | 47.5 | 0.0 | 29.7 | 46.5 | 0.0 | 32.1 | 23.5 | 7.8 | 7.8 |
| Incr Delay (d2), s/veh | 2.7 | 0.3 | 19.7 | 91.4 | 0.0 | 3.2 | 359.6 | 0.0 | 171.4 | 0.1 | 0.6 | 0.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 3.7 | 17.6 | 8.8 | 0.0 | 9.6 | 25.2 | 0.0 | 51.9 | 3.4 | 3.2 | 3.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 52.5 | 29.9 | 49.4 | 138.9 | 0.0 | 33.0 | 406.1 | 0.0 | 203.5 | 23.6 | 8.4 | 8.4 |
| LnGrp LOS | D | C | D | F | A | C | F | A | F | C | A | A |
| Approach Vol, veh/h | | 805 | | | 605 | | | 1700 | | | 884 | |
| Approach Delay, s/veh | | 45.0 | | | 65.2 | | | 288.9 | | | 11.8 | |
| Approach LOS | | D | | | E | | | F | | | B | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 16.0 | 73.5 | 6.4 | 40.6 | 44.5 | 45.0 | 13.0 | 34.0 |
| Change Period (Y+Rc), s | 4.5 | * 5.4 | 4.5 | * 5.4 | * 5.4 | * 5.4 | 4.5 | * 5.4 |
| Max Green Setting (Gmax), s | 11.5 | * 37 | 5.5 | * 32 | * 8.5 | * 40 | 8.5 | * 29 |
| Max Q Clear Time (g_c+I1), s | 14.0 | 10.5 | 2.9 | 24.0 | 10.0 | 43.0 | 11.9 | 32.0 |
| Green Ext Time (p_c), s | 0.0 | 7.4 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 144.5 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1095 | 1015 | 0 | 735 | 420 | 0 | 0 | 0 | 690 | 0 | 1155 |
| Future Volume (veh/h) | 0 | 1095 | 1015 | 0 | 735 | 420 | 0 | 0 | 0 | 690 | 0 | 1155 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1900 | 1900 | 0 | 1900 | 1900 | | | | 1900 | 0 | 1900 |
| Adj Flow Rate, veh/h | 0 | 1153 | 0 | 0 | 774 | 0 | | | | 726 | 0 | 1216 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | | | | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Cap, veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| Arrive On Green | 0.00 | 1.00 | 0.00 | 0.00 | 0.23 | 0.00 | | | | 0.22 | 0.00 | 0.21 |
| Sat Flow, veh/h | 0 | 3705 | 1610 | 0 | 3705 | 1610 | | | | 3510 | 0 | 2834 |
| Grp Volume(v), veh/h | 0 | 1153 | 0 | 0 | 774 | 0 | | | | 726 | 0 | 1216 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1805 | 1610 | 0 | 1805 | 1610 | | | | 1755 | 0 | 1417 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.6 | 0.0 | | | | 21.4 | 0.0 | 22.5 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.6 | 0.0 | | | | 21.4 | 0.0 | 22.5 |
| Prop In Lane | 0.00 | | 1.00 | 0.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| V/C Ratio(X) | 0.00 | 0.45 | | 0.00 | 0.30 | | | | | 0.94 | 0.00 | 2.00 |
| Avail Cap(c_a), veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| HCM Platoon Ratio | 1.00 | 2.00 | 2.00 | 1.00 | 0.33 | 0.33 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.63 | 0.00 | 0.00 | 0.94 | 0.00 | | | | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 19.0 | 0.0 | | | | 40.4 | 0.0 | 41.2 |
| Incr Delay (d2), s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 0.3 | 0.0 | | | | 19.9 | 0.0 | 456.9 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.1 | 0.0 | 0.0 | 9.0 | 0.0 | | | | 11.2 | 0.0 | 54.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 19.3 | 0.0 | | | | 60.3 | 0.0 | 498.2 |
| LnGrp LOS | A | A | | A | B | | | | | E | A | F |
| Approach Vol, veh/h | | 1153 | A | | 774 | A | | | | | 1942 | |
| Approach Delay, s/veh | | 0.4 | | | 19.3 | | | | | | 334.5 | |
| Approach LOS | | A | | | B | | | | | | F | |

| Timer - Assigned Phs | 2 | 4 | 6 |
|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 78.0 | 27.0 | 78.0 |
| Change Period (Y+Rc), s | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | 73.0 | 22.0 | 37.9 |
| Max Q Clear Time (g_c+I1), s | 2.0 | 24.5 | 20.6 |
| Green Ext Time (p_c), s | 19.3 | 0.0 | 6.9 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 171.9 |
| HCM 6th LOS | F |

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 95 | 595 | 245 | 235 | 355 | 60 | 340 | 115 | 245 | 25 | 80 | 40 |
| Future Volume (veh/h) | 95 | 595 | 245 | 235 | 355 | 60 | 340 | 115 | 245 | 25 | 80 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 100 | 626 | 258 | 247 | 374 | 63 | 358 | 121 | 258 | 26 | 84 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 144 | 754 | 1048 | 172 | 1277 | 213 | 893 | 135 | 288 | 157 | 121 | 60 |
| Arrive On Green | 0.03 | 0.13 | 0.13 | 0.10 | 0.41 | 0.40 | 0.25 | 0.25 | 0.24 | 0.09 | 0.10 | 0.09 |
| Sat Flow, veh/h | 1810 | 1900 | 1610 | 1810 | 3095 | 517 | 3510 | 532 | 1134 | 1810 | 1195 | 597 |
| Grp Volume(v), veh/h | 100 | 626 | 258 | 247 | 217 | 220 | 358 | 0 | 379 | 26 | 0 | 126 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1610 | 1810 | 1805 | 1807 | 1755 | 0 | 1666 | 1810 | 0 | 1792 |
| Q Serve(g_s), s | 5.8 | 33.7 | 8.9 | 10.0 | 8.4 | 8.6 | 8.9 | 0.0 | 23.1 | 1.4 | 0.0 | 7.1 |
| Cycle Q Clear(g_c), s | 5.8 | 33.7 | 8.9 | 10.0 | 8.4 | 8.6 | 8.9 | 0.0 | 23.1 | 1.4 | 0.0 | 7.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.29 | 1.00 | | 0.68 | 1.00 | | 0.33 |
| Lane Grp Cap(c), veh/h | 144 | 754 | 1048 | 172 | 745 | 746 | 893 | 0 | 424 | 157 | 0 | 181 |
| V/C Ratio(X) | 0.70 | 0.83 | 0.25 | 1.43 | 0.29 | 0.30 | 0.40 | 0.00 | 0.89 | 0.17 | 0.00 | 0.69 |
| Avail Cap(c_a), veh/h | 172 | 754 | 1048 | 172 | 745 | 746 | 1204 | 0 | 571 | 198 | 0 | 222 |
| HCM Platoon Ratio | 0.33 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.72 | 0.72 | 0.72 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.9 | 42.2 | 11.5 | 47.5 | 20.6 | 20.7 | 32.5 | 0.0 | 38.1 | 44.4 | 0.0 | 45.9 |
| Incr Delay (d2), s/veh | 4.5 | 7.6 | 0.4 | 224.9 | 1.0 | 1.0 | 0.1 | 0.0 | 11.1 | 0.2 | 0.0 | 4.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.9 | 18.8 | 6.8 | 15.2 | 3.7 | 3.8 | 3.8 | 0.0 | 10.6 | 0.6 | 0.0 | 3.4 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 54.4 | 49.8 | 11.9 | 272.4 | 21.6 | 21.7 | 32.6 | 0.0 | 49.2 | 44.6 | 0.0 | 50.3 |
| LnGrp LOS | D | D | B | F | C | C | C | A | D | D | A | D |
| Approach Vol, veh/h | | 984 | | | 684 | | | 737 | | | 152 | |
| Approach Delay, s/veh | | 40.3 | | | 112.2 | | | 41.2 | | | 49.3 | |
| Approach LOS | | D | | | F | | | D | | | D | |
| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 14.0 | 45.7 | | 14.6 | 12.3 | 47.3 | | 30.7 | | | | |
| Change Period (Y+Rc), s | 5.0 | 5.0 | | 5.5 | 5.0 | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | 9.0 | 29.0 | | 11.5 | 9.0 | 29.0 | | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 12.0 | 35.7 | | 9.1 | 7.8 | 10.6 | | 25.1 | | | | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.1 | 0.0 | 0.9 | | 0.6 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 60.3 | | | | | | | | | |
| HCM 6th LOS | | | E | | | | | | | | | |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 8 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 165 | 180 | 175 | 245 | 255 | 80 |
| Future Vol, veh/h | 165 | 180 | 175 | 245 | 255 | 80 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 200 | 0 | 25 | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 174 | 189 | 184 | 258 | 268 | 84 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 936 | 310 | 352 | 0 | - | 0 |
| Stage 1 | 310 | - | - | - | - | - |
| Stage 2 | 626 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 297 | 735 | 1218 | - | - | - |
| Stage 1 | 748 | - | - | - | - | - |
| Stage 2 | 537 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 252 | 735 | 1218 | - | - | - |
| Mov Cap-2 Maneuver | 303 | - | - | - | - | - |
| Stage 1 | 635 | - | - | - | - | - |
| Stage 2 | 537 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 21.2 | 3.5 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1218 | - | 303 | 735 | - | - |
| HCM Lane V/C Ratio | 0.151 | - | 0.573 | 0.258 | - | - |
| HCM Control Delay (s) | 8.5 | - | 31.7 | 11.6 | - | - |
| HCM Lane LOS | A | - | D | B | - | - |
| HCM 95th %tile Q(veh) | 0.5 | - | 3.3 | 1 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 33.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 160 | 520 | 540 | 265 | 230 | 205 |
| Future Vol, veh/h | 160 | 520 | 540 | 265 | 230 | 205 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 160 | - | - | - | 25 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 168 | 547 | 568 | 279 | 242 | 216 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 847 | 0 | - | 0 | 1591 | 708 |
| Stage 1 | - | - | - | - | 708 | - |
| Stage 2 | - | - | - | - | 883 | - |
| Critical Hdwy | 4.1 | - | - | - | 6.4 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.4 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.4 | - |
| Follow-up Hdwy | 2.2 | - | - | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuver | 799 | - | - | - | ~ 119 | 438 |
| Stage 1 | - | - | - | - | 492 | - |
| Stage 2 | - | - | - | - | 408 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 799 | - | - | - | ~ 94 | 438 |
| Mov Cap-2 Maneuver | - | - | - | - | ~ 175 | - |
| Stage 1 | - | - | - | - | 389 | - |
| Stage 2 | - | - | - | - | 408 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 2.5 | 0 | 144.3 |
| HCM LOS | | | F |

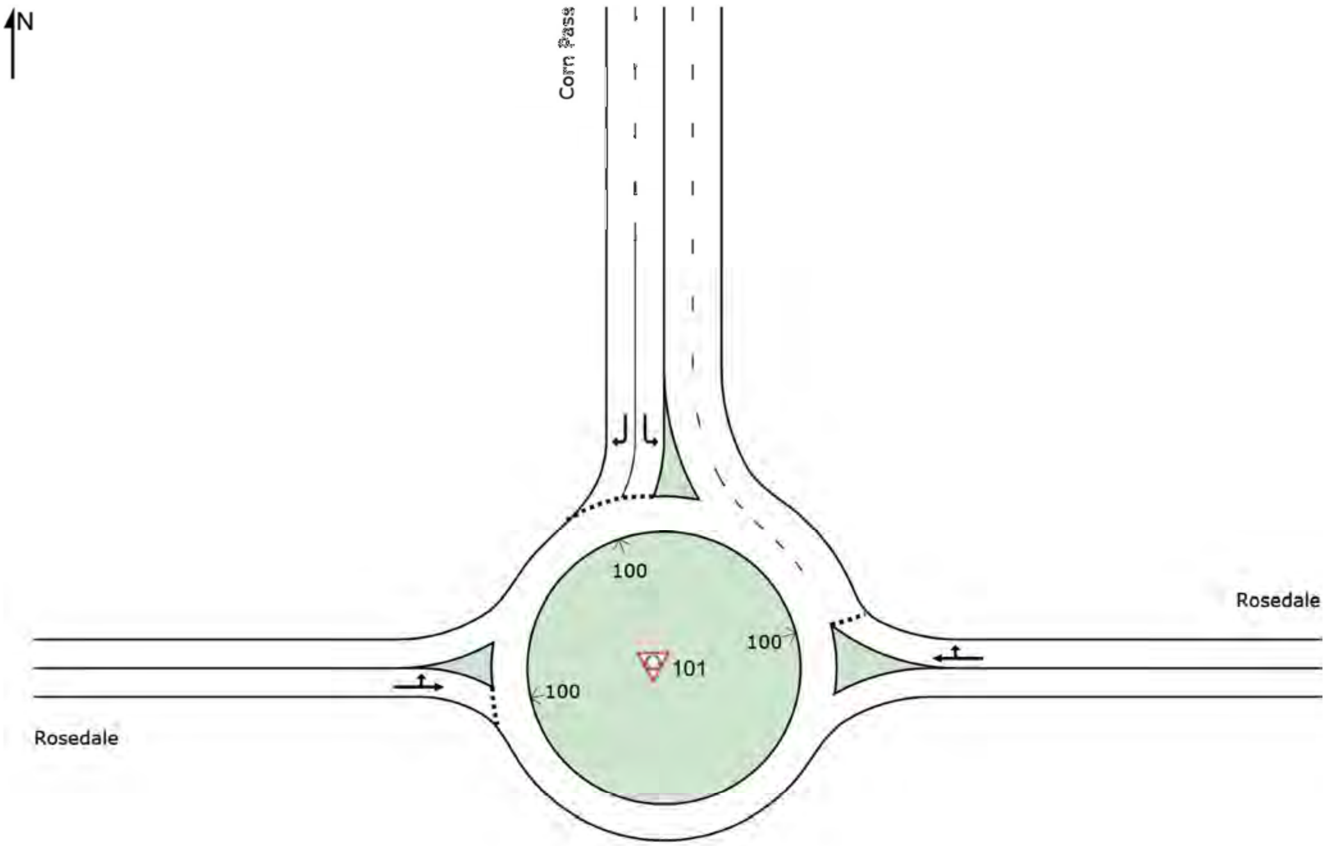
| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 799 | - | - | - | 175 | 438 |
| HCM Lane V/C Ratio | 0.211 | - | - | - | 1.383 | 0.493 |
| HCM Control Delay (s) | 10.7 | - | - | - | 254.2 | 20.9 |
| HCM Lane LOS | B | - | - | - | F | C |
| HCM 95th %tile Q(veh) | 0.8 | - | - | - | 14.6 | 2.7 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

# SITE LAYOUT

## Site: 101 [Corn Pass/Rosedale 2040 No Build]

New Site
Site Category: (None)
Roundabout



# MOVEMENT SUMMARY

## Site: 101 [Corn Pass/Rosedale 2040 Build]

New Site
Site Category: (None)
Roundabout

**Movement Performance - Vehicles**

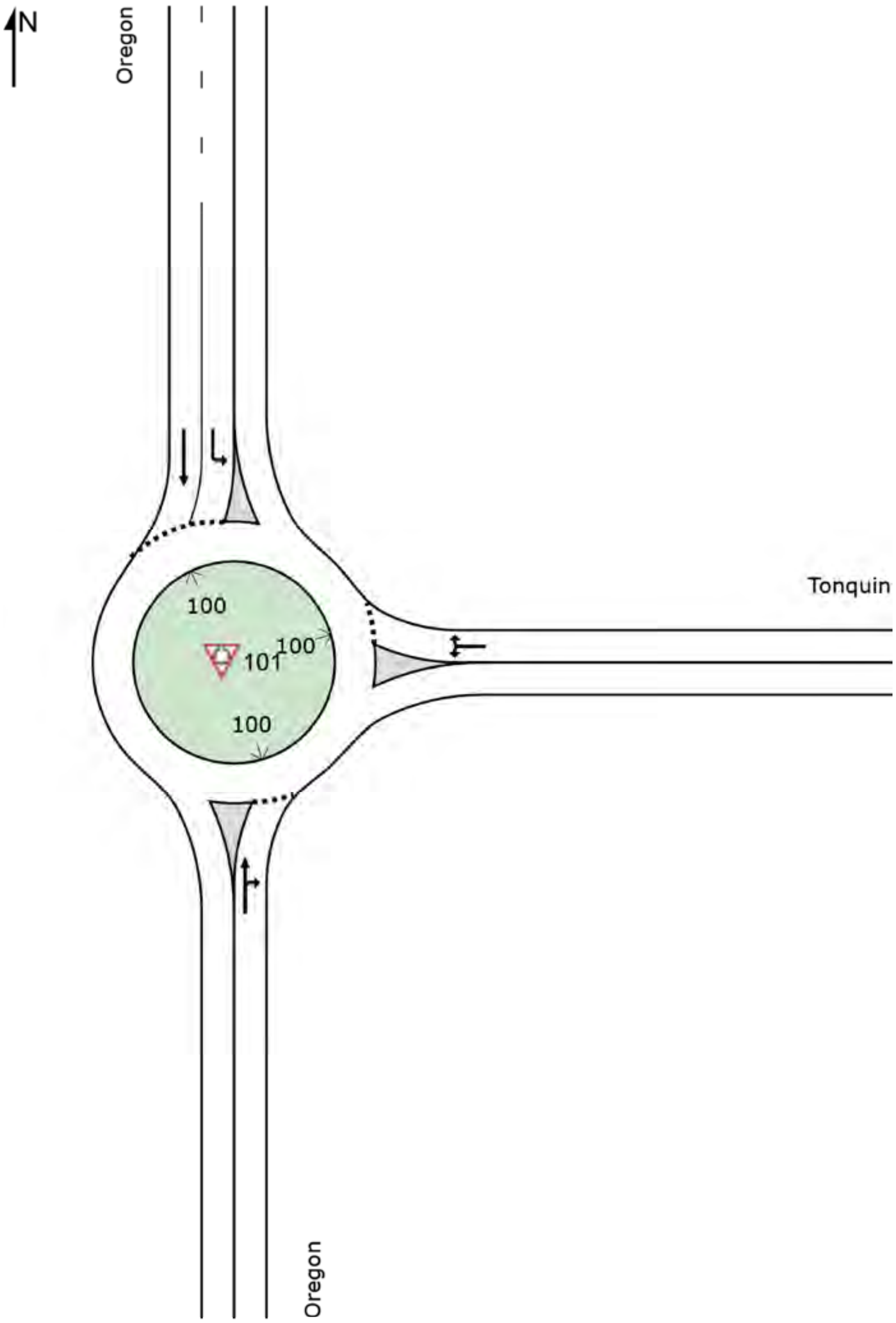
| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Rosedale | | | | | | | | | | | | |
| 6 | T1 | 253 | 2.0 | 0.336 | 5.7 | LOS A | 2.0 | 51.9 | 0.11 | 0.03 | 0.11 | 34.8 |
| 16 | R2 | 195 | 2.0 | 0.336 | 5.7 | LOS A | 2.0 | 51.9 | 0.11 | 0.03 | 0.11 | 33.8 |
| Approach | | 447 | 2.0 | 0.336 | 5.7 | LOS A | 2.0 | 51.9 | 0.11 | 0.03 | 0.11 | 34.4 |
| North: Corn Pass | | | | | | | | | | | | |
| 7 | L2 | 179 | 2.0 | 0.163 | 4.7 | LOS A | 0.7 | 17.3 | 0.38 | 0.27 | 0.38 | 32.7 |
| 14 | R2 | 26 | 2.0 | 0.024 | 3.5 | LOS A | 0.1 | 2.3 | 0.34 | 0.20 | 0.34 | 34.7 |
| Approach | | 205 | 2.0 | 0.163 | 4.6 | LOS A | 0.7 | 17.3 | 0.38 | 0.26 | 0.38 | 32.9 |
| West: Rosedale | | | | | | | | | | | | |
| 5 | L2 | 16 | 2.0 | 0.305 | 6.1 | LOS A | 1.6 | 41.2 | 0.41 | 0.27 | 0.41 | 34.6 |
| 2 | T1 | 326 | 2.0 | 0.305 | 6.1 | LOS A | 1.6 | 41.2 | 0.41 | 0.27 | 0.41 | 34.5 |
| Approach | | 342 | 2.0 | 0.305 | 6.1 | LOS A | 1.6 | 41.2 | 0.41 | 0.27 | 0.41 | 34.5 |
| All Vehicles | | 995 | 2.0 | 0.336 | 5.6 | LOS A | 2.0 | 51.9 | 0.27 | 0.16 | 0.27 | 34.1 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

## Site: 101 [Oregon/Tonquin 2040 No Build]

New Site
Site Category: (None)
Roundabout



# MOVEMENT SUMMARY

## Site: 101 [Oregon/Tonquin 2040 Build]

New Site
Site Category: (None)
Roundabout

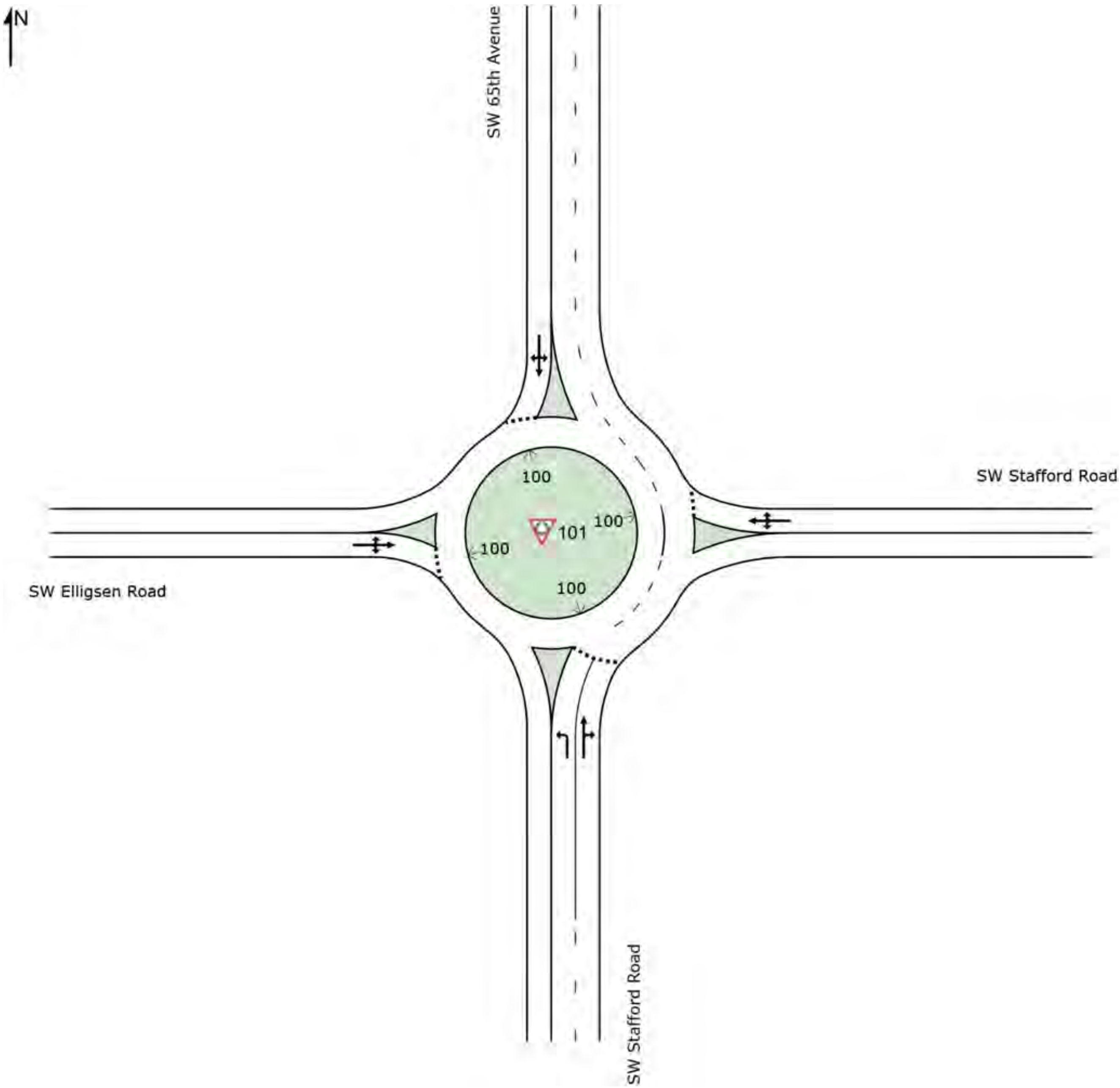
| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Movement Performance - Vehicles** | | | | | | | | | | | | |
| South: Oregon | | | | | | | | | | | | |
| 8 | T1 | 205 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 32.8 |
| 18 | R2 | 432 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 31.9 |
| Approach | | 637 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 32.2 |
| East: Tonquin | | | | | | | | | | | | |
| 1 | L2 | 700 | 1.0 | 0.713 | 14.5 | LOS B | 11.8 | 298.8 | 0.75 | 0.73 | 1.09 | 28.9 |
| 16 | R2 | 79 | 10.0 | 0.713 | 14.8 | LOS B | 11.8 | 298.8 | 0.75 | 0.73 | 1.09 | 28.0 |
| Approach | | 779 | 1.9 | 0.713 | 14.6 | LOS B | 11.8 | 298.8 | 0.75 | 0.73 | 1.09 | 28.8 |
| North: Oregon | | | | | | | | | | | | |
| 7 | L2 | 147 | 3.0 | 0.203 | 7.3 | LOS A | 0.8 | 20.0 | 0.60 | 0.60 | 0.60 | 31.5 |
| 4 | T1 | 579 | 2.0 | 0.791 | 24.8 | LOS C | 9.9 | 250.3 | 0.90 | 1.31 | 2.11 | 27.0 |
| Approach | | 726 | 2.2 | 0.791 | 21.3 | LOS C | 9.9 | 250.3 | 0.84 | 1.16 | 1.80 | 27.8 |
| All Vehicles | | 2142 | 2.0 | 0.791 | 15.4 | LOS C | 11.8 | 298.8 | 0.71 | 0.76 | 1.16 | 29.3 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

## Site: 101 [65th/Elligsen/Stafford 2040 Build]

New Site
Site Category: (None)
Roundabout



# MOVEMENT SUMMARY

## Site: 101 [65th/Elligsen/Stafford 2040 Build]

New Site
Site Category: (None)
Roundabout

**Movement Performance - Vehicles**

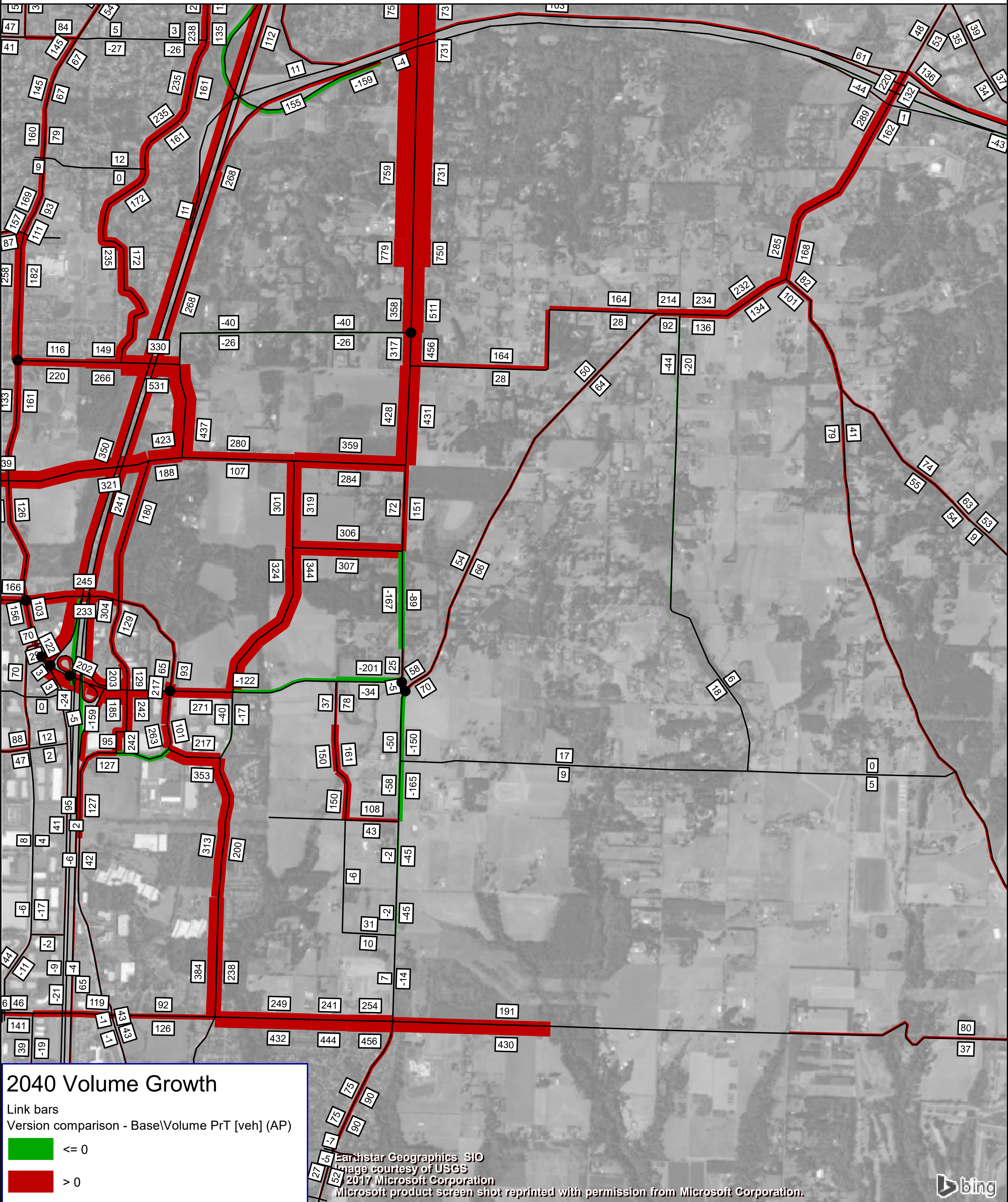
| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SW Stafford Road | | | | | | | | | | | | |
| 3 | L2 | 70 | 3.0 | 0.073 | 4.4 | LOS A | 0.3 | 7.0 | 0.44 | 0.34 | 0.44 | 32.8 |
| 8 | T1 | 104 | 3.0 | 0.703 | 15.7 | LOS C | 9.5 | 242.8 | 0.79 | 1.03 | 1.46 | 30.0 |
| 18 | R2 | 565 | 3.0 | 0.703 | 15.7 | LOS C | 9.5 | 242.8 | 0.79 | 1.03 | 1.46 | 29.2 |
| Approach | | 739 | 3.0 | 0.703 | 14.6 | LOS B | 9.5 | 242.8 | 0.76 | 0.97 | 1.37 | 29.6 |
| East: SW Stafford Road | | | | | | | | | | | | |
| 1 | L2 | 598 | 3.0 | 0.817 | 21.2 | LOS C | 18.0 | 460.3 | 0.90 | 1.31 | 2.00 | 27.0 |
| 6 | T1 | 95 | 2.0 | 0.817 | 21.1 | LOS C | 18.0 | 460.3 | 0.90 | 1.31 | 2.00 | 26.9 |
| 16 | R2 | 142 | 2.0 | 0.817 | 21.1 | LOS C | 18.0 | 460.3 | 0.90 | 1.31 | 2.00 | 26.3 |
| Approach | | 835 | 2.7 | 0.817 | 21.2 | LOS C | 18.0 | 460.3 | 0.90 | 1.31 | 2.00 | 26.8 |
| North: SW 65th Avenue | | | | | | | | | | | | |
| 7 | L2 | 129 | 2.0 | 0.572 | 16.4 | LOS C | 3.9 | 99.7 | 0.79 | 0.96 | 1.31 | 29.2 |
| 4 | T1 | 133 | 3.0 | 0.572 | 16.5 | LOS C | 3.9 | 99.7 | 0.79 | 0.96 | 1.31 | 29.1 |
| 14 | R2 | 84 | 2.0 | 0.572 | 16.4 | LOS C | 3.9 | 99.7 | 0.79 | 0.96 | 1.31 | 28.4 |
| Approach | | 346 | 2.4 | 0.572 | 16.4 | LOS C | 3.9 | 99.7 | 0.79 | 0.96 | 1.31 | 29.0 |
| West: SW Elligsen Road | | | | | | | | | | | | |
| 5 | L2 | 174 | 2.0 | 0.669 | 22.2 | LOS C | 5.1 | 129.6 | 0.84 | 1.08 | 1.61 | 27.0 |
| 2 | T1 | 95 | 2.0 | 0.669 | 22.2 | LOS C | 5.1 | 129.6 | 0.84 | 1.08 | 1.61 | 27.0 |
| 12 | R2 | 98 | 3.0 | 0.669 | 22.2 | LOS C | 5.1 | 129.6 | 0.84 | 1.08 | 1.61 | 26.4 |
| Approach | | 366 | 2.3 | 0.669 | 22.2 | LOS C | 5.1 | 129.6 | 0.84 | 1.08 | 1.61 | 26.8 |
| All Vehicles | | 2286 | 2.7 | 0.817 | 18.5 | LOS C | 18.0 | 460.3 | 0.83 | 1.11 | 1.63 | 28.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

DKS

# Tualatin Area Volume Difference Plot (Base vs. Potential Growth)

# 2040 Volume Growth (with Urban Reserves) - Tualatin




| | | |
|---|---|---|
| Washington County | Westside Focus Model | 2040 PM 1-Hour |
| Steve L Kelley | S000004_2040RTS+URTS_NCHRP765_v1.ver | 23.01.2020 |

# Cooper Mountain Transportation Study Recommended Improvements

DKS

### Table 4: Recommended Transportation System Improvements

| ID | Project Description | Total Estimated Cost | Concept Plan Share of Total Cost by Area: South Cooper Mountain Annexation Area Share | North Cooper Mountain Share | Urban Reserve Share | Regional Traffic Growth Share | Estimated Year of Need |
|---|---|---|---|---|---|---|---|
| Projects Constructing or Realigning Streets On-site | | | | | | | |
| 1 | Extend 185th Avenue from Gassner Road to Kemmer Road as a 3-lane County arterial. | **$5,760,000** | *$440,000* | *$750,000* | *$1,550,000* | *$3,020,000* | - |
| 2 | Realign 175th Avenue between Outlook Lane and Cooper Mountain Lane, as a 3-lane County arterial. | **$5,695,000** | *$805,000* | *$55,000* | *$1,210,000* | *$3,625,000* | - |
| 3 | Realign the curve along Grabhorn Road near Stone Creek Drive, as a 3-lane County arterial. | **$4,575,000** | *$695,000* | *$115,000* | *$585,000* | *$3,185,000* | - |
| 4 | Realign the curve along Grabhorn Road north of Tile Flat Road, as a 3-lane County arterial. | **$2,930,000** | *$445,000* | *$75,000* | *$375,000* | *$2,040,000* | - |
| 5 | Realign Grabhorn Road east to provide a through connection with Tile Flat Road, as a 3-lane County arterial. | **$4,710,000** | *$75,000* | *$150,000* | *$75,000* | *$4,410,000* | |
| 6a | Create a new east-to-west 3-lane City Collector street from Tile Flat Road to the new north-to-south Collector Street. | **$3,255,000** | *$950,000* | *$0* | *$2,100,000* | *$205,000* | |
| 6b | Create a new east-to-west 3-lane City Collector street from the new north-to-south Collector Street to 175th Avenue. | **$10,970,000** | *$3,205,000* | *$0* | *$7,080,000* | *$685,000* | |
| 6c | Create a new east-to-west 3-lane City Collector street from 175th Avenue to Loon Drive. | **$8,530,000** | *$2,490,000* | *$0* | *$5,505,000* | *$530,000* | |
| 7 | Extend Tile Flat Road between Scholls Ferry Road and the Roy Rogers Road/Bull Mountain Road intersection, as a 3-lane County arterial. | **$18,780,000** | *$1,355,000* | *$355,000* | *$315,000* | *$16,755,000* | - |
| 8a | Create a new north-to-south 2-lane City collector street between Grabhorn Road and the UGB, just south of the Alvord Lane Extension | **$9,465,000** | *$6,180,000* | *$65,000* | *$960,000* | *$2,260,000* | - |
| 8b | Create a new north-to-south 2-lane City collector street between the UGB, just south of the Alvord Lane Extension and Scholls Ferry Road | **$11,020,000** | *$7,195,000* | *$75,000* | *$1,115,000* | *$2,630,000* | - |
| 8c | Create a new north-to-south 2-lane City collector street between Scholls Ferry Road and the Tile Flat Road | **$1,935,000** | *$1,265,000* | *$15,000* | *$195,000* | *$460,000* | - |

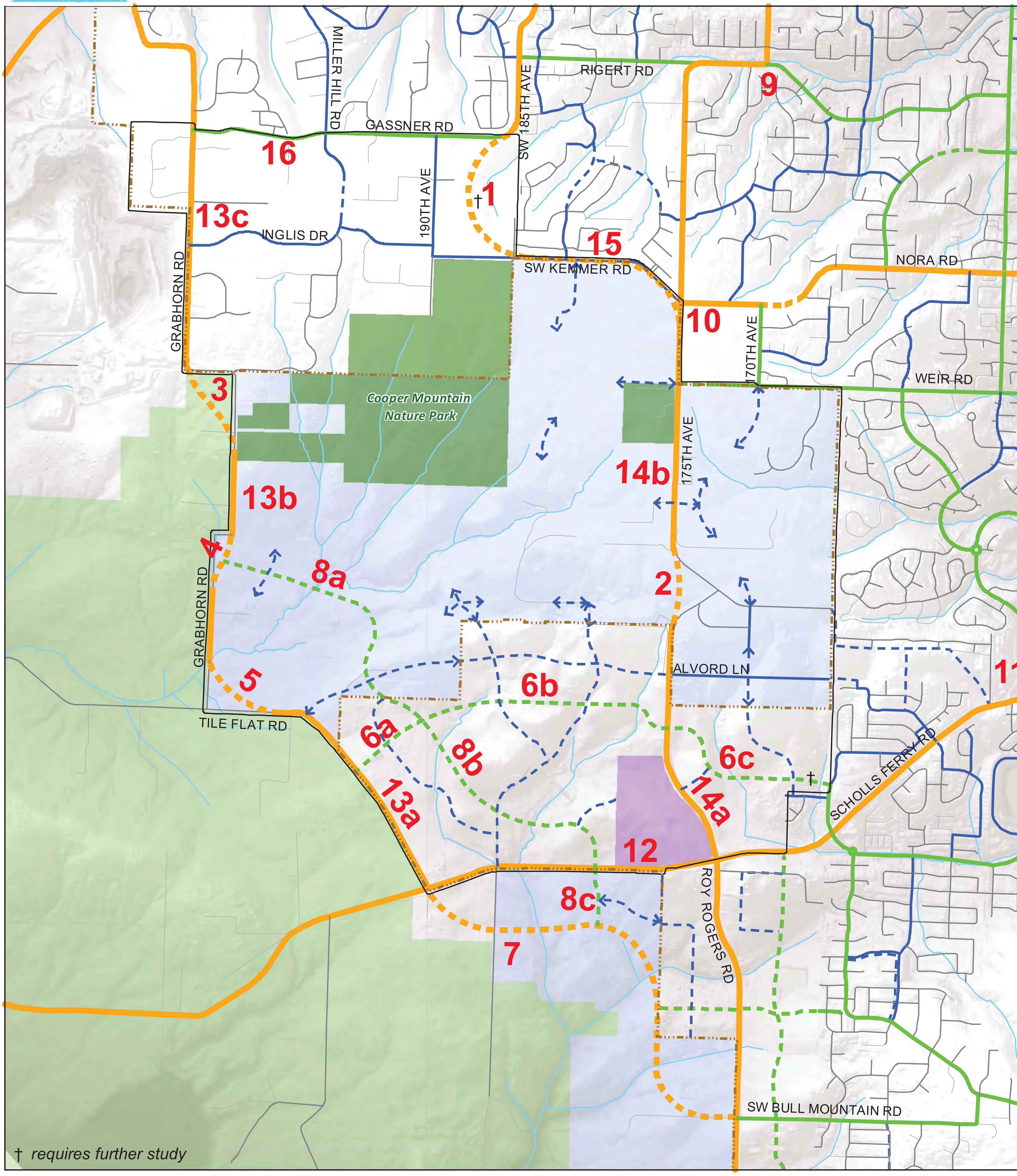
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | extension. | | | | | | |
| | Subtotals (Percent share of subtotal cost) | $87,625,000 | $25,100,000 (29%) | $1,655,000 (2%) | $21,065,000 (24%) | $39,805,000 (45%) | - |
| **Projects Improving Existing Intersections** | | | | | | | |
| 9 | Improve the Rigert Road/170th Avenue intersection. | **$2,000,000** | *$560,000* | *$50,000* | *$1,160,000* | *$230,000* | 2030 |
| 10 | Improve the Kemmer Road/175th Avenue intersection. | **$2,500,000** | *$650,000* | *$165,000* | *$1,280,000* | *$405,000* | 2020 |
| 11 | Improve the Scholls Ferry Road/ Horizon-Teal Boulevard intersection. | **$500,000** | *$205,000* | *$5,000* | *$155,000* | *$135,000* | 2030 |
| | **Subtotals (Percent share of subtotal cost)** | **$5,000,000** | ***$1,415,000 (28%)*** | ***$220,000 (4%)*** | ***$2,595,000 (52%)*** | ***$770,000 (15%)*** | - |
| Projects Upgrading Existing County Streets to Urban Standards | | | | | | | |
| 12 | Improve Scholls Ferry Road from Roy Rogers Road-175th Avenue to Tile Flat Road as a 5-lane County arterial. | **$8,165,000** | *$6,815,000* | *$0* | *$360,000* | *$990,000* | N/A |
| 13a | Improve Grabhorn Road from Scholls Ferry Road to the UGB, north of the new east-to-west Collector Street, as a 3-lane County arterial. | **$3,025,000** | *$750,000* | *$125,000* | *$635,000* | *$1,520,000* | N/A |
| 13b | Improve Grabhorn Road from the UGB, north of the new east-to-west Collector Street, to the UGB, near Stone Creek Drive, as a 3-lane County arterial. | **$4,170,000** | *$1,035,000* | *$170,000* | *$875,000* | *$2,090,000* | |
| 13c | Improve Grabhorn Road from the UGB, near Stone Creek Drive, to Gassner Road, as a 3-lane County arterial. | **$4,335,000** | *$1,075,000* | *$175,000* | *$905,000* | *$2,175,000* | |
| 14a | Improve 175th Avenue from Scholls Ferry Road to the UGB, north of Alvord Lane, as a 3-lane County arterial. | **$3,985,000** | *$2,480,000* | *$0* | *$1,235,000* | *$265,000* | |
| 14b | Improve 175th Avenue from the UGB, north of Alvord Lane, to Kemmer Road as a 3-lane County arterial. | **$3,940,000** | *$2,455,000* | *$0* | *$1,225,000* | *$265,000* | N/A |
| 15 | Improve Kemmer Road from 175th Avenue to the 185th Avenue extension as a 3-lane County arterial. | **$2,590,000** | *$270,000* | *$235,000* | *$1,760,000* | *$325,000* | N/A |
| 16 | Improve Gassner Road from Grabhorn Road to the 185th Avenue extension as a 2-lane County collector. | **$2,475,000** | *$35,000* | *$625,000* | *$1,625,000* | *$190,000* | N/A |
| | **Subtotals (Percent share of subtotal cost)** | $32,685,000 | ***$14,915,000 (46%)*** | ***$1,330,000 (4%)*** | ***$8,620,000 (26%)*** | ***$7,820,000 (24%)*** | - |
| Projects to Construct Community Shared-Use Paths or Enhanced Street Crossings | | | | | | | |
| 17 | Construct a community shared-use path (South Cooper | **$1,830,000** | *$795,000* | *$105,000* | *$930,000* | *$0* | N/A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Loop Trail) along the east side of Grabhorn Road and Tile Flat Road, between the west side of the Cooper Mountain Nature Park and Scholls Ferry Road. | | | | | | |
| 18 | Construct a community shared-use path (South Cooper Loop Trail) along the north side of Scholls Ferry Road, between Tile Flat Road and 175th Avenue. | **$1,000,000** | *$435,000* | *$60,000* | *$510,000* | *$0* | N/A |
| 19 | Construct a community shared-use path (South Cooper Loop Trail) along the west side of 175th Avenue, between Scholls Ferry Road and Weir Road. | **$2,725,000** | *$1,180,000* | *$160,000* | *$1,385,000* | *$0* | N/A |
| 20 | Construct a community shared-use path, along the south side of the proposed neighborhood route between the proposed north-to-south collector street and 175th Avenue. | **$650,000** | *$280,000* | *$40,000* | *$330,000* | *$0* | N/A |
| 21 | Construct a community shared-use path, along the north side of the proposed neighborhood route connecting the proposed north-to-south collector street with the proposed east-to-west collector street, east of 175th Avenue | **$560,000** | *$245,000* | *$35,000* | *$285,000* | *$0* | |
| 22 | Install crosswalk and pedestrian activated flasher on 175th Avenue at Weir Road. | **$80,000** | *$35,000* | *$5,000* | *$40,000* | *$0* | N/A |
| | ***Subtotals*** *(Percent share of subtotal cost)* | $6,845,000 | ***$2,970,000*** *(43%)* | ***$405,000*** *(6%)* | ***$3,480,000*** *(51%)* | ***$0*** *(0%)* | - |
| | **Total Costs of Recommended Transportation System Improvements** *(Percent share of total cost)* | $132,155,000 | ***$44,400,000*** *(34%)* | ***$3,610,000*** *(3%)* | ***$35,755,000*** *(27%)* | ***$48,395,000*** *(37%)* | - |

**Table 5: Projects Identified in Previous Studies or Plans that were Re-Affirmed by the South Cooper Mountain Concept Plan**

| ID | Project Description | Total Estimated Cost | South Cooper Mountain Annexation Area Share | North Cooper Mountain Share | Urban Reserve Share | Regional Traffic Growth Share | Estimated Year of Need |
|---|---|---|---|---|---|---|---|
| - | Widen 209th Avenue-Grabhorn Road to five-lanes, north of Leland Drive. | **$27,390,000** | *$3,270,000* | *$1,310,000* | *$3,925,000* | *$18,880,000* | 2030 |
| - | Widen Farmington Road to five-lanes through the 185th Avenue intersection. | **$24,000,000** | *$2,850,000* | *$1,140,000* | *$3,420,000* | *$16,590,000* | 2015 |
| - | Add a westbound right turn lane at the Murray Boulevard/Beard Road-Brockman Road intersection. | **$240,000** | *$5,000* | *$5,000* | *$40,000* | *$195,000* | 2035 |
| - | Install a traffic signal at the Roy Rogers Road/Bull Mountain Road intersection. | **$355,000** | *$50,000* | *$50,000* | *$50,000* | *$205,000* | 2015 |
| - | Widen Roy Rogers Road-175th Avenue to five-lanes from Scholls Ferry Road to just south of Beef Bend Road. | **$33,085,000** | *$6,355,000* | *$1,155,000* | *$5,770,000* | *$19,805,000* | 2035 |
| 23 | Construct a regional shared-use path (Cooper Mountain Regional Trail) between the 175th Avenue/Weir Road intersection, the 185th Avenue/Gassner Road intersection (along the west side of the 185th Avenue extension), and the Grabhorn Road/Gassner Road intersection. | **$2,915,000** | *$610,000* | *$85,000* | *$760,000* | *$1,460,000* | N/A |
| | Total Cost of Projects Identified in Previous Studies or Plans | **$87,985,000** | ***$13,140,000 (15%)*** | ***$3,745,000 (4%)*** | ***$13,965,000 (16%)*** | ***$57,135,000 (65%)*** | - |

# South Cooper Mountain Concept & Community Plans




# Figure 4: Recommended Transportation System Improvements

**Proposed Functional Classification***

- Arterial
- Collector
- Neighborhood Route
- Local
- Private

- Rural Reserve**
- Urban Reserve
- Study Area
- Urban Growth Boundary
- Existing Parks
- Planned High School Site
- Streams
- # Transportation Improvement ID

** Realignments and new roads are shown in dashed lines. New roads east of study area are based on Washington County's Transportation System Plan; new roads within UGB south of study area are based on current River Terrace Community Plan transportation planning. All new road alignments are conceptual.*

*** As amended by HB 4078A.*

Prepared By: Angelo Planning Group

As approved by Beaverton City Council, April 8, 2014

NORTH

0 500 1,000 2,000 Feet

*Coordinate System: NAD 1983 HARN St atePlane Oregon North FIPS 3601 Feet Intl*

# **Appendix D:** Concept Designs and Cost Estimates for Feasibility Projects

Jacobs

# Memorandum

| | | | |
|---|---|---|---|
| **Subject** | **Transportation Feasibility Cost Estimates** | **Project Name** | Urban Reserves Transportation Study |
| **Attention** | Technical Advisory Committee Members | | |
| **From** | Jacobs Consultant Team | | |
| **Date** | March 24, 2020 | | |

The cost estimates for the Transportation Feasibility projects are included below and on the project feasibility plan sheets. Generally, this type of estimate is a Class 5 estimate -30% to +50%.

**Includes:** Both capital costs and owner costs, in current 2020 US dollars

- Cost of materials
- Labor rates
- Equipment

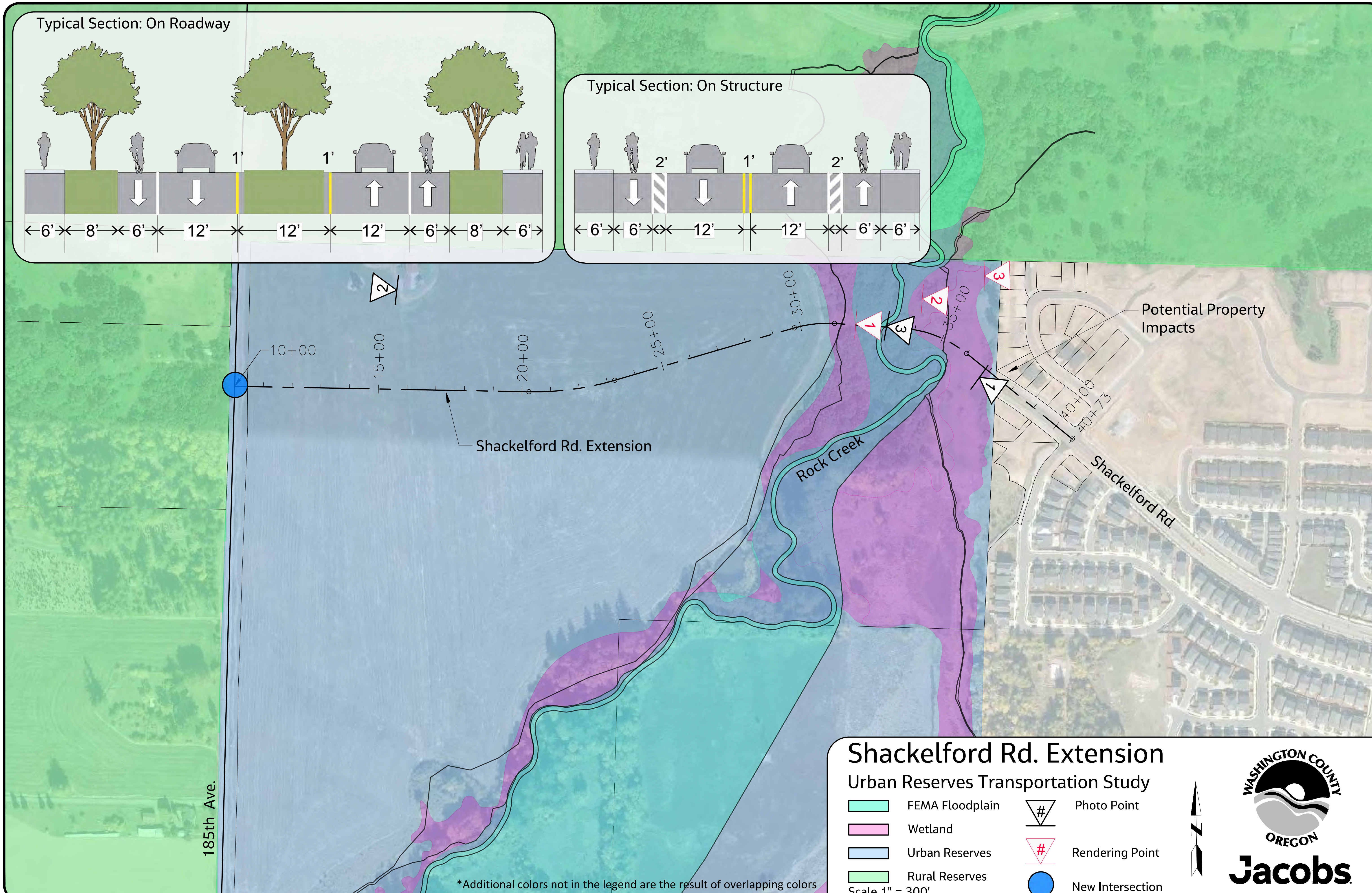
**General Exclusions:**

- Project finance costs.
- Escalation to YOE (Year of Expenditure).
- Unforeseen sub-surface or existing conditions.
- Third party overhead to underground relocations.
- Construction contingency, (change order contingency).
- Owner's Contingency.
- ROW acquisitions

**Cost Resources:**

- 2019 R.S. Means
- ODOT historical bid tabulations
- Vendor Quotes on Materials and Subcontractors, where appropriate
- Estimator Judgment & Historical Data

| Alignment | Low Range -30% | Estimate Range Total $ | High Range 50% |
|---|---|---|---|
| Shackelford Rd Extension | $16,891,000 | $24,130,000 | $36,195,000 |
| SW 185th Ave Widening | $18,102,350 | $25,860,500 | $38,790,750 |
| SW 185th Ave Extension | $6,372,100 | $9,103,000 | $13,654,500 |
| SW 175th Ave Realignment | $6,460,650 | $9,229,500 | $13,844,250 |
| SW Beef Bend Rd Opt 1 Re-align | $2,251,970 | $3,217,100 | $4,825,650 |
| SW Beef Bend Rd Opt 2 Re-align | $20,013,000 | $28,590,000 | $42,885,000 |



Typical Section: On Roadway
1'
1'
6' 8' 6' 12' 12' 12' 6' 8' 6'
Typical Section: On Structure
2'
1'
2'
6' 6' 12' 12' 6' 6'
10+00
15+00
20+00
25+00
30+00
35+00
40+00
40+73
Shackelford Rd. Extension
Rock Creek
Potential Property Impacts
Shackelford Rd
185th Ave.
*Additional colors not in the legend are the result of overlapping colors
Shackelford Rd. Extension
Urban Reserves Transportation Study
FEMA Floodplain
Wetland
Urban Reserves
Rural Reserves
Scale 1" = 300'
Photo Point
Rendering Point
New Intersection
WASHINGTON COUNTY OREGON
Jacobs

Shackelford Rd. Extension

Horizontal Scale: 1" = 300'   Vertical Exaggeration: 5

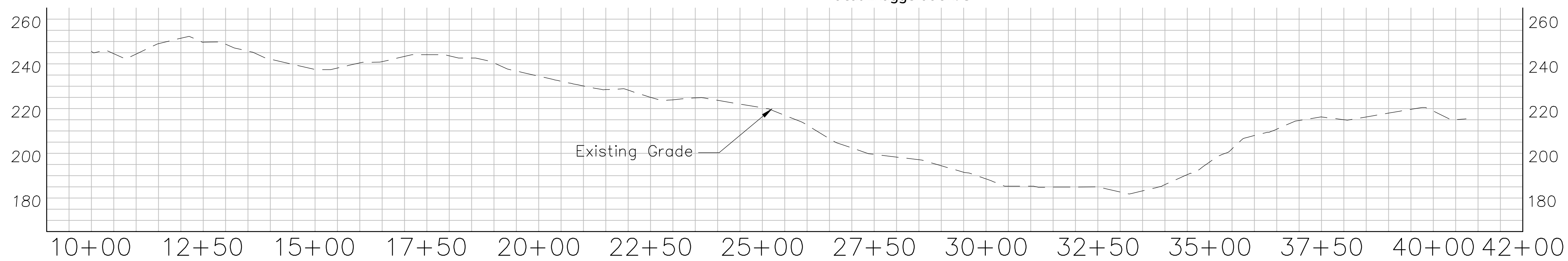



Photo 1

Photo 2

Photo 3

Rendering 1 - On Bridge Facing West

Rendering 2 - Ortho Facing West

Rendering 3 - On Bridge Facing Southwest

## Design & Construction Comments/Considerations:

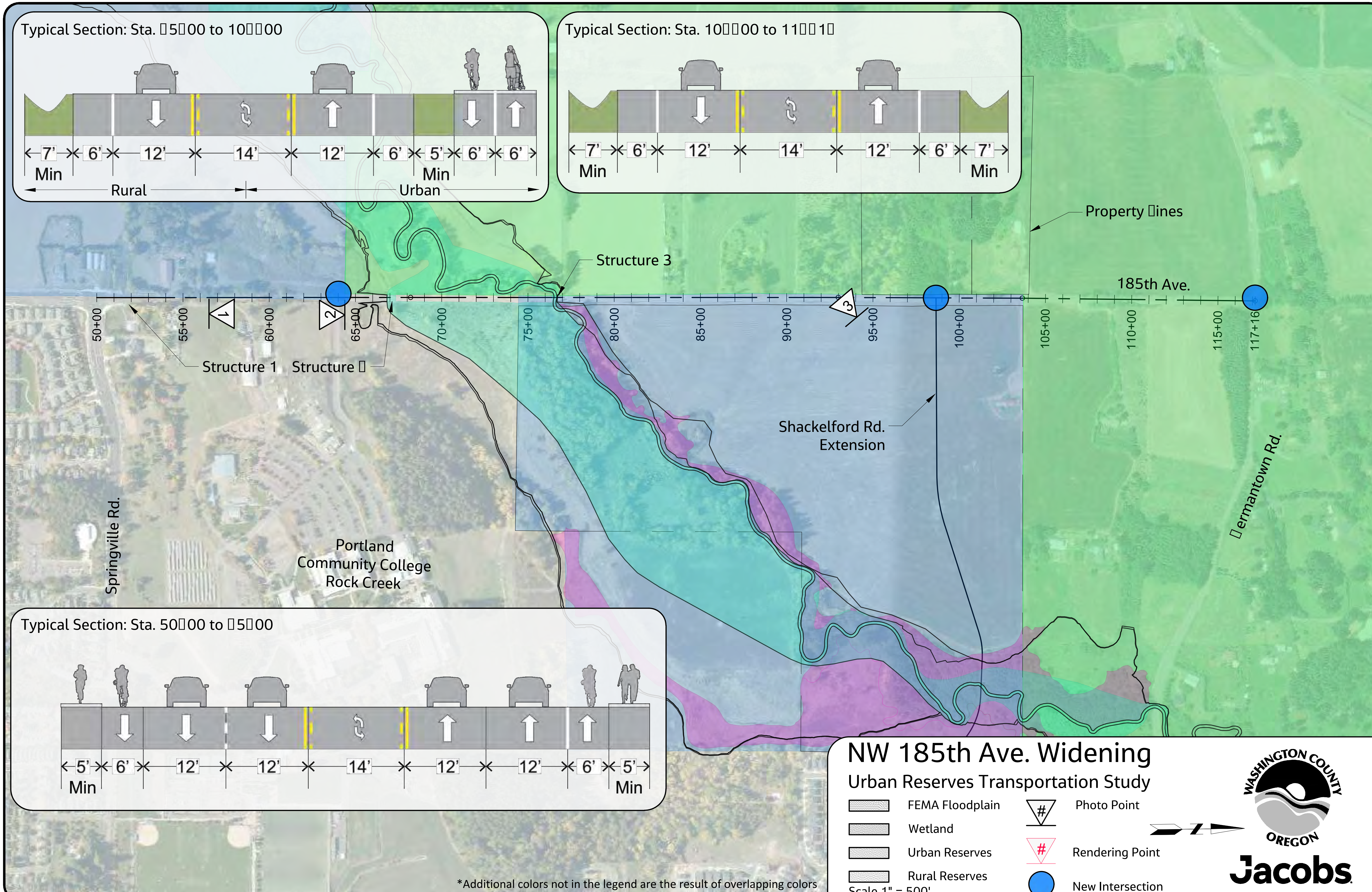
- Extend Shackelford Rd. to 185th Ave. A minor realignment of the existing Shackelford Rd. may be necessary.
- Tie in at 185th Ave. placed at the bottom of a sag curve to allow appropriate sight distance.
- A structure length of approximately 800' (Sta. 30+00 to 38+00) needed to avoid the floodplain and wetlands.
- Alignment and structure placed to provide the most narrow and clear crossing possible (minimizing impacts).
- Design speed of 35 mph through the extension.
- Estimated cost of construction range is □1□□00□000 to □3□□00□000

# Shackelford Rd. Extension

Urban Reserves Transportation Study

WASHINGTON COUNTY OREGON

Jacobs


Typical Section: Sta. □5□00 to 10□□00
7' Min
6'
12'
14'
12'
6'
5'
6'
6'
Min
Rural
Urban
Typical Section: Sta. 10□□00 to 11□□1□
7' Min
6'
12'
14'
12'
6'
7' Min
Property □ines
Structure 3
185th Ave.
50+00
55+00
60+00
65+00
70+00
75+00
80+00
85+00
90+00
95+00
100+00
105+00
110+00
115+00
117+16
1
2
3
Structure 1
Structure □
Shackelford Rd. Extension
□ermantown Rd.
Springville Rd.
Portland Community College Rock Creek
Typical Section: Sta. 50□00 to □5□00
5' Min
6'
12'
12'
14'
12'
12'
6'
5' Min
*Additional colors not in the legend are the result of overlapping colors
NW 185th Ave. Widening
Urban Reserves Transportation Study
FEMA Floodplain
Wetland
Urban Reserves
Rural Reserves
Scale 1" = 500'
Photo Point
Rendering Point
New Intersection
WASHINGTON COUNTY OREGON
Jacobs

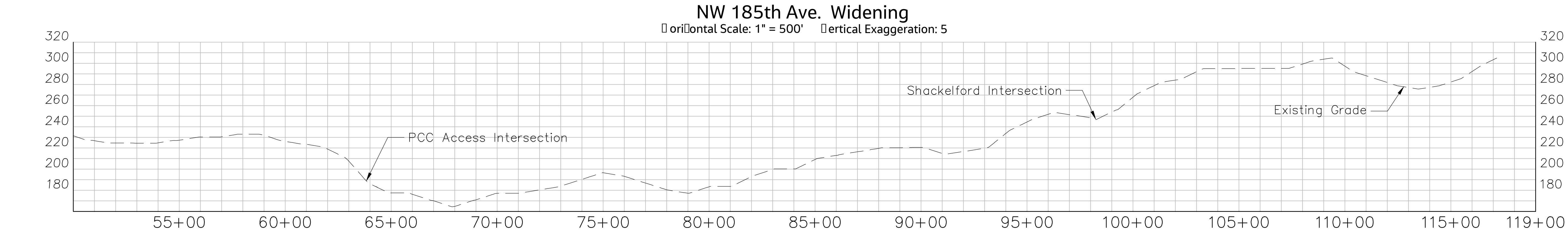



Photo 1:

Rendering 1 – NW 185th Ave.

Photo 2:

Rendering 2 – Ortho SE at Shackelford Rd.

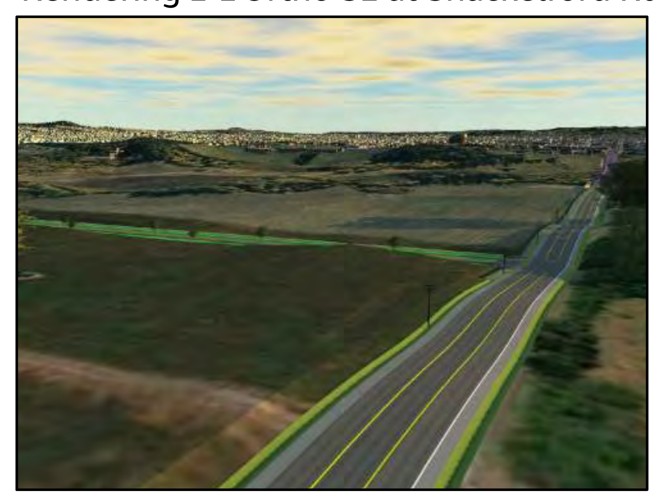
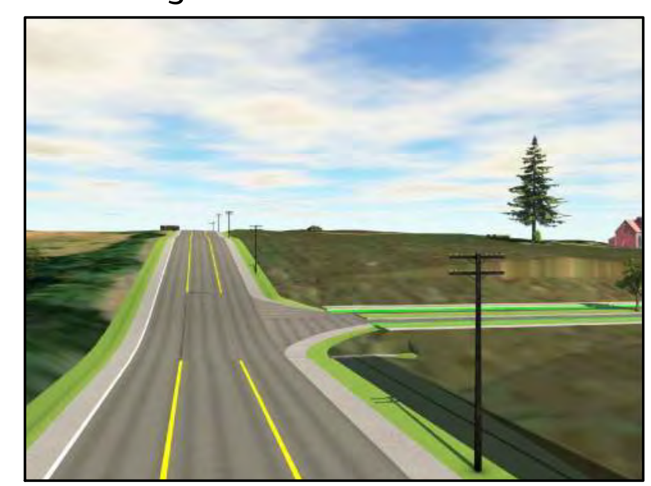


Photo 3 :

Rendering 3 – NW 185th at Shackelford Rd.



## Design & Construction Comments/Considerations:

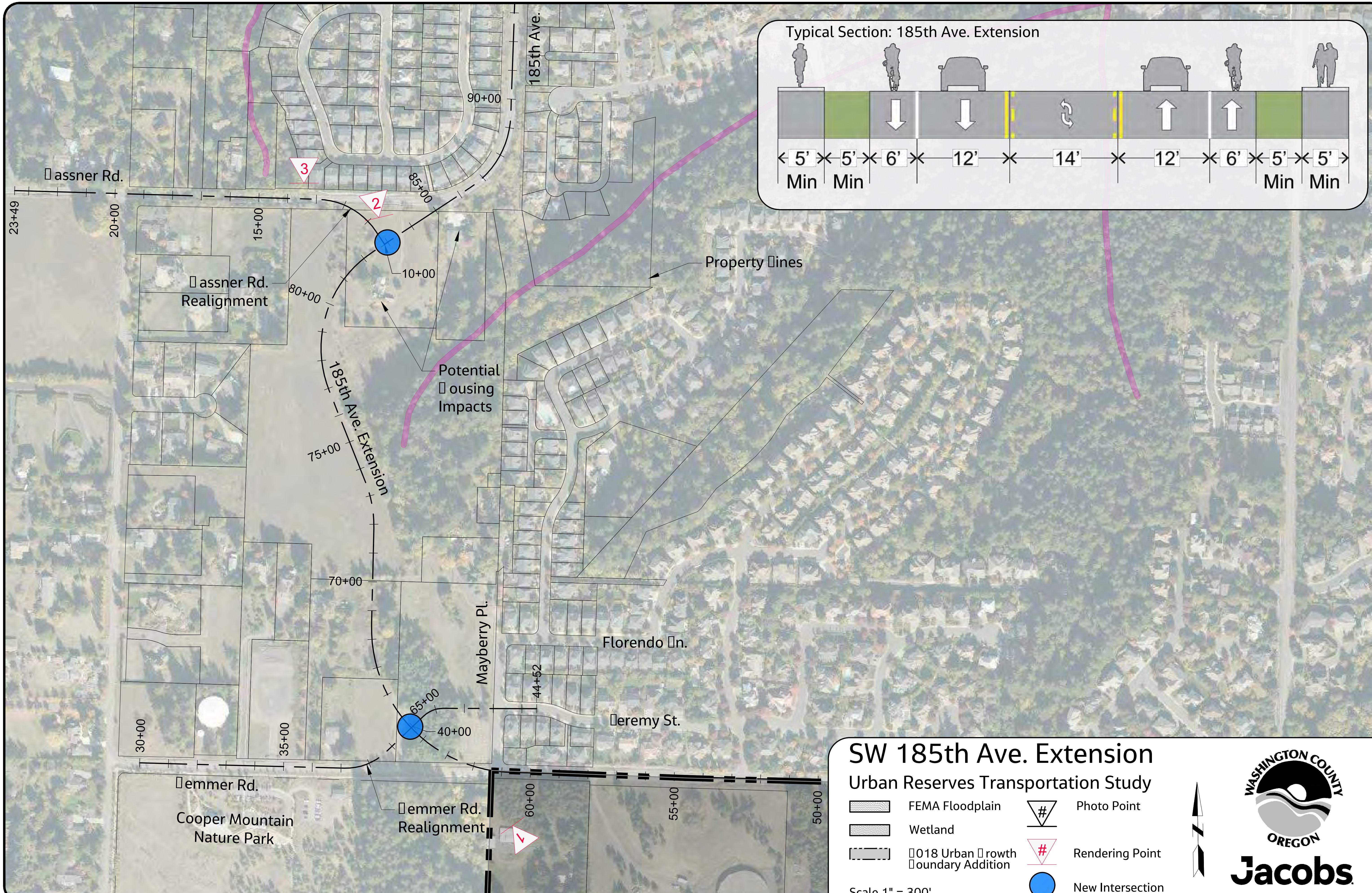
- 185th Ave. complete streets project from Springville Rd. to Germantown Rd.
- Project to protect west edge of pavement and widen east.
- 3 structures along 185th Ave. will be impacted, two box culverts and one sheet pile wall.
- Proposed intersections at Shackelford Rd. and Germantown Rd. The Shackelford Rd. intersection is placed to maximize the sight distance along the rolling topography.
- A regional stormwater solution should be considered and special attention given to the wetlands and flood plains in the surrounding area.
- Design speed of [illegible]0 mph for the entire length of improvements.
- The proposed section will create a shared use path on the east side of the improvements from Springville Rd. to Shackelford Rd., then transition to the Washington County standard rural cross-section at Shackelford Rd. intersection. The two-way left turn-lane will continue to Germantown Rd.
- Estimated cost of construction range is [illegible]3,800,000 to [illegible]51,000,000

# NW 185th Ave Widening

Urban Reserves Transportation Study

WASHINGTON COUNTY OREGON

Jacobs




# SW 185th Ave. Extension

Urban Reserves Transportation Study

FEMA Floodplain
Wetland
018 Urban rowth oundary Addition
Photo Point
Rendering Point
New Intersection

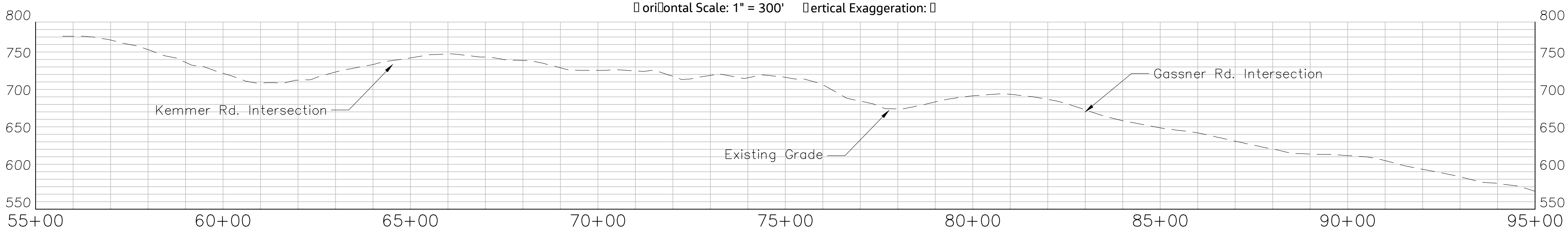
Scale 1" = 300'

WASHINGTON COUNTY OREGON

Jacobs

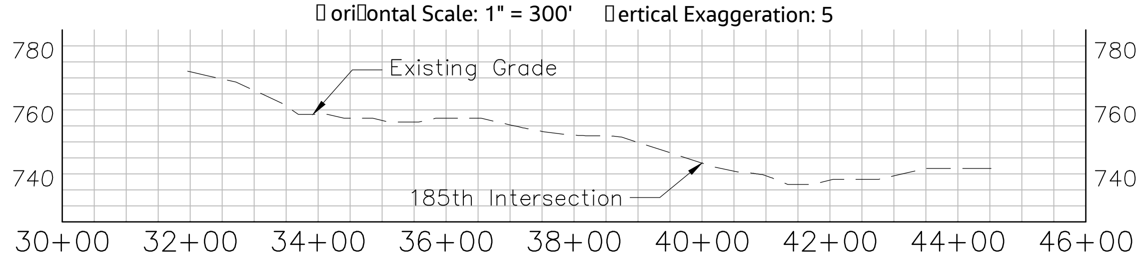
SW 185th Ave. Realignment □ Extension

□ori□ontal Scale: 1" = 300' □ertical Exaggeration: □



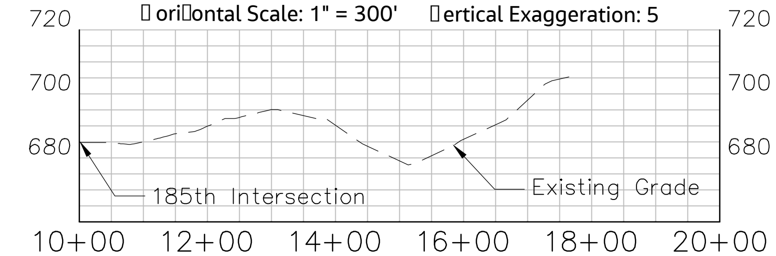

□emmer Rd. Realignment

□ori□ontal Scale: 1" = 300' □ertical Exaggeration: 5




□assner Rd. Realignment

□ori□ontal Scale: 1" = 300' □ertical Exaggeration: 5




Rendering 1

Rendering □

Rendering 3

## Design & Construction Comments/Considerations:

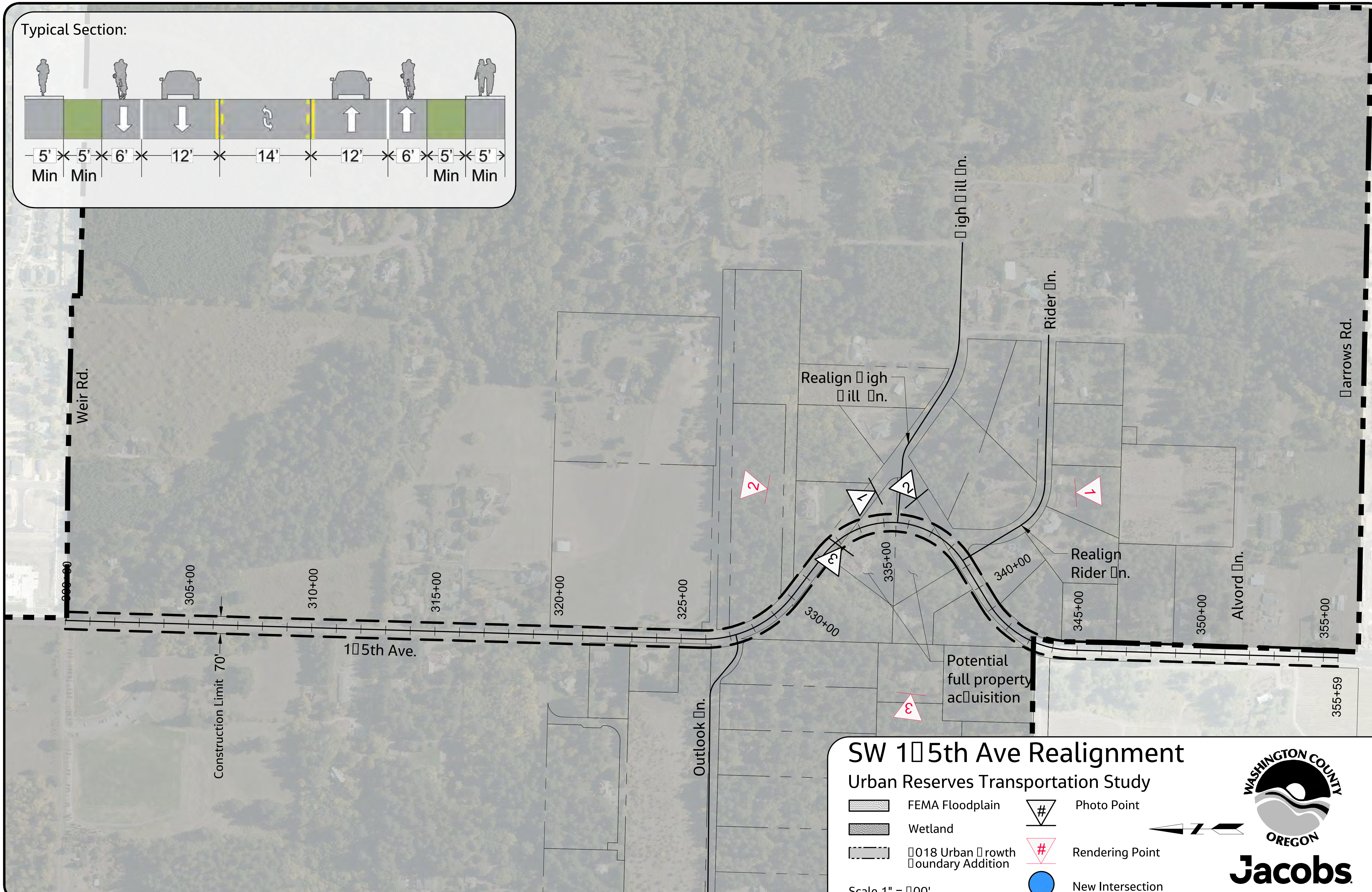
- Extend 185th Ave. south from □assner Rd. to □emmer Rd. with realignments of □assner Rd. and □emmer Rd.
- New intersections at □assner Rd.□185th Ave. and □emmer Rd.□185th Ave. □oth would be stop controlled with 185th Ave. free□flow.
- Alternative alignment □not shown□could take 185th Ave. south and connect with □emmer Rd. at a □0 degree angle. This would prioriti□e the free flow movement on □emmer Rd. over 185th Ave. This alternative would also consider a roundabout for the intersection and impact 1 less property.
- Preferred extension alignment geometry chosen to minimi□e impacts to the surrounding community and topography.
- □ Parcels impacted with realignment.
- □esign speed assumed to be 35 mph along 185th Ave.□30 mph on □emmer Rd.□and 15mph on □eremy St.
- Assumed a □□ max super□elevation with along curves.
- Estimated cost of construction range is □□□□00□000 to □13□□00□000

# SW 185th Ave. Extension

Urban Reserves Transportation Study

WASHINGTON COUNTY OREGON

Jacobs



Typical Section:
5' Min
5' Min
6'
12'
14'
12'
6'
5' Min
5' Min
□igh □ill □n.
Rider □n.
□arrows Rd.
Weir Rd.
Realign □igh □ill □n.
Realign Rider □n.
Potential full property ac□uisition
Alvord □n.
1□5th Ave.
Construction Limit 70'
Outlook □n.
305+00
310+00
315+00
320+00
325+00
330+00
335+00
340+00
345+00
350+00
355+00
355+59
SW 1□5th Ave Realignment
Urban Reserves Transportation Study
FEMA Floodplain
Wetland
□018 Urban □rowth □oundary Addition
Photo Point
Rendering Point
New Intersection
Scale 1" = □00'
WASHINGTON COUNTY OREGON
Jacobs

## SW 1□5th Ave. Widening and Realignment

□ori□ontal Scale: 1" = □00'  □ertical Exaggeration: 1

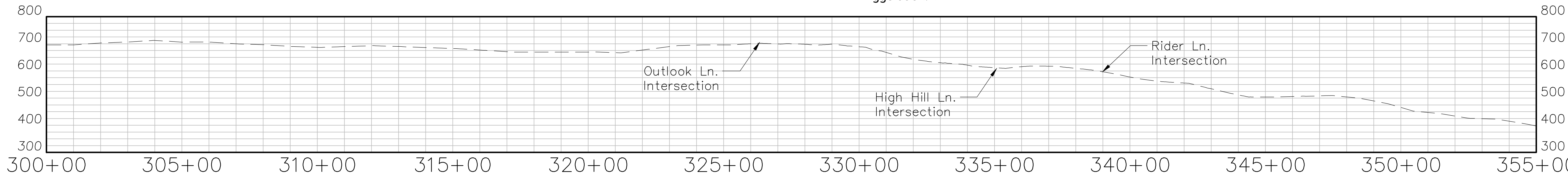



Photo 1:

Photo □:

Photo 3:

Rendering 1:

Rendering □:

Rendering 3:

## Design & Construction Comments/Considerations:

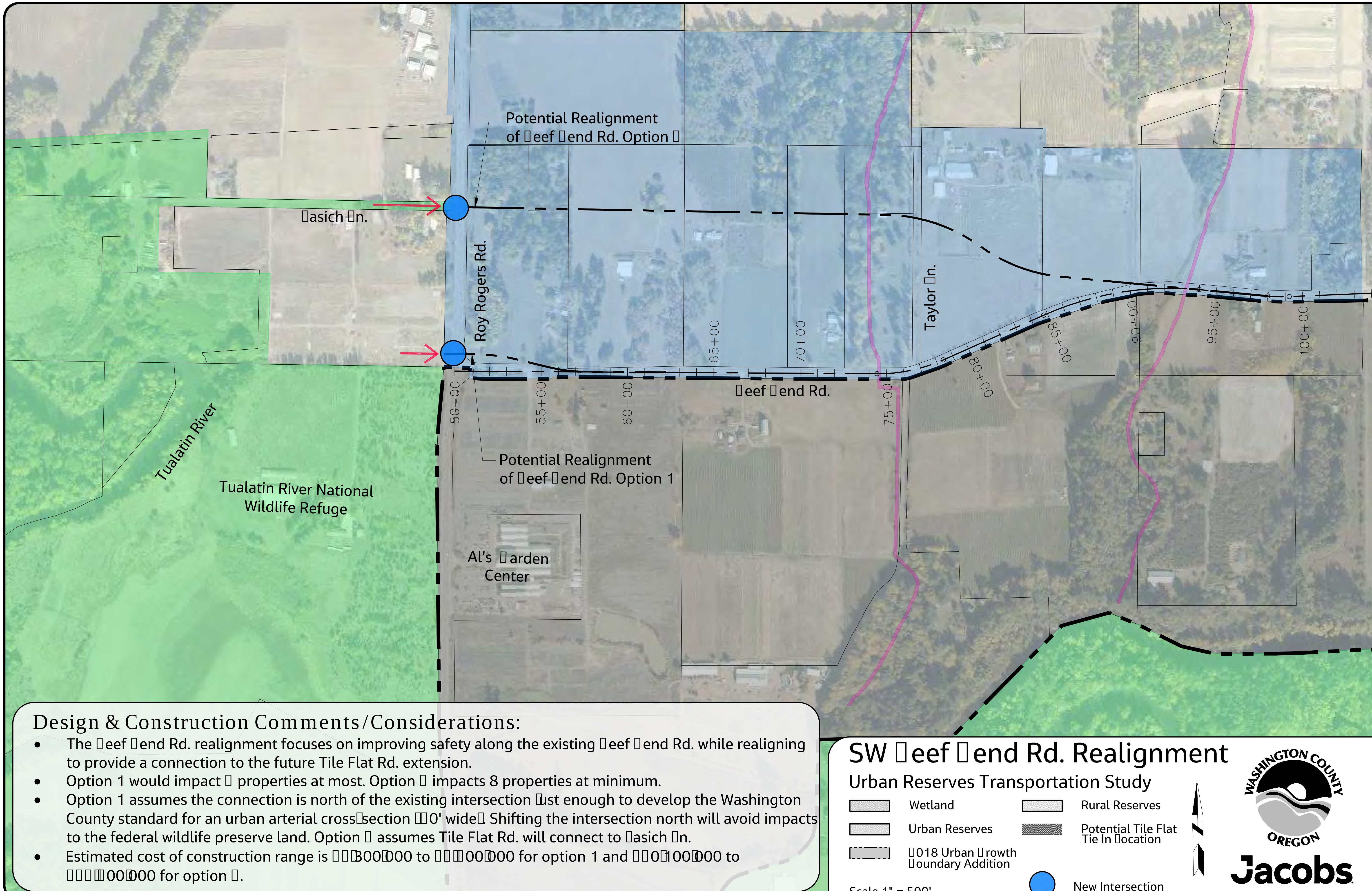
- The 1□5th Ave. realignment pro□ect will increase safety and flow from Weir Rd. to □arrow Rd.
- Pro□ect would widen 1□5th Ave. to meet the Washington County standards for an urban arterial including widening for bike lanes□center turn lane□and sidewalks.
- Pro□ect would revise the hori□ontal geometry to accommodate a 35 mph design speed.
- At minimum□5 parcels will be impacted with improvements.
- Realignment□extensions of □igh □ill Rd. □ Rider □n. are re□uired with the geometry revisions.
- Alternative design speeds evaluated included 30 mph and □5 mph□but the property impacts did not change.
- The currently adopted alignment proposes straightening 1□5th Ave. from station 3□5□00 to 3□5□00. This would result in a roadway with grades as high as 13□ . The alternative alignment shown would closely follow the existing topography of 1□5th Ave. and impacts to the surrounding area would be the same□or less than the adopted alignment.
- Estimated cost of construction range is □□□500□00 to □13□00□00

# SW 1□5th Ave. Realignment

Urban Reserves Transportation Study

WASHINGTON COUNTY OREGON

Jacobs




## Design & Construction Comments/Considerations:

- The Beef Bend Rd. realignment focuses on improving safety along the existing Beef Bend Rd. while realigning to provide a connection to the future Tile Flat Rd. extension.
- Option 1 would impact [illegible] properties at most. Option 2 impacts 8 properties at minimum.
- Option 1 assumes the connection is north of the existing intersection just enough to develop the Washington County standard for an urban arterial cross-section ([illegible]0' wide). Shifting the intersection north will avoid impacts to the federal wildlife preserve land. Option 2 assumes Tile Flat Rd. will connect to Kasich Ln.
- Estimated cost of construction range is [illegible]300,000 to [illegible]00,000 for option 1 and [illegible]0,100,000 to [illegible]00,000 for option 2.

# SW Beef Bend Rd. Realignment

## Urban Reserves Transportation Study

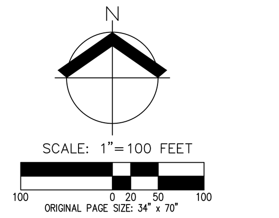
Wetland
Rural Reserves
Urban Reserves
Potential Tile Flat Tie In Location
2018 Urban Growth Boundary Addition
New Intersection

Scale 1" = 500'

Washington County Oregon

Jacobs


| CURVE TABLE: ALIGNMENTS | | | | | |
|---|---|---|---|---|---|
| CURVE # | RADIUS | LENGTH | CHORD DIRECTION | START POINT | END POINT |
| C1 | 630.00 | 346.62 | N72° 42' 16.03"E | (7617404.36,620560.21) | (7617731.14,620661.97) |
| C2 | 630.00 | 378.14 | N74° 08' 16.60"E | (7617803.59,620709.12) | (7618161.90,620810.93) |
| C3 | 630.00 | 399.51 | N73° 09' 58.93"E | (7619304.12,620784.35) | (7619680.13,620898.11) |
| C4 | 630.00 | 388.10 | N72° 38' 51.15"E | (7620065.67,621168.07) | (7620430.27,621282.00) |



LEGEND

EXISTING GROUND CONTOUR (5 FT)
EXISTING GROUND CONTOUR (10FT)
FINISHED GROUND CONTOUR (2 FT)
FINISHED GROUND CONTOUR (10 FT)

DESIGN ASSUMPTIONS

DESIGN SPEED: 35 MPH
MAX GRADE: 10%
MAX HOR. CURVE RADIUS WITH CROWN SECTION: 630 FT
SAG VERTICAL CURVE MIN. K VALUE: 49
CREST VERTICAL CURVE MIN. K VALUE: 29
RIGHT OF WAY WIDTH: 102 FT

ASSUME BOONES FERRY RD IS RECONSTRUCTED WITH A SHED SECTION OF 2.5%

PROPERTY LINES SHOWN ARE CONSIDERED APPROXIMATE AND ARE BASED ON MINIMAL BOUNDARY SURVEYING AND RECORDED SURVEYS, PLATS, AND DEEDS.

ORTHOMOSAIC CREATED FROM IMAGERY TAKEN ON 3/11/20 FROM A DJI PHANTOM 4 RTK AT 90 METERS AGL. THE RESULTING GROUND SAMPLING DISTANCE OF THE IMAGERY IS 2.75 CM. SURFACE ELEVATION DATA WAS COLLECTED ON 3/11/20 UTILIZING A GEOCUE TRUEVIEW 410 SYSTEM ON A DJI M600PRO AT 70 METERS AGL. SURFACE DEVELOPED ON NGVD 29 DATUM. GROUND CONTROL POINTS AND INDEPENDENT CHECK SHOTS WERE COLLECTED BY SURVEY-GRADE GPS AND TOTAL STATION EQUIPMENT AND USED TO CORRECT AND VALIDATE THIS DATA.


LEGEND (NATURAL RESOURCES):

APPROXIMATE POTENTIAL WETLAND AREA: 29,912 SF± (0.67 ACRES±)

APPROXIMATE POTENTIAL VEGETATED CORRIDOR BOUNDARY

WETLAND AND WATER FEATURES SHOWN ARE BASED ON DESKTOP REVIEW AND ARE CONSIDERED APPROXIMATE ONLY. FULL WETLAND AND WATER DELINEATION REQUIRED FOR DEVELOPMENT.

DATE: 06/11/2020

EXHIBIT
**E**

**BASALK CREEK PARKWAY EXTENSION**
**ALIGNMENT OPTION 1B (NORTH)**

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

DRWN: GMB
CHKD: JAW
AKS JOB:
4458-02

# **Appendix E:** Performance Assessment of Supplemental System Improvements Memo

720 SW WASHINGTON STREET, SUITE 500, PORTLAND, OR 97205 • 503.243.3500 • DKSASSOCIATES.COM

# PERFORMANCE ASSESSMENT OF SUPPLEMENTAL SYSTEM IMPROVEMENTS

DATE: August 12, 2020

TO: Washington County URTS Project Team

FROM: Carl Springer, PE | DKS Associates

Rochelle Starrett, EIT and Kelly White | DKS Associates

SUBJECT: Urban Reserve Transportation Study | Performance Assessment of Supplemental System Improvements Project #19123-000

## INTRODUCTION

This memorandum presents the performance evaluation results of system alternatives that were identified through this study. An earlier step of this study looked at a 2040 system needs assessment for the County if and when growth occurs in all designated Urban Reserve Areas. This baseline assessment demonstrated performance without additional system improvements beyond those already identified in the Regional Transportation Plan (RTP)[1], the Transportation System Plan (TSP), and those identified in Metro's Urban Growth Report.[2] The next step considered a short list of possible new street extensions and upgrades that were proposed to mitigate growth impacts that were identified in the baseline findings. This memorandum presents our findings for each of the mitigation projects, which will be referred to as "Supplemental System Improvements." They include a combination of previously identified but not funded TSP projects and new mitigations developed through this study. In the following pages, we present our findings for each proposed supplemental system improvement as it relates to the following issues:

- How travel routes would change, and an evaluation of the resulting system performance with the mitigation in place.
- A consideration of the mitigation effectiveness relative to the County's TSP goals.

[1] 2018 Regional Transportation Plan, Metro, published June 2018.

[2] Washington County Transportation System Plan, published September 2019.

- A review of transit/walking/biking availability as urban reserve areas transition to become part of the urban growth area.

## PURPOSE

The purpose of the Washington County Urban Reserve Transportation Study is to prepare the County and cities for future Urban Reserve Area concept planning. Specifically, this study confirms the need and magnitude-of-cost estimates for selected key projects adjacent to Urban Reserve Areas. Further refinement planning will be required at the time of concept planning to identify all system improvements necessary to support a specific growth plan. The refined concept planning should include:

- Consideration of the environmental constraints for development areas that shape the buildable lands within each Urban Reserve Area.
- Based on the buildable areas that are defined, development of the multimodal system and connection to existing city and County roadways and trails.
- Inclusion of the transportation mitigations related to growth identified from this study, plus other improvements already adopted into the County TSP.

## SUPPLEMENTAL SYSTEM IMPROVEMENTS

As previously mentioned, several projects including street extensions and upgrades were proposed to mitigate growth impacts from the Urban Reserve Areas. The short project list was identified collaboratively between County staff, the project management team, and the Technical Advisory Committee for the study, which included representatives from the cities. Three categories of projects are included in the short list of supplemental system improvements, as shown in Figure 1:

- **System improvements analyzed in the Feasibility Analysis (Task 3.1)** – Five projects from either an adopted TSP project or a refinement of a TSP project underwent a supplemental engineering analysis to better understand the expected challenges and associated costs. Each of these system improvements were found to have substantially higher costs than indicated in preliminary planning.
  - NW Shackelford Road Extension
  - NW 185th Avenue Widening
  - SW 185th Avenue Extension
  - SW 175th Avenue Realignment
  - SW Beef Bend Road Widening and Realignment
- **System improvements identified in the Transportation Needs Assessment (Task 2.4)** – Another five projects were considered by the TAC to be possible solutions for urban scale development near the UGB boundary. These projects are not included in the County TSP, with the exception of the SW 124th Avenue widening which is included in the County TSP but not in the RTP financially constrained project list, as it was expected that development would complete this improvement.
  - SW Tile Flat Road Extension
  - SW Cornelius Pass Road Extension

    - SW Farmington Road Widening
    - SW 124th Avenue Widening
    - SW Brookman Road Extension
- **Sensitivity tests for projects already identified in the RTP and/or TSP** – In a few cases, proposed solutions that were identified in early planning discussions were selected for further testing and review due to their proximity to parallel roadways in the future street network. These projects were evaluated to better understand the expected performance benefits of each.
    - Three sensitivity test scenarios evaluated the two proposed I-5 overcrossings (Day Road extension and Basalt Creek Parkway extension) near the I-5 and Stafford Road interchange. The scenarios assessed impacts of constructing only one crossing, both crossings, or neither crossing to identify appropriate phasing for construction.
    - Potential consequences of not constructing parallel roadways or upgrades in the Rosa, Beef Bend South, and Sherwood West Urban Reserve Areas.

### ADDITIONAL COUNTY PROJECTS

Many other roadway improvement projects adjacent to or within Urban Reserve Areas were identified by the County as part of previous planning efforts, however not all were included in the short list for this memorandum. These improvements included collectors through Urban Reserve areas and financially constrained projects from the Regional Transportation Plan that are within the vicinity of the Urban Reserve areas. The comprehensive list of approximately one hundred other proposed improvements is attached in the Appendix, Section 3. These additional projects should also be considered at the time that specific Urban Reserve Areas advance to concept planning along with specific mitigation projects that are evaluated in this memorandum.

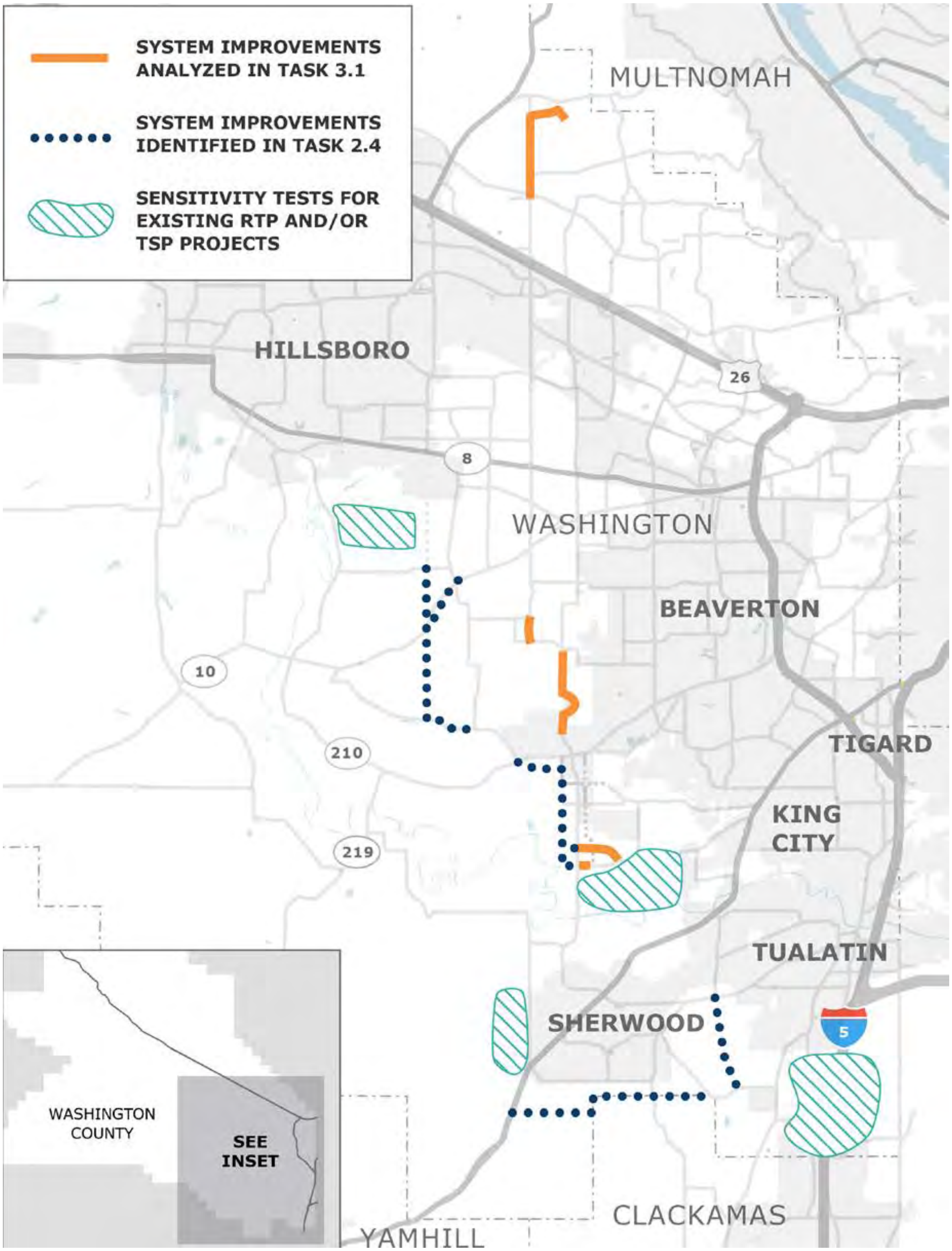



**FIGURE 1. SUPPLEMENTAL SYSTEM IMPROVEMENTS**

## EVALUATION PROCESS

Washington County has identified five overarching goals for future transportation planning projects: safety, community, economic vitality, feasibility, and natural environment[3]. These goals were used to identify qualitative and quantitative evaluation criteria for each supplemental system improvement. The identified evaluation criteria, a summary of how the scoring was applied, and the tools used to evaluate each criterion are summarized below in Table 1. If and when urban reserve areas transition to become urban development land, consideration will be given to how best to provide connections to quality transit service. At the time of concept planning, site design should prepare for potential transit services by configuring higher density, mixed-use development near existing or new routes that are likely to meet TriMet's business case for service.

[3] Washington County. *Cooper Mountain Transportation Study.* https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/PlanningPrograms/TransportationPlanning/cmts.cfm

#### TABLE 1: PROJECT EVALUATION CRITERIA

| SCORING CRITERIA | SCORING | EVALUATION TOOL | RELATED GOALS |
|---|---|---|---|
| ROADWAY CONGESTION | High scoring projects will decrease the v/c ratio at adjacent study intersections or roadway links; additional consideration will be given to projects that can reduce the v/c ratio below Washington County's mobility standard. | Travel Demand Model, Synchro | Community |
| VOLUME SHIFT | High scoring projects will shift traffic away from congested corridors and on to parallel routes, as appropriate. | Travel Demand Model | Safety, Community |
| RIGHT-OF-WAY | High scoring projects will utilize existing, available right-of-way. | Planning Level Estimate | Natural Environment, Feasibility |
| SAFETY | High scoring projects will be located near an existing high crash corridor and would likely increase the safety of travelers.[4] | Designated High Crash Corridor Map from Washington County Safety Action Plan | Safety |
| COST | High scoring projects will have a feasible cost compared to other projects. | Planning Level Estimate | Economic Vitality, Feasibility |
| ACCESS & CONNECTIVITY | High scoring projects will improve connectivity from/through the urban reserves and can facilitate new connections between residential and employment areas. | Qualitative Assessment | Safety, Community, Economic Vitality |
| ACTIVE TRANSPORTATION | High scoring projects will include facilities or upgrades for people walking and biking. | Qualitative Assessment | Safety, Community |
| ENVIRONMENT | High scoring projects will minimize their impacts or avoid environmentally sensitive areas (*e.g.* areas with constrained slope, wetlands) | Washington County Map of Sensitive Areas, RLIS Data | Natural Environment |

[4] High crash corridors were used as a proxy for understanding where future improvements have the potential to improve safety. In general, it is expected that reducing the number of vehicles on a high crash corridor would improve overall safety, however, measuring the safety benefits was outside this study's scope. Future safety analyses are recommended to fully understand the potential for safety benefits associated with each proposed supplemental system improvement.

## PROJECT ASSESSMENT

### INTERSECTION PERFORMANCE

Table 2 summarizes the intersection operations results for the baseline and supplemental system improvements. Baseline operations for the year 2040 include the development of the urban reserve areas identified in the previous memorandum and their associated vehicle traffic. The baseline transportation network used in this analysis includes all previously identified RTP and TSP projects except for the system improvements that were evaluated in the Feasibility Analysis (Task 3.1). The NW Shackelford Road Extension, NW 185$^{th}$ Avenue Widening, and SW 185$^{th}$ Avenue Extension were not assumed for the baseline analysis.

The operations in 2040 with supplemental system improvements assumes that the urban reserves fully develop and each of the projects identified above on Figure 1 is also completed but does not assume any changes to the intersection control in the baseline analysis. Operations were evaluated using *Synchro 10* software and compared against Washington County and ODOT Performance Measures as listed in the *Transportation Needs Assessment Memorandum*.[5]

The projects identified in Figure 1 are corridor improvements to facilitate regional traffic and typically do not include identified intersection control improvements that could accompany these projects. The study intersections of Clark Hill Road / Tile Flat Road and Brookman Road / Ladd Hill Road are both expected to exceed mobility standards with completion of the supplemental system improvements if no changes are made to the existing intersection control. Although intersection operations will degrade at these locations due to the supplemental system improvements, regional traffic can be better served through enhanced corridors. Furthermore, vehicle operations at identified study intersections will be mitigated through control improvements that will be identified as part of the future corridor planning studies.

[5] Transportation Needs Assessment Memorandum, Task 2.4 of the Washington County Urban Reserve Transportation Study, completed by DKS Associates on March 31, 2020.

**TABLE 2: INTERSECTION OPERATIONS**

| | INTERSECTION | CONTROL TYPE[1] | MOBILITY STANDARD | 2040 BASELINE | | | 2040 WITH SUPPLEMENTAL IMPROVEMENTS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOS | DELAY | V/C | LOS | DELAY | V/C |
| 1 | NW DAVID HILL ROAD / NW THATCHER ROAD | TWSC | 0.9/0.9 | A/D | 8/29 | 0.18/0.47 | *no change* | | |
| 2 | NW GALES CREEK ROAD / NW THATCHER ROAD | TWSC | 0.9/0.9 | A/E | 8/36 | 0.26/0.63 | *no change* | | |
| 3 | NW CORNELIUS PASS ROAD / NW WEST UNION ROAD | SIGNAL | 0.9 | F | 150.7 | ***1.22*** | *no change* | | |
| 4 | NW 185TH AVENUE / NW SPRINGVILLE ROAD | SIGNAL | 0.9 | D | 45.0 | 0.84 | C | 29.0 | 0.80 |
| 5 | SW RIVER ROAD / SW ROSEDALE ROAD | TWSC | 0.9 | A/E | 9/48 | 0.39/0.30 | A/E | 9/38 | 0.35/0.25 |
| 6 | SW CORNELIUS PASS ROAD / SW ROSEDALE ROAD | ROUNDABOUT | 0.9 | A | 5.8 | 0.32 | A | 5.8 | 0.33 |
| 7 | SW 170TH AVENUE / SW RIGERT ROAD | AWSC | 0.9 | F | 291.1 | ***1.70*** | F | 311.7 | ***1.73*** |
| 8 | SW CLARK HILL ROAD / SW TILE FLAT ROAD | AWSC | 0.9 | D | 31.7 | 0.83 | F | 79.5 | ***1.04*** |
| 9 | SW TILE FLAT ROAD / SW SCHOLLS FERRY ROAD | SIGNAL | 0.9 | C | 20.2 | 0.66 | C | 21.4 | 0.67 |
| 10 | SW ROY ROGERS ROAD / SW BEEF BEND ROAD | SIGNAL | 0.9 | B | 10.3 | 0.68 | B | 16.0 | 0.68 |
| 11 | OR 219 / SW SCHOLLS FERRY ROAD | TWSC | 0.9/0.9 | B/F | 10/481 | 0.48/***1.96*** | *no change* | | |
| 12 | OR 219 / SW SEIFFERT ROAD | TWSC | 0.9/0.9 | A/B | 8/11 | 0.34/0.19 | *no change* | | |
| 13 | SW ELWERT ROAD / SW SCHOLLS-SHERWOOD ROAD | AWSC | 0.9 | F | 332.8 | ***1.76*** | *no change* | | |
| 14 | SW ELWERT ROAD / SW EDY ROAD | SIGNAL | 0.9 | C | 32.1 | 0.88 | C | 30.7 | 0.86 |

| INTERSECTION | | CONTROL TYPE[1] | MOBILITY STANDARD | 2040 BASELINE | | | 2040 WITH SUPPLEMENTAL IMPROVEMENTS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOS | DELAY | V/C | LOS | DELAY | V/C |
| 15 | OR 99W / SW BROOKMAN ROAD | SIGNAL | 0.9 | D | 41.2 | ***1.00*** | D | 40 | ***1.00*** |
| 16 | SW BROOKMAN ROAD / SW LADD HILL ROAD | TWSC | 0.9/0.9 | A/C | 9/23 | 0.24/0.40 | A/F | 8/87 | 0.08/***1.06*** |
| 17 | SW OREGON STREET / SW TONQUIN ROAD | ROUNDABOUT | 0.9 | C | 15.3 | 0.79 | A | 9.9 | 0.63 |
| 18 | SW BOONES FERRY ROAD / SW NORWOOD ROAD | TWSC | 0.9/0.9 | B/F | 12/274 | 0.47/***1.05*** | *no change* | | |
| 19 | SW NORWOOD ROAD / SW 65TH AVENUE | TWSC | 0.9/0.9 | A/F | 9/99 | 0.41/0.77 | *no change* | | |
| 20 | SW DAY ROAD / SW BOONES FERRY ROAD | SIGNAL | 0.99 | F | 139.7 | ***1.18*** | F | 183.2 | ***1.27*** |
| 21 | I-5 SB RAMPS / SW BOONES FERRY ROAD | SIGNAL | 0.99 | F | 173.4 | 0.82 | F | 163.2 | 0.89 |
| 22 | SW ELLIGSEN ROAD / SW PARKWAY CENTER / DAY ROAD EXTENSION | SIGNAL | 0.99 | D | 51.7 | 0.88 | D | 52.7 | 0.90 |
| 23 | SW 65TH AVENUE / SW ELLIGSEN ROAD / SW STAFFORD ROAD | ROUNDABOUT | 0.9 | B | 11.3 | 0.65 | B | 11.5 | 0.66 |

1 INTERSECTION OPERATIONS REPORTED AS WORST-CASE MAJOR/WORST CASE MINOR AT TWO-WAY STOP CONTROL (TWSC) INTERSECTIONS

INTERSECTION OPERATIONS REPORTED FOR THE OVERALL INTERSECTION AT SIGNAL

INTERSECTION OPERATIONS REPORTED FOR THE WORST CASE MOVEMENT AT ALL-WAY STOP CONTROL (AWSC) OR ROUNDABOUT INTERSECTIONS

## ACTIVE TRANSPORTATION BENEFITS

All of the identified supplemental projects provide benefits for active transportation. The identified projects are largely located in existing rural areas of Washington County where roads are typically narrow with limited, if any, bicycle and pedestrian facilities. Any construction or widening project within the urban area will improve roadways to Washington County's urban standards which include both sidewalks and bike lanes on collector and arterial roads[6]. Some of the identified projects also provide a more comfortable parallel route for bicyclists and pedestrians, complete a key facility gap, or improve multimodal connections to Washington County's regional parks and trails system. Many of the identified roadway extension projects can also significantly reduce out of direction travel for multimodal users. Identified multimodal benefits specific to each project are also discussed within the project evaluation section.

## EVALUATION RESULTS FOR SUPPLEMENTAL PROJECTS

### TILE FLAT ROAD EXTENSION B (BULL MOUNTAIN ROAD TO BEEF BEND ROAD)

The Tile Flat Road Extension project will extend Tile Flat Road south from Scholls Ferry Road to connect at Roy Rogers Road, with expected connections at Jean Louise Road, Bull Mountain Road, and Beef Bend Road. The extension will be divided into two pieces: Extension A, which is the portion from Scholls Ferry Road to Bull Mountain Road, and Extension B, which is the portion from Bull Mountain Road to Beef Bend Road. Tile Flat Road Extension A is within the River Terrace West urban reserve and is expected to be built with development of that area. Tile Flat Road Extension A was included in the baseline project assumptions for this analysis.

The Tile Flat Road Extension B provides a new collector connection, facilitating access to local neighborhoods and providing an alternative route to Roy Rogers Road and Scholls Ferry Road. This project will also extend bike lanes and sidewalks in an area with limited existing facilities, and its lower speed will be more comfortable for users compared to alternative facilities like Roy Rogers Road.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *small benefit* to Roy Rogers Road

Active Transportation: *large benefit* from new neighborhood parallel route

Environment: *large disadvantage* from potential wetlands and creek crossings

**Congestion Impacts:** The proposed extensions of Tile Flat Road (Extension A and Extension B) are expected to carry between 3,600 and 8,000 vehicles each day by 2040 with development of all urban reserve areas; Tile Flat Road Extension B is expected to carry between 3,800 and 4,200 vehicles each day by 2040 with development of all

[6] Washington County. *Road Design and Construction Standards.* https://www.co.washington.or.us/LUT/Divisions/Engineering/ConsultantResources/road-design-standards.cfm

urban reserve areas. This extension (Extension B) completes the larger Tile Flat Extension project and increases the overall utility of this corridor for regional traffic by providing another connection to Beef Bend Road via Roy Rogers Road. Constructing Tile Flat Road Extension B can further reduce traffic on Roy Rogers Road between Bull Mountain Road and Beef Bend Road which is expected to be highly congested in the future. With this extension in place, most segments of Roy Rogers (between Scholls Ferry Road and Scholls-Sherwood Road) will not exceed capacity. The adjacent study intersections of Roy Rogers Road/Beef Bend Road and Tile Flat Road/Scholls Ferry Road also will not see a significant change in intersection operations with this project, as seen in Table 2.

Although the congestion relief for Roy Rogers Road appears minor with implementation of Extension B, the modeling likely understates the potential congestion relief that could be realized. High modeled travel speeds on Roy Rogers Road (55 mph) compared to Tile Flat Road Extension (35 mph) lead to a similar modeled travel time on Roy Rogers Road and the new Tile Flat Road Extension for a given origin and destination, despite the congestion on Roy Rogers Road. Furthermore, this modeling fails to capture intersection delay, including at adjacent congested intersections like the Scholls Ferry Road/175$^{th}$ Avenue/Roy Rogers Road intersection, which could further impact a driver's route choice. Since travel times are similar for both routes, the modeled shift in traffic patterns is likely underestimated.

**Other Project Benefits:** This project will include sidewalks and bike lanes, and lower traffic speeds along the Tile Flat Road extension will create a more comfortable multi-modal environment.

**Challenges:** The estimated construction cost for Extension B is high since this project will include the construction of new roadway and will have extensive right-of-way impacts. This project is located near the Tualatin River which could impact wetlands, require creek crossings, or include other topographic challenges. The expected environmental challenges for this project could further increase the construction cost. The Tile Flat Road Extension B will likely only be constructed with development in the long-term future. This project is located within a rural area that is not designated as either urban reserve or rural reserve (rural undesignated) and would require approval of an exception to the Oregon Statewide Planning Goals to adopt the proposed alignment into the Washington County Transportation System Plan. In addition, the proposed roadway may impact a property the City of Tigard has purchased for a future park on the west side of Roy Rogers Road. The county and city will continue to coordinate closely on the alignment of the proposed extension.

### CORNELIUS PASS ROAD EXTENSION (ROSEDALE ROAD TO FARMINGTON ROAD)

The Cornelius Pass Road Extension provides a parallel route to 209th Avenue and connects Rosedale Road to Farmington Road and extends further south to Scholls Ferry Road via Clark Hill Road and Tile Flat Road. This project will also include new sidewalks and bike lanes to minimize out of direction travel for bicyclists and pedestrians.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *large benefit* to 209th Avenue

Safety: *small benefit* from reduced volume on Tualatin-Valley Highway

Cost: *small disadvantage* from potential intersection control upgrades

Access & Connectivity: *large benefit* from improved access between job centers and residential development

**Congestion Impacts:** The proposed extension is expected to carry between 9,600 and 12,300 vehicles per day by 2040 with development of all urban reserve areas. This project moderately relieves 209th Avenue to reduce congestion on an over-capacity route and allows select segments of 209th Avenue to meet Washington County's mobility standard with this project. The adjacent study intersections of Rosedale Road/River Road, Cornelius Pass Road/Rosedale Road, and Tile Flat Road/Scholls Ferry Road see no significant operational impacts with this project, as seen in Table 2. While the adjacent study intersection of Tile Flat Road/Clark Hill Road will exceed its mobility standard with this project, the degraded vehicle operations could be addressed by upgrading the existing stop-controlled intersection to either a signal or roundabout.

**Other Project Benefits:** Completing the extension of Cornelius Pass Road provides a new north-south corridor in Washington County to connect developing areas in the south county with existing job centers in Hillsboro and Beaverton. The provision of sidewalks and bike lanes also provides a key active transportation connection through a largely rural area with limited existing facilities.

This extension also reduces motor vehicle volumes on Tualatin Valley Highway, as vehicles can continue south on Cornelius Pass Road instead of traveling on TV Highway to an adjacent parallel route. Reducing traffic volumes on Tualatin Valley Highway can reduce congestion, vehicle crash exposure, and may improve overall safety.

**Challenges:** Since this project will extend an existing roadway as new construction, the estimated project cost is high. Significant right-of-way impacts are expected for this project unless a portion of it can be constructed as part of new development. The proposed project is also expected to include intersection control improvements, including at the study intersection of Tile Flat Road/Clark Hill Road and the intersection of Cornelius Pass Road/Clark Hill Road/Farmington Road. Environmental constraints appear to be minimal for this project although the potential alignment could impact some small wetland areas. This project is located within a rural area that is not designated as either urban reserve or rural reserve (rural undesignated) and would require approval of an exception to the Oregon Statewide Planning Goals to adopt the proposed alignment into the Washington County Transportation System Plan.

### BROOKMAN ROAD EXTENSION AS THREE LANES (LADD HILL ROAD TO BASALT CREEK PARKWAY)

This project extends Brookman Road east from its current terminus at Ladd Hill Road to Basalt Creek Parkway, creating an arterial road connection between Sherwood and Wilsonville.

**Congestion Impacts:** This project is expected to carry between 8,700 and 10,000 vehicles per day by 2040 with development of all urban reserve areas. Creating this new connection will moderately relieve traffic on OR 99W and Tonquin Road, shifting traffic away from the Oregon Street roundabout. This project will also help to relieve regional congestion on Tonquin Road and OR 99W through Sherwood and on OR 99W and Tualatin-Sherwood Road approaching the I-5 interchange. While sections of OR 99W and Tualatin-Sherwood Road remain congested, this project decreases the number of segments on these roads that are over-capacity. However, select segments of Basalt Creek Parkway and Day Road between Tonquin Road and Boones Ferry Road and on Tonquin Road approaching the Brookman Road Extension will exceed capacity with construction of the Brookman Road Extension.

This project is adjacent to three study intersections: OR 99W/Brookman Road, Oregon Street/Tonquin Road, and Ladd Hill Road/Brookman Road. Vehicle operations moderately improve at the intersections of OR 99W/Brookman Road and Oregon Street/Tonquin Road with this project although these locations will also meet their mobility standards in the baseline scenario. The study intersection of Ladd Hill Road/Brookman Road is pushed over its mobility standard with increased vehicle traffic on Brookman Road from this project; however, these impacts could be mitigated by upgrading the existing stop-controlled intersection to either a signal or roundabout.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *large benefit* to OR 99W and Tonquin Road

Safety: *small benefit* from reduced volume on OR 99W

Cost: *large disadvantage* from potential intersection control upgrades and potential environmental constraints

Access & Connectivity: *large benefit* from improved access between Sherwood and I-5

Environment: *large disadvantage* from potential wetlands and flooding potential

**Other Project Benefits:** The Brookman Road Extension also provides significant benefits for connectivity, active transportation, and safety. Constructing this corridor provides a new, significant regional connection to facilitate travel between Sherwood/OR 99W and Wilsonville/I-5 and shift traffic off OR 99W. This project will improve access between existing job centers and residential areas, particularly important as Sherwood continues to grow. The Brookman Road Extension will also include bike lanes and sidewalks which will significantly reduce out of direction travel for bicyclists or pedestrians traveling between these same areas. This connection provides a more direct route for travel between Sherwood/OR 99W and I-5 allowing vehicles to divert from OR 99W to access I-5 earlier.

**Challenges:** Construction of this project appears to have environmental constraints and limited available right-of-way. The identified alignment will likely impact wetland areas and pass through the floodplain of Rock Creek which will likely require a structure or other special accommodation. Furthermore, the area immediately north of the proposed extension is identified as a significant natural area in the Sherwood Community Plan[7]. Significant right-of-way will also be required to construct this new roadway. While a portion of this right-of-way could be obtained through development, Washington County would also likely need to acquire right-of-way to facilitate this significant regional connection. Completing this project is also expected to trigger intersection control improvements, including at the study intersection of Brookman Road/Ladd Hill Road. These three considerations could significantly increase the cost of this project. An additional challenge to this project is that a small portion of the Brookman Road Extension would travel through a rural undesignated area of Clackamas County. This will require multi-jurisdictional coordination for TSP amendments, right-of-way acquisition, permitting, constructing, and long-term maintenance.

[7] Washington County. *Sherwood Community Plan.* https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/Publications/sherwoodcp.cfm

### 124TH AVENUE WIDENING TO FIVE LANES (TUALATIN-SHERWOOD ROAD TO TONQUIN ROAD)

This project widens 124th Avenue to five lanes between Tualatin-Sherwood Road and Tonquin Road and is expected to be completed in coordination with new development along 124th Avenue.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *small benefit* for Sherwood; *small disadvantage for regional traffic*

Active Transportation: *small benefit* from improvement over existing wide shoulder

**Congestion Impacts:** This project is expected to carry between 16,700 and 19,200 vehicles each day by 2040 with development of all urban reserve areas. Widening 124th Avenue moderately relieves traffic on Tonquin Road and shifts vehicles away from the adjacent study intersection of Oregon Street/Tonquin Road. However, this widening also generates a small increase in vehicles on Tualatin-Sherwood Road. The observed volume shifts result in modest capacity benefits for 124th Avenue and Tonquin Road while segments of Tualatin-Sherwood Road near 124th Avenue are pushed further over capacity. Portions of Basalt Creek Parkway and Day Road between Tonquin Road and Boones Ferry Road are also expected to exceed capacity although this change is largely linked with increased vehicle traffic from the Brookman Road Extension project. Decreased traffic volumes at the Oregon Street and Tonquin Road study intersection also provide a modest capacity benefit although this intersection meets Washington County's mobility standard under the future baseline. Overall, this project increases capacity on local roads in Sherwood by shifting traffic to key regional connections.

**Other Project Benefits:** The widening project will provide new bicycle and pedestrian facilities, replacing the existing wide shoulder, and connect to existing sidewalks and bike lanes along Tualatin-Sherwood Road.

The construction of this project appears to be straightforward with minimal environmental constraints or right-of-way needs. Although there are several small wetlands nearby, the widening is not expected to impact these environmentally sensitive areas. Construction costs for this project are expected to be consistent with typical widening projects.

**Challenges:** No significant challenges have been identified.

### FARMINGTON ROAD WIDENING TO THREE LANES (209TH AVENUE TO CORNELIUS PASS ROAD EXTENSION)

This project widens Farmington Road to three-lanes between 209th Avenue and Cornelius Pass Road.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *small benefit* to Farmington Road

**Congestion Impacts:** This project is expected to serve between 7,700 and 8,000 vehicles each day by 2040 with development of all urban reserve areas. Despite the widening, traffic volumes are expected to decrease on this road since the Cornelius Pass Roadway Extension project reduces the number of vehicles that must use Farmington Road to continue traveling north. The combination of decreased volume and a new center two-way left turn lane moderately reduces congestion on Farmington Road between 209th Avenue and Cornelius Pass Road.

**Other Project Benefits:** The construction of this project appears to be straightforward with minimal environmental constraints or right-of-way needs. Construction costs for this project are expected to be consistent with typical widening projects.

The cross-section will include a wide shoulder, with no additional bicycle or pedestrian facilities. This project shows no significant change in active transportation benefits.

**Challenges:** No significant challenges have been identified.

## SHACKELFORD ROAD EXTENSION (EXISTING TERMINUS TO 185TH AVENUE)

Shackelford Road Extension (existing terminus to 185th Avenue) The Shackelford Road Extension project extends a three-lane roadway from Shackelford Road's existing terminus to 185th Avenue and provides a parallel route to Springville Road.

**Congestion Impacts:** This project is expected to serve 2,500 vehicles each day by 2040 with development of all urban reserve areas. The construction of this project provides a small reduction in vehicles for Springville Road which moderately relieves congestion for existing residential areas and on Springville Road. No significant changes in intersection operations are expected at the adjacent study intersection of 185th Avenue and Springville Road. This connection provides an alternative access to Joss Avenue for North Bethany residents to significant employment opportunities and other key destinations located to the west in the Portland metropolitan area. While these roads are not expected to exceed Washington County's mobility target under the baseline scenario, opening the Shackelford Extension can mitigate localized congestion within existing residential areas and enhance neighborhood connectivity.

### EVALUATION HIGHLIGHTS

Roadway Congestion & Volume Shift: *small benefit* to Springville Road

Cost: *large disadvantage* from required structure

Access & Connectivity: *small benefit* from enhanced neighborhood circulation

Active Transportation: *large benefit* from new facilities and connections to existing network

Environment: *large disadvantage* from wetlands and creek crossings

**Other Project Benefits:** Constructing this extension provides benefits to bicyclists and pedestrians. The proposed bike lanes and sidewalks on this extension will connect to existing bike lanes on Shackelford Road and to the proposed multi-use path that will be constructed with the 185th Avenue widening project which can improve access to Washington County's existing trail network and Portland Community College's Rock Creek Campus. This project will also improve local connectivity and circulation within the Bethany West Urban Reserve.

**Challenges:** This project faces several significant environmental constraints as the proposed extension alignment will pass through the flood plain and wetlands surrounding Rock Creek. Minimizing the environmental impact will require a structure of approximately 800 feet for the roadway which will significantly increase the project cost. This project will also require significant right-of-way although it is expected that most of this right-of-way could be acquired through development.

### 185$^{TH}$ AVENUE WIDENING (SHACKELFORD ROAD EXTENSION TO SPRINGVILLE ROAD)

The 185$^{th}$ Avenue Widening extends a three-lane section on 185$^{th}$ Avenue between Springville Road and the future Shackelford Road Extension.

**Congestion Impacts:** This project is expected to serve 5,700 vehicles each day by 2040 with development of all urban reserve areas. Construction of this project, in conjunction with the Shackelford Road Extension, is expected to result in a small increase in vehicle traffic on 185$^{th}$ Avenue over adjacent parallel routes through residential areas, including Joss Avenue. With the widening project, there are no significant changes in link v/c ratios on 185$^{th}$ Avenue despite the increased traffic volume, and there are also no significant changes in intersection operations at the nearby study intersection of 185$^{th}$ Avenue/Springville Road. All roadway segments and the study intersection remain within their Washington County Mobility standard.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *small benefit* to Springville Road

Cost: *large disadvantage* from impacted structures

Active Transportation: *large benefit* from new facilities and connections to existing network

Environment: *large disadvantage* from potential wetlands and creek crossings

**Other Project Benefits:** This widening project will also benefit bicyclists and pedestrians by extending a multi-use path on the east side of 185$^{th}$ Avenue which will connect to the existing bike lanes on 185$^{th}$ Avenue south of Springville Road and the bike lanes that will be part of the Shackelford Road Extension project. Completing this gap will provide a critical connection in Washington County's bike, pedestrian, and trail network in addition to serving Portland Community College's Rock Creek Campus.

**Challenges:** Widening this existing roadway is particularly challenging due to existing environmental constraints. A portion of 185$^{th}$ Avenue currently lies in the flood plain of Rock Creek and there are several adjacent wetland areas which could be impacted. The widening will require replacement of two box culverts required due to the project's vicinity to Rock Creek. This section of 185$^{th}$ Avenue is also constrained by a rolling topography; the proposed widening is also expected to impact an existing sheet pile wall. The expected environmental and topographic challenges, along with the potential right-of-way needs, is expected to significantly increase the cost of this project.

### 185$^{TH}$ AVENUE EXTENSION (GASSNER ROAD TO KEMMER ROAD)

The 185$^{th}$ Avenue Extension connects 185$^{th}$ Avenue south from Gassner Road to Kemmer Road, creating a short parallel route to 190$^{th}$ Avenue and reducing out of direction travel for vehicles on 185$^{th}$ Avenue. This project completes a missing link in the 185$^{th}$ Avenue corridor that extends north to US 26 and Germantown Road/Cornelius Pass Road and south to OR 99W via 175$^{th}$ Avenue.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *small benefit* to 190$^{th}$ Avenue and 175$^{th}$ near extension

Right of Way: *large disadvantage* from 6 impacted properties

Cost: *large disadvantage* from right of way impacts

Active Transportation: *large benefit* from new facilities connecting existing residential areas and parks

**Congestion Impacts:** This extension is expected to serve 9,900 vehicles each day by 2040 with development of all urban reserve areas. Providing this extension leads to a large decrease in vehicle traffic on 190$^{th}$ Avenue/Kemmer Road and on 175$^{th}$ Avenue in the vicinity of the extension. Shifting traffic to the 185$^{th}$ Avenue extension can provide a modest relief to congestion on both 190$^{th}$ Avenue/Kemmer Road and 175$^{th}$ Avenue between Bany Road and Kemmer Road (much of which is currently a two-lane arterial), although most of these segments operate within Washington County's mobility standard under the future baseline. Furthermore, the 185$^{th}$ Avenue extension will include two-way left turn lanes which could minimize delays from left-turning vehicles and improve north-south traffic flow in the area. The adjacent study intersection at 170$^{th}$ Avenue/Rigert Road does not see a significant change in vehicle operations as a result of this project. The shift in traffic volumes is also expected to benefit the existing roundabout at 175$^{th}$ Avenue/Kemmer Road. Without the 185$^{th}$ Avenue extension, the southbound approach to this roundabout is expected to exceed its capacity; by opening the 185$^{th}$ Avenue extension, the southbound approach is expected to operate within its mobility standard while the eastbound approach exceeds capacity. Altogether, this project is expected to maintain a similar level of congestion within the study area.

**Other Project Benefits:** This extension will provide a significant new bicycle and pedestrian connection. There are currently no sidewalks on 190$^{th}$ Avenue, a narrow two-lane road with limited shoulders. This project will fill a key sidewalk gap by connecting the existing sidewalks on 185$^{th}$ Avenue and Kemmer Road and providing a more direct route for pedestrians and bicyclists between residential areas to the north and the Cooper Mountain Nature Park.

**Challenges:** This roadway extension project is expected to have high right-of-way and construction costs. The proposed alignment is expected to impact six properties. Limited, small-scale infill opportunities are available for these properties, so Washington County may face a higher right-of-way cost compared to other projects with similar right-of-way impacts. The high right-of-way cost contributes to a high overall project cost for a relatively short project that completes an important link in a longer arterial corridor.

## 175TH AVENUE WIDENING AND REALIGNMENT (WEIR ROAD TO BARROWS ROAD)

### EVALUATION HIGHLIGHTS

Roadway Congestion & Volume Shift: *small benefit* to 175th Avenue

Right of Way: *small disadvantage* from 5 impacted properties

Cost: *large disadvantage* from right of way impacts

Access & Connectivity: *large benefit* from improved connections between job centers and residential areas

Active Transportation: *large benefit* from infill on key gap

The 175th Avenue Widening and Realignment would reconstruct the existing hairpin curves on 175th Avenue ("the kink"). The widening would bring the road up to current design standards, including a new center two-way left turn lane, consistent with the existing cross-section both north and south of this project, and is proposed to increase the design speed through the curves from 15 mph to 35 mph by smoothing out the kink. The improvements would also include bicycle and pedestrian facilities through the project area,

**Congestion Impacts:** This project is expected to serve 19,800 vehicles each day by 2040 with development of all urban reserve areas. The increased design speed and inclusion of a center turn lane will provide more consistent travel speeds for vehicles on 175th Avenue and wider lanes can better accommodate large vehicles and future transit. These features could provide modest relief to congestion on 175th Avenue which stems from the existing, low-speed curves on this road.

**Other Project Benefits:** This project will reduce congestion and increase mobility through the Cooper Mountain area. It will allow for better bicycle, pedestrian, truck, emergency vehicle, and future transit vehicle access between the developing South Cooper Mountain area, which will include a small commercial area and a high school, and neighborhoods to the north. This project is intended to improve safety by improving visibility along the horizontal and vertical curves and by providing bike lanes and sidewalks to connect with existing facilities north and south of this project.

**Challenges:** Constructing this project will be very challenging. The proposed alignment extends through a developed low-density residential area and impacts at least five properties. Construction of this project would also include the realignment of two existing local roadway intersections with 175th Ave for safety – High Hill Lane and Rider Lane. Since significant redevelopment is not expected within the project area, this project would likely be constructed as a larger capital project with right-of-way acquisition costs. The high right-of-way cost contributes to a high project cost overall although these costs will be shared between the City of Beaverton and Washington County.

### BEEF BEND ROAD REALIGNMENT (OPTIONS 1 & 2)

Two realignment options were identified for Beef Bend Road. In Option 1, the existing intersection with Roy Rogers Road is realigned immediately north of its current location and Beef Bend Road is realigned approaching the intersection. Under Option 2, the intersection of Beef Bend and Roy Rogers Road is realigned further north, about 900 feet, at the existing intersection of Roy Rogers Road and Lasich Lane which shifts Beef Bend Road further north for a greater portion of its alignment.

**EVALUATION HIGHLIGHTS**

Roadway Congestion & Volume Shift: *no impact* to Beef Bend Road

Right of Way: *large disadvantage* from Option 2 which impacts at least 8 properties

Environment: *large benefit* from minimizing impacts to Tualatin River National Wildlife Refuge

**Congestion Impacts:** This project is expected to serve between 7,500 and 11,100 vehicles each day by 2040 with development of all urban reserve areas. No significant changes are expected as a result of the proposed realignment.

**Other Project Benefits:** These realignments are intended to avoid impacts to the adjacent Tualatin River National Wildlife Refuge and Option 2 would improve existing horizonal and vertical curves to improve safety while allowing the roadway to be widened consistent with Washington County's urban arterial standards. Both realignments will include sidewalks and bike lanes.

**Challenges:** Realigning Beef Bend Road based on Option 2 requires a longer section of new roadway and is expected to impact at least eight properties contributing to its relatively higher cost. Roy Rogers Road has significant vertical curves in the vicinity of Lasich Lane, which may make sight distance challenging at this location, depending on eventual vertical alignment improvements to Roy Rogers Road when it is eventually widened. Option 2 is also more likely to impact small wetlands or other environmentally sensitive areas identified in the Bull Mountain Community Plan[8]. Conversely, Option 1 requires only a short section of new roadway and is only expected to impact one or two properties.

[8] Washington County. *Bull Mountain Community Plan.* https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/Publications/bull-mountain-cp.cfm

## I-5 OVERCROSSINGS EVALUATION

Initial modeling results and traffic analysis included both the Day Road and Basalt Creek overcrossings in both the baseline and supplemental system improvements scenarios, although the Basalt Creek overcrossing is not expected to be completed until after 2040 when the Stafford Basin Urban Reserve intensely develops. The impacts of not constructing either overpass, or only completing one overcrossing were tested through the following three scenarios. Each of these scenarios assumes that the identified supplemental system improvements are also complete:

1. Only Basalt Creek Parkway Overcrossing (No Day Road Overcrossing) Complete by 2040
2. Only Day Road Overcrossing (No Basalt Creek Parkway Overcrossing) Complete by 2040
3. Neither Day Road nor Basalt Creek Parkway Overcrossing Complete by 2040

Removing one or both I-5 overcrossings primarily shifts traffic to one of the adjacent overcrossings (*i.e.* Norwood Road overcrossing, Stafford Road interchange) with relatively little impact to regional traffic patterns.

The analysis results showed the need for the Day Road overcrossing to be completed by 2040 (with development of the urban reserve areas) to alleviate congestion in the Stafford Road interchange area. The Basalt Creek Parkway overcrossing will likely be needed further in the future, beyond 2040, to accommodate future growth within the greater Stafford urban reserve areas.

### Only Basalt Creek Parkway Overcrossing (No Day Road Overcrossing) Complete by 2040

The Day Road overcrossing is expected to serve 15,400 vehicles each day by 2040. Without construction of the Day Road overcrossing by 2040, 7,500 more vehicles are expected to travel through the Stafford Road Interchange and 4,800 more vehicles are expected to use the Basalt Creek overcrossing each day. The additional traffic on eastbound Elligsen Road will push segments approaching the northbound and southbound I-5 on ramps over capacity. Northbound Boones Ferry Road between Day Road and the I-5 southbound ramps is also expected to approach capacity. Construction of the Day Road overcrossing will mitigate most impacts in the Stafford Road interchange area and reduce congestion on most segments of Boones Ferry Road.

### Only Day Road Overcrossing (No Basalt Creek Parkway Overcrossing) Complete by 2040

The Basalt Creek Parkway overcrossing is expected to serve 7,400 vehicles each day by 2040. Without construction of the Basalt Creek overcrossing by 2040, 1,000 more vehicles are expected to travel through the Stafford Road Interchange, 2,300 more vehicles are expected to use the Day Road overcrossing, and 3,000 more vehicles are expected to use the Norwood Road overcrossing by 2040. Delaying construction of the Basalt Creek overcrossing beyond 2040 will have a more modest impact on congestion in the study area. Congestion on the I-5 southbound off-ramp will slightly increase without construction since vehicles traveling south to Tualatin/Sherwood from I-205 can no longer take Stafford Road to the Frobase Road/Basalt Creek Parkway extension to avoid congestion on I-5. A portion of traffic traveling between I-205 and Tualatin/Sherwood is also expected to shift north towards the Norwood Road overcrossing which will reduce future traffic volumes on the Basalt Creek Parkway extension and 124$^{th}$ Avenue. However, the Norwood Road overcrossing is still not expected to exceed capacity even with this additional traffic. Additional traffic on the Day Road overcrossing is, however, expected to push the westbound approach to the Boones Ferry Road intersection over capacity.

#### Neither Day Road nor Basalt Creek Parkway Overcrossing Complete by 2040

Without either overcrossing, over 11,000 more vehicles are expected to travel through the Stafford Road interchange each day and 7,000 more vehicles are expected to use the Norwood Road overcrossing. The additional traffic on eastbound Elligsen Road will push segments approaching the northbound and southbound I-5 on ramps over capacity. Northbound Boones Ferry Road between Day Road and the I-5 southbound ramps is also expected to exceed capacity, and southbound Boones Ferry Road is expected to approach or exceed capacity in the same segment. The Day Road overcrossing needs to be constructed by 2040 to alleviate congestion in the Stafford Road interchange while the Basalt Creek Parkway overcrossing can be completed later.

### PARALLEL ROUTES EVALUATION

Initial modeling and traffic analysis results also included new collector roadway connections expected to be completed with each urban reserve development. The impacts of not completing this road network was evaluated using the regional travel demand models for a new north-south collector roadway in Sherwood West (parallel to Elwert Road), the extension of Fisher Road in Beef Bend South, and the proposed Rosa Road improvements in the Rosa urban reserve.

#### Sherwood West Parallel Routes Evaluation

The proposed parallel route is expected to serve as a collector through the Sherwood West urban reserves, concentrating traffic traveling to or from OR 99W on Edy Road, Kruger Road, and Chapman Road. Removing previously identified parallel routes in the Sherwood West urban reserve moderately increases traffic on Elwert Road as vehicles travel between Sherwood West and OR 99W and can also moderately increase traffic on OR 99W.

Higher traffic on OR 99W will cause the southbound segment approaching Meinecke Parkway to exceed capacity. Similar congestion impacts were noted at the Elwert Road/Scholls-Sherwood Road intersection and at the Elwert Road/Handley Street intersection which will exceed Washington County's mobility standard.

#### Beef Bend South Parallel Route Evaluation

Removing the Fisher Road extension restricts local access between existing King City, including the commercial center, and the new Beef Bend South urban reserve. Without the extension in place, future development must use Beef Bend Road to access these areas, adding 4,800 vehicles to Beef Bend Road each day along with other key local access roads, such as 131$^{st}$ Avenue. The Fisher Road extension allows for local traffic to circulate through the city without having to use Beef Bend Road, leaving the arterial capacity for through traffic from Roy Rogers Road to OR 99W.

These volume shifts will increase congestion on Beef Bend Road between 131st Avenue and 150th Avenue and on Roy Rogers Road between Beef Bend Road and Elsner Road. Without the Fisher Road extension, westbound Beef Bend Road between 131st Avenue and 150th Avenue and northbound Roy Rogers Road between Beef Bend Road and Elsner Road will exceed their capacity. Northbound 131st Avenue is also expected to exceed Washington County's mobility standard without the Fisher Road extension.

### Rosa Parallel Route Evaluation

No impacts to vehicle congestion are expected without the Rosa Road improvements due to the low volume on River Road and Rosedale Road. Removing the proposed improvements to Rosa Road only leads to a small increase in vehicle traffic on both River Road and Rosedale Road. However, improving Rosa Road will improve local access, connectivity, and circulation within the Rosa urban reserve.

### Benefits of Parallel Routes

Future capacity constraints on key roadways in Washington County clearly highlight a need for parallel routes in the Sherwood West and Beef Bend South urban reserve areas. However, even without the need for additional roadway capacity, providing parallel routes in urban reserve areas improves local circulation/access, reduces out of direction travel, and enhances the walkability and bikeability of these areas. All identified local improvements should be constructed with development of the urban reserve areas.

# APPENDIX

## CONTENTS

## SECTION 1. 2040 BASELINE OPERATIONS

### HCM 6TH EDITION

| Intersection | |
|---|---|
| Int Delay, s/veh | 10.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 50 | 85 | 35 | 55 | 155 | 10 | 85 | 165 | 25 | 15 | 180 | 105 |
| Future Vol, veh/h | 50 | 85 | 35 | 55 | 155 | 10 | 85 | 165 | 25 | 15 | 180 | 105 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 0 | 0 | 10 | 2 | 0 | 0 | 0 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 200 | - | - | 100 | - | - | 200 | - | - | 200 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 53 | 89 | 37 | 58 | 163 | 11 | 89 | 174 | 26 | 16 | 189 | 111 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 741 | 657 | 247 | 705 | 699 | 197 | 302 | 0 | 0 | 200 | 0 | 0 |
| Stage 1 | 279 | 279 | - | 365 | 365 | - | - | - | - | - | - | - |
| Stage 2 | 462 | 378 | - | 340 | 334 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 335 | 387 | 797 | 354 | 366 | 849 | 1270 | - | - | 1384 | - | - |
| Stage 1 | 732 | 683 | - | 658 | 627 | - | - | - | - | - | - | - |
| Stage 2 | 584 | 619 | - | 679 | 647 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 191 | 355 | 795 | 256 | 336 | 841 | 1268 | - | - | 1384 | - | - |
| Mov Cap-2 Maneuver | 191 | 355 | - | 256 | 336 | - | - | - | - | - | - | - |
| Stage 1 | 679 | 673 | - | 612 | 583 | - | - | - | - | - | - | - |
| Stage 2 | 382 | 576 | - | 555 | 638 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 21.2 | 24.6 | 2.5 | 0.4 |
| HCM LOS | C | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1268 | - | - | 191 | 423 | 256 | 349 | 1384 | - | - |
| HCM Lane V/C Ratio | 0.071 | - | - | 0.276 | 0.299 | 0.226 | 0.498 | 0.011 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 30.9 | 17.1 | 23.1 | 25.1 | 7.6 | - | - |
| HCM Lane LOS | A | - | - | D | C | C | D | A | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 1.1 | 1.2 | 0.8 | 2.7 | 0 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | ↰ | ↑ | ↑ | ↱ | ↰ | ↱ |
| Traffic Vol, veh/h | 65 | 290 | 420 | 255 | 180 | 140 |
| Future Vol, veh/h | 65 | 290 | 420 | 255 | 180 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 1 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Free | - | None |
| Storage Length | 100 | - | - | 50 | 200 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 68 | 305 | 442 | 268 | 189 | 147 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 442 | 0 | - | 0 | 884 | 442 |
| Stage 1 | - | - | - | - | 442 | - |
| Stage 2 | - | - | - | - | 442 | - |
| Critical Hdwy | 4.1 | - | - | - | 6.4 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.4 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.4 | - |
| Follow-up Hdwy | 2.2 | - | - | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuver | 1129 | - | - | 0 | 318 | 620 |
| Stage 1 | - | - | - | 0 | 652 | - |
| Stage 2 | - | - | - | 0 | 652 | - |
| Platoon blocked, % | | - | - | | | |
| Mov Cap-1 Maneuver | 1129 | - | - | - | 299 | 620 |
| Mov Cap-2 Maneuver | - | - | - | - | 299 | - |
| Stage 1 | - | - | - | - | 613 | - |
| Stage 2 | - | - | - | - | 652 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.5 | 0 | 25.6 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | SBLn1 | SBLn2 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1129 | - | - | 299 | 620 |
| HCM Lane V/C Ratio | 0.061 | - | - | 0.634 | 0.238 |
| HCM Control Delay (s) | 8.4 | - | - | 35.7 | 12.6 |
| HCM Lane LOS | A | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 4 | 0.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 370 | 540 | 115 | 350 | 130 | 50 | 105 | 1150 | 950 | 45 | 695 | 40 |
| Future Volume (veh/h) | 370 | 540 | 115 | 350 | 130 | 50 | 105 | 1150 | 950 | 45 | 695 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.97 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 389 | 568 | 121 | 368 | 137 | 53 | 111 | 1211 | 1000 | 47 | 732 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 275 | 540 | 553 | 365 | 308 | 119 | 337 | 858 | 723 | 116 | 1510 | 87 |
| Arrive On Green | 0.15 | 0.28 | 0.28 | 0.10 | 0.24 | 0.22 | 0.05 | 0.45 | 0.45 | 0.03 | 0.44 | 0.42 |
| Sat Flow, veh/h | 1810 | 1900 | 1608 | 3510 | 1304 | 504 | 1810 | 1900 | 1601 | 1810 | 3464 | 199 |
| Grp Volume(v), veh/h | 389 | 568 | 121 | 368 | 0 | 190 | 111 | 1211 | 1000 | 47 | 381 | 393 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1608 | 1755 | 0 | 1808 | 1810 | 1900 | 1601 | 1810 | 1805 | 1858 |
| Q Serve(g_s), s | 19.0 | 35.5 | 6.7 | 13.0 | 0.0 | 11.2 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Cycle Q Clear(g_c), s | 19.0 | 35.5 | 6.7 | 13.0 | 0.0 | 11.2 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.28 | 1.00 | | 1.00 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 275 | 540 | 553 | 365 | 0 | 427 | 337 | 858 | 723 | 116 | 787 | 810 |
| V/C Ratio(X) | 1.41 | 1.05 | 0.22 | 1.01 | 0.00 | 0.45 | 0.33 | 1.41 | 1.38 | 0.41 | 0.48 | 0.48 |
| Avail Cap(c_a), veh/h | 275 | 540 | 553 | 365 | 0 | 427 | 337 | 858 | 723 | 144 | 787 | 810 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 44.8 | 29.1 | 56.0 | 0.0 | 41.0 | 20.3 | 34.3 | 34.3 | 30.2 | 25.2 | 25.3 |
| Incr Delay (d2), s/veh | 206.6 | 53.3 | 0.1 | 49.1 | 0.0 | 0.3 | 0.2 | 191.7 | 180.6 | 0.8 | 2.1 | 2.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 24.4 | 24.5 | 2.6 | 8.2 | 0.0 | 5.1 | 1.8 | 71.0 | 57.6 | 0.8 | 8.5 | 8.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 259.6 | 98.1 | 29.2 | 105.1 | 0.0 | 41.2 | 20.5 | 226.0 | 214.8 | 31.1 | 27.3 | 27.3 |
| LnGrp LOS | F | F | C | F | A | D | C | F | F | C | C | C |
| Approach Vol, veh/h | | 1078 | | | 558 | | | 2322 | | | 821 | |
| Approach Delay, s/veh | | 148.6 | | | 83.4 | | | 211.4 | | | 27.6 | |
| Approach LOS | | F | | | F | | | F | | | C | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.0 | 58.5 | 23.0 | 33.5 | 8.0 | 60.5 | 17.0 | 39.5 |
| Change Period (Y+Rc), s | 4.0 | 5.5 | 4.0 | 5.5 | 4.0 | 5.5 | 5.0 | 5.5 |
| Max Green Setting (Gmax), s | 6.0 | 53.0 | 19.0 | 28.0 | 6.0 | 53.0 | 12.0 | 34.0 |
| Max Q Clear Time (g_c+I1), s | 6.3 | 20.9 | 21.0 | 13.2 | 3.8 | 58.5 | 15.0 | 37.5 |
| Green Ext Time (p_c), s | 0.0 | 6.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 150.7 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 250 | 105 | 600 | 130 | 90 | 35 | 215 | 1350 | 50 | 135 | 90 |
| Future Volume (veh/h) | 50 | 250 | 105 | 600 | 130 | 90 | 35 | 215 | 1350 | 50 | 135 | 90 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.97 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 53 | 263 | 111 | 632 | 137 | 95 | 37 | 226 | 1421 | 53 | 142 | 95 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 112 | 195 | 82 | 866 | 254 | 176 | 474 | 752 | 1819 | 237 | 427 | 286 |
| Arrive On Green | 0.15 | 0.15 | 0.15 | 0.25 | 0.25 | 0.23 | 0.03 | 0.40 | 0.40 | 0.04 | 0.40 | 0.39 |
| Sat Flow, veh/h | 1165 | 1267 | 535 | 3510 | 1031 | 715 | 1810 | 1900 | 2830 | 1810 | 1061 | 710 |
| Grp Volume(v), veh/h | 53 | 0 | 374 | 632 | 0 | 232 | 37 | 226 | 1421 | 53 | 0 | 237 |
| Grp Sat Flow(s),veh/h/ln | 1165 | 0 | 1802 | 1755 | 0 | 1745 | 1810 | 1900 | 1415 | 1810 | 0 | 1771 |
| Q Serve(g_s), s | 3.2 | 0.0 | 15.0 | 16.1 | 0.0 | 11.3 | 1.2 | 7.9 | 35.1 | 1.7 | 0.0 | 9.1 |
| Cycle Q Clear(g_c), s | 14.5 | 0.0 | 15.0 | 16.1 | 0.0 | 11.3 | 1.2 | 7.9 | 35.1 | 1.7 | 0.0 | 9.1 |
| Prop In Lane | 1.00 | | 0.30 | 1.00 | | 0.41 | 1.00 | | 1.00 | 1.00 | | 0.40 |
| Lane Grp Cap(c), veh/h | 112 | 0 | 278 | 866 | 0 | 431 | 474 | 752 | 1819 | 237 | 0 | 712 |
| V/C Ratio(X) | 0.47 | 0.00 | 1.35 | 0.73 | 0.00 | 0.54 | 0.08 | 0.30 | 0.78 | 0.22 | 0.00 | 0.33 |
| Avail Cap(c_a), veh/h | 112 | 0 | 278 | 1263 | 0 | 628 | 973 | 752 | 1819 | 724 | 0 | 712 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 47.5 | 0.0 | 41.2 | 33.7 | 0.0 | 32.1 | 17.5 | 20.2 | 12.5 | 17.3 | 0.0 | 20.3 |
| Incr Delay (d2), s/veh | 1.1 | 0.0 | 177.9 | 1.5 | 0.0 | 1.3 | 0.0 | 0.2 | 2.3 | 0.2 | 0.0 | 0.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.3 | 0.0 | 20.3 | 6.9 | 0.0 | 4.9 | 0.5 | 3.5 | 17.7 | 0.7 | 0.0 | 3.7 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 48.6 | 0.0 | 219.1 | 35.1 | 0.0 | 33.4 | 17.5 | 20.4 | 14.8 | 17.5 | 0.0 | 20.4 |
| LnGrp LOS | D | A | F | D | A | C | B | C | B | B | A | C |
| Approach Vol, veh/h | | 427 | | | 864 | | | 1684 | | | 290 | |
| Approach Delay, s/veh | | 197.9 | | | 34.7 | | | 15.6 | | | 19.9 | |
| Approach LOS | | F | | | C | | | B | | | B | |
| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | | 19.0 | 7.2 | 43.1 | | 28.0 | 7.8 | 42.5 | | | | |
| Change Period (Y+Rc), s | | 4.5 | 4.0 | 5.5 | | 5.5 | 4.0 | 5.5 | | | | |
| Max Green Setting (Gmax), s | | 14.5 | 30.0 | 37.0 | | 33.5 | 30.0 | 37.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 17.0 | 3.2 | 11.1 | | 18.1 | 3.7 | 37.1 | | | | |
| Green Ext Time (p_c), s | | 0.0 | 0.0 | 0.9 | | 4.3 | 0.1 | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 44.9 | | | | | | | | | |
| HCM 6th LOS | | | D | | | | | | | | | |

Notes

User approved pedestrian interval to be less than phase max green.

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2.7 | | | | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 35 | 75 | 490 | 25 | 145 | 650 |
| Future Vol, veh/h | 35 | 75 | 490 | 25 | 145 | 650 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | - | 100 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 36 | 77 | 505 | 26 | 149 | 670 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1486 | 518 | 0 | 0 | 531 | 0 |
| Stage 1 | 518 | - | - | - | - | - |
| Stage 2 | 968 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 139 | 562 | - | - | 1047 | - |
| Stage 1 | 602 | - | - | - | - | - |
| Stage 2 | 372 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 119 | 562 | - | - | 1047 | - |
| Mov Cap-2 Maneuver | 119 | - | - | - | - | - |
| Stage 1 | 602 | - | - | - | - | - |
| Stage 2 | 319 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 23.7 | 0 | 1.6 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 119 | 562 | 1047 | - |
| HCM Lane V/C Ratio | - | - | 0.303 | 0.138 | 0.143 | - |
| HCM Control Delay (s) | - | - | 47.9 | 12.4 | 9 | - |
| HCM Lane LOS | - | - | E | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 1.2 | 0.5 | 0.5 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 192.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 590 | 50 | 135 | 125 | 125 | 865 |
| Future Vol, veh/h | 590 | 50 | 135 | 125 | 125 | 865 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 621 | 53 | 142 | 132 | 132 | 911 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Approach | EB | | WB | | SB | |
|---|---|---|---|---|---|---|
| Opposing Approach | WB | | EB | | | |
| Opposing Lanes | 2 | | 2 | | 0 | |
| Conflicting Approach Left | SB | | | | WB | |
| Conflicting Lanes Left | 2 | | 0 | | 2 | |
| Conflicting Approach Right | | | SB | | EB | |
| Conflicting Lanes Right | 0 | | 2 | | 2 | |
| HCM Control Delay | 165.9 | | 15.3 | | 256.1 | |
| HCM LOS | F | | C | | F | |

| Lane | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 0% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 100% | 100% | 0% | 0% | 0% |
| Vol Right, % | 0% | 0% | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 590 | 50 | 135 | 125 | 125 | 865 |
| LT Vol | 590 | 0 | 0 | 0 | 125 | 0 |
| Through Vol | 0 | 50 | 135 | 0 | 0 | 0 |
| RT Vol | 0 | 0 | 0 | 125 | 0 | 865 |
| Lane Flow Rate | 621 | 53 | 142 | 132 | 132 | 911 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util (X) | 1.303 | 0.103 | 0.303 | 0.255 | 0.273 | 1.587 |
| Departure Headway (Hd) | 8.85 | 8.331 | 9.424 | 8.684 | 8.08 | 6.853 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 416 | 433 | 384 | 417 | 447 | 537 |
| Service Time | 6.55 | 6.031 | 7.124 | 6.384 | 5.78 | 4.553 |
| HCM Lane V/C Ratio | 1.493 | 0.122 | 0.37 | 0.317 | 0.295 | 1.696 |
| HCM Control Delay | 178.9 | 12 | 16.2 | 14.3 | 13.8 | 291.1 |
| HCM Lane LOS | F | B | C | B | B | F |
| HCM 95th-tile Q | 23.8 | 0.3 | 1.3 | 1 | 1.1 | 45.4 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 21.9 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✣ | | | ✣ | | | ✣ | | | ✣ | |
| Traffic Vol, veh/h | 5 | 165 | 5 | 5 | 145 | 150 | 10 | 160 | 20 | 120 | 345 | 5 |
| Future Vol, veh/h | 5 | 165 | 5 | 5 | 145 | 150 | 10 | 160 | 20 | 120 | 345 | 5 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 174 | 5 | 5 | 153 | 158 | 11 | 168 | 21 | 126 | 363 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 13.6 | 16.6 | 13.4 | 31.7 |
| HCM LOS | B | C | B | D |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 5% | 3% | 2% | 26% |
| Vol Thru, % | 84% | 94% | 48% | 73% |
| Vol Right, % | 11% | 3% | 50% | 1% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 190 | 175 | 300 | 470 |
| LT Vol | 10 | 5 | 5 | 120 |
| Through Vol | 160 | 165 | 145 | 345 |
| RT Vol | 20 | 5 | 150 | 5 |
| Lane Flow Rate | 200 | 184 | 316 | 495 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.365 | 0.35 | 0.547 | 0.828 |
| Departure Headway (Hd) | 6.562 | 6.839 | 6.234 | 6.028 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 546 | 523 | 575 | 599 |
| Service Time | 4.637 | 4.917 | 4.301 | 4.085 |
| HCM Lane V/C Ratio | 0.366 | 0.352 | 0.55 | 0.826 |
| HCM Control Delay | 13.4 | 13.6 | 16.6 | 31.7 |
| HCM Lane LOS | B | B | C | D |
| HCM 95th-tile Q | 1.7 | 1.6 | 3.3 | 8.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 25 | 390 | 215 | 35 | 430 | 320 | 85 | 85 | 15 | 245 | 185 | 40 |
| Future Volume (veh/h) | 25 | 390 | 215 | 35 | 430 | 320 | 85 | 85 | 15 | 245 | 185 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 26 | 411 | 226 | 37 | 453 | 337 | 89 | 89 | 16 | 258 | 195 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 354 | 517 | 284 | 271 | 918 | 680 | 117 | 119 | 21 | 319 | 295 | 64 |
| Arrive On Green | 0.03 | 0.45 | 0.43 | 0.04 | 0.46 | 0.44 | 0.06 | 0.08 | 0.08 | 0.18 | 0.20 | 0.19 |
| Sat Flow, veh/h | 1810 | 1152 | 634 | 1810 | 1977 | 1464 | 1810 | 1567 | 282 | 1810 | 1515 | 326 |
| Grp Volume(v), veh/h | 26 | 0 | 637 | 37 | 413 | 377 | 89 | 0 | 105 | 258 | 0 | 237 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 0 | 1786 | 1810 | 1805 | 1636 | 1810 | 0 | 1849 | 1810 | 0 | 1841 |
| Q Serve(g_s), s | 0.5 | 0.0 | 20.5 | 0.7 | 10.6 | 10.9 | 3.2 | 0.0 | 3.7 | 9.1 | 0.0 | 7.9 |
| Cycle Q Clear(g_c), s | 0.5 | 0.0 | 20.5 | 0.7 | 10.6 | 10.9 | 3.2 | 0.0 | 3.7 | 9.1 | 0.0 | 7.9 |
| Prop In Lane | 1.00 | | 0.35 | 1.00 | | 0.89 | 1.00 | | 0.15 | 1.00 | | 0.18 |
| Lane Grp Cap(c), veh/h | 354 | 0 | 801 | 271 | 838 | 760 | 117 | 0 | 140 | 319 | 0 | 359 |
| V/C Ratio(X) | 0.07 | 0.00 | 0.80 | 0.14 | 0.49 | 0.50 | 0.76 | 0.00 | 0.75 | 0.81 | 0.00 | 0.66 |
| Avail Cap(c_a), veh/h | 464 | 0 | 1339 | 353 | 1353 | 1227 | 339 | 0 | 527 | 882 | 0 | 1077 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 10.8 | 0.0 | 16.0 | 13.1 | 12.4 | 13.0 | 30.7 | 0.0 | 30.2 | 26.4 | 0.0 | 24.8 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 2.2 | 0.2 | 0.5 | 0.6 | 9.8 | 0.0 | 3.0 | 4.9 | 0.0 | 0.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.0 | 7.9 | 0.3 | 3.9 | 3.7 | 1.7 | 0.0 | 1.7 | 4.2 | 0.0 | 3.4 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 10.9 | 0.0 | 18.3 | 13.3 | 12.9 | 13.6 | 40.5 | 0.0 | 33.2 | 31.3 | 0.0 | 25.6 |
| LnGrp LOS | B | A | B | B | B | B | D | A | C | C | A | C |
| Approach Vol, veh/h | | 663 | | | 827 | | | 194 | | | 495 | |
| Approach Delay, s/veh | | 18.0 | | | 13.2 | | | 36.6 | | | 28.6 | |
| Approach LOS | | B | | | B | | | D | | | C | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 7.0 | 33.9 | 8.8 | 17.0 | 5.9 | 35.0 | 16.3 | 9.6 |
| Change Period (Y+Rc), s | 4.5 | 5.5 | 4.5 | 4.5 | 4.0 | 5.5 | 4.5 | * 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 48.5 | 12.5 | 38.5 | 6.0 | 48.5 | 32.5 | * 19 |
| Max Q Clear Time (g_c+I1), s | 2.7 | 22.5 | 5.2 | 9.9 | 2.5 | 12.9 | 11.1 | 5.7 |
| Green Ext Time (p_c), s | 0.0 | 5.9 | 0.1 | 0.7 | 0.0 | 7.4 | 0.7 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 20.2 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 0 | 5 | 210 | 0 | 75 | 5 | 1360 | 120 | 110 | 1575 | 0 |
| Future Volume (veh/h) | 0 | 0 | 5 | 210 | 0 | 75 | 5 | 1360 | 120 | 110 | 1575 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 0 | 5 | 221 | 0 | 79 | 5 | 1432 | 126 | 116 | 1658 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 0 | 0 | 292 | 358 | 0 | 302 | 226 | 2160 | 963 | 304 | 2560 | 0 |
| Arrive On Green | 0.00 | 0.00 | 0.18 | 0.19 | 0.00 | 0.18 | 0.57 | 0.60 | 0.60 | 0.06 | 0.71 | 0.00 |
| Sat Flow, veh/h | 0 | 0 | 1610 | 1434 | 0 | 1610 | 305 | 3610 | 1610 | 1810 | 3705 | 0 |
| Grp Volume(v), veh/h | 0 | 0 | 5 | 221 | 0 | 79 | 5 | 1432 | 126 | 116 | 1658 | 0 |
| Grp Sat Flow(s),veh/h/ln | 0 | 0 | 1610 | 1434 | 0 | 1610 | 305 | 1805 | 1610 | 1810 | 1805 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.2 | 11.5 | 0.0 | 3.3 | 0.7 | 20.5 | 2.6 | 1.8 | 19.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.2 | 11.7 | 0.0 | 3.3 | 11.3 | 20.5 | 2.6 | 1.8 | 19.2 | 0.0 |
| Prop In Lane | 0.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 0 | 0 | 292 | 358 | 0 | 302 | 226 | 2160 | 963 | 304 | 2560 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 | 0.02 | 0.62 | 0.00 | 0.26 | 0.02 | 0.66 | 0.13 | 0.38 | 0.65 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 | 789 | 791 | 0 | 789 | 340 | 3513 | 1567 | 406 | 4118 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 26.1 | 30.4 | 0.0 | 27.1 | 12.5 | 10.4 | 6.8 | 9.8 | 6.1 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.2 | 0.0 | 0.4 | 0.1 | 0.3 | 0.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.0 | 0.1 | 3.9 | 0.0 | 1.2 | 0.1 | 7.0 | 0.8 | 0.6 | 5.3 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 | 26.1 | 31.1 | 0.0 | 27.3 | 12.6 | 10.8 | 6.9 | 10.1 | 6.4 | 0.0 |
| LnGrp LOS | A | A | C | C | A | C | B | B | A | B | A | A |
| Approach Vol, veh/h | | 5 | | | 300 | | | 1563 | | | 1774 | |
| Approach Delay, s/veh | | 26.1 | | | 30.1 | | | 10.5 | | | 6.7 | |
| Approach LOS | | C | | | C | | | B | | | A | |
| Timer - Assigned Phs | 1 | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 8.6 | 50.4 | | 18.6 | | 59.0 | | 18.6 | | | | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | * 4.5 | | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 9.0 | 73.5 | | * 38 | | 86.5 | | 37.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 3.8 | 22.5 | | 2.2 | | 21.2 | | 13.7 | | | | |
| Green Ext Time (p_c), s | 0.0 | 21.9 | | 0.0 | | 28.9 | | 0.4 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 10.3 |
| HCM 6th LOS | | B |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Intersection | |
|---|---|
| Int Delay, s/veh | 139.6 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 345 | 100 | 105 | 215 | 410 | 365 |
| Future Vol, veh/h | 345 | 100 | 105 | 215 | 410 | 365 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 363 | 105 | 111 | 226 | 432 | 384 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1072 | 624 | 816 | 0 | - | 0 |
| Stage 1 | 624 | - | - | - | - | - |
| Stage 2 | 448 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | ~ 246 | 489 | 820 | - | - | - |
| Stage 1 | 538 | - | - | - | - | - |
| Stage 2 | 648 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 208 | 489 | 820 | - | - | - |
| Mov Cap-2 Maneuver | ~ 208 | - | - | - | - | - |
| Stage 1 | 455 | - | - | - | - | - |
| Stage 2 | 648 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 480.9 | 3.3 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 820 | - | 239 | - | - |
| HCM Lane V/C Ratio | 0.135 | - | 1.96 | - | - |
| HCM Control Delay (s) | 10.1 | 0 | $ 480.9 | - | - |
| HCM Lane LOS | B | A | F | - | - |
| HCM 95th %tile Q(veh) | 0.5 | - | 33.9 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.1 | | | | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 130 | 210 | 5 | 145 | 365 |
| Future Vol, veh/h | 5 | 130 | 210 | 5 | 145 | 365 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 137 | 221 | 5 | 153 | 384 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 914 | 224 | 0 | 0 | 226 | 0 |
| Stage 1 | 224 | - | - | - | - | - |
| Stage 2 | 690 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 306 | 820 | - | - | 1354 | - |
| Stage 1 | 818 | - | - | - | - | - |
| Stage 2 | 502 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 262 | 820 | - | - | 1354 | - |
| Mov Cap-2 Maneuver | 262 | - | - | - | - | - |
| Stage 1 | 818 | - | - | - | - | - |
| Stage 2 | 430 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 10.8 | 0 | 2.3 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 760 | 1354 | - |
| HCM Lane V/C Ratio | - | - | 0.187 | 0.113 | - |
| HCM Control Delay (s) | - | - | 10.8 | 8 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 0.7 | 0.4 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 188.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 5 | 15 | 30 | 470 | 55 | 230 | 50 | 345 | 425 | 225 | 330 | 5 |
| Future Vol, veh/h | 5 | 15 | 30 | 470 | 55 | 230 | 50 | 345 | 425 | 225 | 330 | 5 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 15 | 31 | 485 | 57 | 237 | 52 | 356 | 438 | 232 | 340 | 5 |
| Number of Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 2 | 1 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 2 | 2 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 1 | 2 | 2 |
| HCM Control Delay | 15.7 | 80.1 | 313.3 | 167.1 |
| HCM LOS | C | F | F | F |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 |
|---|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 100% | 0% | 100% | 0% | 40% |
| Vol Thru, % | 0% | 45% | 0% | 33% | 0% | 19% | 59% |
| Vol Right, % | 0% | 55% | 0% | 67% | 0% | 81% | 1% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 50 | 770 | 5 | 45 | 470 | 285 | 560 |
| LT Vol | 50 | 0 | 5 | 0 | 470 | 0 | 225 |
| Through Vol | 0 | 345 | 0 | 15 | 0 | 55 | 330 |
| RT Vol | 0 | 425 | 0 | 30 | 0 | 230 | 5 |
| Lane Flow Rate | 52 | 794 | 5 | 46 | 485 | 294 | 577 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 | 6 |
| Degree of Util (X) | 0.121 | 1.673 | 0.015 | 0.119 | 1.121 | 0.593 | 1.269 |
| Departure Headway (Hd) | 9.087 | 8.164 | 12.456 | 11.417 | 9.697 | 8.573 | 9.175 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 397 | 452 | 289 | 316 | 378 | 423 | 398 |
| Service Time | 6.787 | 5.864 | 10.156 | 9.117 | 7.397 | 6.273 | 7.175 |
| HCM Lane V/C Ratio | 0.131 | 1.757 | 0.017 | 0.146 | 1.283 | 0.695 | 1.45 |
| HCM Control Delay | 13 | 332.8 | 15.3 | 15.7 | 114.7 | 23 | 167.1 |
| HCM Lane LOS | B | F | C | C | F | C | F |
| HCM 95th-tile Q | 0.4 | 43.5 | 0 | 0.4 | 15.6 | 3.7 | 21.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 240 | 40 | 55 | 405 | 160 | 25 | 450 | 45 | 295 | 580 | 75 |
| Future Volume (veh/h) | 20 | 240 | 40 | 55 | 405 | 160 | 25 | 450 | 45 | 295 | 580 | 75 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 21 | 253 | 42 | 58 | 426 | 168 | 26 | 474 | 47 | 311 | 611 | 79 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 112 | 578 | 96 | 336 | 471 | 186 | 271 | 678 | 67 | 441 | 811 | 105 |
| Arrive On Green | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.03 | 0.40 | 0.40 | 0.12 | 0.49 | 0.49 |
| Sat Flow, veh/h | 836 | 1589 | 264 | 1101 | 1297 | 511 | 1810 | 1701 | 169 | 1810 | 1648 | 213 |
| Grp Volume(v), veh/h | 21 | 0 | 295 | 58 | 0 | 594 | 26 | 0 | 521 | 311 | 0 | 690 |
| Grp Sat Flow(s),veh/h/ln | 836 | 0 | 1853 | 1101 | 0 | 1808 | 1810 | 0 | 1870 | 1810 | 0 | 1862 |
| Q Serve(g_s), s | 2.6 | 0.0 | 12.7 | 4.4 | 0.0 | 32.7 | 0.9 | 0.0 | 24.4 | 10.0 | 0.0 | 31.4 |
| Cycle Q Clear(g_c), s | 35.3 | 0.0 | 12.7 | 17.1 | 0.0 | 32.7 | 0.9 | 0.0 | 24.4 | 10.0 | 0.0 | 31.4 |
| Prop In Lane | 1.00 | | 0.14 | 1.00 | | 0.28 | 1.00 | | 0.09 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 112 | 0 | 673 | 336 | 0 | 657 | 271 | 0 | 745 | 441 | 0 | 916 |
| V/C Ratio(X) | 0.19 | 0.00 | 0.44 | 0.17 | 0.00 | 0.90 | 0.10 | 0.00 | 0.70 | 0.71 | 0.00 | 0.75 |
| Avail Cap(c_a), veh/h | 127 | 0 | 706 | 355 | 0 | 689 | 320 | 0 | 745 | 528 | 0 | 916 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 48.4 | 0.0 | 25.3 | 31.8 | 0.0 | 31.7 | 19.7 | 0.0 | 26.3 | 18.4 | 0.0 | 21.5 |
| Incr Delay (d2), s/veh | 0.8 | 0.0 | 0.4 | 0.2 | 0.0 | 15.0 | 0.2 | 0.0 | 5.4 | 3.4 | 0.0 | 5.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 0.0 | 5.6 | 1.2 | 0.0 | 16.6 | 0.4 | 0.0 | 11.7 | 4.3 | 0.0 | 14.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 49.2 | 0.0 | 25.7 | 32.0 | 0.0 | 46.7 | 19.8 | 0.0 | 31.7 | 21.8 | 0.0 | 27.2 |
| LnGrp LOS | D | A | C | C | A | D | B | A | C | C | A | C |
| Approach Vol, veh/h | | 316 | | | 652 | | | 547 | | | 1001 | |
| Approach Delay, s/veh | | 27.3 | | | 45.4 | | | 31.1 | | | 25.6 | |
| Approach LOS | | C | | | D | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 17.0 | 45.9 | | 42.2 | 7.2 | 55.7 | | 42.2 | | | | |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 17.5 | 34.5 | | 39.5 | 5.5 | 46.5 | | 39.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 12.0 | 26.4 | | 37.3 | 2.9 | 33.4 | | 34.7 | | | | |
| Green Ext Time (p_c), s | 0.5 | 2.1 | | 0.4 | 0.0 | 4.0 | | 1.8 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 32.1 | | | | | | | | | |
| HCM 6th LOS | | | C | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 165 | 80 | 45 | 135 | 5 | 75 | 5 | 1330 | 80 | 60 | 2470 | 65 |
| Future Volume (veh/h) | 165 | 80 | 45 | 135 | 5 | 75 | 5 | 1330 | 80 | 60 | 2470 | 65 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1870 | 1900 | 1900 | 1900 | 1856 | 1856 | 1841 | 1885 | 1900 |
| Adj Flow Rate, veh/h | 181 | 88 | 49 | 142 | 5 | 79 | 5 | 1400 | 84 | 66 | 2714 | 71 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 3 | 4 | 1 | 0 |
| Cap, veh/h | 228 | 199 | 111 | 194 | 17 | 265 | 43 | 2266 | 136 | 114 | 2549 | 1122 |
| Arrive On Green | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.02 | 0.67 | 0.65 | 0.06 | 0.71 | 0.71 |
| Sat Flow, veh/h | 1335 | 1147 | 638 | 1252 | 97 | 1528 | 1810 | 3380 | 202 | 1753 | 3582 | 1577 |
| Grp Volume(v), veh/h | 181 | 0 | 137 | 142 | 0 | 84 | 5 | 728 | 756 | 66 | 2714 | 71 |
| Grp Sat Flow(s),veh/h/ln | 1335 | 0 | 1785 | 1252 | 0 | 1625 | 1810 | 1763 | 1819 | 1753 | 1791 | 1577 |
| Q Serve(g_s), s | 14.3 | 0.0 | 7.9 | 12.1 | 0.0 | 5.2 | 0.3 | 26.7 | 27.1 | 4.2 | 82.0 | 1.6 |
| Cycle Q Clear(g_c), s | 19.5 | 0.0 | 7.9 | 20.0 | 0.0 | 5.2 | 0.3 | 26.7 | 27.1 | 4.2 | 82.0 | 1.6 |
| Prop In Lane | 1.00 | | 0.36 | 1.00 | | 0.94 | 1.00 | | 0.11 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 228 | 0 | 310 | 194 | 0 | 282 | 43 | 1182 | 1220 | 114 | 2549 | 1122 |
| V/C Ratio(X) | 0.79 | 0.00 | 0.44 | 0.73 | 0.00 | 0.30 | 0.12 | 0.62 | 0.62 | 0.58 | 1.06 | 0.06 |
| Avail Cap(c_a), veh/h | 228 | 0 | 310 | 194 | 0 | 282 | 118 | 1254 | 1294 | 114 | 2549 | 1122 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 51.1 | 0.0 | 42.6 | 52.0 | 0.0 | 41.5 | 55.1 | 10.7 | 10.8 | 52.4 | 16.6 | 5.0 |
| Incr Delay (d2), s/veh | 17.2 | 0.0 | 1.0 | 13.3 | 0.0 | 0.6 | 1.2 | 0.8 | 0.8 | 7.2 | 38.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.4 | 0.0 | 3.6 | 4.8 | 0.0 | 2.1 | 0.2 | 9.8 | 10.3 | 2.1 | 41.5 | 0.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 68.3 | 0.0 | 43.6 | 65.4 | 0.0 | 42.1 | 56.3 | 11.5 | 11.6 | 59.6 | 54.7 | 5.0 |
| LnGrp LOS | E | A | D | E | A | D | E | B | B | E | F | A |
| Approach Vol, veh/h | | 318 | | | 226 | | | 1489 | | | 2851 | |
| Approach Delay, s/veh | | 57.7 | | | 56.7 | | | 11.7 | | | 53.6 | |
| Approach LOS | | E | | | E | | | B | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.0 | 81.3 | | 24.0 | 5.2 | 86.0 | | 24.0 |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 |
| Max Green Setting (Gmax), s | 5.5 | 80.0 | | 19.5 | 5.5 | 80.0 | | 19.5 |
| Max Q Clear Time (g_c+I1), s | 6.2 | 29.1 | | 21.5 | 2.3 | 84.0 | | 22.0 |
| Green Ext Time (p_c), s | 0.0 | 16.4 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | | 41.2 |
| HCM 6th LOS | | | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 125 | 115 | 190 | 105 | 195 | 205 |
| Future Vol, veh/h | 125 | 115 | 190 | 105 | 195 | 205 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 200 | 0 | - | - | - | 0 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 132 | 121 | 200 | 111 | 205 | 216 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 716 | 205 | 421 | 0 | - | 0 |
| Stage 1 | 205 | - | - | - | - | - |
| Stage 2 | 511 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 400 | 841 | 1149 | - | - | - |
| Stage 1 | 834 | - | - | - | - | - |
| Stage 2 | 606 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 326 | 841 | 1149 | - | - | - |
| Mov Cap-2 Maneuver | 326 | - | - | - | - | - |
| Stage 1 | 680 | - | - | - | - | - |
| Stage 2 | 606 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 16.9 | 5.7 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1149 | - | 326 | 841 | - | - |
| HCM Lane V/C Ratio | 0.174 | - | 0.404 | 0.144 | - | - |
| HCM Control Delay (s) | 8.8 | 0 | 23.3 | 10 | - | - |
| HCM Lane LOS | A | A | C | B | - | - |
| HCM 95th %tile Q(veh) | 0.6 | - | 1.9 | 0.5 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.9 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 50 | 190 | 760 | 115 | 190 | 745 |
| Future Vol, veh/h | 50 | 190 | 760 | 115 | 190 | 745 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | 70 | 290 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 53 | 200 | 800 | 121 | 200 | 784 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1986 | 800 | 0 | 0 | 921 | 0 |
| Stage 1 | 800 | - | - | - | - | - |
| Stage 2 | 1186 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 68 | 388 | - | - | 750 | - |
| Stage 1 | 446 | - | - | - | - | - |
| Stage 2 | 293 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | ~ 50 | 388 | - | - | 750 | - |
| Mov Cap-2 Maneuver | ~ 50 | - | - | - | - | - |
| Stage 1 | 446 | - | - | - | - | - |
| Stage 2 | 214 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 75.8 | 0 | 2.3 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 50 | 388 | 750 | - |
| HCM Lane V/C Ratio | - | - | 1.053 | 0.515 | 0.267 | - |
| HCM Control Delay (s) | - | - | 273.9 | 23.7 | 11.5 | - |
| HCM Lane LOS | - | - | F | C | B | - |
| HCM 95th %tile Q(veh) | - | - | 4.6 | 2.8 | 1.1 | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 650 | 0 | 0 | 520 | 140 |
| Future Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 650 | 0 | 0 | 520 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 100 | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 89 | 0 | 42 | 0 | 0 | 0 | 42 | 684 | 0 | 0 | 547 | 147 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1389 | 1389 | 621 | 1410 | 1462 | 684 | 694 | 0 | 0 | 684 | 0 | 0 |
| Stage 1 | 621 | 621 | - | 768 | 768 | - | - | - | - | - | - | - |
| Stage 2 | 768 | 768 | - | 642 | 694 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 121 | 144 | 491 | 117 | 130 | 452 | 911 | - | - | 919 | - | - |
| Stage 1 | 478 | 482 | - | 397 | 414 | - | - | - | - | - | - | - |
| Stage 2 | 397 | 414 | - | 466 | 447 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 117 | 137 | 491 | 103 | 124 | 452 | 911 | - | - | 919 | - | - |
| Mov Cap-2 Maneuver | 117 | 137 | - | 103 | 124 | - | - | - | - | - | - | - |
| Stage 1 | 456 | 482 | - | 379 | 395 | - | - | - | - | - | - | - |
| Stage 2 | 379 | 395 | - | 426 | 447 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 71.2 | 0 | 0.5 | 0 |
| HCM LOS | F | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 911 | - | - | 117 | 491 | - | 919 | - | - |
| HCM Lane V/C Ratio | 0.046 | - | - | 0.765 | 0.086 | - | - | - | - |
| HCM Control Delay (s) | 9.1 | - | - | 98.6 | 13 | 0 | 0 | - | - |
| HCM Lane LOS | A | - | - | F | B | A | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 4.3 | 0.3 | - | 0 | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 175 | 565 | 175 | 190 | 205 | 675 | 750 | 160 | 190 | 580 | 45 |
| Future Volume (veh/h) | 15 | 175 | 565 | 175 | 190 | 205 | 675 | 750 | 160 | 190 | 580 | 45 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 16 | 184 | 595 | 184 | 200 | 216 | 711 | 789 | 168 | 200 | 611 | 47 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 56 | 543 | 651 | 171 | 291 | 315 | 401 | 593 | 126 | 667 | 2219 | 170 |
| Arrive On Green | 0.03 | 0.29 | 0.29 | 0.09 | 0.35 | 0.34 | 0.11 | 0.39 | 0.38 | 0.37 | 0.65 | 0.64 |
| Sat Flow, veh/h | 1810 | 1900 | 1587 | 1810 | 835 | 902 | 3510 | 1518 | 323 | 1810 | 3397 | 261 |
| Grp Volume(v), veh/h | 16 | 184 | 595 | 184 | 0 | 416 | 711 | 0 | 957 | 200 | 324 | 334 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1587 | 1810 | 0 | 1737 | 1755 | 0 | 1841 | 1810 | 1805 | 1852 |
| Q Serve(g_s), s | 0.9 | 8.0 | 30.0 | 9.9 | 0.0 | 21.6 | 12.0 | 0.0 | 41.0 | 8.2 | 8.0 | 8.0 |
| Cycle Q Clear(g_c), s | 0.9 | 8.0 | 30.0 | 9.9 | 0.0 | 21.6 | 12.0 | 0.0 | 41.0 | 8.2 | 8.0 | 8.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.52 | 1.00 | | 0.18 | 1.00 | | 0.14 |
| Lane Grp Cap(c), veh/h | 56 | 543 | 651 | 171 | 0 | 606 | 401 | 0 | 719 | 667 | 1179 | 1210 |
| V/C Ratio(X) | 0.28 | 0.34 | 0.91 | 1.08 | 0.00 | 0.69 | 1.77 | 0.00 | 1.33 | 0.30 | 0.28 | 0.28 |
| Avail Cap(c_a), veh/h | 119 | 543 | 651 | 171 | 0 | 606 | 401 | 0 | 719 | 667 | 1179 | 1210 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.66 | 0.00 | 0.66 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 29.7 | 29.4 | 47.5 | 0.0 | 29.6 | 46.5 | 0.0 | 32.1 | 23.5 | 7.7 | 7.7 |
| Incr Delay (d2), s/veh | 2.7 | 0.3 | 17.3 | 91.4 | 0.0 | 3.0 | 354.2 | 0.0 | 155.6 | 0.2 | 0.6 | 0.6 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 3.7 | 16.8 | 8.8 | 0.0 | 9.4 | 24.9 | 0.0 | 48.6 | 3.5 | 3.0 | 3.1 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 52.5 | 29.9 | 46.7 | 138.9 | 0.0 | 32.6 | 400.7 | 0.0 | 187.7 | 23.7 | 8.3 | 8.3 |
| LnGrp LOS | D | C | D | F | A | C | F | A | F | C | A | A |
| Approach Vol, veh/h | | 795 | | | 600 | | | 1668 | | | 858 | |
| Approach Delay, s/veh | | 42.9 | | | 65.2 | | | 278.5 | | | 11.9 | |
| Approach LOS | | D | | | E | | | F | | | B | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 16.0 | 73.5 | 6.4 | 40.6 | 44.5 | 45.0 | 13.0 | 34.0 |
| Change Period (Y+Rc), s | 4.5 | * 5.4 | 4.5 | * 5.4 | * 5.4 | * 5.4 | 4.5 | * 5.4 |
| Max Green Setting (Gmax), s | 11.5 | * 37 | 5.5 | * 32 | * 8.5 | * 40 | 8.5 | * 29 |
| Max Q Clear Time (g_c+I1), s | 14.0 | 10.0 | 2.9 | 23.6 | 10.2 | 43.0 | 11.9 | 32.0 |
| Green Ext Time (p_c), s | 0.0 | 7.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 139.7 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1050 | 1030 | 0 | 705 | 390 | 0 | 0 | 0 | 670 | 0 | 1150 |
| Future Volume (veh/h) | 0 | 1050 | 1030 | 0 | 705 | 390 | 0 | 0 | 0 | 670 | 0 | 1150 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1900 | 1900 | 0 | 1900 | 1900 | | | | 1900 | 0 | 1900 |
| Adj Flow Rate, veh/h | 0 | 1105 | 0 | 0 | 742 | 0 | | | | 705 | 0 | 1211 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | | | | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Cap, veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| Arrive On Green | 0.00 | 1.00 | 0.00 | 0.00 | 0.23 | 0.00 | | | | 0.22 | 0.00 | 0.21 |
| Sat Flow, veh/h | 0 | 3705 | 1610 | 0 | 3705 | 1610 | | | | 3510 | 0 | 2834 |
| Grp Volume(v), veh/h | 0 | 1105 | 0 | 0 | 742 | 0 | | | | 705 | 0 | 1211 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1805 | 1610 | 0 | 1805 | 1610 | | | | 1755 | 0 | 1417 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 17.8 | 0.0 | | | | 20.6 | 0.0 | 22.5 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 17.8 | 0.0 | | | | 20.6 | 0.0 | 22.5 |
| Prop In Lane | 0.00 | | 1.00 | 0.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| V/C Ratio(X) | 0.00 | 0.43 | | 0.00 | 0.29 | | | | | 0.92 | 0.00 | 1.99 |
| Avail Cap(c_a), veh/h | 0 | 2544 | | 0 | 2544 | | | | | 769 | 0 | 607 |
| HCM Platoon Ratio | 1.00 | 2.00 | 2.00 | 1.00 | 0.33 | 0.33 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.65 | 0.00 | 0.00 | 0.90 | 0.00 | | | | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 18.7 | 0.0 | | | | 40.1 | 0.0 | 41.2 |
| Incr Delay (d2), s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 0.3 | 0.0 | | | | 15.6 | 0.0 | 453.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.1 | 0.0 | 0.0 | 8.6 | 0.0 | | | | 10.4 | 0.0 | 54.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 19.0 | 0.0 | | | | 55.7 | 0.0 | 494.5 |
| LnGrp LOS | A | A | | A | B | | | | | E | A | F |
| Approach Vol, veh/h | | 1105 | A | | 742 | A | | | | | 1916 | |
| Approach Delay, s/veh | | 0.4 | | | 19.0 | | | | | | 333.0 | |
| Approach LOS | | A | | | B | | | | | | F | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 78.0 | | 27.0 | | 78.0 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | | 73.0 | | 22.0 | | 37.9 |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | 24.5 | | 19.8 |
| Green Ext Time (p_c), s | | 18.0 | | 0.0 | | 6.7 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 173.4 |
| HCM 6th LOS | F |

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 105 | 630 | 290 | 210 | 375 | 40 | 400 | 110 | 215 | 20 | 75 | 45 |
| Future Volume (veh/h) | 105 | 630 | 290 | 210 | 375 | 40 | 400 | 110 | 215 | 20 | 75 | 45 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 111 | 663 | 305 | 221 | 395 | 42 | 421 | 116 | 226 | 21 | 79 | 47 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 156 | 796 | 1048 | 172 | 1409 | 149 | 814 | 132 | 256 | 158 | 113 | 67 |
| Arrive On Green | 0.03 | 0.14 | 0.14 | 0.10 | 0.43 | 0.42 | 0.23 | 0.23 | 0.22 | 0.09 | 0.10 | 0.09 |
| Sat Flow, veh/h | 1810 | 1900 | 1610 | 1810 | 3294 | 348 | 3510 | 567 | 1105 | 1810 | 1116 | 664 |
| Grp Volume(v), veh/h | 111 | 663 | 305 | 221 | 215 | 222 | 421 | 0 | 342 | 21 | 0 | 126 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1610 | 1810 | 1805 | 1837 | 1755 | 0 | 1672 | 1810 | 0 | 1780 |
| Q Serve(g_s), s | 6.4 | 35.7 | 11.0 | 10.0 | 8.1 | 8.3 | 11.0 | 0.0 | 20.8 | 1.1 | 0.0 | 7.2 |
| Cycle Q Clear(g_c), s | 6.4 | 35.7 | 11.0 | 10.0 | 8.1 | 8.3 | 11.0 | 0.0 | 20.8 | 1.1 | 0.0 | 7.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.19 | 1.00 | | 0.66 | 1.00 | | 0.37 |
| Lane Grp Cap(c), veh/h | 156 | 796 | 1048 | 172 | 772 | 786 | 814 | 0 | 388 | 158 | 0 | 181 |
| V/C Ratio(X) | 0.71 | 0.83 | 0.29 | 1.28 | 0.28 | 0.28 | 0.52 | 0.00 | 0.88 | 0.13 | 0.00 | 0.70 |
| Avail Cap(c_a), veh/h | 172 | 796 | 1048 | 172 | 772 | 786 | 1204 | 0 | 573 | 198 | 0 | 220 |
| HCM Platoon Ratio | 0.33 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.74 | 0.74 | 0.74 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 41.7 | 12.3 | 47.5 | 19.5 | 19.6 | 35.2 | 0.0 | 39.3 | 44.3 | 0.0 | 45.9 |
| Incr Delay (d2), s/veh | 6.9 | 7.6 | 0.5 | 163.9 | 0.9 | 0.9 | 0.2 | 0.0 | 7.8 | 0.1 | 0.0 | 4.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.3 | 19.8 | 8.0 | 12.3 | 3.6 | 3.7 | 4.7 | 0.0 | 9.3 | 0.5 | 0.0 | 3.4 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 56.6 | 49.3 | 12.9 | 211.4 | 20.4 | 20.5 | 35.4 | 0.0 | 47.0 | 44.4 | 0.0 | 50.6 |
| LnGrp LOS | E | D | B | F | C | C | D | A | D | D | A | D |
| Approach Vol, veh/h | | 1079 | | | 658 | | | 763 | | | 147 | |
| Approach Delay, s/veh | | 39.7 | | | 84.6 | | | 40.6 | | | 49.7 | |
| Approach LOS | | D | | | F | | | D | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 14.0 | 48.0 | | 14.7 | 13.1 | 48.9 | | 28.4 |
| Change Period (Y+Rc), s | 5.0 | 5.0 | | 5.5 | 5.0 | 5.0 | | 5.0 |
| Max Green Setting (Gmax), s | 9.0 | 29.0 | | 11.5 | 9.0 | 29.0 | | 35.0 |
| Max Q Clear Time (g_c+I1), s | 12.0 | 37.7 | | 9.2 | 8.4 | 10.3 | | 22.8 |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.1 | 0.0 | 0.9 | | 0.6 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 51.7 |
| HCM 6th LOS | D |

# MOVEMENT SUMMARY

## Site: 101 [Corn Pass/Rosedale 2040 Task 3 Baseline ]

New Site
Site Category: (None)
Roundabout

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
| East: Rosedale | | | | | | | | | | | | |
| 6 | T1 | 295 | 2.0 | 0.332 | 5.7 | LOS A | 2.0 | 51.4 | 0.06 | 0.01 | 0.06 | 34.9 |
| 16 | R2 | 153 | 2.0 | 0.332 | 5.7 | LOS A | 2.0 | 51.4 | 0.06 | 0.01 | 0.06 | 33.8 |
| Approach | | 447 | 2.0 | 0.332 | 5.7 | LOS A | 2.0 | 51.4 | 0.06 | 0.01 | 0.06 | 34.5 |
| North: Corn Pass | | | | | | | | | | | | |
| 7 | L2 | 221 | 2.0 | 0.209 | 5.3 | LOS A | 0.9 | 23.0 | 0.43 | 0.33 | 0.43 | 32.4 |
| 14 | R2 | 26 | 2.0 | 0.025 | 3.6 | LOS A | 0.1 | 2.4 | 0.37 | 0.23 | 0.37 | 34.7 |
| Approach | | 247 | 2.0 | 0.209 | 5.2 | LOS A | 0.9 | 23.0 | 0.42 | 0.31 | 0.42 | 32.6 |
| West: Rosedale | | | | | | | | | | | | |
| 5 | L2 | 5 | 2.0 | 0.318 | 6.5 | LOS A | 1.7 | 42.7 | 0.45 | 0.33 | 0.45 | 34.5 |
| 2 | T1 | 337 | 2.0 | 0.318 | 6.5 | LOS A | 1.7 | 42.7 | 0.45 | 0.33 | 0.45 | 34.4 |
| Approach | | 342 | 2.0 | 0.318 | 6.5 | LOS A | 1.7 | 42.7 | 0.45 | 0.33 | 0.45 | 34.4 |
| All Vehicles | | 1037 | 2.0 | 0.332 | 5.8 | LOS A | 2.0 | 51.4 | 0.28 | 0.19 | 0.28 | 34.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Oregon/Tonquin 2040 Task 3 Baseline ]

New Site
Site Category: (None)
Roundabout

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
| South: Oregon | | | | | | | | | | | | |
| 8 | T1 | 200 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 32.8 |
| 18 | R2 | 437 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 31.9 |
| Approach | | 637 | 2.0 | 0.550 | 9.6 | LOS A | 4.1 | 104.3 | 0.51 | 0.34 | 0.51 | 32.2 |
| East: Tonquin | | | | | | | | | | | | |
| 1 | L2 | 700 | 1.0 | 0.709 | 14.3 | LOS B | 11.4 | 288.3 | 0.74 | 0.70 | 1.04 | 29.0 |
| 16 | R2 | 79 | 10.0 | 0.709 | 14.6 | LOS B | 11.4 | 288.3 | 0.74 | 0.70 | 1.04 | 28.1 |
| Approach | | 779 | 1.9 | 0.709 | 14.4 | LOS B | 11.4 | 288.3 | 0.74 | 0.70 | 1.04 | 28.9 |
| North: Oregon | | | | | | | | | | | | |
| 7 | L2 | 147 | 3.0 | 0.203 | 7.3 | LOS A | 0.8 | 20.0 | 0.60 | 0.60 | 0.60 | 31.5 |
| 4 | T1 | 579 | 2.0 | 0.791 | 24.8 | LOS C | 9.9 | 250.3 | 0.90 | 1.31 | 2.11 | 27.0 |
| Approach | | 726 | 2.2 | 0.791 | 21.3 | LOS C | 9.9 | 250.3 | 0.84 | 1.16 | 1.80 | 27.8 |
| All Vehicles | | 2142 | 2.0 | 0.791 | 15.3 | LOS C | 11.4 | 288.3 | 0.71 | 0.75 | 1.14 | 29.4 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [65th/Elligsen/Stafford 2040 Task 3 Baseline]

New Site
Site Category: (None)
Roundabout

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
| South: SW Stafford Road | | | | | | | | | | | | |
| 3 | L2 | 87 | 3.0 | 0.078 | 3.9 | LOS A | 0.3 | 7.7 | 0.34 | 0.21 | 0.34 | 33.0 |
| 8 | T1 | 87 | 3.0 | 0.554 | 9.9 | LOS A | 3.6 | 91.9 | 0.56 | 0.43 | 0.56 | 32.5 |
| 18 | R2 | 533 | 3.0 | 0.554 | 9.9 | LOS A | 3.6 | 91.9 | 0.56 | 0.43 | 0.56 | 31.6 |
| Approach | | 707 | 3.0 | 0.554 | 9.2 | LOS A | 3.6 | 91.9 | 0.53 | 0.40 | 0.53 | 31.9 |
| East: SW Stafford Road | | | | | | | | | | | | |
| 1 | L2 | 565 | 3.0 | 0.650 | 12.9 | LOS B | 7.7 | 197.2 | 0.69 | 0.80 | 1.11 | 29.6 |
| 6 | T1 | 63 | 2.0 | 0.650 | 12.9 | LOS B | 7.7 | 197.2 | 0.69 | 0.80 | 1.11 | 29.6 |
| 16 | R2 | 47 | 2.0 | 0.650 | 12.9 | LOS B | 7.7 | 197.2 | 0.69 | 0.80 | 1.11 | 28.8 |
| Approach | | 676 | 2.8 | 0.650 | 12.9 | LOS B | 7.7 | 197.2 | 0.69 | 0.80 | 1.11 | 29.5 |
| North: SW 65th Avenue | | | | | | | | | | | | |
| 7 | L2 | 32 | 2.0 | 0.345 | 10.3 | LOS B | 1.6 | 40.7 | 0.69 | 0.72 | 0.78 | 32.2 |
| 4 | T1 | 103 | 3.0 | 0.345 | 10.4 | LOS B | 1.6 | 40.7 | 0.69 | 0.72 | 0.78 | 32.1 |
| 14 | R2 | 84 | 2.0 | 0.345 | 10.3 | LOS B | 1.6 | 40.7 | 0.69 | 0.72 | 0.78 | 31.3 |
| Approach | | 219 | 2.5 | 0.345 | 10.3 | LOS B | 1.6 | 40.7 | 0.69 | 0.72 | 0.78 | 31.8 |
| West: SW Elligsen Road | | | | | | | | | | | | |
| 5 | L2 | 153 | 2.0 | 0.486 | 13.1 | LOS B | 3.0 | 75.6 | 0.75 | 0.86 | 1.08 | 30.2 |
| 2 | T1 | 42 | 2.0 | 0.486 | 13.1 | LOS B | 3.0 | 75.6 | 0.75 | 0.86 | 1.08 | 30.1 |
| 12 | R2 | 120 | 3.0 | 0.486 | 13.2 | LOS B | 3.0 | 75.6 | 0.75 | 0.86 | 1.08 | 29.4 |
| Approach | | 314 | 2.4 | 0.486 | 13.2 | LOS B | 3.0 | 75.6 | 0.75 | 0.86 | 1.08 | 29.9 |
| All Vehicles | | 1916 | 2.8 | 0.650 | 11.3 | LOS B | 7.7 | 197.2 | 0.64 | 0.65 | 0.86 | 30.7 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SECTION 2. 2040 OPERATIONS WITH SUPPLEMENTAL IMPROVEMENTS

## HCM 6TH EDITION

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 55 | 155 | 10 | 50 | 85 | 35 | 85 | 165 | 25 | 15 | 180 | 105 |
| Future Vol, veh/h | 55 | 155 | 10 | 50 | 85 | 35 | 85 | 165 | 25 | 15 | 180 | 105 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 0 | 0 | 10 | 2 | 0 | 0 | 0 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 200 | - | - | 100 | - | - | 200 | - | - | 200 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 58 | 163 | 11 | 53 | 89 | 37 | 89 | 174 | 26 | 16 | 189 | 111 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 717 | 657 | 247 | 729 | 699 | 197 | 302 | 0 | 0 | 200 | 0 | 0 |
| Stage 1 | 279 | 279 | - | 365 | 365 | - | - | - | - | - | - | - |
| Stage 2 | 438 | 378 | - | 364 | 334 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 347 | 387 | 797 | 341 | 366 | 849 | 1270 | - | - | 1384 | - | - |
| Stage 1 | 732 | 683 | - | 658 | 627 | - | - | - | - | - | - | - |
| Stage 2 | 601 | 619 | - | 659 | 647 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 245 | 355 | 795 | 203 | 336 | 841 | 1268 | - | - | 1384 | - | - |
| Mov Cap-2 Maneuver | 245 | 355 | - | 203 | 336 | - | - | - | - | - | - | - |
| Stage 1 | 679 | 673 | - | 612 | 583 | - | - | - | - | - | - | - |
| Stage 2 | 448 | 576 | - | 487 | 638 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 23.5 | 21 | 2.5 | 0.4 |
| HCM LOS | C | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1268 | - | - | 245 | 367 | 203 | 407 | 1384 | - | - |
| HCM Lane V/C Ratio | 0.071 | - | - | 0.236 | 0.473 | 0.259 | 0.31 | 0.011 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 24.2 | 23.3 | 28.8 | 17.8 | 7.6 | - | - |
| HCM Lane LOS | A | - | - | C | C | D | C | A | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.9 | 2.4 | 1 | 1.3 | 0 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 65 | 290 | 420 | 255 | 180 | 140 |
| Future Vol, veh/h | 65 | 290 | 420 | 255 | 180 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 1 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Free | - | None |
| Storage Length | 100 | - | - | 50 | 200 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 68 | 305 | 442 | 268 | 189 | 147 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 442 | 0 | - | 0 | 884 | 442 |
| Stage 1 | - | - | - | - | 442 | - |
| Stage 2 | - | - | - | - | 442 | - |
| Critical Hdwy | 4.1 | - | - | - | 6.4 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.4 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.4 | - |
| Follow-up Hdwy | 2.2 | - | - | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuver | 1129 | - | - | 0 | 318 | 620 |
| Stage 1 | - | - | - | 0 | 652 | - |
| Stage 2 | - | - | - | 0 | 652 | - |
| Platoon blocked, % | | - | - | | | |
| Mov Cap-1 Maneuver | 1129 | - | - | - | 299 | 620 |
| Mov Cap-2 Maneuver | - | - | - | - | 299 | - |
| Stage 1 | - | - | - | - | 613 | - |
| Stage 2 | - | - | - | - | 652 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.5 | 0 | 25.6 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | SBLn1 | SBLn2 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1129 | - | - | 299 | 620 |
| HCM Lane V/C Ratio | 0.061 | - | - | 0.634 | 0.238 |
| HCM Control Delay (s) | 8.4 | - | - | 35.7 | 12.6 |
| HCM Lane LOS | A | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 4 | 0.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 370 | 540 | 115 | 350 | 130 | 50 | 105 | 1150 | 950 | 45 | 695 | 40 |
| Future Volume (veh/h) | 370 | 540 | 115 | 350 | 130 | 50 | 105 | 1150 | 950 | 45 | 695 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.97 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 389 | 568 | 121 | 368 | 137 | 53 | 111 | 1211 | 1000 | 47 | 732 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 275 | 540 | 553 | 365 | 308 | 119 | 337 | 858 | 723 | 116 | 1510 | 87 |
| Arrive On Green | 0.15 | 0.28 | 0.28 | 0.10 | 0.24 | 0.22 | 0.05 | 0.45 | 0.45 | 0.03 | 0.44 | 0.42 |
| Sat Flow, veh/h | 1810 | 1900 | 1608 | 3510 | 1304 | 504 | 1810 | 1900 | 1601 | 1810 | 3464 | 199 |
| Grp Volume(v), veh/h | 389 | 568 | 121 | 368 | 0 | 190 | 111 | 1211 | 1000 | 47 | 381 | 393 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1608 | 1755 | 0 | 1808 | 1810 | 1900 | 1601 | 1810 | 1805 | 1858 |
| Q Serve(g_s), s | 19.0 | 35.5 | 6.7 | 13.0 | 0.0 | 11.2 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Cycle Q Clear(g_c), s | 19.0 | 35.5 | 6.7 | 13.0 | 0.0 | 11.2 | 4.3 | 56.5 | 56.5 | 1.8 | 18.9 | 18.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.28 | 1.00 | | 1.00 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 275 | 540 | 553 | 365 | 0 | 427 | 337 | 858 | 723 | 116 | 787 | 810 |
| V/C Ratio(X) | 1.41 | 1.05 | 0.22 | 1.01 | 0.00 | 0.45 | 0.33 | 1.41 | 1.38 | 0.41 | 0.48 | 0.48 |
| Avail Cap(c_a), veh/h | 275 | 540 | 553 | 365 | 0 | 427 | 337 | 858 | 723 | 144 | 787 | 810 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 44.8 | 29.1 | 56.0 | 0.0 | 41.0 | 20.3 | 34.3 | 34.3 | 30.2 | 25.2 | 25.3 |
| Incr Delay (d2), s/veh | 206.6 | 53.3 | 0.1 | 49.1 | 0.0 | 0.3 | 0.2 | 191.7 | 180.6 | 0.8 | 2.1 | 2.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 24.4 | 24.5 | 2.6 | 8.2 | 0.0 | 5.1 | 1.8 | 71.0 | 57.6 | 0.8 | 8.5 | 8.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 259.6 | 98.1 | 29.2 | 105.1 | 0.0 | 41.2 | 20.5 | 226.0 | 214.8 | 31.1 | 27.3 | 27.3 |
| LnGrp LOS | F | F | C | F | A | D | C | F | F | C | C | C |
| Approach Vol, veh/h | | 1078 | | | 558 | | | 2322 | | | 821 | |
| Approach Delay, s/veh | | 148.6 | | | 83.4 | | | 211.4 | | | 27.6 | |
| Approach LOS | | F | | | F | | | F | | | C | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.0 | 58.5 | 23.0 | 33.5 | 8.0 | 60.5 | 17.0 | 39.5 |
| Change Period (Y+Rc), s | 4.0 | 5.5 | 4.0 | 5.5 | 4.0 | 5.5 | 5.0 | 5.5 |
| Max Green Setting (Gmax), s | 6.0 | 53.0 | 19.0 | 28.0 | 6.0 | 53.0 | 12.0 | 34.0 |
| Max Q Clear Time (g_c+I1), s | 6.3 | 20.9 | 21.0 | 13.2 | 3.8 | 58.5 | 15.0 | 37.5 |
| Green Ext Time (p_c), s | 0.0 | 6.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 150.7 |
| HCM 6th LOS | F |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 255 | 80 | 605 | 85 | 90 | 35 | 285 | 1290 | 55 | 165 | 90 |
| Future Volume (veh/h) | 50 | 255 | 80 | 605 | 85 | 90 | 35 | 285 | 1290 | 55 | 165 | 90 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 0.97 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 53 | 268 | 84 | 637 | 89 | 95 | 37 | 300 | 1358 | 58 | 174 | 95 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 392 | 307 | 96 | 844 | 199 | 212 | 383 | 669 | 1677 | 202 | 415 | 226 |
| Arrive On Green | 0.22 | 0.22 | 0.22 | 0.24 | 0.24 | 0.23 | 0.03 | 0.35 | 0.35 | 0.04 | 0.36 | 0.35 |
| Sat Flow, veh/h | 1810 | 1386 | 435 | 3510 | 826 | 882 | 1810 | 1900 | 2830 | 1810 | 1155 | 631 |
| Grp Volume(v), veh/h | 53 | 0 | 352 | 637 | 0 | 184 | 37 | 300 | 1358 | 58 | 0 | 269 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 0 | 1821 | 1755 | 0 | 1709 | 1810 | 1900 | 1415 | 1810 | 0 | 1785 |
| Q Serve(g_s), s | 2.6 | 0.0 | 20.2 | 18.2 | 0.0 | 10.0 | 1.4 | 13.1 | 38.0 | 2.2 | 0.0 | 12.3 |
| Cycle Q Clear(g_c), s | 2.6 | 0.0 | 20.2 | 18.2 | 0.0 | 10.0 | 1.4 | 13.1 | 38.0 | 2.2 | 0.0 | 12.3 |
| Prop In Lane | 1.00 | | 0.24 | 1.00 | | 0.52 | 1.00 | | 1.00 | 1.00 | | 0.35 |
| Lane Grp Cap(c), veh/h | 392 | 0 | 403 | 844 | 0 | 411 | 383 | 669 | 1677 | 202 | 0 | 641 |
| V/C Ratio(X) | 0.14 | 0.00 | 0.87 | 0.75 | 0.00 | 0.45 | 0.10 | 0.45 | 0.81 | 0.29 | 0.00 | 0.42 |
| Avail Cap(c_a), veh/h | 545 | 0 | 557 | 1268 | 0 | 617 | 419 | 669 | 1677 | 275 | 0 | 678 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.1 | 0.0 | 40.6 | 38.0 | 0.0 | 35.3 | 22.6 | 26.9 | 16.7 | 22.7 | 0.0 | 26.3 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 8.7 | 1.7 | 0.0 | 0.9 | 0.0 | 0.5 | 3.1 | 0.3 | 0.0 | 0.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.1 | 0.0 | 9.9 | 7.9 | 0.0 | 4.3 | 0.6 | 6.0 | 19.1 | 1.0 | 0.0 | 5.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 34.2 | 0.0 | 49.3 | 39.8 | 0.0 | 36.2 | 22.6 | 27.4 | 19.8 | 23.0 | 0.0 | 26.5 |
| LnGrp LOS | C | A | D | D | A | D | C | C | B | C | A | C |
| Approach Vol, veh/h | | 405 | | | 821 | | | 1695 | | | 327 | |
| Approach Delay, s/veh | | 47.4 | | | 39.0 | | | 21.2 | | | 25.9 | |
| Approach LOS | | D | | | D | | | C | | | C | |

| Timer - Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 27.9 | 7.4 | 42.8 | | 30.0 | 8.1 | 42.0 |
| Change Period (Y+Rc), s | | 4.5 | 4.0 | 5.5 | | 5.5 | 4.0 | 5.5 |
| Max Green Setting (Gmax), s | | 32.5 | 5.5 | 39.5 | | 37.5 | 8.5 | 36.5 |
| Max Q Clear Time (g_c+I1), s | | 22.2 | 3.4 | 14.3 | | 20.2 | 4.2 | 40.0 |
| Green Ext Time (p_c), s | | 1.1 | 0.0 | 1.1 | | 4.2 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 29.4 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.7 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 35 | 75 | 435 | 25 | 145 | 570 |
| Future Vol, veh/h | 35 | 75 | 435 | 25 | 145 | 570 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | - | 100 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 36 | 77 | 448 | 26 | 149 | 588 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1347 | 461 | 0 | 0 | 474 | 0 |
| Stage 1 | 461 | - | - | - | - | - |
| Stage 2 | 886 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 168 | 605 | - | - | 1099 | - |
| Stage 1 | 639 | - | - | - | - | - |
| Stage 2 | 406 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 145 | 605 | - | - | 1099 | - |
| Mov Cap-2 Maneuver | 145 | - | - | - | - | - |
| Stage 1 | 639 | - | - | - | - | - |
| Stage 2 | 351 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 20.1 | 0 | 1.8 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 145 | 605 | 1099 | - |
| HCM Lane V/C Ratio | - | - | 0.249 | 0.128 | 0.136 | - |
| HCM Control Delay (s) | - | - | 37.9 | 11.8 | 8.8 | - |
| HCM Lane LOS | - | - | E | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0.9 | 0.4 | 0.5 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 206 |
| Intersection LOS | F |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 590 | 50 | 115 | 110 | 125 | 900 |
| Future Vol, veh/h | 590 | 50 | 115 | 110 | 125 | 900 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 621 | 53 | 121 | 116 | 132 | 947 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 2 | 2 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 2 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 2 |
| HCM Control Delay | 162.2 | 14.8 | 275.3 |
| HCM LOS | F | B | F |

| Lane | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 0% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 100% | 100% | 0% | 0% | 0% |
| Vol Right, % | 0% | 0% | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 590 | 50 | 115 | 110 | 125 | 900 |
| LT Vol | 590 | 0 | 0 | 0 | 125 | 0 |
| Through Vol | 0 | 50 | 115 | 0 | 0 | 0 |
| RT Vol | 0 | 0 | 0 | 110 | 0 | 900 |
| Lane Flow Rate | 621 | 53 | 121 | 116 | 132 | 947 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util (X) | 1.293 | 0.102 | 0.258 | 0.224 | 0.271 | 1.635 |
| Departure Headway (Hd) | 8.855 | 8.337 | 9.515 | 8.775 | 7.998 | 6.773 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 416 | 433 | 380 | 412 | 453 | 549 |
| Service Time | 6.555 | 6.037 | 7.215 | 6.475 | 5.698 | 4.473 |
| HCM Lane V/C Ratio | 1.493 | 0.122 | 0.318 | 0.282 | 0.291 | 1.725 |
| HCM Control Delay | 174.9 | 12 | 15.5 | 14 | 13.6 | 311.7 |
| HCM Lane LOS | F | B | C | B | B | F |
| HCM 95th-tile Q | 23.3 | 0.3 | 1 | 0.8 | 1.1 | 48.9 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 55.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 5 | 105 | 5 | 5 | 135 | 350 | 10 | 180 | 20 | 440 | 345 | 5 |
| Future Vol, veh/h | 5 | 105 | 5 | 5 | 135 | 350 | 10 | 180 | 20 | 440 | 345 | 5 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 111 | 5 | 5 | 142 | 368 | 11 | 189 | 21 | 463 | 363 | 5 |
| Number of Lanes | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 1 | 2 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 1 | 1 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 2 | 2 | 1 |
| HCM Control Delay | 16.1 | 75.2 | 20.4 | 58.1 |
| HCM LOS | C | F | C | F |

| Lane | NBLn1 | EBLn1 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Vol Left, % | 5% | 4% | 100% | 0% | 100% | 0% |
| Vol Thru, % | 86% | 91% | 0% | 28% | 0% | 99% |
| Vol Right, % | 10% | 4% | 0% | 72% | 0% | 1% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 210 | 115 | 5 | 485 | 440 | 350 |
| LT Vol | 10 | 5 | 5 | 0 | 440 | 0 |
| Through Vol | 180 | 105 | 0 | 135 | 0 | 345 |
| RT Vol | 20 | 5 | 0 | 350 | 0 | 5 |
| Lane Flow Rate | 221 | 121 | 5 | 511 | 463 | 368 |
| Geometry Grp | 6 | 6 | 7 | 7 | 7 | 7 |
| Degree of Util (X) | 0.514 | 0.3 | 0.012 | 1.03 | 1.029 | 0.765 |
| Departure Headway (Hd) | 8.603 | 9.206 | 8.46 | 7.426 | 8.223 | 7.698 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 422 | 393 | 426 | 490 | 445 | 472 |
| Service Time | 6.603 | 7.206 | 6.16 | 5.126 | 5.923 | 5.398 |
| HCM Lane V/C Ratio | 0.524 | 0.308 | 0.012 | 1.043 | 1.04 | 0.78 |
| HCM Control Delay | 20.4 | 16.1 | 11.3 | 75.9 | 79.5 | 31.3 |
| HCM Lane LOS | C | C | B | F | F | D |
| HCM 95th-tile Q | 2.9 | 1.2 | 0 | 14.6 | 13.8 | 6.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 25 | 360 | 225 | 35 | 410 | 340 | 85 | 100 | 15 | 265 | 210 | 40 |
| Future Volume (veh/h) | 25 | 360 | 225 | 35 | 410 | 340 | 85 | 100 | 15 | 265 | 210 | 40 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 26 | 379 | 237 | 37 | 432 | 358 | 89 | 105 | 16 | 279 | 221 | 42 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 338 | 477 | 298 | 265 | 849 | 700 | 117 | 139 | 21 | 338 | 335 | 64 |
| Arrive On Green | 0.03 | 0.44 | 0.41 | 0.04 | 0.45 | 0.43 | 0.06 | 0.09 | 0.09 | 0.19 | 0.22 | 0.21 |
| Sat Flow, veh/h | 1810 | 1093 | 684 | 1810 | 1878 | 1548 | 1810 | 1610 | 245 | 1810 | 1552 | 295 |
| Grp Volume(v), veh/h | 26 | 0 | 616 | 37 | 415 | 375 | 89 | 0 | 121 | 279 | 0 | 263 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 0 | 1777 | 1810 | 1805 | 1621 | 1810 | 0 | 1856 | 1810 | 0 | 1847 |
| Q Serve(g_s), s | 0.6 | 0.0 | 20.7 | 0.8 | 11.3 | 11.7 | 3.3 | 0.0 | 4.4 | 10.2 | 0.0 | 9.0 |
| Cycle Q Clear(g_c), s | 0.6 | 0.0 | 20.7 | 0.8 | 11.3 | 11.7 | 3.3 | 0.0 | 4.4 | 10.2 | 0.0 | 9.0 |
| Prop In Lane | 1.00 | | 0.38 | 1.00 | | 0.96 | 1.00 | | 0.13 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 338 | 0 | 776 | 265 | 816 | 733 | 117 | 0 | 160 | 338 | 0 | 399 |
| V/C Ratio(X) | 0.08 | 0.00 | 0.79 | 0.14 | 0.51 | 0.51 | 0.76 | 0.00 | 0.75 | 0.83 | 0.00 | 0.66 |
| Avail Cap(c_a), veh/h | 433 | 0 | 1399 | 332 | 1421 | 1277 | 333 | 0 | 510 | 747 | 0 | 930 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 11.7 | 0.0 | 17.1 | 13.9 | 13.5 | 14.1 | 31.8 | 0.0 | 30.8 | 27.0 | 0.0 | 24.8 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 2.3 | 0.2 | 0.6 | 0.7 | 9.8 | 0.0 | 2.7 | 5.1 | 0.0 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.0 | 8.1 | 0.3 | 4.3 | 4.0 | 1.7 | 0.0 | 2.0 | 4.7 | 0.0 | 3.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 11.7 | 0.0 | 19.3 | 14.1 | 14.1 | 14.7 | 41.6 | 0.0 | 33.5 | 32.1 | 0.0 | 25.5 |
| LnGrp LOS | B | A | B | B | B | B | D | A | C | C | A | C |
| Approach Vol, veh/h | | 642 | | | 827 | | | 210 | | | 542 | |
| Approach Delay, s/veh | | 19.0 | | | 14.4 | | | 37.0 | | | 28.9 | |
| Approach LOS | | B | | | B | | | D | | | C | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 7.0 | 34.2 | 9.0 | 18.9 | 6.0 | 35.2 | 17.4 | 10.5 |
| Change Period (Y+Rc), s | 4.5 | 5.5 | 4.5 | 4.5 | 4.0 | 5.5 | 4.5 | * 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 52.9 | 12.7 | 34.3 | 5.6 | 52.9 | 28.5 | * 19 |
| Max Q Clear Time (g_c+I1), s | 2.8 | 22.7 | 5.3 | 11.0 | 2.6 | 13.7 | 12.2 | 6.4 |
| Green Ext Time (p_c), s | 0.0 | 5.9 | 0.1 | 0.7 | 0.0 | 7.6 | 0.7 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 21.4 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 5 | 15 | 50 | 220 | 60 | 80 | 95 | 1275 | 115 | 105 | 1565 | 10 |
| Future Volume (veh/h) | 5 | 15 | 50 | 220 | 60 | 80 | 95 | 1275 | 115 | 105 | 1565 | 10 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 5 | 16 | 53 | 232 | 63 | 84 | 100 | 1342 | 121 | 111 | 1647 | 11 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 248 | 85 | 282 | 320 | 166 | 221 | 199 | 2278 | 1016 | 283 | 2599 | 17 |
| Arrive On Green | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.61 | 0.63 | 0.63 | 0.04 | 0.71 | 0.69 |
| Sat Flow, veh/h | 1260 | 387 | 1282 | 1353 | 738 | 984 | 305 | 3610 | 1610 | 1810 | 3676 | 25 |
| Grp Volume(v), veh/h | 5 | 0 | 69 | 232 | 0 | 147 | 100 | 1342 | 121 | 111 | 808 | 850 |
| Grp Sat Flow(s),veh/h/ln | 1260 | 0 | 1669 | 1353 | 0 | 1723 | 305 | 1805 | 1610 | 1810 | 1805 | 1896 |
| Q Serve(g_s), s | 0.4 | 0.0 | 3.9 | 19.6 | 0.0 | 8.5 | 31.2 | 25.5 | 3.5 | 2.5 | 27.8 | 27.8 |
| Cycle Q Clear(g_c), s | 8.9 | 0.0 | 3.9 | 23.5 | 0.0 | 8.5 | 50.2 | 25.5 | 3.5 | 2.5 | 27.8 | 27.8 |
| Prop In Lane | 1.00 | | 0.77 | 1.00 | | 0.57 | 1.00 | | 1.00 | 1.00 | | 0.01 |
| Lane Grp Cap(c), veh/h | 248 | 0 | 368 | 320 | 0 | 387 | 199 | 2278 | 1016 | 283 | 1276 | 1340 |
| V/C Ratio(X) | 0.02 | 0.00 | 0.19 | 0.73 | 0.00 | 0.38 | 0.50 | 0.59 | 0.12 | 0.39 | 0.63 | 0.63 |
| Avail Cap(c_a), veh/h | 283 | 0 | 414 | 352 | 0 | 428 | 234 | 2692 | 1201 | 307 | 1507 | 1582 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.6 | 0.0 | 37.0 | 46.2 | 0.0 | 38.5 | 26.1 | 12.6 | 8.6 | 11.3 | 9.1 | 9.1 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.1 | 5.3 | 0.0 | 0.2 | 2.3 | 0.3 | 0.1 | 0.3 | 0.8 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.0 | 1.6 | 7.0 | 0.0 | 3.6 | 2.3 | 9.8 | 1.2 | 0.9 | 10.0 | 10.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 42.6 | 0.0 | 37.1 | 51.5 | 0.0 | 38.8 | 28.5 | 12.9 | 8.7 | 11.6 | 9.8 | 9.8 |
| LnGrp LOS | D | A | D | D | A | D | C | B | A | B | A | A |
| Approach Vol, veh/h | | 74 | | | 379 | | | 1563 | | | 1769 | |
| Approach Delay, s/veh | | 37.5 | | | 46.5 | | | 13.6 | | | 9.9 | |
| Approach LOS | | D | | | D | | | B | | | A | |

| Timer - Assigned Phs | 1 | 2 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 8.9 | 77.7 | 30.2 | 86.6 | 30.2 |
| Change Period (Y+Rc), s | 4.0 | 6.0 | * 4.5 | 6.0 | 4.5 |
| Max Green Setting (Gmax), s | 6.4 | 85.1 | * 29 | 95.5 | 28.5 |
| Max Q Clear Time (g_c+I1), s | 4.5 | 52.2 | 10.9 | 29.8 | 25.5 |
| Green Ext Time (p_c), s | 0.0 | 19.6 | 0.1 | 27.6 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 15.7 |
| HCM 6th LOS | B |

**Notes**

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 139.6 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 345 | 100 | 105 | 215 | 410 | 365 |
| Future Vol, veh/h | 345 | 100 | 105 | 215 | 410 | 365 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 363 | 105 | 111 | 226 | 432 | 384 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1072 | 624 | 816 | 0 | - | 0 |
| Stage 1 | 624 | - | - | - | - | - |
| Stage 2 | 448 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | ~ 246 | 489 | 820 | - | - | - |
| Stage 1 | 538 | - | - | - | - | - |
| Stage 2 | 648 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 208 | 489 | 820 | - | - | - |
| Mov Cap-2 Maneuver | ~ 208 | - | - | - | - | - |
| Stage 1 | 455 | - | - | - | - | - |
| Stage 2 | 648 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 480.9 | 3.3 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 820 | - | 239 | - | - |
| HCM Lane V/C Ratio | 0.135 | - | 1.96 | - | - |
| HCM Control Delay (s) | 10.1 | 0 | $ 480.9 | - | - |
| HCM Lane LOS | B | A | F | - | - |
| HCM 95th %tile Q(veh) | 0.5 | - | 33.9 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.1 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 5 | 130 | 210 | 5 | 145 | 365 |
| Future Vol, veh/h | 5 | 130 | 210 | 5 | 145 | 365 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 137 | 221 | 5 | 153 | 384 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 914 | 224 | 0 | 0 | 226 | 0 |
| Stage 1 | 224 | - | - | - | - | - |
| Stage 2 | 690 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 306 | 820 | - | - | 1354 | - |
| Stage 1 | 818 | - | - | - | - | - |
| Stage 2 | 502 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 262 | 820 | - | - | 1354 | - |
| Mov Cap-2 Maneuver | 262 | - | - | - | - | - |
| Stage 1 | 818 | - | - | - | - | - |
| Stage 2 | 430 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 10.8 | 0 | 2.3 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 760 | 1354 | - |
| HCM Lane V/C Ratio | - | - | 0.187 | 0.113 | - |
| HCM Control Delay (s) | - | - | 10.8 | 8 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 0.7 | 0.4 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 188.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 5 | 15 | 30 | 470 | 55 | 230 | 50 | 345 | 425 | 225 | 330 | 5 |
| Future Vol, veh/h | 5 | 15 | 30 | 470 | 55 | 230 | 50 | 345 | 425 | 225 | 330 | 5 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 5 | 15 | 31 | 485 | 57 | 237 | 52 | 356 | 438 | 232 | 340 | 5 |
| Number of Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 2 | 1 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 2 | 2 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 1 | 2 | 2 |
| HCM Control Delay | 15.7 | 80.1 | 313.3 | 167.1 |
| HCM LOS | C | F | F | F |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 |
|---|---|---|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 100% | 0% | 100% | 0% | 40% |
| Vol Thru, % | 0% | 45% | 0% | 33% | 0% | 19% | 59% |
| Vol Right, % | 0% | 55% | 0% | 67% | 0% | 81% | 1% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 50 | 770 | 5 | 45 | 470 | 285 | 560 |
| LT Vol | 50 | 0 | 5 | 0 | 470 | 0 | 225 |
| Through Vol | 0 | 345 | 0 | 15 | 0 | 55 | 330 |
| RT Vol | 0 | 425 | 0 | 30 | 0 | 230 | 5 |
| Lane Flow Rate | 52 | 794 | 5 | 46 | 485 | 294 | 577 |
| Geometry Grp | 7 | 7 | 7 | 7 | 7 | 7 | 6 |
| Degree of Util (X) | 0.121 | 1.673 | 0.015 | 0.119 | 1.121 | 0.593 | 1.269 |
| Departure Headway (Hd) | 9.087 | 8.164 | 12.456 | 11.417 | 9.697 | 8.573 | 9.175 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 397 | 452 | 289 | 316 | 378 | 423 | 398 |
| Service Time | 6.787 | 5.864 | 10.156 | 9.117 | 7.397 | 6.273 | 7.175 |
| HCM Lane V/C Ratio | 0.131 | 1.757 | 0.017 | 0.146 | 1.283 | 0.695 | 1.45 |
| HCM Control Delay | 13 | 332.8 | 15.3 | 15.7 | 114.7 | 23 | 167.1 |
| HCM Lane LOS | B | F | C | C | F | C | F |
| HCM 95th-tile Q | 0.4 | 43.5 | 0 | 0.4 | 15.6 | 3.7 | 21.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 20 | 240 | 40 | 55 | 380 | 160 | 25 | 450 | 45 | 295 | 560 | 75 |
| Future Volume (veh/h) | 20 | 240 | 40 | 55 | 380 | 160 | 25 | 450 | 45 | 295 | 560 | 75 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 21 | 253 | 42 | 58 | 400 | 168 | 26 | 474 | 47 | 311 | 589 | 79 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 112 | 555 | 92 | 318 | 444 | 186 | 302 | 707 | 70 | 457 | 830 | 111 |
| Arrive On Green | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.34 | 0.03 | 0.42 | 0.42 | 0.12 | 0.51 | 0.50 |
| Sat Flow, veh/h | 857 | 1589 | 264 | 1101 | 1270 | 534 | 1810 | 1701 | 169 | 1810 | 1640 | 220 |
| Grp Volume(v), veh/h | 21 | 0 | 295 | 58 | 0 | 568 | 26 | 0 | 521 | 311 | 0 | 668 |
| Grp Sat Flow(s),veh/h/ln | 857 | 0 | 1853 | 1101 | 0 | 1804 | 1810 | 0 | 1870 | 1810 | 0 | 1860 |
| Q Serve(g_s), s | 2.5 | 0.0 | 12.9 | 4.5 | 0.0 | 31.4 | 0.8 | 0.0 | 23.7 | 9.7 | 0.0 | 29.1 |
| Cycle Q Clear(g_c), s | 33.9 | 0.0 | 12.9 | 17.5 | 0.0 | 31.4 | 0.8 | 0.0 | 23.7 | 9.7 | 0.0 | 29.1 |
| Prop In Lane | 1.00 | | 0.14 | 1.00 | | 0.30 | 1.00 | | 0.09 | 1.00 | | 0.12 |
| Lane Grp Cap(c), veh/h | 112 | 0 | 647 | 318 | 0 | 630 | 302 | 0 | 777 | 457 | 0 | 942 |
| V/C Ratio(X) | 0.19 | 0.00 | 0.46 | 0.18 | 0.00 | 0.90 | 0.09 | 0.00 | 0.67 | 0.68 | 0.00 | 0.71 |
| Avail Cap(c_a), veh/h | 122 | 0 | 670 | 331 | 0 | 653 | 344 | 0 | 777 | 552 | 0 | 942 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 48.5 | 0.0 | 26.4 | 33.2 | 0.0 | 32.5 | 18.3 | 0.0 | 24.9 | 17.4 | 0.0 | 20.0 |
| Incr Delay (d2), s/veh | 0.8 | 0.0 | 0.5 | 0.3 | 0.0 | 15.4 | 0.1 | 0.0 | 4.6 | 2.6 | 0.0 | 4.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 0.0 | 5.7 | 1.2 | 0.0 | 16.1 | 0.4 | 0.0 | 11.2 | 4.1 | 0.0 | 13.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 49.3 | 0.0 | 26.9 | 33.4 | 0.0 | 47.9 | 18.4 | 0.0 | 29.5 | 20.0 | 0.0 | 24.5 |
| LnGrp LOS | D | A | C | C | A | D | B | A | C | B | A | C |
| Approach Vol, veh/h | | 316 | | | 626 | | | 547 | | | 979 | |
| Approach Delay, s/veh | | 28.4 | | | 46.5 | | | 28.9 | | | 23.1 | |
| Approach LOS | | C | | | D | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 16.7 | 47.6 | | 40.7 | 7.2 | 57.1 | | 40.7 | | | | |
| Change Period (Y+Rc), s | 4.5 | 4.5 | | 4.5 | 4.5 | 4.5 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 17.3 | 36.3 | | 37.5 | 5.1 | 48.9 | | 37.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 11.7 | 25.7 | | 35.9 | 2.8 | 31.1 | | 33.4 | | | | |
| Green Ext Time (p_c), s | 0.5 | 2.5 | | 0.3 | 0.0 | 4.5 | | 1.5 | | | | |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 31.0 |
| HCM 6th LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 165 | 80 | 45 | 185 | 30 | 75 | 5 | 1240 | 170 | 60 | 2420 | 65 |
| Future Volume (veh/h) | 165 | 80 | 45 | 185 | 30 | 75 | 5 | 1240 | 170 | 60 | 2420 | 65 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1870 | 1900 | 1900 | 1900 | 1856 | 1856 | 1841 | 1885 | 1900 |
| Adj Flow Rate, veh/h | 181 | 88 | 49 | 195 | 32 | 79 | 5 | 1305 | 179 | 66 | 2659 | 71 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 3 | 4 | 1 | 0 |
| Cap, veh/h | 206 | 198 | 110 | 192 | 84 | 207 | 43 | 2094 | 285 | 114 | 2553 | 1124 |
| Arrive On Green | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.02 | 0.67 | 0.65 | 0.06 | 0.71 | 0.71 |
| Sat Flow, veh/h | 1302 | 1147 | 638 | 1252 | 486 | 1199 | 1810 | 3117 | 425 | 1753 | 3582 | 1577 |
| Grp Volume(v), veh/h | 181 | 0 | 137 | 195 | 0 | 111 | 5 | 734 | 750 | 66 | 2659 | 71 |
| Grp Sat Flow(s),veh/h/ln | 1302 | 0 | 1785 | 1252 | 0 | 1684 | 1810 | 1763 | 1779 | 1753 | 1791 | 1577 |
| Q Serve(g_s), s | 12.7 | 0.0 | 8.0 | 12.0 | 0.0 | 6.8 | 0.3 | 27.1 | 27.9 | 4.2 | 82.5 | 1.6 |
| Cycle Q Clear(g_c), s | 19.5 | 0.0 | 8.0 | 20.0 | 0.0 | 6.8 | 0.3 | 27.1 | 27.9 | 4.2 | 82.5 | 1.6 |
| Prop In Lane | 1.00 | | 0.36 | 1.00 | | 0.71 | 1.00 | | 0.24 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 206 | 0 | 308 | 192 | 0 | 291 | 43 | 1184 | 1195 | 114 | 2553 | 1124 |
| V/C Ratio(X) | 0.88 | 0.00 | 0.44 | 1.01 | 0.00 | 0.38 | 0.12 | 0.62 | 0.63 | 0.58 | 1.04 | 0.06 |
| Avail Cap(c_a), veh/h | 206 | 0 | 308 | 192 | 0 | 291 | 109 | 1208 | 1219 | 154 | 2553 | 1124 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 52.8 | 0.0 | 42.9 | 53.8 | 0.0 | 42.4 | 55.3 | 10.7 | 11.0 | 52.6 | 16.6 | 5.0 |
| Incr Delay (d2), s/veh | 32.6 | 0.0 | 1.0 | 68.3 | 0.0 | 0.8 | 1.2 | 1.0 | 1.0 | 4.6 | 29.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 7.2 | 0.0 | 3.6 | 9.3 | 0.0 | 2.9 | 0.2 | 10.0 | 10.4 | 2.0 | 38.8 | 0.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 85.4 | 0.0 | 43.9 | 122.1 | 0.0 | 43.2 | 56.5 | 11.6 | 12.0 | 57.2 | 46.4 | 5.0 |
| LnGrp LOS | F | A | D | F | A | D | E | B | B | E | F | A |
| Approach Vol, veh/h | | 318 | | | 306 | | | 1489 | | | 2796 | |
| Approach Delay, s/veh | | 67.5 | | | 93.5 | | | 12.0 | | | 45.6 | |
| Approach LOS | | E | | | F | | | B | | | D | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 10.0 | 81.7 | | 24.0 | 5.2 | 86.5 | | 24.0 |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 |
| Max Green Setting (Gmax), s | 8.2 | 77.3 | | 19.5 | 5.0 | 80.5 | | 19.5 |
| Max Q Clear Time (g_c+I1), s | 6.2 | 29.9 | | 21.5 | 2.3 | 84.5 | | 22.0 |
| Green Ext Time (p_c), s | 0.0 | 16.3 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 39.8 |
| HCM 6th LOS | | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 35.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 75 | 220 | 70 | 25 | 440 | 20 | 65 | 45 | 10 | 35 | 50 | 130 |
| Future Vol, veh/h | 75 | 220 | 70 | 25 | 440 | 20 | 65 | 45 | 10 | 35 | 50 | 130 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 200 | - | - | 100 | - | - | - | - | - | - | - | 0 |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 92 | 95 | 92 | 92 | 92 | 95 | 95 | 92 | 92 | 95 | 95 |
| Heavy Vehicles, % | 0 | 2 | 0 | 2 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 0 |
| Mvmt Flow | 79 | 239 | 74 | 27 | 478 | 22 | 68 | 47 | 11 | 38 | 53 | 137 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 568 | 323 | 53 | 543 | 455 | 53 | 190 | 0 | 0 | 58 | 0 | 0 |
| Stage 1 | 129 | 129 | - | 189 | 189 | - | - | - | - | - | - | - |
| Stage 2 | 439 | 194 | - | 354 | 266 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.52 | 6.2 | 7.12 | 6.52 | 6.22 | 4.1 | - | - | 4.12 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4.018 | 3.3 | 3.518 | 4.018 | 3.318 | 2.2 | - | - | 2.218 | - | - |
| Pot Cap-1 Maneuver | 437 | 595 | 1020 | 451 | 501 | 1014 | 1396 | - | - | 1546 | - | - |
| Stage 1 | 880 | 789 | - | 813 | 744 | - | - | - | - | - | - | - |
| Stage 2 | 601 | 740 | - | 663 | 689 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | - | 549 | 1020 | 261 | ~ 462 | 1014 | 1396 | - | - | 1546 | - | - |
| Mov Cap-2 Maneuver | - | 549 | - | 261 | ~ 462 | - | - | - | - | - | - | - |
| Stage 1 | 836 | 767 | - | 772 | 707 | - | - | - | - | - | - | - |
| Stage 2 | 181 | 703 | - | 411 | 670 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | | 83.6 | 4.2 | 1.2 |
| HCM LOS | - | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1396 | - | - | - | 616 | 261 | 473 | 1546 | - | - |
| HCM Lane V/C Ratio | 0.049 | - | - | - | 0.508 | 0.104 | 1.057 | 0.025 | - | - |
| HCM Control Delay (s) | 7.7 | 0 | - | - | 16.7 | 20.4 | 87 | 7.4 | 0 | - |
| HCM Lane LOS | A | A | - | - | C | C | F | A | A | - |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 2.9 | 0.3 | 15.5 | 0.1 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.9 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 50 | 190 | 760 | 115 | 190 | 745 |
| Future Vol, veh/h | 50 | 190 | 760 | 115 | 190 | 745 |
| Conflicting Peds, #/hr | 2 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | - | 70 | 290 | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 53 | 200 | 800 | 121 | 200 | 784 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1986 | 800 | 0 | 0 | 921 | 0 |
| Stage 1 | 800 | - | - | - | - | - |
| Stage 2 | 1186 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 68 | 388 | - | - | 750 | - |
| Stage 1 | 446 | - | - | - | - | - |
| Stage 2 | 293 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | ~ 50 | 388 | - | - | 750 | - |
| Mov Cap-2 Maneuver | ~ 50 | - | - | - | - | - |
| Stage 1 | 446 | - | - | - | - | - |
| Stage 2 | 214 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 75.8 | 0 | 2.3 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 50 | 388 | 750 | - |
| HCM Lane V/C Ratio | - | - | 1.053 | 0.515 | 0.267 | - |
| HCM Control Delay (s) | - | - | 273.9 | 23.7 | 11.5 | - |
| HCM Lane LOS | - | - | F | C | B | - |
| HCM 95th %tile Q(veh) | - | - | 4.6 | 2.8 | 1.1 | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 650 | 0 | 0 | 520 | 140 |
| Future Vol, veh/h | 85 | 0 | 40 | 0 | 0 | 0 | 40 | 650 | 0 | 0 | 520 | 140 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 100 | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 89 | 0 | 42 | 0 | 0 | 0 | 42 | 684 | 0 | 0 | 547 | 147 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1389 | 1389 | 621 | 1410 | 1462 | 684 | 694 | 0 | 0 | 684 | 0 | 0 |
| Stage 1 | 621 | 621 | - | 768 | 768 | - | - | - | - | - | - | - |
| Stage 2 | 768 | 768 | - | 642 | 694 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.1 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 | 2.2 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 121 | 144 | 491 | 117 | 130 | 452 | 911 | - | - | 919 | - | - |
| Stage 1 | 478 | 482 | - | 397 | 414 | - | - | - | - | - | - | - |
| Stage 2 | 397 | 414 | - | 466 | 447 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 117 | 137 | 491 | 103 | 124 | 452 | 911 | - | - | 919 | - | - |
| Mov Cap-2 Maneuver | 117 | 137 | - | 103 | 124 | - | - | - | - | - | - | - |
| Stage 1 | 456 | 482 | - | 379 | 395 | - | - | - | - | - | - | - |
| Stage 2 | 379 | 395 | - | 426 | 447 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 71.2 | 0 | 0.5 | 0 |
| HCM LOS | F | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 911 | - | - | 117 | 491 | - | 919 | - | - |
| HCM Lane V/C Ratio | 0.046 | - | - | 0.765 | 0.086 | - | - | - | - |
| HCM Control Delay (s) | 9.1 | - | - | 98.6 | 13 | 0 | 0 | - | - |
| HCM Lane LOS | A | - | - | F | B | A | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 4.3 | 0.3 | - | 0 | - | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 15 | 175 | 580 | 175 | 190 | 220 | 690 | 870 | 160 | 190 | 620 | 45 |
| Future Volume (veh/h) | 15 | 175 | 580 | 175 | 190 | 220 | 690 | 870 | 160 | 190 | 620 | 45 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 16 | 184 | 611 | 184 | 200 | 232 | 726 | 916 | 168 | 200 | 653 | 47 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 56 | 613 | 695 | 153 | 302 | 350 | 368 | 581 | 107 | 650 | 2169 | 156 |
| Arrive On Green | 0.03 | 0.32 | 0.32 | 0.08 | 0.38 | 0.36 | 0.14 | 0.50 | 0.48 | 0.36 | 0.64 | 0.62 |
| Sat Flow, veh/h | 1810 | 1900 | 1587 | 1810 | 802 | 930 | 3510 | 1561 | 286 | 1810 | 3415 | 246 |
| Grp Volume(v), veh/h | 16 | 184 | 611 | 184 | 0 | 432 | 726 | 0 | 1084 | 200 | 345 | 355 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1587 | 1810 | 0 | 1732 | 1755 | 0 | 1847 | 1810 | 1805 | 1855 |
| Q Serve(g_s), s | 0.9 | 7.6 | 33.9 | 8.9 | 0.0 | 21.9 | 11.0 | 0.0 | 39.1 | 8.4 | 9.0 | 9.1 |
| Cycle Q Clear(g_c), s | 0.9 | 7.6 | 33.9 | 8.9 | 0.0 | 21.9 | 11.0 | 0.0 | 39.1 | 8.4 | 9.0 | 9.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.54 | 1.00 | | 0.15 | 1.00 | | 0.13 |
| Lane Grp Cap(c), veh/h | 56 | 613 | 695 | 153 | 0 | 652 | 368 | 0 | 688 | 650 | 1147 | 1179 |
| V/C Ratio(X) | 0.28 | 0.30 | 0.88 | 1.20 | 0.00 | 0.66 | 1.97 | 0.00 | 1.58 | 0.31 | 0.30 | 0.30 |
| Avail Cap(c_a), veh/h | 128 | 613 | 695 | 153 | 0 | 652 | 368 | 0 | 688 | 650 | 1147 | 1179 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.33 | 1.33 | 1.33 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.60 | 0.00 | 0.60 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 26.7 | 27.1 | 48.0 | 0.0 | 27.5 | 45.2 | 0.0 | 26.6 | 24.2 | 8.6 | 8.7 |
| Incr Delay (d2), s/veh | 2.7 | 0.2 | 12.3 | 136.3 | 0.0 | 2.3 | 444.2 | 0.0 | 263.3 | 0.2 | 0.7 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 3.5 | 15.8 | 9.8 | 0.0 | 9.3 | 27.3 | 0.0 | 65.2 | 3.6 | 3.5 | 3.6 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 52.5 | 26.9 | 39.4 | 184.4 | 0.0 | 29.9 | 489.4 | 0.0 | 290.0 | 24.4 | 9.3 | 9.3 |
| LnGrp LOS | D | C | D | F | A | C | F | A | F | C | A | A |
| Approach Vol, veh/h | | 811 | | | 616 | | | 1810 | | | 900 | |
| Approach Delay, s/veh | | 36.8 | | | 76.0 | | | 370.0 | | | 12.7 | |
| Approach LOS | | D | | | E | | | F | | | B | |

| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.0 | 71.6 | 6.4 | 43.5 | 43.5 | 43.1 | 12.0 | 37.9 |
| Change Period (Y+Rc), s | 4.5 | * 5.4 | 4.5 | * 5.4 | * 5.4 | * 5.4 | 4.5 | * 5.4 |
| Max Green Setting (Gmax), s | 10.5 | * 35 | 6.0 | * 34 | * 7.5 | * 38 | 7.5 | * 33 |
| Max Q Clear Time (g_c+I1), s | 13.0 | 11.1 | 2.9 | 23.9 | 10.4 | 41.1 | 10.9 | 35.9 |
| Green Ext Time (p_c), s | 0.0 | 7.2 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 183.2 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 1090 | 1030 | 0 | 730 | 430 | 0 | 0 | 0 | 670 | 0 | 1285 |
| Future Volume (veh/h) | 0 | 1090 | 1030 | 0 | 730 | 430 | 0 | 0 | 0 | 670 | 0 | 1285 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | | | | No | |
| Adj Sat Flow, veh/h/ln | 0 | 1900 | 1900 | 0 | 1900 | 1900 | | | | 1900 | 0 | 1900 |
| Adj Flow Rate, veh/h | 0 | 1147 | 0 | 0 | 768 | 0 | | | | 705 | 0 | 1353 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | | | | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | 0 | 0 |
| Cap, veh/h | 0 | 2407 | | 0 | 2407 | | | | | 903 | 0 | 715 |
| Arrive On Green | 0.00 | 1.00 | 0.00 | 0.00 | 0.22 | 0.00 | | | | 0.26 | 0.00 | 0.25 |
| Sat Flow, veh/h | 0 | 3705 | 1610 | 0 | 3705 | 1610 | | | | 3510 | 0 | 2834 |
| Grp Volume(v), veh/h | 0 | 1147 | 0 | 0 | 768 | 0 | | | | 705 | 0 | 1353 |
| Grp Sat Flow(s),veh/h/ln | 0 | 1805 | 1610 | 0 | 1805 | 1610 | | | | 1755 | 0 | 1417 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.7 | 0.0 | | | | 19.6 | 0.0 | 26.5 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 18.7 | 0.0 | | | | 19.6 | 0.0 | 26.5 |
| Prop In Lane | 0.00 | | 1.00 | 0.00 | | 1.00 | | | | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 0 | 2407 | | 0 | 2407 | | | | | 903 | 0 | 715 |
| V/C Ratio(X) | 0.00 | 0.48 | | 0.00 | 0.32 | | | | | 0.78 | 0.00 | 1.89 |
| Avail Cap(c_a), veh/h | 0 | 2407 | | 0 | 2407 | | | | | 903 | 0 | 715 |
| HCM Platoon Ratio | 1.00 | 2.00 | 2.00 | 1.00 | 0.33 | 0.33 | | | | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.60 | 0.00 | 0.00 | 0.92 | 0.00 | | | | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 21.0 | 0.0 | | | | 36.3 | 0.0 | 39.2 |
| Incr Delay (d2), s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 0.3 | 0.0 | | | | 4.2 | 0.0 | 406.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.0 | 0.1 | 0.0 | 0.0 | 9.1 | 0.0 | | | | 8.8 | 0.0 | 58.6 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 0.4 | 0.0 | 0.0 | 21.3 | 0.0 | | | | 40.5 | 0.0 | 445.8 |
| LnGrp LOS | A | A | | A | C | | | | | D | A | F |
| Approach Vol, veh/h | | 1147 | A | | 768 | A | | | | | 2058 | |
| Approach Delay, s/veh | | 0.4 | | | 21.3 | | | | | | 306.9 | |
| Approach LOS | | A | | | C | | | | | | F | |
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | | | | | |
| Phs Duration (G+Y+Rc), s | | 74.0 | | 31.0 | | 74.0 | | | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | | | | | |
| Max Green Setting (Gmax), s | | 69.0 | | 26.0 | | 31.0 | | | | | | |
| Max Q Clear Time (g_c+I1), s | | 2.0 | | 28.5 | | 20.7 | | | | | | |
| Green Ext Time (p_c), s | | 18.9 | | 0.0 | | 4.9 | | | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 163.2 |
| HCM 6th LOS | | F |

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 105 | 630 | 270 | 210 | 375 | 70 | 370 | 140 | 215 | 20 | 75 | 45 |
| Future Volume (veh/h) | 105 | 630 | 270 | 210 | 375 | 70 | 370 | 140 | 215 | 20 | 75 | 45 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.98 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 111 | 663 | 284 | 221 | 395 | 74 | 389 | 147 | 226 | 21 | 79 | 47 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cap, veh/h | 157 | 760 | 1027 | 241 | 1358 | 252 | 836 | 158 | 244 | 112 | 85 | 51 |
| Arrive On Green | 0.03 | 0.13 | 0.13 | 0.13 | 0.45 | 0.44 | 0.24 | 0.24 | 0.23 | 0.06 | 0.08 | 0.06 |
| Sat Flow, veh/h | 1810 | 1900 | 1610 | 1810 | 3039 | 564 | 3510 | 666 | 1023 | 1810 | 1116 | 664 |
| Grp Volume(v), veh/h | 111 | 663 | 284 | 221 | 233 | 236 | 389 | 0 | 373 | 21 | 0 | 126 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1900 | 1610 | 1810 | 1805 | 1798 | 1755 | 0 | 1689 | 1810 | 0 | 1780 |
| Q Serve(g_s), s | 6.4 | 35.9 | 10.3 | 12.7 | 8.6 | 8.8 | 10.0 | 0.0 | 22.7 | 1.2 | 0.0 | 7.4 |
| Cycle Q Clear(g_c), s | 6.4 | 35.9 | 10.3 | 12.7 | 8.6 | 8.8 | 10.0 | 0.0 | 22.7 | 1.2 | 0.0 | 7.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.31 | 1.00 | | 0.61 | 1.00 | | 0.37 |
| Lane Grp Cap(c), veh/h | 157 | 760 | 1027 | 241 | 806 | 804 | 836 | 0 | 402 | 112 | 0 | 136 |
| V/C Ratio(X) | 0.71 | 0.87 | 0.28 | 0.92 | 0.29 | 0.29 | 0.47 | 0.00 | 0.93 | 0.19 | 0.00 | 0.93 |
| Avail Cap(c_a), veh/h | 207 | 760 | 1027 | 241 | 806 | 804 | 836 | 0 | 402 | 112 | 0 | 136 |
| HCM Platoon Ratio | 0.33 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.76 | 0.76 | 0.76 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 42.9 | 12.6 | 44.9 | 18.5 | 18.6 | 34.3 | 0.0 | 39.4 | 46.7 | 0.0 | 48.5 |
| Incr Delay (d2), s/veh | 3.1 | 10.4 | 0.5 | 35.5 | 0.9 | 0.9 | 0.1 | 0.0 | 27.1 | 0.3 | 0.0 | 55.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.1 | 20.4 | 7.5 | 8.0 | 3.7 | 3.8 | 4.2 | 0.0 | 12.3 | 0.5 | 0.0 | 5.4 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 52.8 | 53.4 | 13.2 | 80.4 | 19.4 | 19.5 | 34.4 | 0.0 | 66.5 | 47.0 | 0.0 | 103.7 |
| LnGrp LOS | D | D | B | F | B | B | C | A | E | D | A | F |
| Approach Vol, veh/h | | 1058 | | | 690 | | | 762 | | | 147 | |
| Approach Delay, s/veh | | 42.5 | | | 39.0 | | | 50.1 | | | 95.6 | |
| Approach LOS | | D | | | D | | | D | | | F | |
| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 18.0 | 46.0 | | 12.0 | 13.1 | 50.9 | | 29.0 | | | | |
| Change Period (Y+Rc), s | 5.0 | 5.0 | | 5.5 | 5.0 | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | 13.0 | 41.0 | | 6.5 | 11.0 | 43.0 | | 24.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 14.7 | 37.9 | | 9.4 | 8.4 | 10.8 | | 24.7 | | | | |
| Green Ext Time (p_c), s | 0.0 | 0.8 | | 0.0 | 0.0 | 1.0 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | | | 46.7 | | | | | | | | | |
| HCM 6th LOS | | | D | | | | | | | | | |

# MOVEMENT SUMMARY

## Site: 101 [Corn Pass/Rosedale 2040 Task 3 Alternatives]

New Site
Site Category: (None)
Roundabout

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
| South: Corn Pass Extension | | | | | | | | | | | | |
| 3 | L2 | 76 | 3.0 | 0.209 | 5.2 | LOS A | 0.9 | 23.3 | 0.39 | 0.27 | 0.39 | 34.2 |
| 8 | T1 | 364 | 3.0 | 0.209 | 5.2 | LOS A | 0.9 | 23.3 | 0.39 | 0.27 | 0.39 | 34.6 |
| 18 | R2 | 22 | 3.0 | 0.209 | 5.2 | LOS A | 0.9 | 23.3 | 0.39 | 0.27 | 0.39 | 33.9 |
| Approach | | 462 | 3.0 | 0.209 | 5.2 | LOS A | 0.9 | 23.3 | 0.39 | 0.27 | 0.39 | 34.5 |
| East: Rosedale | | | | | | | | | | | | |
| 1 | L2 | 1 | 3.0 | 0.190 | 6.3 | LOS A | 0.8 | 20.8 | 0.55 | 0.49 | 0.55 | 34.7 |
| 6 | T1 | 105 | 2.0 | 0.190 | 6.2 | LOS A | 0.8 | 20.8 | 0.55 | 0.49 | 0.55 | 34.7 |
| 16 | R2 | 53 | 2.0 | 0.190 | 6.2 | LOS A | 0.8 | 20.8 | 0.55 | 0.49 | 0.55 | 33.6 |
| Approach | | 159 | 2.0 | 0.190 | 6.2 | LOS A | 0.8 | 20.8 | 0.55 | 0.49 | 0.55 | 34.3 |
| North: Corn Pass | | | | | | | | | | | | |
| 7 | L2 | 105 | 2.0 | 0.323 | 6.1 | LOS A | 1.6 | 41.3 | 0.38 | 0.26 | 0.38 | 34.0 |
| 4 | T1 | 272 | 3.0 | 0.323 | 6.2 | LOS A | 1.6 | 41.3 | 0.38 | 0.26 | 0.38 | 33.9 |
| 14 | R2 | 26 | 2.0 | 0.022 | 3.2 | LOS A | 0.1 | 2.1 | 0.29 | 0.15 | 0.29 | 35.0 |
| Approach | | 403 | 2.7 | 0.323 | 6.0 | LOS A | 1.6 | 41.3 | 0.38 | 0.25 | 0.38 | 34.0 |
| West: Rosedale | | | | | | | | | | | | |
| 5 | L2 | 16 | 2.0 | 0.217 | 6.1 | LOS A | 1.0 | 24.9 | 0.52 | 0.44 | 0.52 | 34.4 |
| 2 | T1 | 116 | 2.0 | 0.217 | 6.1 | LOS A | 1.0 | 24.9 | 0.52 | 0.44 | 0.52 | 34.3 |
| 12 | R2 | 65 | 3.0 | 0.217 | 6.2 | LOS A | 1.0 | 24.9 | 0.52 | 0.44 | 0.52 | 33.3 |
| Approach | | 197 | 2.3 | 0.217 | 6.1 | LOS A | 1.0 | 24.9 | 0.52 | 0.44 | 0.52 | 34.0 |
| All Vehicles | | 1221 | 2.7 | 0.323 | 5.7 | LOS A | 1.6 | 41.3 | 0.43 | 0.32 | 0.43 | 34.2 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Oregon/Tonquin 2040 Task 3 Alternatives]

New Site
Site Category: (None)
Roundabout

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total veh/h | Demand Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Oregon | | | | | | | | | | | | |
| 8 | T1 | 263 | 2.0 | 0.395 | 7.1 | LOS A | 2.4 | 60.4 | 0.41 | 0.26 | 0.41 | 34.1 |
| 18 | R2 | 195 | 2.0 | 0.395 | 7.1 | LOS A | 2.4 | 60.4 | 0.41 | 0.26 | 0.41 | 33.1 |
| Approach | | 458 | 2.0 | 0.395 | 7.1 | LOS A | 2.4 | 60.4 | 0.41 | 0.26 | 0.41 | 33.7 |
| East: Tonquin | | | | | | | | | | | | |
| 1 | L2 | 447 | 1.0 | 0.514 | 9.7 | LOS A | 3.3 | 85.3 | 0.60 | 0.49 | 0.61 | 30.8 |
| 16 | R2 | 79 | 10.0 | 0.514 | 10.0 | LOS A | 3.3 | 85.3 | 0.60 | 0.49 | 0.61 | 29.8 |
| Approach | | 526 | 2.4 | 0.514 | 9.7 | LOS A | 3.3 | 85.3 | 0.60 | 0.49 | 0.61 | 30.7 |
| North: Oregon | | | | | | | | | | | | |
| 7 | L2 | 147 | 3.0 | 0.161 | 5.5 | LOS A | 0.6 | 16.4 | 0.49 | 0.42 | 0.49 | 32.3 |
| 4 | T1 | 579 | 2.0 | 0.627 | 13.4 | LOS B | 6.4 | 163.3 | 0.74 | 0.92 | 1.23 | 31.2 |
| Approach | | 726 | 2.2 | 0.627 | 11.8 | LOS B | 6.4 | 163.3 | 0.69 | 0.82 | 1.08 | 31.4 |
| All Vehicles | | 1711 | 2.2 | 0.627 | 9.9 | LOS A | 6.4 | 163.3 | 0.59 | 0.57 | 0.76 | 31.7 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [65th/Elligsen/Stafford 2040 Task 3 Alternatives]

New Site
Site Category: (None)
Roundabout

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance ft | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed mph |
| South: SW Stafford Road | | | | | | | | | | | | |
| 3 | L2 | 98 | 3.0 | 0.088 | 4.0 | LOS A | 0.3 | 8.8 | 0.34 | 0.21 | 0.34 | 33.0 |
| 8 | T1 | 92 | 3.0 | 0.559 | 10.0 | LOS B | 3.6 | 93.3 | 0.56 | 0.43 | 0.56 | 32.5 |
| 18 | R2 | 533 | 3.0 | 0.559 | 10.0 | LOS B | 3.6 | 93.3 | 0.56 | 0.43 | 0.56 | 31.5 |
| Approach | | 723 | 3.0 | 0.559 | 9.2 | LOS A | 3.6 | 93.3 | 0.53 | 0.40 | 0.53 | 31.8 |
| East: SW Stafford Road | | | | | | | | | | | | |
| 1 | L2 | 565 | 3.0 | 0.660 | 13.4 | LOS B | 8.0 | 204.8 | 0.70 | 0.84 | 1.18 | 29.4 |
| 6 | T1 | 53 | 2.0 | 0.660 | 13.3 | LOS B | 8.0 | 204.8 | 0.70 | 0.84 | 1.18 | 29.4 |
| 16 | R2 | 58 | 2.0 | 0.660 | 13.3 | LOS B | 8.0 | 204.8 | 0.70 | 0.84 | 1.18 | 28.7 |
| Approach | | 676 | 2.8 | 0.660 | 13.4 | LOS B | 8.0 | 204.8 | 0.70 | 0.84 | 1.18 | 29.4 |
| North: SW 65th Avenue | | | | | | | | | | | | |
| 7 | L2 | 37 | 2.0 | 0.370 | 10.8 | LOS B | 1.8 | 46.0 | 0.70 | 0.75 | 0.84 | 32.0 |
| 4 | T1 | 114 | 3.0 | 0.370 | 10.8 | LOS B | 1.8 | 46.0 | 0.70 | 0.75 | 0.84 | 31.9 |
| 14 | R2 | 84 | 2.0 | 0.370 | 10.8 | LOS B | 1.8 | 46.0 | 0.70 | 0.75 | 0.84 | 31.0 |
| Approach | | 235 | 2.5 | 0.370 | 10.8 | LOS B | 1.8 | 46.0 | 0.70 | 0.75 | 0.84 | 31.6 |
| West: SW Elligsen Road | | | | | | | | | | | | |
| 5 | L2 | 153 | 2.0 | 0.495 | 13.5 | LOS B | 3.0 | 77.5 | 0.75 | 0.87 | 1.11 | 30.0 |
| 2 | T1 | 37 | 2.0 | 0.495 | 13.5 | LOS B | 3.0 | 77.5 | 0.75 | 0.87 | 1.11 | 30.0 |
| 12 | R2 | 125 | 3.0 | 0.495 | 13.6 | LOS B | 3.0 | 77.5 | 0.75 | 0.87 | 1.11 | 29.2 |
| Approach | | 314 | 2.4 | 0.495 | 13.6 | LOS B | 3.0 | 77.5 | 0.75 | 0.87 | 1.11 | 29.7 |
| All Vehicles | | 1948 | 2.8 | 0.660 | 11.5 | LOS B | 8.0 | 204.8 | 0.65 | 0.67 | 0.89 | 30.5 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SECTION 3: PLANNED ROADWAY IMPROVEMENT PROJECTS ADJACENT TO OR WITHIN URBAN RESERVE AREAS

## COMPREHENSIVE LIST OF PLANNED COLLECTORS AND FINANCIALLY CONSTRAINED RTP PROJECTS

## Urban Reserves Transportation Study (URTS) Cost Estimates

These URTS cost estimates were developed to provide a rough idea of transportation infrastructure impacts in urban reserve areas. Projects are listed by Urban Reserve area and are based on Metro's Preliminary Urban Growth Boundary Transportation Analysis maps. There are a variety of collector and arterial projects, ranging from new roadways in greenfield land to widening and/or realigning existing roadways. Some local streets are planned to become higher-level facilities.

The cost estimates are very high-level for planning purposes only and were developed based on the following process:

- Regional Transportation Plan (RTP) costs were used, where available:
    - RTP costs were estimated for many of the arterial/collector facilities in or near the urban reserve areas. Many of these cost estimates were developed for the 2014 RTP (or earlier) and refined for the 2018 RTP. Most are very high-level conceptual costs and may be outdated due to rising construction costs.
- Rough cost of $2,500/lineal foot was used for both new greenfield projects and improvements to existing roadways. This cost rate was developed as a rough average of several recent Washington County capital improvement projects and is intended to include some right-of-way costs. This rate will be high for some projects and low for others.
- Washington County Capital Projects staff provided a cursory review of all project cost estimates and highlighted which projects may need to be adjusted based on knowledge of specific challenges on a route (e.g. creek crossings, topographic issues, right-of-way needs) or portions of projects already completed. Adjustments to many projects (including RTP projects) were made accordingly.

Many of these projects are needed primarily to serve the development they pass through and others are regional in nature. Each project was identified as UR (primarily serving the urban reserve area where they lie) or UR/Regional (serving both the urban reserve area as well as a regionwide area). A few were identified as local. Separate totals are provided for each urban reserve area for UR, UR/Regional or local. This categorization is intended to help cities plan how to fund roadway infrastructure. Several projects are listed in more than one urban reserve area since they are regional in nature. A good example of this is Roy Rogers Road which has three sections that are all important to several urban reserve areas (Cooper Mountain, River Terrace West, River Terrace South, Beef Bend South, Sherwood North, Sherwood West).

## Bendemeer and Bethany West Urban Reserves

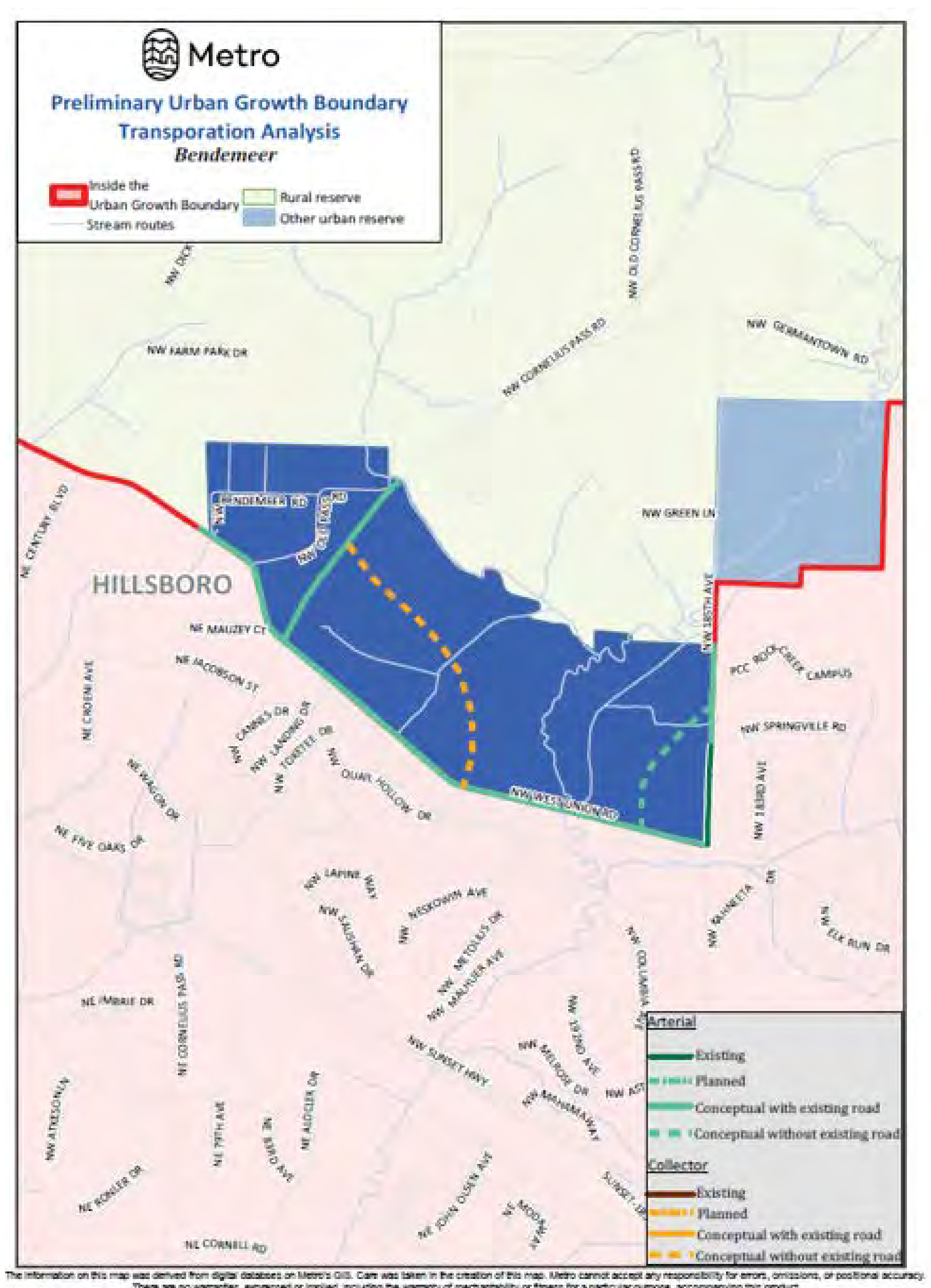
| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11478 | 185th Ave | Shackelford Rd | Springville Rd | Widen to 3 lanes (Note - TSP shows as 4/5 lanes) | FC | - | Planning Level | $60.6M | UR/Regional | County |
| 10565 | Springville Rd | PCC Access | Joss Ave | Widen to 3 lanes | FC | - | Planning Level | $9.7M | Regional | County |
| 10571 | West Union Rd | 185th Ave | Laidlaw Rd | Widen to 5 lanes | FC | - | Planning Level | $29.0M | Regional | County |
| 10575 | West Union Rd | Cornelius Pass Rd | 185th Ave | Widen to 5 lanes | FC/MSTIP (Design & ROW only) | - | Planning Level | $22.0M | UR/Regional | County |
| 11457 | Shackelford Rd Bridge | | | Bridge | TSP | - | Planning Level | $15.6M | UR/Regional | TBD |
| 11456 | Shackelford Rd | 185th Ave | Bridge | New 2/3-lane collector roadway | TSP | - | Planning Level | $12.8M | UR/Regional | TBD |
| Metro UGR | Cornelius Pass Rd | West Union Rd | UR Boundary (north) | Improve roadway | TSP | 3,160 | $2,500 | $10.0M | UR/Regional | County |
| Metro UGR | Springville Rd Extension | 185th Ave/ Springville Rd | West Union Rd west of 185th Ave | New 2/3-lane arterial roadway | New | 2,200 | $2,500 | $7.5M | UR | TBD |
| Metro UGR | New Collector Roadway | Cornelius Pass Rd north of West Union Rd | West Union Rd east of Cornelius Pass Rd | New 2/3-lane collector roadway | New | 4,590 | $2,500 | $13.5M | UR | TBD |
| **Total** | | | | | | | | **$180.7M** | | |
| **Total UR** | | | | | | | | **$21.0M** | | |
| **Total Regional** | | | | | | | | **$38.7M** | | |
| **Total UR/Regional** | | | | | | | | **$121.0M** | | |

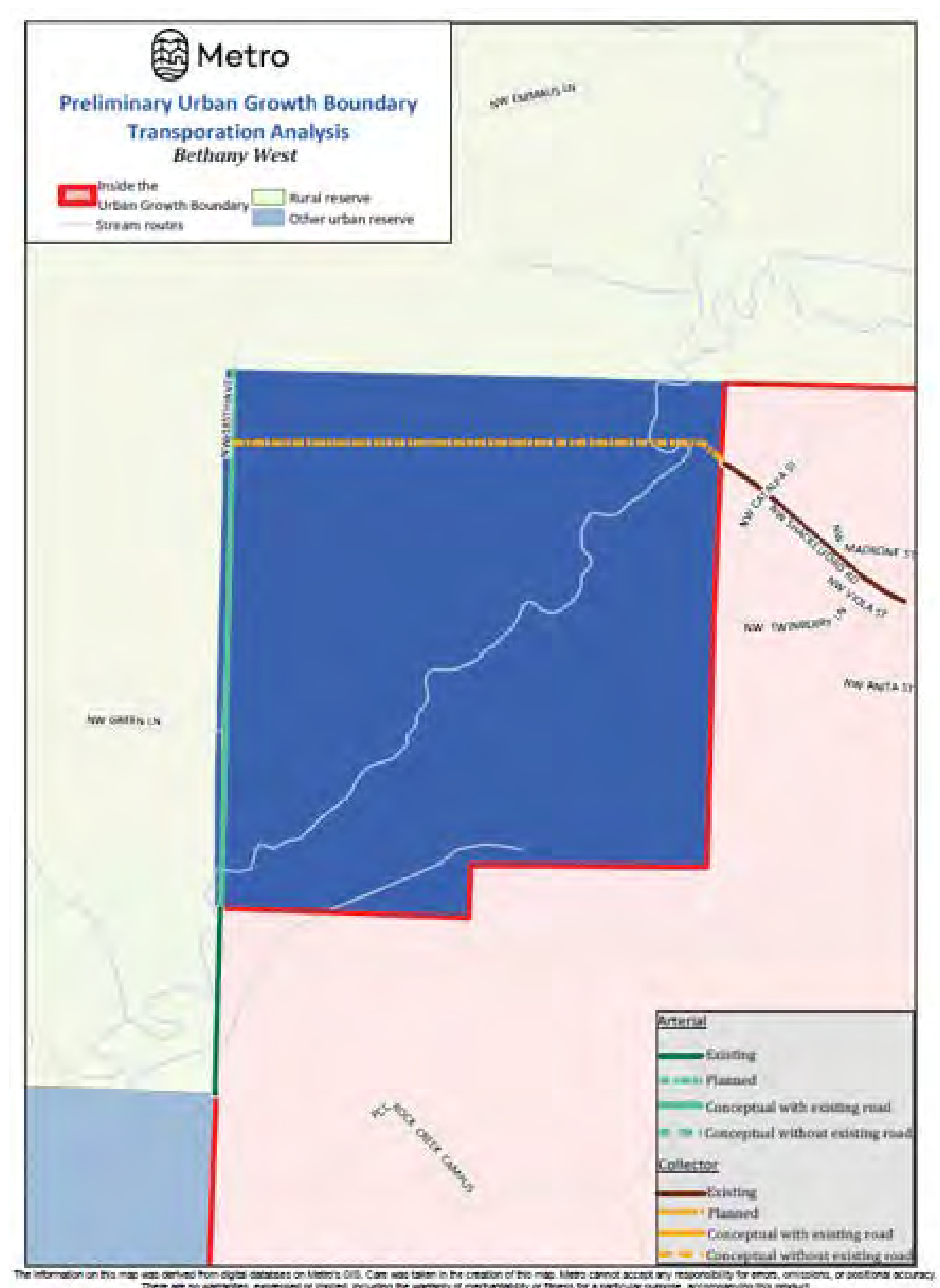
[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate



## Brookwood Parkway Urban Reserve

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | Cost Estimate | UR/ Regional[2] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|
| 11393 | US 26 | Brookwood Pkwy | Cornelius Pass Rd | Widen US 26 to six lanes | FC | $26.6M | Regional | County |

| | |
|---|---|
| **Total** | **$26.6M** |
| **Total UR** | **$0.0M** |
| **Total Regional** | **$26.6M** |
| **Total UR/Regional** | **$0.0M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified

[2] Based on expected roadway use, could be used for cost sharing

The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

**David Hill Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 10784 | David Hill Rd | Thatcher Rd | West UGB | Improve to collector road standards | FC | 7,750 | $2,500 | $19.5M | UR/Regional | County |
| 10773 | Thatcher Rd | Purdin Rd | Gales Creek Rd | Improve to arterial standards and improve intersection w/Gales Creek Rd | FC | 8,100 | $2,500 | $20.5M | Regional | County |
| 11973 | Gales Creek Rd | Thatcher Rd | Willamina Ave | Improve to arterial standards | FC | - | Planning Level | $1.0M | Regional | County |
| Metro UGR | New Collector 1 | Gales Creek Rd | David Hill Rd | New 2/3-lane collector roadway | New | 5,150 | $2,500 | $13.0M | UR | TBD |
| Metro UGR | Creekwood Pl | Gales Creek Rd | New Collector 1 | New 2/3-lane collector roadway | New | 1,350 | $2,500 | $3.5M | UR | Private |
| Metro UGR | New Collector 2 | David Hill Rd | Purdin Rd | New 2/3-lane collector roadway | New | 4,700 | $2,500 | $12.0M | UR | TBD |
| Metro UGR | New Collector 3 | David Hill Rd | New Collector 2 (west) | New 2/3-lane collector roadway | New | 3,800 | $2,500 | $9.5M | UR | TBD |
| Metro UGR | New Collector 4 | David Hill Rd | New Collector 2 (east) | New 2/3-lane collector roadway | New | 4,050 | $2,500 | $10.5M | UR | TBD |
| Metro UGR | Plum Hill Ln | New Collector 4 | Thatcher Rd | New 2/3-lane collector roadway | New | 1,000 | $2,500 | $2.5M | UR | Private |

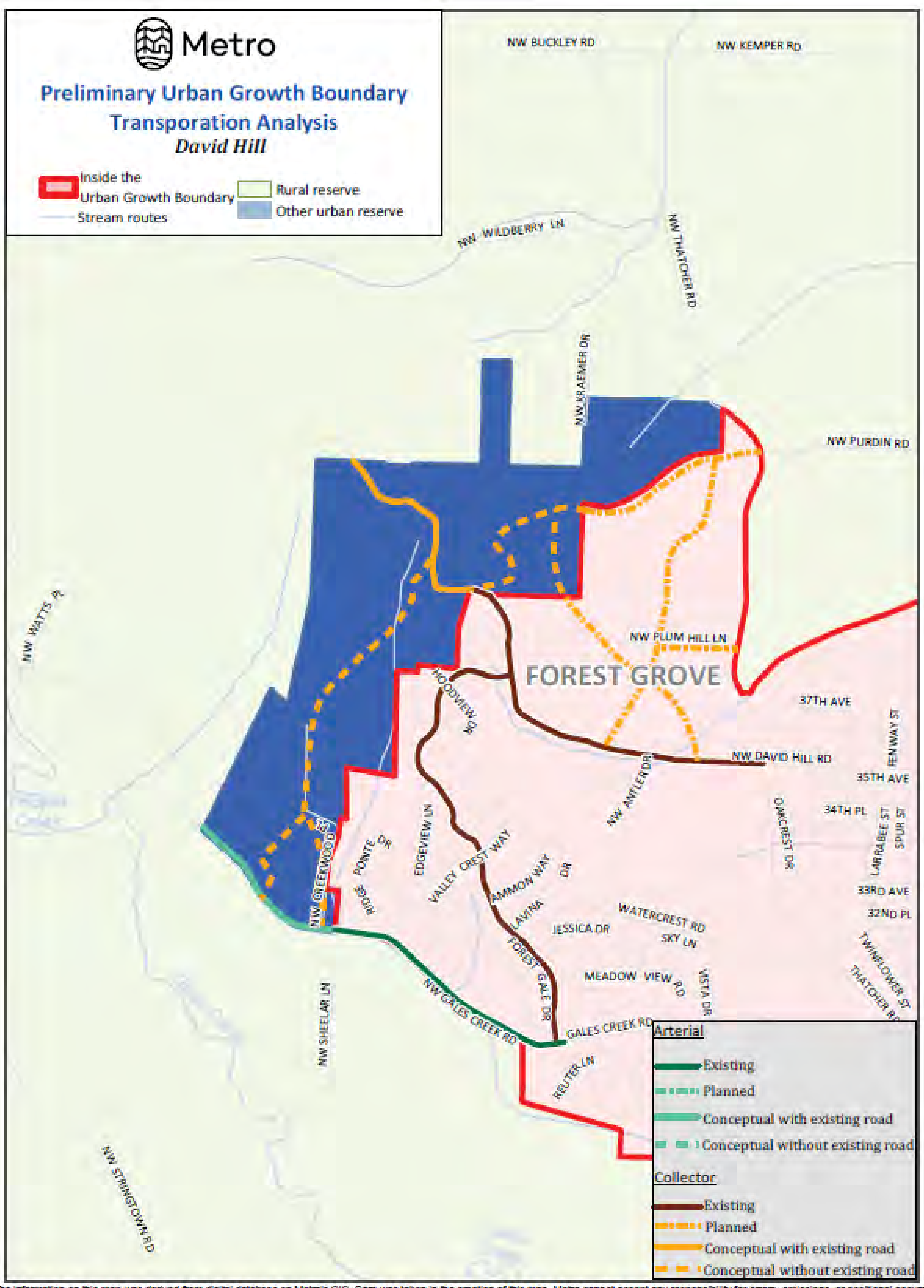
| | |
|---|---|
| **Total** | **$92.0M** |
| **Total UR** | **$51.0M** |
| **Total Regional** | **$19.5M** |
| **Total UR/Regional** | **$21.5M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate



**Rosa Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11911 | Rosedale Rd | Century Blvd | 209th | Widen to 3 lanes | FC/SH | - | Planning Level | $10.0M | Regional | County |
| TSP | Rosedale Rd | Century Blvd | River Rd | Widen to 3 lanes | TSP/SH | 4,800 | $2,500 | $12.0M | UR/Regional | County |
| 11920/ 11921 | Cornelius Pass Rd | Blanton St | Rosedale Rd | New 5-lane arterial roadway | FC/SH | -<br>- | Planning Level<br>Planning Level | $19.8M<br>$8.5M | Regional | Hillsboro/ County/TBD |
| TSP | Century Blvd | Existing terminus (north) | Rosedale Rd | New 2/3-lane collector roadway | FC/MSTIP Bonding/SH | - | Planning Level | $9.8M | UR/Regional | Hillsboro/County |
| TSP | River Rd | Oakhurst St | Rosedale Rd | Improve existing roadway to 2/3-lane arterial standards | TSP | 8,550 | $2,500 | $25.5M | UR/Regional | County |
| Metro UGR | Rosa Rd | Century Blvd | River Rd | Improve existing roadway to 2/3-lane collector | New | 4,900 | $2,500 | $12.5M | UR | TBD |
| TSP | Murphy Ln | Century Blvd | River Rd | Extend existing roadway as 2/3-lane collector | TSP | 5,200 | $2,500 | $13.0M | UR | County |
| Metro UGR | Brookwood Ave | Oakhurst St | River Rd | Extend existing roadway as 2/3-lane collector | New | 3,250 | $2,500 | $10.5M | UR | TBD |
| Metro UGR | New collector | Rosa Rd | Brookwood Ave Extension | New 2/3-lane collector roadway | New | 3,350 | $2,500 | $8.5M | UR | TBD |

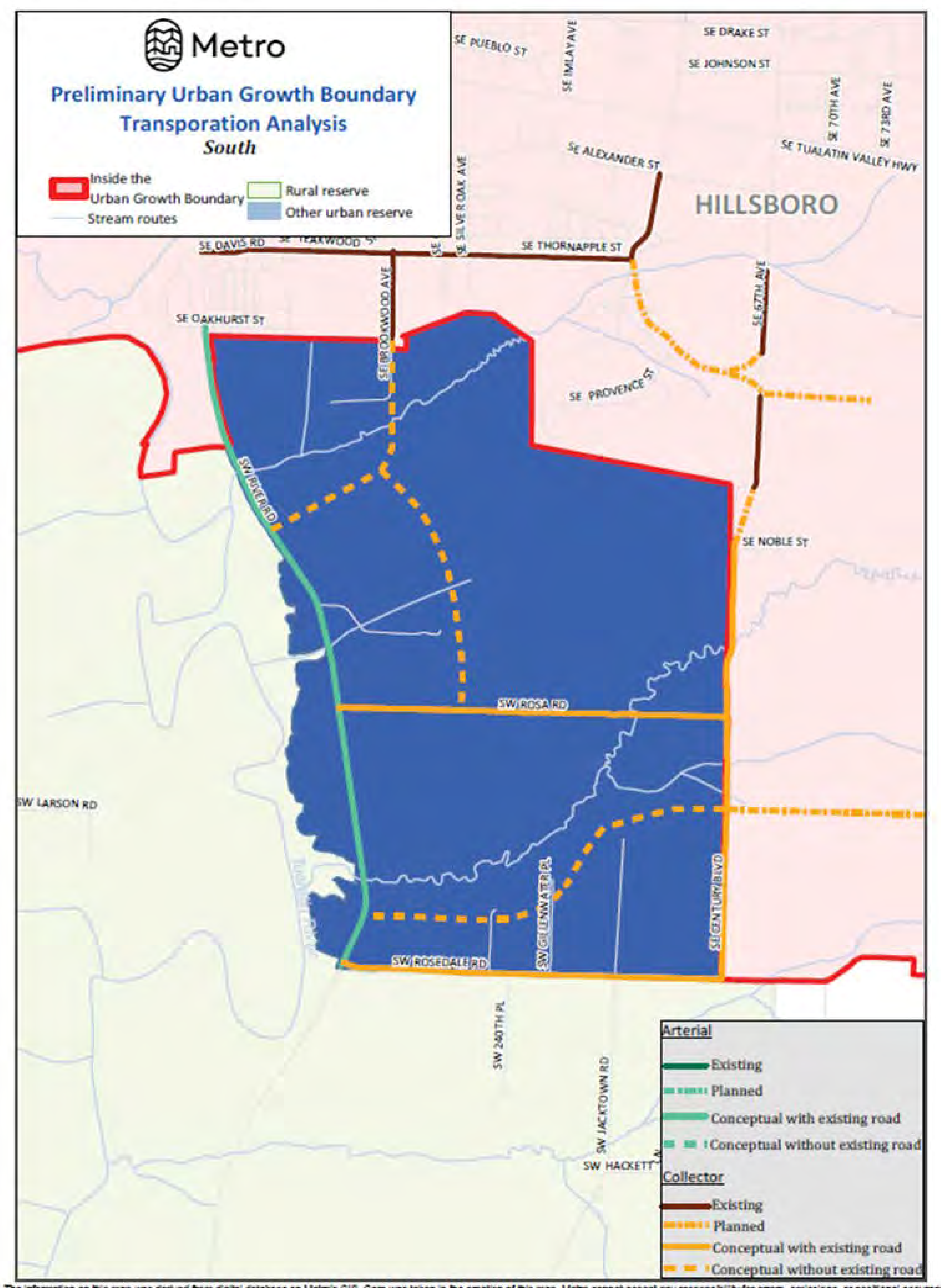
| | |
|---|---|
| **Total** | **$130.1M** |
| **Total UR** | **$44.5M** |
| **Total Regional** | **$38.3M** |
| **Total UR/Regional** | **$47.3M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost Sharing Program, SH = South Hillsboro SDC

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

## Cooper Mountain Urban Reserves

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 12067 | Rigert Rd | 185th Ave | 170th Ave | Improve to 2/3-lane collector standards | FC | - | Planning Level | $10.5M | Regional | County |
| 11486/ 11903/ 11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/RT/ WWS | - - - | Planning Level Planning Level Planning Level | $0.0M $11.0M $25.0M | UR/Regional | County |
| 11915 | Scholls Ferry Rd | Tile Flat Rd | Roy Rogers Rd | Improve to 5-lane arterial standards | FC/MSTIP Bonding/SCM/RT | - | Planning Level | $8.3M | Regional | County |
| 11919 | Tile Flat Rd | Scholls Ferry | UGB – north boundary of South Cooper Mountain | Interim 3-lane improvement w/urban side ped/bike | FC/MSTIP Bonding/SCM | - | Planning Level | $3.0M | UR/Regional | County |
| 11892 | Barrows Rd Extension | Tile Flat Rd | Loon Dr | New 3-lane collector | FC/SCM | - | Planning Level | $22.8M | Regional | TBD |
| 11893 | New North-South Collector Rd (Mountainside Way) | Scholls Ferry Rd | UGB (between South Cooper Mtn and Cooper Mtn) | New 3-lane collector | FC/MSTIP/ MSTIP Bonding | - | Planning Level | $11.0M | UR/Regional | TBD |
| 11452 | Scholls Ferry Rd | West of Tile Flat Rd | | Realign curves to improve safety | FC | - | Planning Level | $4.6M | Regional | County |
| TSP | Grabhorn Rd | South UR Boundary | North UR Boundary | Improve to 2/3-lane collector | TSP | 7,850 | $2,500 | $24.0M | UR/Regional | County |
| Metro UGR | Mountainside Way extension | South UR Boundary | Grabhorn Rd | Extend as 2/3-lane collector roadway | New | 3,900 | $2,500 | $10.0M | UR | TBD |
| Metro UGR/ TSP | 175th Ave | South UR Boundary | North UR Boundary | Improve to 3-lane arterial standard, including realignment | TSP | - | Planning Level | $16.4M | UR/Regional | County |
| Metro UGR/ TSP | 185th Ave Extension | Gassner Rd | Kemmer Rd | Extend 185th Ave as 3-lane arterial | TSP Refinement Area | - | Planning Level | $13.7M | Regional | TBD |

**Total** $160.3M
**Total UR** $10.0M
**Total Regional** $59.9M
**Total UR/Regional** $90.40

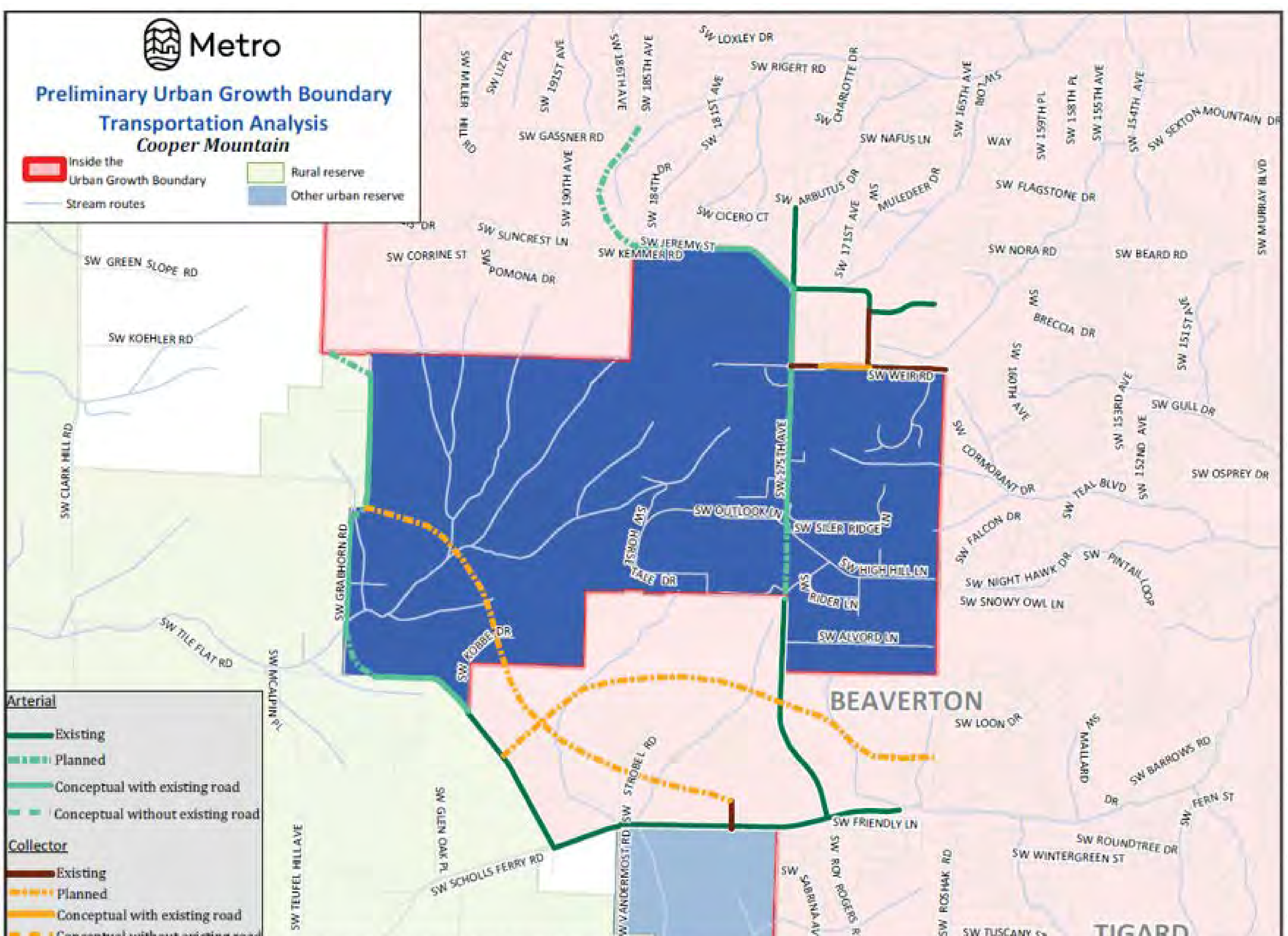
[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, SCM = South Cooper Mtn. SDC, RT = River Terrace SDC, WWS = Willamette Water Supply Project

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate

Projects included in more than one UR area




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

**River Terrace West Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486/<br>11903/<br>11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/WWS | -<br>-<br>- | Planning Level<br>Planning Level<br>Planning Level | $0.0M<br>$11.0M<br>$25.0M | UR/Regional | County |
| 11915 | Scholls Ferry Rd | Tile Flat Rd | Roy Rogers Rd | Improve to 5-lane arterial standards | FC/MSTIP Bonding/SCM/RT | - | Planning Level | $8.3M | Regional | County |
| 11452 | Scholls Ferry Rd | West of Tile Flat Rd | | Realign curves to improve safety | FC | - | Planning Level | $4.6M | Regional | County |
| Metro UGR | Tile Flat Rd extension | Scholls Ferry Rd | Bull Mountain Rd | Extend as 2/3-lane arterial roadway | New | - | Planning Level | $72.9M | UR/Regional | TBD |
| Metro UGR | Jean Louise Rd | Existing terminus (west) | Tile Flat Rd extension | Extend as 2/3-lane collector roadway | New | 550 | $2,500 | $1.5M | UR | Tigard |
| Metro UGR | New North-South Collector Rd (aligns with Mountainside Way) | Scholls Ferry Rd | Tile Flat Rd extension | Extend as 2/3-lane collector roadway | New | 1,200 | $2,500 | $3.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$126.3M** |
| **Total UR** | **$4.5M** |
| **Total Regional** | **$12.9M** |
| **Total UR/Regional** | **$108.9M** |

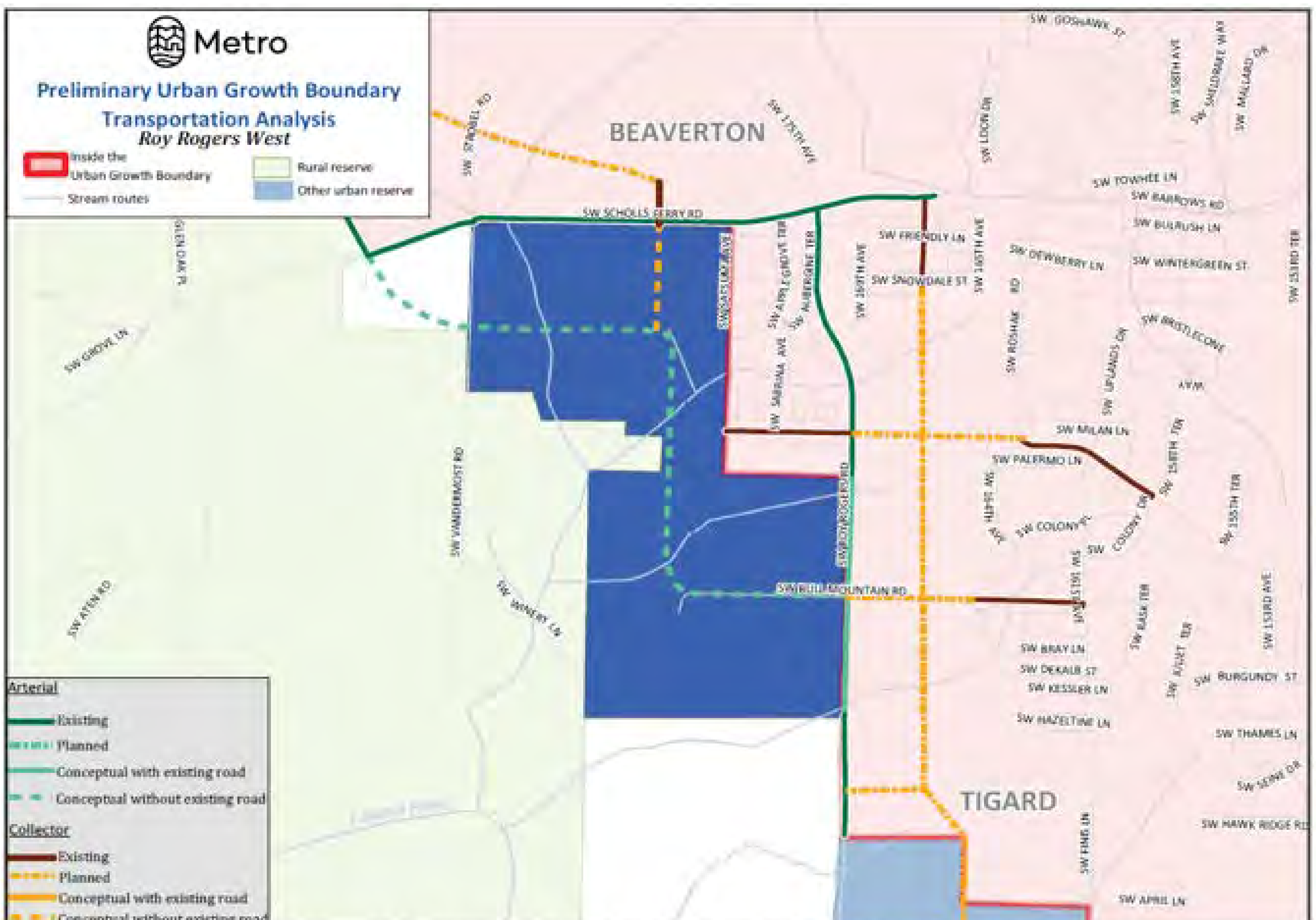
[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, SCM = South Cooper Mtn. SDC, RT = River Terrace SDC, WWS = Willamette Water Supply Project

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate

Projects included in more than one UR area



The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

## River Terrace South Urban Reserves

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486/<br>11903/<br>11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/<br>MSTIP<br>Bonding/WWS | -<br>-<br>- | Planning Level<br>Planning Level<br>Planning Level | $0.0M<br>$11.0M<br>$25.0M | UR/Regional | County |
| 11577 | Beef Bend Rd | Roy Rogers Rd | OR 99W | Improve to 3-lane arterial standards | FC | - | Planning Level | $41.9M | UR/Regional | County |
| Metro UGR | River Terrace Blvd | North UR Boundary | Beef Bend Rd (extends further south into Beef Bend South UR) | Extend as 2/3-lane collector roadway | New | 2,700 | $2,500 | $7.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$84.9M** |
| **Total UR** | **$7.0M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$77.9M** |

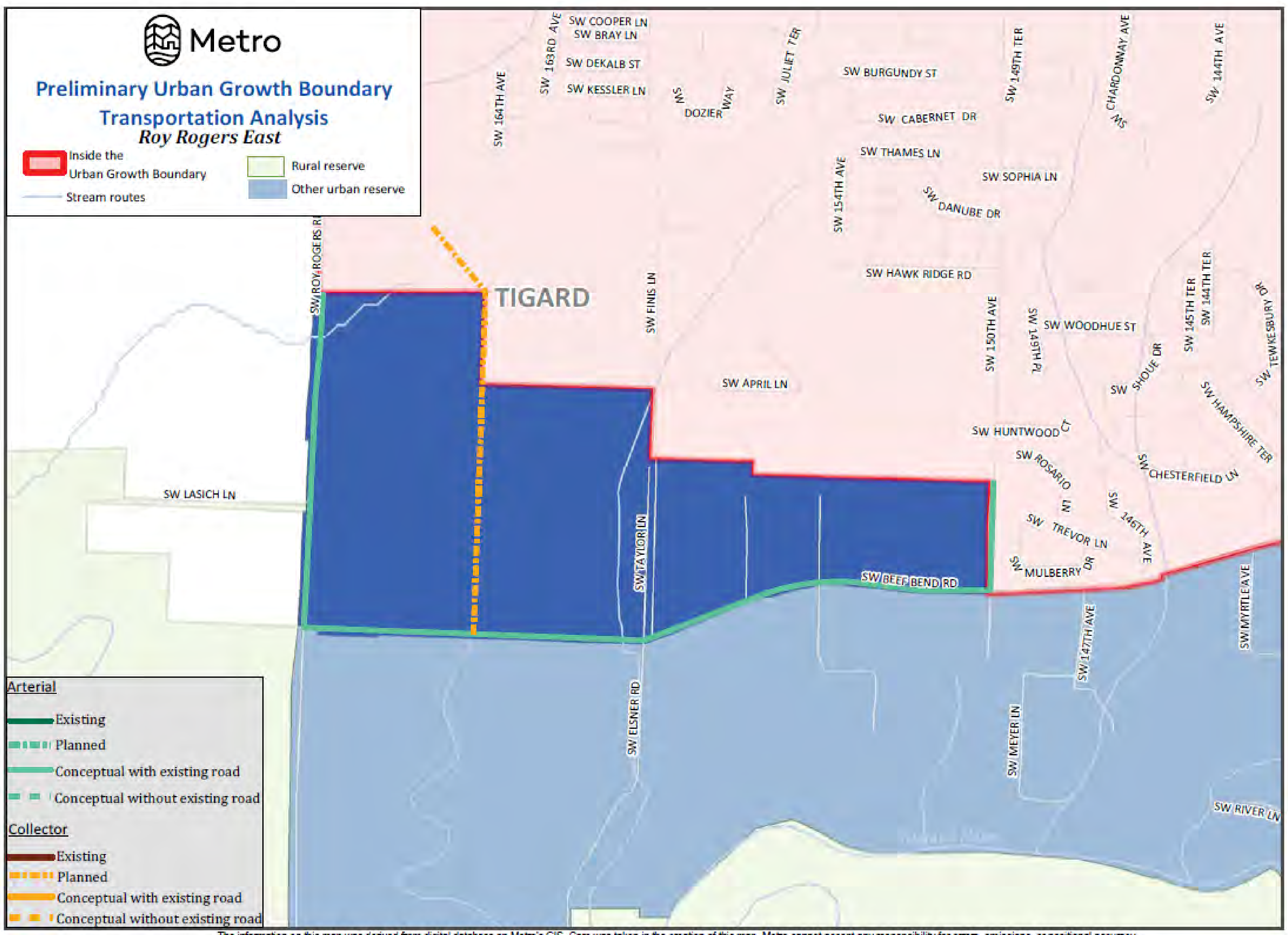
[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, WWS = Willamette Water Supply Project

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate

Projects included in more than one UR area




The information on this map was derived from digital databses on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

**Beef Bend South Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486/ 11903/ 11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/WWS | -<br>-<br>- | Planning Level<br>Planning Level<br>Planning Level | $0.0M<br>$11.0M<br>$25.0M | UR/Regional | County |
| 11577 | Beef Bend Rd | Roy Rogers Rd | OR 99W | Improve to 3-lane arterial standards | FC | - | Planning Level[4] | $41.9M | UR/Regional | County |
| Metro UGR | River Terrace Blvd | Beef Bend Rd (extends further north into River Terrace South UR) | East-West collector | Extend as 2/3-lane collector roadway | New | 1,500 | $2,500 | $4.0M | UR | TBD |
| Metro UGR | Fisher Rd extension | Fisher Rd existing terminus (west) | 150th Ave | Extend as 2/3-lane collector roadway | New | 3,400 | $2,500 | $8.5M | UR | County/TBD |
| Metro UGR | 150th Ave extension | Beef Bend Rd | Fisher Rd extension | Extend as 2/3-lane collector roadway | New | 1,400 | $2,500 | $3.5M | UR | Private/TBD |
| Metro UGR | East-west collector (parallel to, and south of, Beef Bend Rd) | 150th Ave extension | Roy Rogers Rd | Extend as 2/3-lane collector roadway | New | 5,700 | $2,500 | $14.5M | UR | TBD |
| TSP | Elsner Rd | Roy Rogers Rd | Beef Bend Rd | Improve to 2/3 -lane collector standards | TSP | 5,750 | $2,500 | $14.5M | UR | County |
| Metro UGR | 137th Ave | Beef Bend Rd | Fisher Rd | Improve to 3-lane collector standards | New | 2,400 | $2,500 | $6.0M | UR | County |

| | |
|---|---|
| **Total** | **$128.9M** |
| **Total UR** | **$51.0M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$77.9M** |

1 FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, WWS = Willamette Water Supply Project

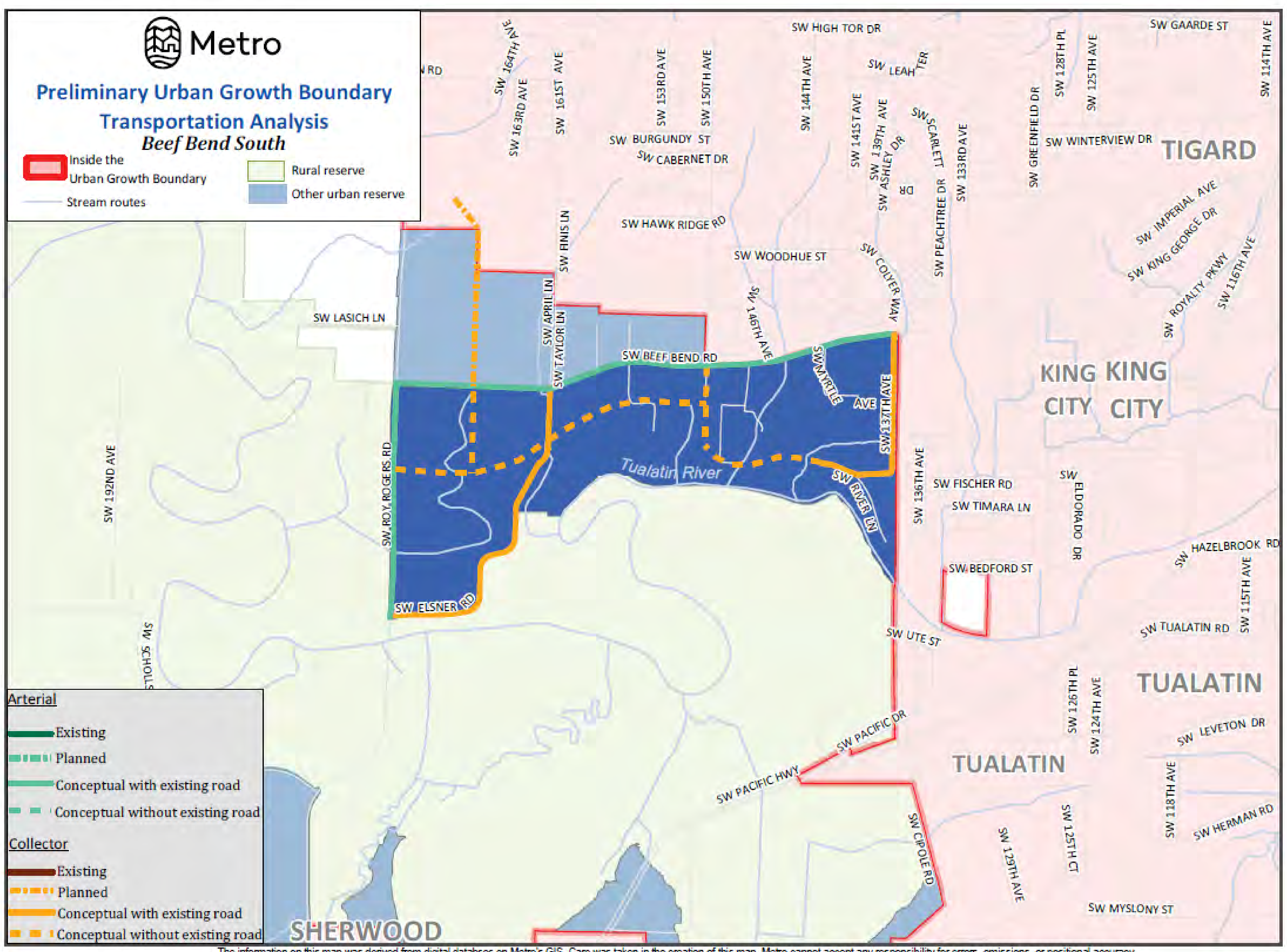
2 Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

3 Based on expected roadway use, could be used for cost sharing

4 Cost Estimate from RTP, but Jacobs Feasibility Cost Estimate for intersection realignment ($2.3M - $4.9M) or more significant realignment ($4.9M - $20.1M) could increase total cost beyond $41.9M

Indicates rough high-level cost estimate

Projects included in more than one UR area




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

## Sherwood North Urban Reserves

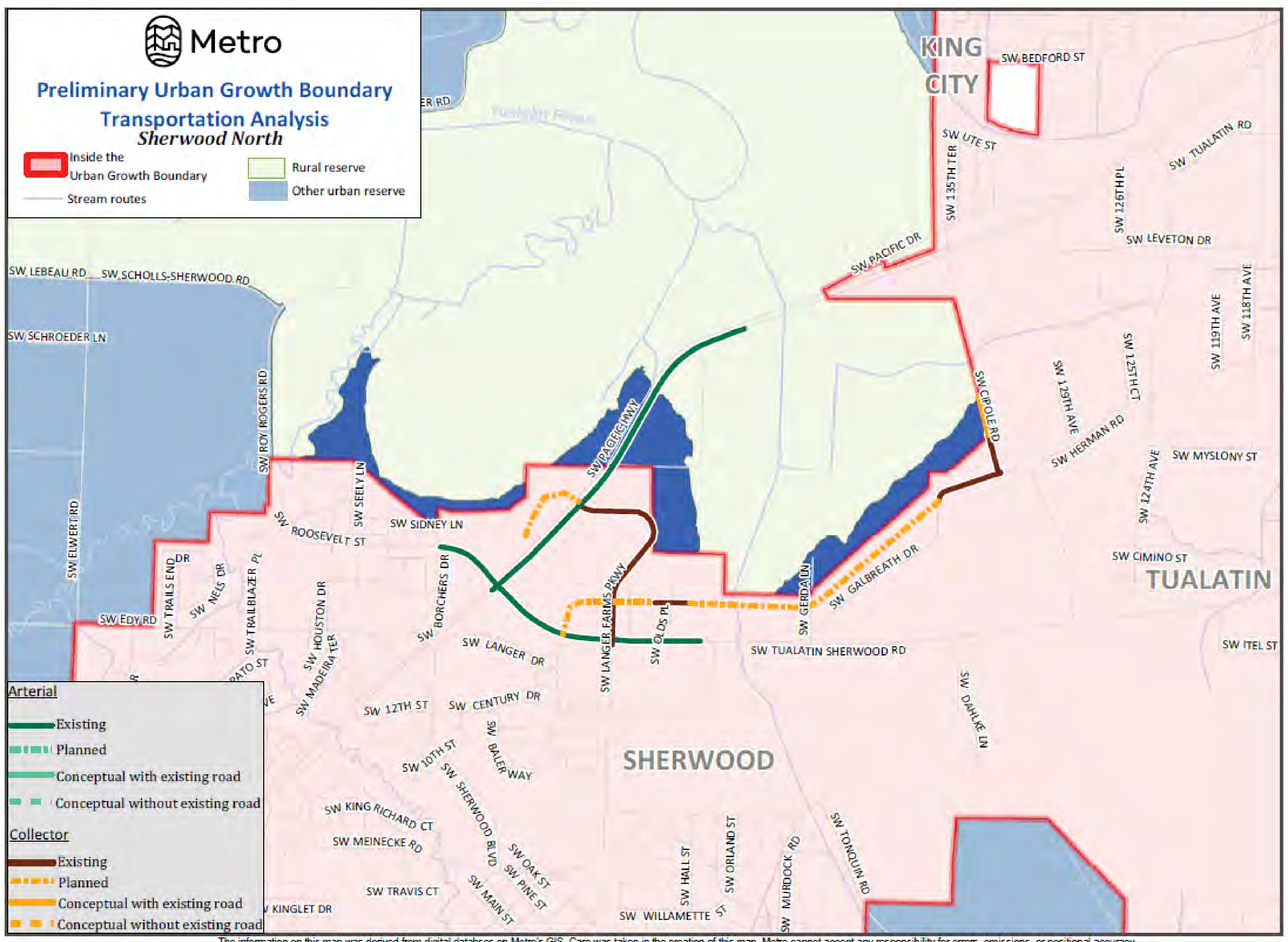
| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | Cost Estimate | UR/Regional/ Local[2] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|
| 11486/ 11903/ 11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/ MSTIP Bonding/WWS | $0.0M $11.0M $25.0M | UR/Regional | County |
| 10692 | Edy Rd | Elwert Rd | Cherry Orchards Pl | Improve to 3-lane collector standards | FC | $8.8M | Regional/Local | County/Sherwood |
| 10700 | Arrow St | Langer Farms Pkwy | Gerda Ln | New 2/3-lane collector roadway (incorporates existing portion) | Sherwood TSP | $8.2M | Local | TBD |
| 12044 | Langer Farms Rd extension | OR 99W | Toward Roy Rogers (not connecting) | Extends 2/3-lane collector west across OR99W, likely looping back to OR 99W due to environmental constraints to Roy Rogers | Sherwood TSP | $3.2M | Local | TBD |
| 11404 | Baler Wy extension | Tualatin-Sherwood Rd | Langer Farms Pkwy | Extend 3-lane collector roadway | FC | $3.8M | Local | TBD |

| | |
|---|---|
| **Total** | **$60.0M** |
| **Total Local** | **$15.2M** |
| **Total UR** | **$0.0M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$44.8M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, WWS = Willamette Water Supply Project

[2] Based on expected roadway use, could be used for cost sharing

Projects included in more than one UR area




The information on this map was derived from digital databses on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

**Sherwood West and South Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11486/<br>11903/<br>11914 | Roy Rogers Rd | Scholls Ferry Rd | Borchers Rd | Improve to 5-lane arterial standards | FC/MSTIP/<br>MSTIP<br>Bonding/WWS | -<br>-<br>- | Planning Level<br>Planning Level<br>Planning Level | $0.0M<br>$11.0M<br>$25.0M | UR/Regional | County |
| Metro UGR | Conzelmann Rd | West UR boundary | Roy Rogers Rd | Reconstruct and extend 2/3-lane collector roadway | New | 4,250 | $2,500 | $11.0M | UR/Local | County/TBD |
| 12045 | Elwert Rd | Edy Rd | | Reconstruct intersection as roundabout or signalize | FC | - | Planning Level | $7.5M | UR/Local | County |
| 10692 | Edy Rd | Elwert Rd | Cherry Orchards Pl | Reconstruct to 3-lane collector standards | FC | - | Planning Level | $8.8M | Local | County/Sherwood |
| TSP | Edy Rd | West UR boundary | East UR boundary | Improve to collector standards | TSP | 5,250 | $2,500 | $13.5M | UR | County |
| 10681 | Elwert Rd | Handley Rd | Edy Rd | Reconstruct to arterial standards | FC | - | Planning Level | $7.5M | Local/Regional | County |
| TSP | Elwert Rd | Edy Rd | North UR boundary | Reconstruct to arterial standards | TSP | 5,300 | $2,500 | $13.5M | UR/Regional | County |
| 10680 | Elwert Rd | Handley Rd | OR 99W/Sunset Blvd | Relocate Kruger Rd intersection north at Elwert/Kruger/Cedar Brook as Roundabout, Reconstruct OR 99W intersection with new signal | FC/MSTIP/<br>Sherwood/<br>Private | - | Planning Level | $12.0M | Local/Regional | County |
| Metro UGR | New Collector | West of Elwert Rd/Edy Rd Intersection | Chapman Rd | New 2/3-lane collector roadway | New | 10,250 | $2,500 | $26.0M | UR | TBD |
| Metro UGR | Kruger Rd | West UR boundary | Elwert Rd | Improve to collector standards | New | 3,800 | $2,500 | $9.5M | UR | County |
| 12047 | Brookman Rd | OR 99W | OR 99W | Realigns and relocates Brookman Rd/OR 99W intersection | FC | - | Planning Level | $15.5M | UR/Regional | County |
| 10682 | Brookman Rd | OR 99W | Ladd Hill Rd | Reconstruct to arterial standards, ROW to accommodate up to 5-lane roadway | FC | - | Planning Level | $15.3M | UR/Regional | County |
| 10693 | Ladd Hill Rd | Sunset Blvd | Brookman Rd | Improve to 3-lane collector roadway | FC | - | Planning Level | $6.3M | Local | Sherwood |
| TSP | Chapman Rd | West UR boundary | OR 99W | Improve to collector standards | TSP | 2,400 | $2,500 | $6.0M | UR | County |
| TSP | Middleton Rd | OR 99W | Brookman Rd | Improve to collector standards | TSP | 4,350 | $2,500 | $11.0M | UR | County |
| Metro UGR | Labrousse Rd | Middleton Rd | South UR boundary | Improve to collector standards | New | 2,350 | $2,500 | $6.0M | UR | County |
| Metro UGR | Oberst Rd | Brookman Rd | South UR boundary | Improve to collector standards | New | 2,450 | $2,500 | $6.5M | UR | County |
| Metro UGR | New Collector Roadway | Labrousse Rd | Brookman Rd | New 2/3-lane collector roadway, includes 90 degree turn/curve | New | 5,500 | $2,500 | $14.0M | UR | TBD |

| | |
|---|---|
| **Total** | **$225.9M** |
| **Total Local** | **$15.1M** |
| **Total Regional** | **$0.0M** |
| **Total UR** | **$111.0M** |
| **Total UR/Regional** | **$99.8M** |

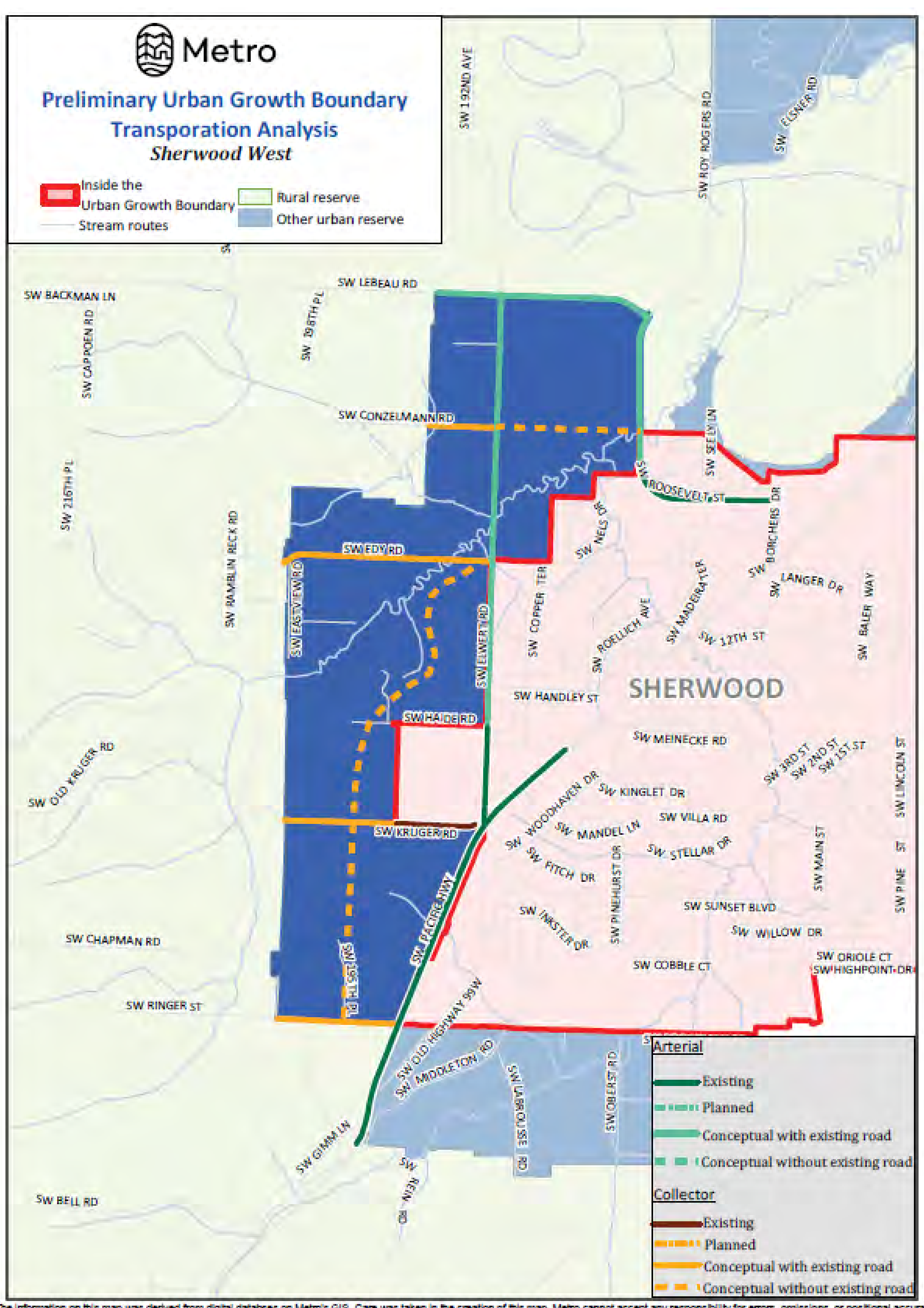
[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified, MSTIP Bonding = MSTIP Bonding Cost-Sharing Program, WWS = Willamette Water Supply Project

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate

Projects included in more than one UR area




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.


The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

### Tonquin Urban Reserves

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 12046 | Tonquin area east-west collector | Oregon St | $124^{th}$ Ave | Construct 3-lane collector roadway | FC | - | Planning Level | $10.5M | Regional | TBD |
| 10674 | Oregon/Tonquin Intersection | | | Reconstruct and realign as roundabout (partial 2-lane) | FC | - | Planning Level | $7.0M | Local/Regional | County |
| TSP | Tonquin Rd | West UR boundary | East UR boundary | Improve to arterial standards | TSP | 7,000 | $3,500 | $24.5M | UR | County |
| Metro UGR | New north-south collector | Tonquin Rd | North UR boundary | Construct new 2/3-lane collector roadway | New | 2,750 | $2,500 | $7.0M | UR | TBD |
| Metro UGR | New east-west collector | Tonquin Rd | $124^{th}$ Ave | Construct new 2/3-lane collector roadway | New | 3,950 | $2,500 | $10.0M | UR | TBD |

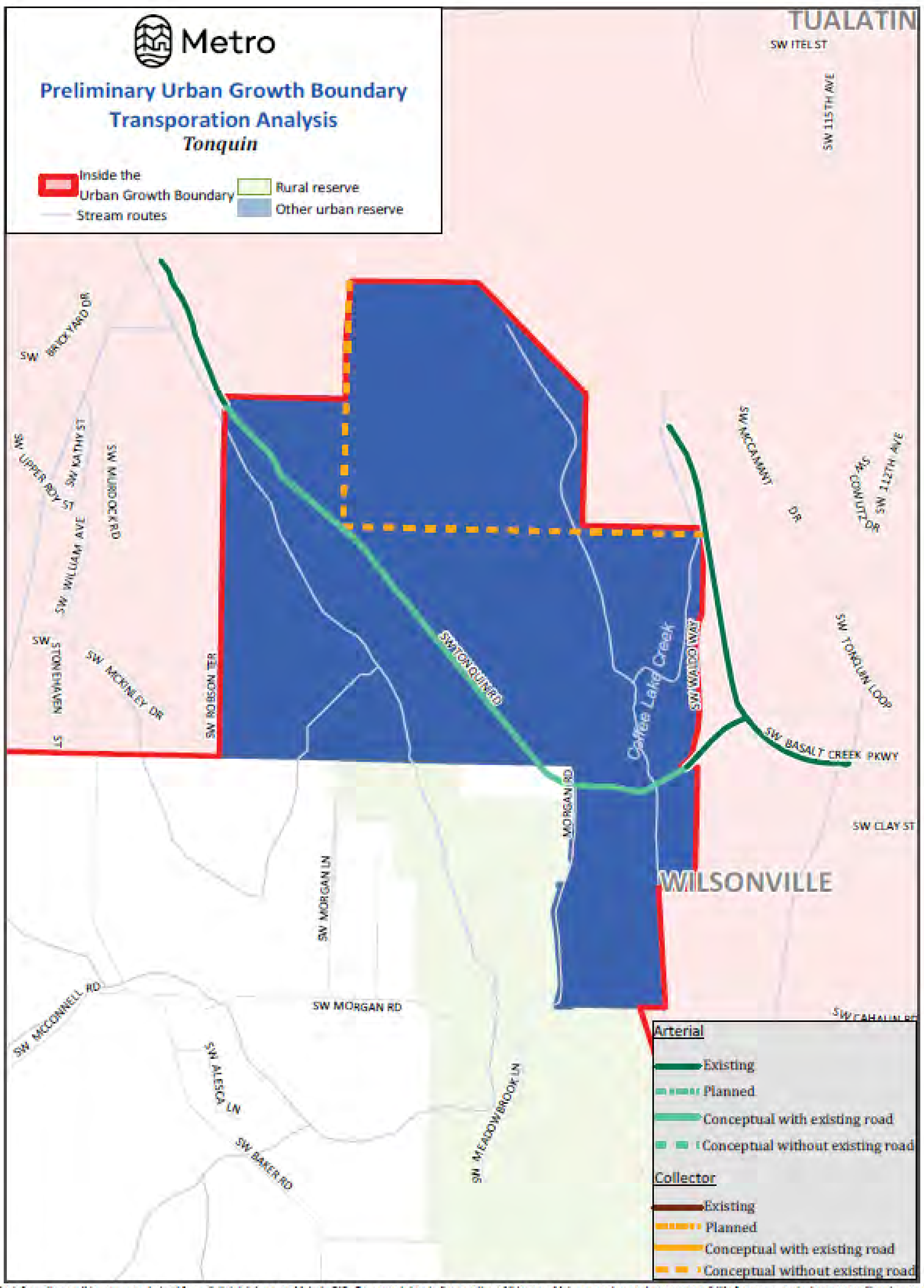
| | |
|---|---|
| **Total** | **$59.0M** |
| **Total UR** | **$41.5M** |
| **Total Regional** | **$10.5M** |
| **Total UR/Regional** | **$7.0M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

## I-5 East (Washington County Urban Reserves)

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| Metro UGR | Frobase Rd | East-West Arterial Overcrossing | 65th Ave | Extend/improve Frobase Rd to 2/3-lane collector roadway | New | 6,100 | $2,500 | $15.5M | UR | County |
| Metro UGR | 82nd Ave | Frobase Rd | Norwood Rd | Improve to collector standards | New | 2,600 | $2,500 | $6.5M | UR | County |
| TSP | Norwood Rd | I-5 overcrossing | 82nd Ave | Improve to collector standards | FC | 500 | $2,500 | $1.5M | UR | County/ODOT |
| TSP | Norwood Rd | 82nd Ave | 65th Ave | Improve to collector standards | TSP | 5,350 | $2,500 | $13.5M | UR | County |
| TSP | 65th Ave | Frobase Rd | I-205 | Improve to 3-lane arterial standards | TSP | 8,600 | $2,500 | $21.5M | Regional/UR | County/Clackamas County |

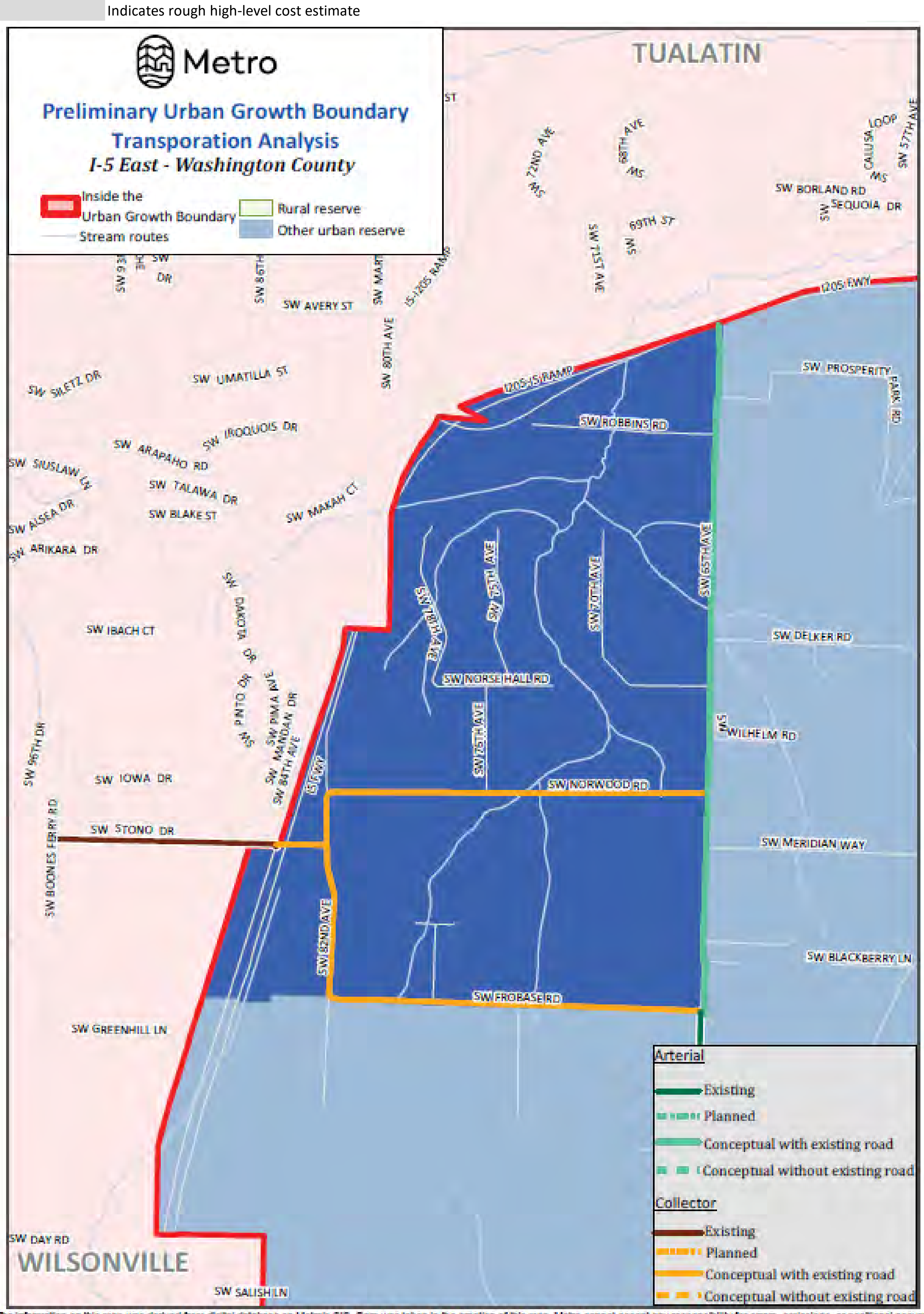
| | |
|---|---|
| **Total** | **$58.5M** |
| **Total UR** | **$37.0M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$21.5M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, New = Recently identified

[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of mechantability or fitness for a particular purpose, accompanying this product.

**Elligsen Road North and South Urban Reserves**

| RTP Project ID | Roadway | From | To | Description | Funding Status[1] | LF | Cost/LF[2] | Cost Estimate | UR/ Regional[3] | Adopted Long-Term Roadway Jurisdiction |
|---|---|---|---|---|---|---|---|---|---|---|
| 11436 | East-West Arterial Overcrossing (Basalt Creek Pkwy) | Boones Ferry Rd | East of I-5 | Extend new 4-lane overcrossing over I-5 | Strategic | - | Planning Level | $40.4M | Regional/UR | TBD |
| 11490 | Day Rd Overcrossing | Boones Ferry Rd | Elligsen Rd | Extend new 4-lane overcrossing over I5 | Strategic | - | Planning Level | $46.9M | Regional/UR | TBD |
| 10054 | 65th/Elligsen/Stafford Intersection | | | Reconstruct intersection as roundabout | FC | - | Planning Level | $5.8M | Regional/UR | County/Clackamas County |
| TSP | Elligsen Rd | West UR boundary | 65th Ave | Improve to 2/3-lane arterial standards (TSP shows as 4/5 lanes) | FC | - | Planning Level | $6.0M | UR/Regional | Wilsonville/County |
| Metro UGR | Frobase Rd | East-West Arterial Overcrossing | 65th Ave | Extend/improve Frobase Rd to 2/3 lane collector roadway | New | 6,100 | $2,500 | $15.5M | UR | County |
| TSP | 65th Ave | Elligsen Rd | Frobase Rd | Improve to arterial standards | TSP | 4,550 | $2,500 | $11.5M | UR/Regional | County/Clackamas County |
| Metro UGR | New north-south collector 1 | Day Rd overcrossing | Frobase Rd | New 2/3-lane collector roadway | New | 3,100 | $2,500 | $8.0M | UR | TBD |
| Metro UGR | New north-south collector 2 | Elligsen Rd | Frobase Rd | New 2/3-lane collector roadway | New | 4,950 | $2,500 | $12.5M | UR | TBD |
| Metro UGR | New east-west collector | New north-south collector 2 | 65th Ave | New 2/3-lane collector roadway | New | 2,600 | $2,500 | $6.5M | UR | TBD |
| Metro UGR | Stafford Rd | Washington/Clackamas County Line | Elligsen Rd | Improve to arterial standards | New | 1,500 | $2,500 | $4.0M | Regional/UR | County/Clackamas County |
| Metro UGR | New north-south collector 3 | Washington/Clackamas County Line | Elligsen Rd | New 2/3-lane collector roadway | New | 1,500 | $2,500 | $4.0M | UR | TBD |

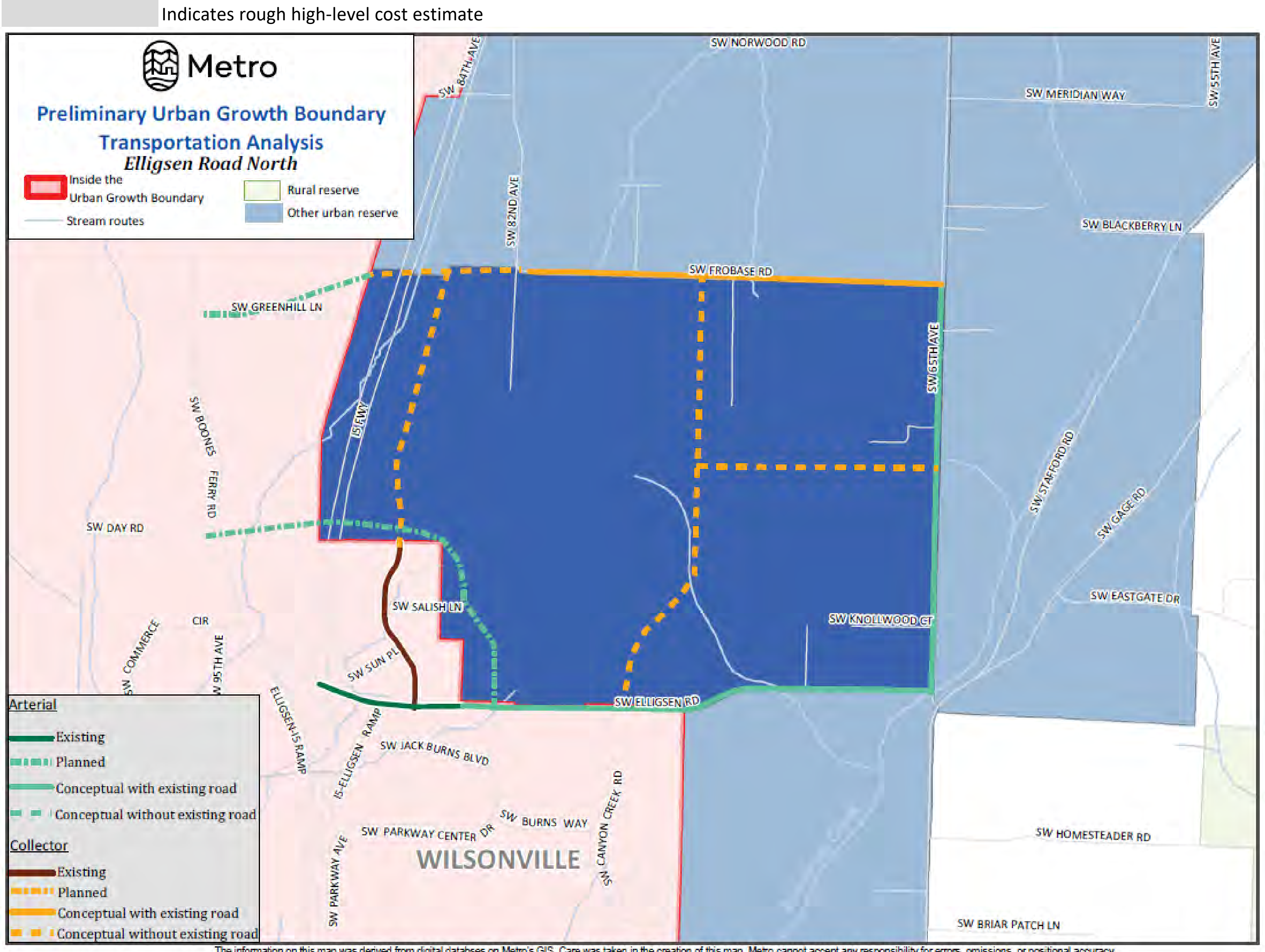
| | |
|---|---|
| **Total** | **$161.1M** |
| **Total UR** | **$46.5M** |
| **Total Regional** | **$0.0M** |
| **Total UR/Regional** | **$114.6M** |

[1] FC = Financially Constrained by 2040, TSP = Included in TSP but not FC, Strategic = Identified in RTP (not funded), New = Recently identified

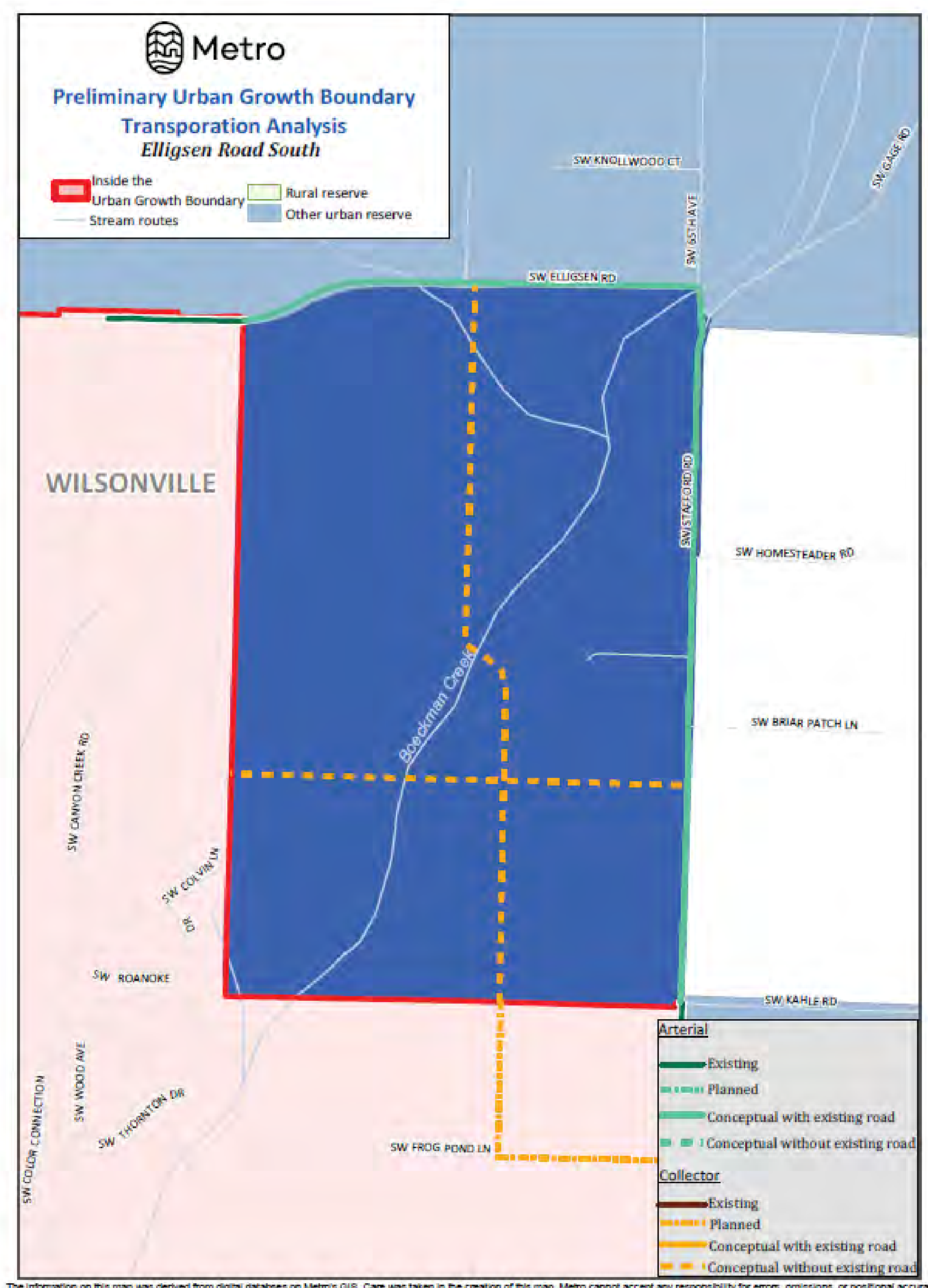
[2] Assume $2,500/LF based on previous County roadway projects (e.g Springville, Cornelius Pass, Brookwood, Roy Rogers)

[3] Based on expected roadway use, could be used for cost sharing

Indicates rough high-level cost estimate




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.




The information on this map was derived from digital databases on Metro's GIS. Care was taken in the creation of this map. Metro cannot accept any responsibility for errors, omissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product.

| Urban Reserve | Total Cost | UR Cost | Regional Cost | UR/Regional Cost | Local Cost |
|---|---|---|---|---|---|
| Bendemeer and Bethany West Urban Reserves | $180.7M | $21.0M | $38.7M | $121.0M | $0.0M |
| Brookwood Parkway Urban Reserve | $26.6M | $0.0M | $26.6M | $0.0M | $0.0M |
| David Hill Urban Reserves | $92.0M | $51.0M | $19.5M | $21.5M | $0.0M |
| Rosa Urban Reserves | $130.1M | $44.5M | $38.3M | $47.3M | $0.0M |
| Cooper Mountain Urban Reserves | $160.3M | $10.0M | $59.9M | $90.4M | $0.0M |
| River Terrace West Urban Reserves | $126.3M | $4.5M | $12.9M | $108.9M | $0.0M |
| River Terrace South Urban Reserves | $84.9M | $7.0M | $0.0M | $77.9M | $0.0M |
| Beef Bend South Urban Reserves | $128.9M | $51.0M | $0.0M | $77.9M | $0.0M |
| Sherwood North Urban Reserves | $60.0M | $0.0M | $0.0M | $44.8M | $15.2M |
| Sherwood West and South Urban Reserves | $225.9M | $111.0M | $0.0M | $99.8M | $15.1M |
| Tonquin Urban Reserves | $59.0M | $41.5M | $10.5M | $7.0M | $0.0M |
| Elligsen Road North and South Urban Reserves | $161.1M | $46.5M | $0.0M | $114.6M | $0.0M |
| I-5 East (Washington County Urban Reserves) | $58.5M | $37.0M | $0.0M | $21.5M | $0.0M |
| | | | | | |
| **Total*** | **$1,264.1M** | **$425.0M** | **$206.4M** | **$602.4M** | **$30.3M** |
| | | | | | |
| | | | | | |
| Cost/LF for projects without planning level estimate | $ 2,500 | | | | |
| *removes redundant projects | | | | | |