Oregon
Theodore R. Kulongoski, Governor

Department of Land Conservation and Development
635 Capitol Street, Suite 150
Salem, OR 97301-2540
(503) 373-0050
Fax (503) 378-5518
www.lcd.state.or.us

NOTICE OF ADOPTED AMENDMENT

10/15/2012

TO: Subscribers to Notice of Adopted Plan or Land Use Regulation Amendments

FROM: Plan Amendment Program Specialist

SUBJECT: City of Sherwood Plan Amendment
DLCD File Number 003-12

The Department of Land Conservation and Development (DLCD) received the attached notice of adoption. Due to the size of amended material submitted, a complete copy has not been attached. A Copy of the adopted plan amendment is available for review at the DLCD office in Salem and the local government office.

Appeal Procedures*

DLCD ACKNOWLEDGMENT or DEADLINE TO APPEAL: Friday, October 26, 2012

This amendment was submitted to DLCD for review prior to adoption pursuant to ORS 197.830(2)(b) only persons who participated in the local government proceedings leading to adoption of the amendment are eligible to appeal this decision to the Land Use Board of Appeals (LUBA).

If you wish to appeal, you must file a notice of intent to appeal with the Land Use Board of Appeals (LUBA) no later than 21 days from the date the decision was mailed to you by the local government. If you have questions, check with the local government to determine the appeal deadline. Copies of the notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR Chapter 661, Division 10). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

*NOTE: The Acknowledgment or Appeal Deadline is based upon the date the decision was mailed by local government. A decision may have been mailed to you on a different date than it was mailed to DLCD. As a result, your appeal deadline may be earlier than the above date specified. NO LUBA Notification to the jurisdiction of an appeal by the deadline, this Plan Amendment is acknowledged.

Cc: Julia Hajduk, City of Sherwood
Gordon Howard, DLCD Urban Planning Specialist
Anne Debbaut, DLCD Regional Representative
Gary Fish, DLCD Transportation Planner

<paa> Y/email

FORM 2

DLCD Notice of Adoption

This Form 2 must be mailed to DLCD within **5-Working Days after the Final Ordinance is signed** by the public Official Designated by the jurisdiction and all other requirements of ORS 197.615 and OAR 660-018-000

DATE STAMP
☐ In person ☐ electronic ☐ mailed
DEPT OF
OCT 09 2012
LAND CONSERVATION AND DEVELOPMENT
For Office Use Only

Jurisdiction: **City of Sherwood**
Local file number: **PA 12-03**
Date of Adoption: **10/2/2012**
Date Mailed: **10/5/2012**
Was a Notice of Proposed Amendment (Form 1) mailed to DLCD? ☒ Yes ☐ No Date:

☒ Comprehensive Plan Text Amendment
☐ Comprehensive Plan Map Amendment
☐ Land Use Regulation Amendment
☐ Zoning Map Amendment
☐ New Land Use Regulation
☒ Other: **TSP amendment**

Summarize the adopted amendment. Do not use technical terms. Do not write "See Attached".

Amend TSP and related figures in the Comprehensive Plan to change the functional classification of Cedar Brook Way from a local to a collector road connecting from Elwert to Handley. This amendment will modify figures 8-1, 8-7 and 8-8 of the TSP and comprehensive plan to refect this change.

Does the Adoption differ from proposal? Please select one

Only change is to clarify that the TSP figures in the comprehensive plan are also being updated to reflect the amended TSP figures.

Plan Map Changed from: **n/a** to:
Zone Map Changed from: **n/a** to:
Location: **Cedar Brook Way will be N of 99W, east of Elwert** Acres Involved:
Specify Density: Previous: New:
Applicable statewide planning goals:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐

Was an Exception Adopted? ☐ YES ☒ NO
Did DLCD receive a Notice of Proposed Amendment...
35-days prior to first evidentiary hearing? ☒ **Yes** ☐ **No**
If no, do the statewide planning goals apply? ☐ **Yes** ☐ **No**

DLCD File No 003-12 (19417) [17202]

If no, did Emergency Circumstances require immediate adoption? ☐ **Yes** ☐ **No**

DLCD file No. _____

Please list all affected State or Federal Agencies, Local Governments or Special Districts:

ODOT

Local Contact: **Julia Hajduk** Phone: **(503) 625-4204** Extension:

Address: **22560 SW Pine** Fax Number: - -

City: **Sherwood** Zip: **97224-** E-mail Address: **hajdukj@sherwoodoregon.gov**

ADOPTION SUBMITTAL REQUIREMENTS

This Form 2 must be received by DLCD no later than 5 working days after the ordinance has been signed by the public official designated by the jurisdiction to sign the approved ordinance(s)

per ORS 197.615 and OAR Chapter 660, Division 18

1. This Form 2 must be submitted by local jurisdictions only (not by applicant).
2. When submitting the adopted amendment, please print a completed copy of Form 2 on light **green paper if available**.
3. Send this Form 2 and **one complete paper copy** (documents and maps) of the adopted amendment to the address below.
4. Submittal of this Notice of Adoption must include the final signed ordinance(s), all supporting finding(s), exhibit(s) and any other supplementary information (ORS 197.615).
5. Deadline to appeals to LUBA is calculated **twenty-one (21) days** from the receipt (postmark date) by DLCD of the adoption (ORS 197.830 to 197.845).
6. In addition to sending the Form 2 - Notice of Adoption to DLCD, please also remember to notify persons who participated in the local hearing and requested notice of the final decision. (ORS 197.615).
7. Submit **one complete paper copy** via United States Postal Service, Common Carrier or Hand Carried to the DLCD Salem Office and stamped with the incoming date stamp.
8. Please mail the adopted amendment packet to:

ATTENTION: PLAN AMENDMENT SPECIALIST
DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT
635 CAPITOL STREET NE, SUITE 150
SALEM, OREGON 97301-2540

9. **Need More Copies?** Please print forms on **8½ -1/2x11 green paper only if available**. If you have any questions or would like assistance, please contact your DLCD regional representative or contact the DLCD Salem Office at (503) 373-0050 x238 or e-mail **plan.amendments@state.or.us**.

City of Sherwood Oregon

Home of the Tualatin River National Wildlife Refuge

ORDINANCE 2012-012

AN ORDINANCE APPROVING AN AMENDMENT TO THE TRANSPORTATION SYSTEM PLAN AND COMPREHENSIVE PLAN REGARDING THE FUNCTIONAL CLASSIFICATION OF CEDAR BROOK WAY

WHEREAS, The Transportation System Plan (TSP) is a 20 year planning document intended to be updated every 5-7 years; and

WHEREAS, Sherwood's TSP was adopted in 2005; and

WHEREAS, the City intends to begin a comprehensive update to the TSP in the next few years; and

WHEREAS, the City has determined that an amendment is needed prior to the next comprehensive update to the TSP in order to clear up discrepancies in the TSP regarding the functional classification and connectivity of Cedar Brook Way between Elwert Road and Handley Road; and

WHEREAS, the City contracted with DKS Associates to study several alternatives prior to proceeding with proposed amendments; and

WHEREAS, after an open house and input from the Planning Commission, staff proceeded with noticing and processing an amendment to: 1) change the functional classification of Cedar Brook Way from a local to collector status road; 2) clarify that the road will connect to Elwert from Handley; and 3) clarify that there would be one road access to Pacific Highway; and

WHEREAS, the proposed amendments were reviewed for compliance and consistency with the Comprehensive Plan, regional and state regulations and found to be fully compliant; and

WHEREAS, the proposed amendments were subject to full and proper notice and review and public hearings were held before the Planning Commission on August 14, 2012 and September 11, 2012; and

WHEREAS, the Planning Commission voted to forward a recommendation of approval to the City Council for the proposed TSP amendment; and

WHEREAS, the analysis and findings to support the Planning Commission recommendation are identified in the attached Exhibit 1, Staff Report to Planning Commission; and

WHEREAS, the City Council held a public hearing on October 2, 2012 and determined that the proposed amendment to the TSP and Comprehensive Plan met the applicable Comprehensive Plan criteria and continued to be consistent with regional and state standards.

NOW, THEREFORE, THE CITY OF SHERWOOD ORDAINS AS FOLLOWS:

Section 1. Findings. After full and due consideration of the proposed amendment, the Planning Commission recommendation, the record, findings, and evidence presented at the public hearing, the Council adopts the findings of fact contained in Exhibit 1 finding that TSP and Comprehensive Plan shall be amended as documented in Exhibits 1-A, DKS Memo of proposed amendments dated July 10, 2012.

Section 2. Approval. The proposed amendments for TSP and Comprehensive Plan (PA) 12-03 identified in Exhibit 1-A is hereby **APPROVED**.

Section 3 - Manager Authorized. The Planning Department is hereby directed to take such action as may be necessary to document this amendment, including notice of adoption to DLCD.

Section 4 - Effective Date. This ordinance shall become effective the 30th day after its enactment by the City Council and approval by the Mayor.

Duly passed by the City Council this 2nd day of October 2012.

Keith S. Mays, Mayor

Attest:

Sylvia Murphy, CMC, City Recorder

	AYE	NAY
Clark	✓	
Langer	✓	
Butterfield	✓	
Folsom	✓	
Henderson	✓	
Grant	Absent	
Mays	✓	

CITY OF SHERWOOD **Date: August 7, 2012**

Staff Report
PA 12-03 – Cedar Brook Way Transportation System Plan Amendment

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To: SHERWOOD PLANNING COMMISSION

From: PLANNING DEPARTMENT

Julia Hajduk, Planning Manager

Proposal overview: This is a City initiated Transportation System Plan (TSP) and Comprehensive Plan amendment to change the functional classification of Cedar Brook Way from a local to a collector road connecting Elwert to Handley. This amendment also identifies one connection to Pacific Highway along this Cedar Brook Way extension, the ultimate location to be determined. The access location will be no greater than 990 feet from the Sunset and Meinecke intersections. This amendment would modify Figures 8-1, 8-7 and 8-8 of the TSP to reflect this change. Exhibit A is the proposed amended figures and Exhibit B is an analysis from DKS identifying several options for refinement and the impacts on nearby intersections.

I. OVERVIEW

A. Applicant: This is a City initiated text amendment; therefore the applicant is the City of Sherwood.

B. Location: There are small parts of Cedar Brook Way currently constructed northwest of Pacific Highway and ultimately, it would extend from its current location at Handley southwest to connect at Elwert in the vicinity of the Elks Lodge property.

G. Review Type: The proposed text amendment requires a Type V review, which involves public hearings before the Planning Commission and City Council. The Planning Commission will make a recommendation to the City Council who will make the final decision. Any appeal of the City Council decision would go directly to the Oregon Land Use Board of Appeals.

H. Public Notice and Hearing: Notice of the August 14th Planning Commission hearing on the proposed amendment was published in The Times on 8/2/12 and 8/9/12 and in the August edition of the Archer. Notice was also posted in 5 public locations around town and on the web site on 7/24/12. While this is a legislative amendment, courtesy notice was mailed to immediately affected property owners on 7/25/12.

I. Review Criteria:
The required findings for the Plan Amendment are identified in Section 16.80.030 of the Sherwood Zoning and Community Development Code (SZCDC). In addition, the amendment must be consistent with Goals 1, 2 and 12 of the Statewide Planning Goals and Chapter 6 of the Comprehensive Plan.

J. Background:

The TSP was updated in 2005. Since that time, there have been five amendments; four for concept plan areas where changes and a fifth amendment to change the functional classification of Columbia Street (related to Cannery project) from a collector to a local street. The City is planning to begin a comprehensive update of the TSP next year; however the City has determined that several issues need to be addressed sooner to help facilitate development and public infrastructure improvement. Specifically there are conflicts within the TSP related to Cedar Brook Way. It appears the road is designated a local street and the local street connectivity map shows a connection to Elwert; however, the road is identified as a 3 lane road which is generally characteristic of a higher classification road. In addition, the connection to an Arterial (Elwert and Pacific Highway) can only be made by a collector road or higher functional classification, thus creating conflicts between the classification and the connectivity and design for the road. This conflict has created uncertainty for potential developers.

In addition, the City has obtained property at the northwest corner of the Kruger/Elwert intersection to help facilitate the realignment of that intersection. This realignment is identified on the Washington County MSTIP3d list, indicating it will be funded within the next 5 years. It is anticipated that funding for the design and construction of the realignment will be identified in the near future. If that occurs, it would be most efficient and cost effective to identify and provide for a stub connection of Cedar Brook Way off of Elwert at that time. However, as the road is currently identified as a local street, the connection would not be permitted, per County standards.

II. PUBLIC COMMENTS

The City posted notices in five locations around the city and provided courtesy mailed notice to directly related property owners in the vicinity of the road extension. Notice was also published in the Times on August 2nd and 9th and in the August Archer. As of the date of this report, no comments have been provided other than what was provided at the Planning Commission work session held on June 26, 2012 prior to formally initiating the Plan Amendment.

III. AGENCY/DEPARTMENTAL COMMENTS

The City requested comments from affected agencies. All original documents are contained in the planning file and are a part of the official record on this case. The following information briefly summarizes those comments:

- The Department of Land and Conservation and Development (DLCD) provided comments recommending that the City look at its Collector Street standards to ensure that they meet the current needs of the City.

  Staff Response: The City plans on beginning an update to the TSP to fully evaluate the transportation system within the next year. In the meantime, as noted within this report, we believe that the amendment will better meet the needs of the City and the intent of the existing TSP policies. We believe that this amendment addresses a conflict and error in the existing TSP that did not clearly identify the connection as a collector.

- Oregon Department of Transportation provided a letter which is attached as Exhibit C stating that they are generally supportive of local street connectivity and that they have determined this amendment will have no significant impacts to the state highway facilities.

- Sherwood Engineering Department has been a partner in the review and processing of this proposal and therefore has not provided formal additional comments.

Washington County, Metro, Clean Water Services, Tualatin Valley Fire and Rescue (TVF&R), Kinder Morgan. Pride Disposal, Bonneville Power Administration, The Sherwood Building Department, Portland General Electric, Northwest Natural Gas, and Raindrops to Refuge were provided the opportunity to comment on this application but did not provide written or verbal comments.

IV. APPLICABLE DEVELOPMENT CODE CRITERA

16.80.030 – Review Criteria
A. Text Amendment
An amendment to the text of the Comprehensive Plan shall be based upon a need for such an amendment as identified by the Council or the Commission. Such an amendment shall be consistent with the intent of the adopted Sherwood Comprehensive Plan, and with all other provisions of the Plan, the Transportation System Plan and this Code, and with any applicable State or City statutes and regulations, including this Section.

The amendment is needed because the existing TSP is not clear regarding the intended status of Cedar Brook Way. The road is identified as a 3 lane road (figure 8-7) which is typically the dimensions of a neighborhood route or larger; however as a local street, it would not be eligible for SDC and TDT credits. This has led to uncertainty from property owners and potential developers in the area regarding whether the road is eligible for SDC and TDT credits. The amendment to clarify the functional classification of Cedar Brook Way as a collector street is consistent with Chapter 6, Section C, Table 1 by aligning the classification to reflect the actual use of the Street. Table 1 states that:

Collector Streets - Provide both access and circulation within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function and do not require as extensive control of access (compared to arterial). Serve residential neighborhoods, distributing trips from the neighborhood and local street system. Collectors are typically greater than 0.5 to 1.0 miles in length.

Local Streets - Sole function of providing access to immediate adjacent land. Service to "through traffic movement" on local street is deliberately discouraged by design.

As demonstrated in the DKS memo, this road connection will provide for more than local trips because it provides an alternative to 99W and the ability to avoid the Sunset and Meinecke intersections. As envisioned, the road would be about .5 miles in length between Elwert and Handley (Cedar brook Way is already a collector from Handley to Meinecke/99W), consistent with the collector. In addition, the anticipated traffic is within the range of a collector at 2000 vehicles per day.

The amendment is consistent with Chapter 6 of the comprehensive Plan as discussed further in this report under Section V.

The amendment is consistent with the intent of the TSP. As noted earlier, the TSP is not clear regarding the actual intent of Cedar Brook Way but it is clear that the plan was that it would be designed to be larger than a

traditional local street as demonstrated on figure 8-7 and 8-4 (there is no 3 lane local street figure). In addition, the TSP at figure 8-8 shows connections of this road to Elwert, however as a County Arterial, it can only be accessed via a collector level street or higher. Is it clear throughout the TSP that increase connectivity, especially in this area, is desired. The DKS memo demonstrates that traffic operations are improved with the increased connectivity, which can only be accomplished with the collector level road. Alternatively, the TSP could be amended to remove the connections to Elwert and the confirm that the status was a local street; however that negatively impacts the traffic operations and provided limited access options for the properties along the highway that are affected by this road connection.

FINDING: As discussed above, the change is consistent with the intent of the collector road and is consistent with the applicable comprehensive plan goals and policies.

B. Map Amendment
An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

1. **The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.**

2. **There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.**
3. **The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.**
4. **4. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.**

The applicable elements of the above standard are 1 and 3. As discussed in the section below, the proposed amendment is consistent with the comprehensive plan and TSP policy regarding the definition of the functional classification.

Regarding "3", the amendment is timely because it will reduce existing uncertainty which could help the properties develop or re-develop. In addition, the re-alignment of the Kruger/Elwert intersection is anticipated to be funded in the near future at which point it will be necessary to determine definitively whether this will be a collector road connecting to Elwert. If it is not a collector road, according to County standards, a road connection in this vicinity would not be possible which would significantly impact the ability of the properties, especially the property directly east of Elwert, to develop.

FINDING: As discussed above the proposed amendment is consistent with the TSP and comprehensive plan elements.

C. Transportation Planning Rule Consistency
1. Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.

2. "Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan.

3. Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

a. Limiting allowed uses to be consistent with the planned function of the transportation facility.

b. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses.

c. Altering land use designations, densities or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

The analysis by DKS included as Exhibit B demonstrates that the scenario to connect Elwert to Handley via a collector road, which this amendment does, provides the least negative impact to the existing intersections at full build-out. Therefore, this amendment will make the transportation system better than full build-out if the amendment were not approved. Changing the functional classification of Cedar Brook Way to a collector roadway is appropriate based on traffic circulation and function. In addition, as previously noted, while technically this action will amend the TSP, it actually clarifies conflicting elements of the TSP regarding connectivity and design. For all of these reasons noted, this amendment is consistent with the TPR.

The City sent notice of this proposed functional classification modification to the State Department of Land Conservation and Development (DLCD), the Oregon Department of Transportation (ODOT) and Washington County.

FINDING: As noted above, while the proposed amendment would change the transportation system plan, the result would have no negative impact on the transportation system. The amendment would allow a road to be built consistent with its actual intended function.

V. APPLICABLE COMPREHENSIVE PLAN POLICIES

B. GOALS, POLICIES, AND STRATEGIES

Goal 1: Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all neighborhoods and businesses.

Policy 1 – The City will ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within the major land use activities. Existing rights of way shall be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.

Policy 2 – Through traffic shall be provided with routes that do not congest local streets and impact residential areas. Outside traffic destined for Sherwood business and industrial areas shall have convenient and efficient access to commercial and industrial areas without the need to use residential streets.

Policy 3 – Local traffic routes within Sherwood shall be planned to provide convenient circulation between home, school, work, recreation and shopping. Convenient access to major out-of-town routes shall be provided from all areas of the city.

FINDING: The amendment and future extension of Cedar Brook Way will provide for connections to residences and commercial activities within causing congestion on local streets and without requiring additional trips onto the already congested arterial street simply for service within this area. The amendment is consistent with these policies.

Goal 2: Develop a transportation system that is consistent with the City's adopted comprehensive land use plan and with the adopted plans of state, local, and regional jurisdictions.

Policy 5 – The City shall adopt a street classification system that is compatible with Washington County Functional Classification System for areas inside the Washington County

FINDING: The amendment is not inconsistent with the County TSP and would result in a transportation system (in regards to connectivity) that is more consistent with the existing TSP by ensuring that a connection to Elwert road, a County arterial, is possible.

Goal 3: Establish a clear and objective set of transportation design and development regulations that addresses all elements of the city transportation system and that promote access to and utilization of a multi-modal transportation system.

Policy 1 – The City of Sherwood shall adopt requirements for land development that mitigate the adverse traffic impacts and ensure all new development contributes a fair share toward on-site and off-site transportation system improvement remedies.

Policy 2 – The City of Sherwood shall require dedication of land for future streets when development is approved. The property developer shall be required to make full street improvements for their portion of the street commensurate with the proportional benefit that the improvement provides the development.

Policy 4 – The City of Sherwood shall adopt a uniform set of design guidelines that provide one or more typical cross section associated with each functional street classification. For example, the City may allow for a standard roadway cross-section and a boulevard cross section for arterial and collector streets.

Policy 5 – The City shall adopt roadway design guidelines and standards that ensure sufficient right-of-way is provided for necessary roadway, bikeway, and pedestrian improvements.

FINDING: The City has already implemented these policies and the amendment does not change this. The amendment does remove conflicts within the existing TSP regarding lane numbers, connectivity and classification which ensures that the City can better implement these policies when development is proposed.

VI. APPLICABLE STATEWIDE PLANNING GOALS

Goal 1 (Citizen Involvement)

FINDING: Staff utilized the public notice requirements of the Code to notify the public of this proposed plan amendment. The City's public notice requirements have been found to comply with Goal 1 and, therefore, this proposal meets Goal 1. In addition, the City hosted an open house prior to beginning the formal plan amendment process to get input and feedback on potential amendments and held a work session with the Planning Commission on June 26, 2012 for further discussion. At the work session, the Planning Commission allowed the public to speak on the potential amendments prior to providing staff with feedback on proceeding with the public notice for the amendment.

Goal 2 (Land Use Planning)

FINDING: The proposed amendment, as demonstrated in this report is processed in compliance with the local, regional and state requirements.

Goal 3 (Agricultural Lands)
Goal 4 (Forest Lands)
Goal 5 (Natural Resources, Scenic and Historic Areas and Open Spaces)
Goal 6 (Air, Water and Land Resources Quality)
Goal 7 (Areas Subject to Natural Hazards)
Goal 8 (Recreational Needs)
Goal 9 (Economic Development)
Goal 10 (Housing)
Goal 11 (Public Facilities and Services)

FINDING: The Statewide Planning Goals 3-11 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

Goal 12 (Transportation)

FINDING: As discussed earlier in this report, the proposed amendment is consistent with the "Transportation Planning Rule" which implements Goal 12.

Goal 13 (Energy Conservation)
Goal 14 (Urbanization)
Goal 15 (Willamette River Greenway)
Goal 16 (Estuarine Resources)
Goal 17 (Coastal Shorelands)
Goal 18 (Beaches and Dunes)
Goal 19 (Ocean Resources)

FINDING: The Statewide Planning Goals 13-19 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

VII. RECOMMENDATION

Based on a review of the applicable code provisions, agency comments and staff review, staff finds that the Plan Amendment is consistent with the applicable criteria and therefore, staff **recommends that the Planning Commission forward a recommendation of APPROVAL** of PA 12-03 – Cedar Brook Way TSP amendment, Handley to Elwert Road.

VIII. EXHIBITS

A. Proposed amendments identified in July 10, 2012 DKS memo
B. Memo from DKS dated June 28, 2012
C. ODOT letter dated August 6, 2012

End of Report

Exhibit A

DKS
720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM (DRAFT)

DATE: July 10, 2012

TO: Bob Galati, City of Sherwood

FROM: Carl Springer, PE; John Bosket, PE; Garth Appanaitis

SUBJECT: Sherwood Transportation System Plan Clarifications for Elwert Road Connection P#12051-000

The purpose of this memorandum is to summarize the modifications to the City of Sherwood Transportation System Plan (TSP) needed to clarify the future street network north of Highway 99W between Elwert Road and Cedar Brook Way. Recent documentation[1] summarized the analysis of several connectivity concepts for the area. The following TSP clarifications are proposed as a result of this analysis and feedback received from agency staff and the public[2].

The following modifications would be needed to figures in Chapter 8 to address the proposed clarifications:

- Figure 8-1: Functional Class Map
  - *Extension of collector road from Cedar Brook Way to Elwert Road with intermediate connection to Highway 99W.*
  - *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

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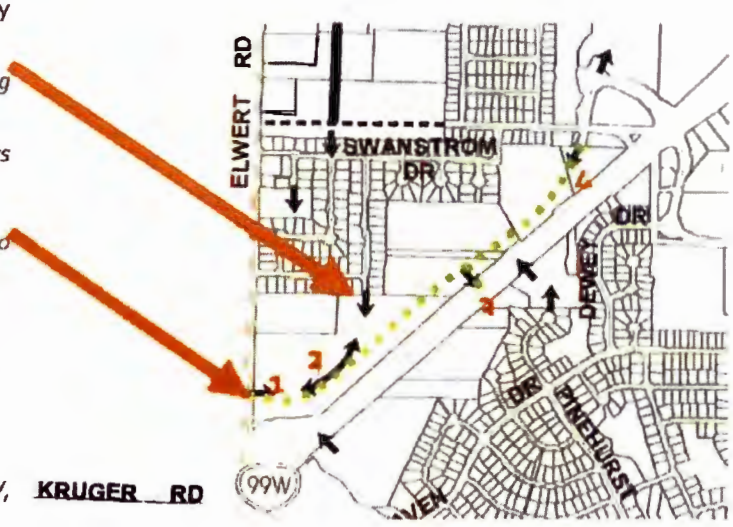
[1] Memorandum: Sherwood TSP Connectivity Refinement – Elwert Road to Cedar Brook Way, prepared by DKS Associates, June 28, 2012.
[2] Open House: Thursday May 31, 2012, 5:00-6:00 PM at Sherwood Police Facility Community Room.

DKS

Figure 8-7: Streets Where ROW is Planned for More Than Two Lanes

- *Modify the designation of the new facility as a 2-lane facility.*
- *Indicate the new intersection with Elwert Road would be an arterial-collector intersection and may include widening for turn pockets within 500 feet of the intersection.*
- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

- Figure 8-8: Local Street Connectivity
  - *Retain arrow showing local street connection to Bushong Terrace*
  - *Replace (overlay) four arrows on map indicating the local street connections with the proposed collector. Arrows to replace include:*
    1) *connection to Elwert Road,*
    2) *swooping connection from Elwert Road to Bushong Terrace*
    3) *connection to Hwy 99W, and*
    4) *Connection to Cedar Brook Way.*



DKS

- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

Council Meeting Date: October 2, 2012
Agenda Item: Public Hearing

TO: Sherwood City Council
FROM: Julia Hajduk, Planning Manager
Through: Joseph Gall, City Manager
Subject: PA 12-03 Cedar Brook Way TSP Amendment

EXECUTIVE SUMMARY

Summary: This is a City initiated Transportation System Plan (TSP) and Comprehensive Plan amendment to change the functional classification of Cedar Brook Way from a local to a collector road connecting Elwert to Handley. This amendment also identifies one connection to Pacific Highway along this Cedar Brook Way extension, the ultimate location to be determined. This amendment would modify Figures 8-1, 8-7 and 8-8 of the TSP to reflect this change. The Planning Commission has held two public hearings and forwarded a recommendation of approval; the findings and analysis that the recommendation for approval was based on are included in Exhibit 1. Exhibit 1-A is the proposed amended figures and Exhibit 1-B is an analysis from DKS identifying several options for refinement and the impacts on nearby intersections.

Previous Council Action: Work Session – September 18, 2012

Background/Problem Discussion: The TSP was updated in 2005. Since that time, there have been five amendments; four for concept plan areas where changes and a fifth amendment to change the functional classification of Columbia Street (related to Cannery project) from a collector to a local street. The City is planning to begin a comprehensive update of the TSP next year; however the City has determined that several issues need to be addressed sooner to help facilitate development and public infrastructure improvement. Specifically there are conflicts within the TSP related to Cedar Brook Way. It appears the road is designated a local street and the local street connectivity map shows a connection to Elwert; however, the road is identified as a 3 lane road which is generally characteristic of a higher classification road. In addition, the connection to an Arterial (Elwert and Pacific Highway) can only be made by a collector road or higher functional classification, thus creating conflicts between the classification and the connectivity and design for the road. This conflict has created uncertainty for potential developers.

In addition, the City has obtained property at the northwest corner of the Kruger/Elwert intersection to help facilitate the realignment of that intersection. This realignment is identified on the Washington County MSTIP3d list, indicating it will be funded within the next 5 years. It is anticipated that funding for the design and construction of the realignment will be identified in the near future. If that occurs, it would be most efficient and cost effective to identify and provide for a stub connection of Cedar Brook Way off of Elwert at that time. However, as the road is currently identified as a local street, the connection would not be permitted, per County standards.

Alternatives: Approve, approve with modifications or deny the Planning Commission recommendation.

Financial Implications: There will be a minimal cost associated with making the Code updates available online and providing informational materials to the public.

Recommendation: Staff recommends that the City Council hold a public hearing and determine whether to adopt the attached Ordinance approving the Planning Commission recommendation.

Attachments:

Ordinance
Exhibit 1: Staff report to the Planning Commission dated August 7, 2012
1-A. Proposed amendments identified in July 10, 2012 DKS memo
1-B. Memo from DKS dated June 28, 2012
1-C. ODOT letter dated August 6, 2012

1-D. DLCD e-mail dated August 2, 2012
1-E. Letter from the Sherwood Elks Lodge dated August 5, 2012
1-F. Testimony submitted by Jim Claus at August 14, 2012 PC meeting
1-G. Testimony submitted by Jim Claus at August 14, 2012 PC meeting
1-H. E-mail from Jim Claus dated September 4, 2012
1-I. Testimony entered into record at September 11, 2012 PC meeting
1-J. Testimony entered into record at September 11, 2012 PC meeting
1-K. September 4, 2012 memo from Staff to the Planning Commission

City of Sherwood Oregon
Home of the Tualatin River National Wildlife Refuge

ORDINANCE 2012-012

AN ORDINANCE APPROVING AN AMENDMENT TO THE TRANSPORTATION SYSTEM PLAN AND COMPREHENSIVE PLAN REGARDING THE FUNCTIONAL CLASSIFICATION OF CEDAR BROOK WAY

WHEREAS, The Transportation System Plan (TSP) is a 20 year planning document intended to be updated every 5-7 years; and

WHEREAS, Sherwood's TSP was adopted in 2005; and

WHEREAS, the City intends to begin a comprehensive update to the TSP in the next few years; and

WHEREAS, the City has determined that an amendment is needed prior to the next comprehensive update to the TSP in order to clear up discrepancies in the TSP regarding the functional classification and connectivity of Cedar Brook Way between Elwert Road and Handley Road; and

WHEREAS, the City contracted with DKS Associates to study several alternatives prior to proceeding with proposed amendments; and

WHEREAS, after an Open House and input from the Planning Commission, staff proceeded with noticing and processing an amendment to: 1) change the functional classification of Cedar Brook Way from a local to collector status road; 2) clarify that the road will connect to Elwert from Handley; and 3) clarify that there would be one road access to Pacific Highway; and

WHEREAS, the proposed amendments were reviewed for compliance and consistency with the Comprehensive Plan, regional and state regulations and found to be fully compliant; and

WHEREAS, the proposed amendments were subject to full and proper notice and review and public hearings were held before the Planning Commission on August 14, 2012 and September 11, 2012; and

WHEREAS, the Planning Commission voted to forward a recommendation of approval to the City Council for the proposed TSP amendment; and

WHEREAS, the analysis and findings to support the Planning Commission recommendation are identified in the attached Exhibit 1, Staff Report to Planning Commission; and

WHEREAS, the City Council held a public hearing on October 2, 2012 and determined that the proposed amendment to the TSP and Comprehensive Plan met the applicable Comprehensive Plan criteria and continued to be consistent with regional and state standards.

NOW, THEREFORE, THE CITY OF SHERWOOD ORDAINS AS FOLLOWS:

Section 1. Findings. After full and due consideration of the proposed amendment, the Planning Commission recommendation, the record, findings, and evidence presented at the public hearing, the Council adopts the findings of fact contained Exhibit 1 finding that TSP and Comprehensive Plan shall be amended as documented in Exhibits 1-A, DKS Memo of proposed amendments dated July 10, 2012.

Section 2. Approval. The proposed amendments for TSP and Comprehensive Plan (PA) 12-03 identified in Exhibit 1-A is hereby **APPROVED**.

Section 3 - Manager Authorized. The Planning Department is hereby directed to take such action as may be necessary to document this amendment, including notice of adoption to DLCD.

Section 4 - Effective Date. This ordinance shall become effective the 30th day after its enactment by the City Council and approval by the Mayor.

Duly passed by the City Council this 2nd day of October 2012.

_____
Keith S. Mays, Mayor

Attest:

_____
Sylvia Murphy, CMC, City Recorder

	AYE	NAY
Clark	____	____
Langer	____	____
Butterfield	____	____
Folsom	____	____
Henderson	____	____
Grant	____	____
Mays	____	____

CITY OF SHERWOOD **Date: August 7, 2012**

Staff Report
PA 12-03 – Cedar Brook Way Transportation System Plan Amendment

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To: SHERWOOD PLANNING COMMISSION

From: PLANNING DEPARTMENT

Julia Hajduk, Planning Manager

Proposal overview: This is a City initiated Transportation System Plan (TSP) and Comprehensive Plan amendment to change the functional classification of Cedar Brook Way from a local to a collector road connecting Elwert to Handley. This amendment also identifies one connection to Pacific Highway along this Cedar Brook Way extension, the ultimate location to be determined. The access location will be no greater than 990 feet from the Sunset and Meinecke intersections. This amendment would modify Figures 8-1, 8-7 and 8-8 of the TSP to reflect this change. Exhibit A is the proposed amended figures and Exhibit B is an analysis from DKS identifying several options for refinement and the impacts on nearby intersections.

I. OVERVIEW

A. Applicant: This is a City initiated text amendment; therefore the applicant is the City of Sherwood.

B. Location: There are small parts of Cedar Brook Way currently constructed northwest of Pacific Highway and ultimately, it would extend from its current location at Handley southwest to connect at Elwert in the vicinity of the Elks Lodge property.

G. Review Type: The proposed text amendment requires a Type V review, which involves public hearings before the Planning Commission and City Council. The Planning Commission will make a recommendation to the City Council who will make the final decision. Any appeal of the City Council decision would go directly to the Oregon Land Use Board of Appeals.

H. Public Notice and Hearing: Notice of the August 14th Planning Commission hearing on the proposed amendment was published in The Times on 8/2/12 and 8/9/12 and in the August edition of the Archer. Notice was also posted in 5 public locations around town and on the web site on 7/24/12. While this is a legislative amendment, courtesy notice was mailed to immediately affected property owners on 7/25/12.

I. Review Criteria:
The required findings for the Plan Amendment are identified in Section 16.80.030 of the Sherwood Zoning and Community Development Code (SZCDC). In addition, the amendment must be consistent with Goals 1, 2 and 12 of the Statewide Planning Goals and Chapter 6 of the Comprehensive Plan.

J. Background:

The TSP was updated in 2005. Since that time, there have been five amendments; four for concept plan areas where changes and a fifth amendment to change the functional classification of Columbia Street (related to Cannery project) from a collector to a local street. The City is planning to begin a comprehensive update of the TSP next year; however the City has determined that several issues need to be addressed sooner to help facilitate development and public infrastructure improvement. Specifically there are conflicts within the TSP related to Cedar Brook Way. It appears the road is designated a local street and the local street connectivity map shows a connection to Elwert; however, the road is identified as a 3 lane road which is generally characteristic of a higher classification road. In addition, the connection to an Arterial (Elwert and Pacific Highway) can only be made by a collector road or higher functional classification, thus creating conflicts between the classification and the connectivity and design for the road. This conflict has created uncertainty for potential developers.

In addition, the City has obtained property at the northwest corner of the Kruger/Elwert intersection to help facilitate the realignment of that intersection. This realignment is identified on the Washington County MSTIP3d list, indicating it will be funded within the next 5 years. It is anticipated that funding for the design and construction of the realignment will be identified in the near future. If that occurs, it would be most efficient and cost effective to identify and provide for a stub connection of Cedar Brook Way off of Elwert at that time. However, as the road is currently identified as a local street, the connection would not be permitted, per County standards.

II. PUBLIC COMMENTS

The City posted notices in five locations around the city and provided courtesy mailed notice to directly related property owners in the vicinity of the road extension. Notice was also published in the Times on August 2nd and 9th and in the August Archer. As of the date of this report, no comments have been provided other than what was provided at the Planning Commission work session held on June 26, 2012 prior to formally initiating the Plan Amendment.

III. AGENCY/DEPARTMENTAL COMMENTS

The City requested comments from affected agencies. All original documents are contained in the planning file and are a part of the official record on this case. The following information briefly summarizes those comments:

- The Department of Land Conservation and Development (DLCD) provided comments recommending that the City look at its Collector Street standards to ensure that they meet the current needs of the City.

  Staff Response: The City plans on beginning an update to the TSP to fully evaluate the transportation system within the next year. In the meantime, as noted within this report, we believe that the amendment will better meet the needs of the City and the intent of the existing TSP policies. We believe that this amendment addresses a conflict and error in the existing TSP that did not clearly identify the connection as a collector.

- Oregon Department of Transportation provided a letter which is attached as Exhibit C stating that they are generally supportive of local street connectivity and that they have determined this amendment will have no significant impacts to the state highway facilities.

- Sherwood Engineering Department has been a partner in the review and processing of this proposal and therefore has not provided formal additional comments.

Washington County, Metro, Clean Water Services, Tualatin Valley Fire and Rescue (TVF&R), Kinder Morgan. Pride Disposal, Bonneville Power Administration, The Sherwood Building Department, Portland General Electric, Northwest Natural Gas, and Raindrops to Refuge were provided the opportunity to comment on this application but did not provide written or verbal comments.

IV. APPLICABLE DEVELOPMENT CODE CRITERA

16.80.030 – Review Criteria
A. Text Amendment
An amendment to the text of the Comprehensive Plan shall be based upon a need for such an amendment as identified by the Council or the Commission. Such an amendment shall be consistent with the intent of the adopted Sherwood Comprehensive Plan, and with all other provisions of the Plan, the Transportation System Plan and this Code, and with any applicable State or City statutes and regulations, including this Section.

The amendment is needed because the existing TSP is not clear regarding the intended status of Cedar Brook Way. The road is identified as a 3 lane road (figure 8-7) which is typically the dimensions of a neighborhood route or larger; however as a local street, it would not be eligible for SDC and TDT credits. This has led to uncertainty from property owners and potential developers in the area regarding whether the road is eligible for SDC and TDT credits. The amendment to clarify the functional classification of Cedar Brook Way as a collector street is consistent with Chapter 6, Section C, Table 1 by aligning the classification to reflect the actual use of the Street. Table 1 states that:

Collector Streets - Provide both access and circulation within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function and do not require as extensive control of access (compared to arterial). Serve residential neighborhoods, distributing trips from the neighborhood and local street system. Collectors are typically greater than 0.5 to 1.0 miles in length.

Local Streets - Sole function of providing access to immediate adjacent land. Service to "through traffic movement" on local street is deliberately discouraged by design.

As demonstrated in the DKS memo, this road connection will provide for more than local trips because it provides an alternative to 99W and the ability to avoid the Sunset and Meinecke intersections. As envisioned, the road would be about .5 miles in length between Elwert and Handley (Cedar brook Way is already a collector from Handley to Meinecke/99W), consistent with the collector. In addition, the anticipated traffic is within the range of a collector at 2000 vehicles per day.

The amendment is consistent with Chapter 6 of the comprehensive Plan as discussed further in this report under Section V.

The amendment is consistent with the intent of the TSP. As noted earlier, the TSP is not clear regarding the actual intent of Cedar Brook Way but it is clear that the plan was that it would be designed to be larger than a

traditional local street as demonstrated on figure 8-7 and 8-4 (there is no 3 lane local street figure). In addition, the TSP at figure 8-8 shows connections of this road to Elwert, however as a County Arterial, it can only be accessed via a collector level street or higher. Is it clear throughout the TSP that increase connectivity, especially in this area, is desired. The DKS memo demonstrates that traffic operations are improved with the increased connectivity, which can only be accomplished with the collector level road. Alternatively, the TSP could be amended to remove the connections to Elwert and the confirm that the status was a local street; however that negatively impacts the traffic operations and provided limited access options for the properties along the highway that are affected by this road connection.

FINDING: As discussed above, the change is consistent with the intent of the collector road and is consistent with the applicable comprehensive plan goals and policies.

B. Map Amendment

An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

1. **The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.**

2. **There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.**
3. **The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.**
4. **4. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.**

The applicable elements of the above standard are 1 and 3. As discussed in the section below, the proposed amendment is consistent with the comprehensive plan and TSP policy regarding the definition of the functional classification.

Regarding "3", the amendment is timely because it will reduce existing uncertainty which could help the properties develop or re-develop. In addition, the re-alignment of the Kruger/Elwert intersection is anticipated to be funded in the near future at which point it will be necessary to determine definitively whether this will be a collector road connecting to Elwert. If it is not a collector road, according to County standards, a road connection in this vicinity would not be possible which would significantly impact the ability of the properties, especially the property directly east of Elwert, to develop.

FINDING: As discussed above the proposed amendment is consistent with the TSP and comprehensive plan elements.

C. Transportation Planning Rule Consistency

1. Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.

2. "Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan.

3. Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

a. Limiting allowed uses to be consistent with the planned function of the transportation facility.

b. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses.

c. Altering land use designations, densities or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

The analysis by DKS included as Exhibit B demonstrates that the scenario to connect Elwert to Handley via a collector road, which this amendment does, provides the least negative impact to the existing intersections at full build-out. Therefore, this amendment will make the transportation system better than full build-out if the amendment were not approved. Changing the functional classification of Cedar Brook Way to a collector roadway is appropriate based on traffic circulation and function. In addition, as previously noted, while technically this action will amend the TSP, it actually clarifies conflicting elements of the TSP regarding connectivity and design. For all of these reasons noted, this amendment is consistent with the TPR.

The City sent notice of this proposed functional classification modification to the State Department of Land Conservation and Development (DLCD), the Oregon Department of Transportation (ODOT) and Washington County.

FINDING: As noted above, while the proposed amendment would change the transportation system plan, the result would have no negative impact on the transportation system. The amendment would allow a road to be built consistent with its actual intended function.

V. APPLICABLE COMPREHENSIVE PLAN POLICIES

B. GOALS, POLICIES, AND STRATEGIES

Goal 1: Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all neighborhoods and businesses.

Policy 1 – The City will ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within the major land use activities. Existing rights of way shall be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.

Policy 2 – Through traffic shall be provided with routes that do not congest local streets and impact residential areas. Outside traffic destined for Sherwood business and industrial areas shall have convenient and efficient access to commercial and industrial areas without the need to use residential streets.

Policy 3 – Local traffic routes within Sherwood shall be planned to provide convenient circulation between home, school, work, recreation and shopping. Convenient access to major out-of-town routes shall be provided from all areas of the city.

FINDING: The amendment and future extension of Cedar Brook Way will provide for connections to residences and commercial activities within causing congestion on local streets and without requiring additional trips onto the already congested arterial street simply for service within this area. The amendment is consistent with these policies.

Goal 2: Develop a transportation system that is consistent with the City's adopted comprehensive land use plan and with the adopted plans of state, local, and regional jurisdictions.

Policy 5 – The City shall adopt a street classification system that is compatible with Washington County Functional Classification System for areas inside the Washington County

FINDING: The amendment is not inconsistent with the County TSP and would result in a transportation system (in regards to connectivity) that is more consistent with the existing TSP by ensuring that a connection to Elwert road, a County arterial, is possible.

Goal 3: Establish a clear and objective set of transportation design and development regulations that addresses all elements of the city transportation system and that promote access to and utilization of a multi-modal transportation system.

Policy 1 – The City of Sherwood shall adopt requirements for land development that mitigate the adverse traffic impacts and ensure all new development contributes a fair share toward on-site and off-site transportation system improvement remedies.

Policy 2 – The City of Sherwood shall require dedication of land for future streets when development is approved. The property developer shall be required to make full street improvements for their portion of the street commensurate with the proportional benefit that the improvement provides the development.

Policy 4 – The City of Sherwood shall adopt a uniform set of design guidelines that provide one or more typical cross section associated with each functional street classification. For example, the City may allow for a standard roadway cross-section and a boulevard cross section for arterial and collector streets.

Policy 5 – The City shall adopt roadway design guidelines and standards that ensure sufficient right-of-way is provided for necessary roadway, bikeway, and pedestrian improvements.

FINDING: The City has already implemented these policies and the amendment does not change this. The amendment does remove conflicts within the existing TSP regarding lane numbers, connectivity and classification which ensures that the City can better implement these policies when development is proposed.

VI. APPLICABLE STATEWIDE PLANNING GOALS

Goal 1 (Citizen Involvement)

FINDING: Staff utilized the public notice requirements of the Code to notify the public of this proposed plan amendment. The City's public notice requirements have been found to comply with Goal 1 and, therefore, this proposal meets Goal 1. In addition, the City hosted an open house prior to beginning the formal plan amendment process to get input and feedback on potential amendments and held a work session with the Planning Commission on June 26, 2012 for further discussion. At the work session, the Planning Commission allowed the public to speak on the potential amendments prior to providing staff with feedback on proceeding with the public notice for the amendment.

Goal 2 (Land Use Planning)

FINDING: The proposed amendment, as demonstrated in this report is processed in compliance with the local, regional and state requirements.

Goal 3 (Agricultural Lands)
Goal 4 (Forest Lands)
Goal 5 (Natural Resources, Scenic and Historic Areas and Open Spaces)
Goal 6 (Air, Water and Land Resources Quality)
Goal 7 (Areas Subject to Natural Hazards)
Goal 8 (Recreational Needs)
Goal 9 (Economic Development)
Goal 10 (Housing)
Goal 11 (Public Facilities and Services)

FINDING: The Statewide Planning Goals 3-11 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

Goal 12 (Transportation)

FINDING: As discussed earlier in this report, the proposed amendment is consistent with the "Transportation Planning Rule" which implements Goal 12.

Goal 13 (Energy Conservation)
Goal 14 (Urbanization)
Goal 15 (Willamette River Greenway)
Goal 16 (Estuarine Resources)
Goal 17 (Coastal Shorelands)
Goal 18 (Beaches and Dunes)
Goal 19 (Ocean Resources)

FINDING: The Statewide Planning Goals 13-19 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

VII. RECOMMENDATION

Based on a review of the applicable code provisions, agency comments and staff review, staff finds that the Plan Amendment is consistent with the applicable criteria and therefore, staff **recommends that the Planning Commission forward a recommendation of APPROVAL** of PA 12-03 – Cedar Brook Way TSP amendment, Handley to Elwert Road.

VIII. EXHIBITS

A. Proposed amendments identified in July 10, 2012 DKS memo
B. Memo from DKS dated June 28, 2012
C. ODOT letter dated August 6, 2012

End of Report

Exhibit A

DKS
720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM (DRAFT)

DATE: July 10, 2012

TO: Bob Galati, City of Sherwood

FROM: Carl Springer, PE; John Bosket, PE; Garth Appanaitis

SUBJECT: Sherwood Transportation System Plan Clarifications for Elwert Road Connection P#12051-000

The purpose of this memorandum is to summarize the modifications to the City of Sherwood Transportation System Plan (TSP) needed to clarify the future street network north of Highway 99W between Elwert Road and Cedar Brook Way. Recent documentation[1] summarized the analysis of several connectivity concepts for the area. The following TSP clarifications are proposed as a result of this analysis and feedback received from agency staff and the public[2].

The following modifications would be needed to figures in Chapter 8 to address the proposed clarifications:

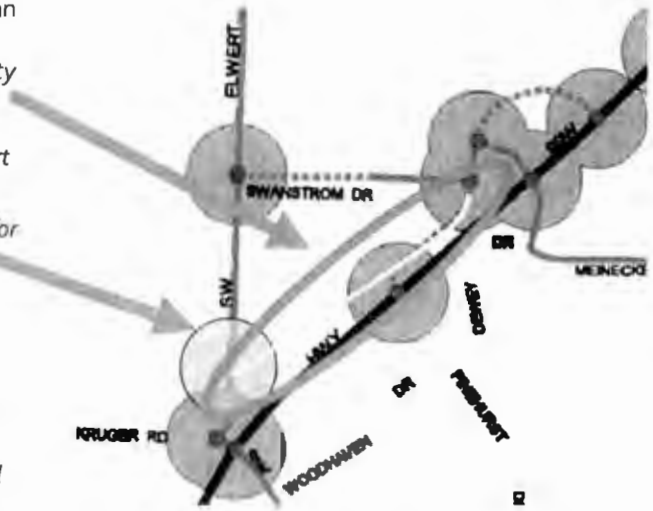
- Figure 8-1: Functional Class Map
  - *Extension of collector road from Cedar Brook Way to Elwert Road with intermediate connection to Highway 99W.*
  - *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

---

[1] Memorandum: Sherwood TSP Connectivity Refinement – Elwert Road to Cedar Brook Way, prepared by DKS Associates, June 28, 2012.
[2] Open House: Thursday May 31, 2012, 5:00-6:00 PM at Sherwood Police Facility Community Room.

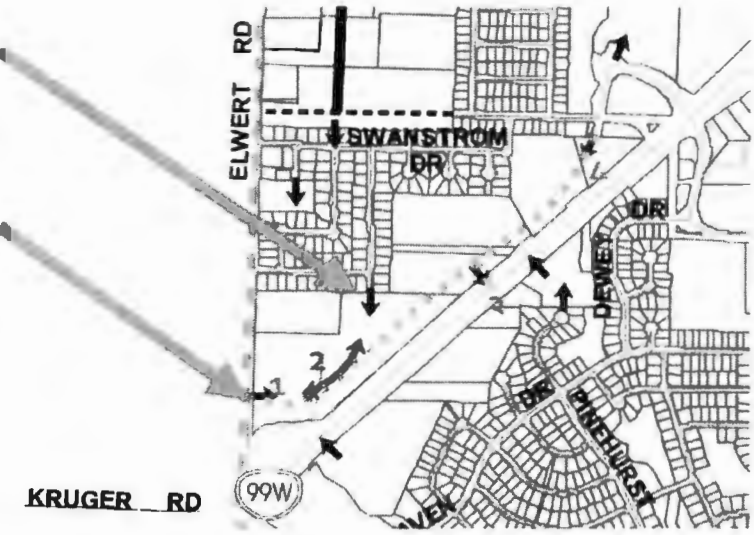
DKS

Figure 8-7: Streets Where ROW is Planned for More Than Two Lanes



- *Modify the designation of the new facility as a 2-lane facility.*
- *Indicate the new intersection with Elwert Road would be an arterial-collector intersection and may include widening for turn pockets within 500 feet of the intersection.*
- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

- Figure 8-8: Local Street Connectivity
  - *Retain arrow showing local street connection to Bushong Terrace*
  - *Replace (overlay) four arrows on map indicating the local street connections with the proposed collector. Arrows to replace include:*
    1) *connection to Elwert Road,*
    2) *swooping connection from Elwert Road to Bushong Terrace*
    3) *connection to Hwy 99W, and*
    4) *Connection to Cedar Brook Way.*



DKS

- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

Exhibit B

DKS
720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM

REGISTERED PROFESSIONAL ENGINEER
54802PE
OREGON
Jan. 23, 2001
JOHN A. BOSKET
EXPIRES: 12/31/2013

DATE: June 28, 2012

TO: Bob Galati, PE - City of Sherwood

FROM: Garth Appanatis
John Bosket, PE
Brad Coy, PE

SUBJECT: **Sherwood TSP Connectivity Refinement - Elwert Road to Cedar Brook Way** P12051-000-000

This memorandum documents the analysis of various street connectivity options for the City of Sherwood in the area on the northwest side of Highway 99W between Elwert Road and Cedar Brook Way. The primary purpose of this effort is to develop connectivity options that are consistent with both the City of Sherwood Transportation System Plan (TSP)[1] and the planned safety improvements at the intersection of Elwert Road and Kruger Road (which include relocating the intersection further north away from Highway 99W and considering a roundabout).

The sections of this memorandum document the background, study area, existing traffic conditions, and an evaluation of connectivity options and street capacity during the 2035 weekday p.m. peak hour. A summary of the findings is provided at the end of the memorandum.

Background

Alignments of future local and collector streets needed to serve developing areas on the northwest side of Highway 99W between Elwert Road and Cedar Brook Way have not yet been identified. However, the City of Sherwood TSP (Figure 8-8) identifies the priority "conceptual street connection[s]" for the local (intracity) transportation system. Figure 1, an excerpt of the TSP figure, shows future street connections at Elwert Road and Bushong Terrace, as well as a connection to the north side of Highway 99W between Elwert

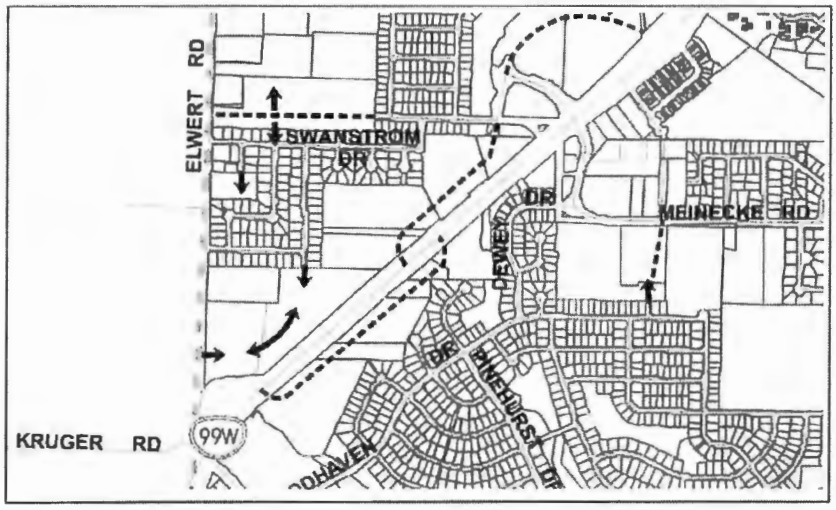


Figure 1: Local Street Connectivity (Enlargement of Sherwood TSP Figure 8-8)

[1] City of Sherwood Transportation System Plan, prepared by DKS Associates, March 2004.

Road and Cedar Brook Way. As noted in the TSP, "specific alignments and design will be better determined upon development review."

The objective of this study is to analyze the ability of various roadway connectivity options to adequately serve existing and future development in the area. Identifying the needed roadway system now will provide the basis for a detailed connectivity plan that future development proposals can follow and incorporate into site plans. This study will not identify a final roadway alignment or design. Future efforts to develop a more detailed plan will require further assessment of area constraints and input from affected property owners.

Creating a new connection to Elwert Road will be an important element of a connectivity plan for this area. However, Washington County classifies Elwert Road as an arterial and requires that only collectors or other arterials have access to arterial roadways.[2] For this reason, the future connection indicated in the City of Sherwood TSP as a local street would need to be a collector roadway. This analysis is an opportunity to clarify the TSP and explore area connectivity of the potential collector road.

Additionally, the Elwert Road/Kruger Road intersection and the proximity to Highway 99W has been identified as an existing safety concern. Exploration of potential safety improvements for this location includes the relocation of the intersection further to the north and consideration of roundabout control. Additional analysis of the system connectivity and local access needs with a realigned intersection would be helpful in pursuit of funding for this project.

Study Area

Figure 2 shows the project study area, which includes five existing study intersections and one potential future study intersection:

- Highway 99W/Elwert Road-Sunset Boulevard
- Elwert Road/Kruger Road
- Elwert Road/Handley Street
- Handley Street/Cedar Brook Way
- Highway 99W/Meinecke Road
- Highway 99W/Potential Future Intersection

Connectivity options being considered for the local/collector street network are limited to the northwest side of Highway 99W between Elwert Road and Cedar Brook Way.

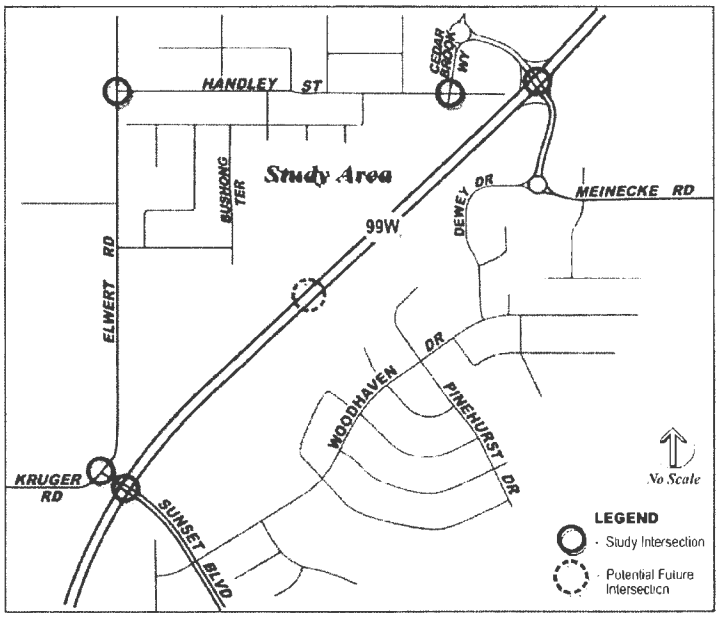


Figure 2: Study Area

[2] Article V: Public Facility and Service Requirements; Section 501-8.5 (Access to County and Public Roads), Washington County, printed 11/24/05.

DKS

Existing Conditions (2012)

This section describes existing opportunities and constraints related to traffic connectivity in the study area, including documentation of the roadway network characteristics, access conditions, and traffic operations during the weekday p.m. peak hour.

Study Area Roadway Network

Table 1 lists various characteristics of key study area roadways, indicating each roadway's capacity for serving auto, pedestrian, and bicycle trips.

Table 1: Existing Study Area Roadway Characteristics

Roadway	Travel Lanes	Speed Limit	On-Street Parking	Side-walks	Bike Lanes
Highway 99W	4-5 Lanes (Divided)	45 mph	No	No	Shoulders
Elwert Road	2 Lanes	35 mph	No	No	No
Kruger Road	2 Lanes	25 mph	No	No	No
Handley Street	2 Lanes	25 mph	Yes	Yes	No
Bushong Terrace	2 Lanes	25 mph	Yes	Yes	No
Cedar Brook Way	2 Lanes	25 mph	No	Yes	Yes
Meinecke Road	2-3 Lanes (Divided)	25 mph	No	Yes	Yes

Table 2 lists the functional classifications of study area roadways. Highway 99W and Elwert Road are classified as arterials because the efficient movement of traffic is a priority over the provision of direct access to neighboring areas. Handley Street and Meinecke Road are collectors. On these streets the need for efficient movement of traffic is more balanced with the need for access. Local streets, such as Kruger Road, Cedar Brook Way, and Bushong Terrace, are intended to be low-speed roadways where safe and convenient access to properties is a priority.

Table 2: Functional Classifications and Jurisdictions of Study Area Roadways

Roadway	Functional Classification (by Jurisdiction)[a]			
	City of Sherwood	*ODOT*	*Metro*	*Washington Co.*
Highway 99W	Principal Arterial	**Statewide, NHS[b], Freight Route**	Principal Arterial (Highway)	Principal Arterial
Elwert Road	Arterial	-	Minor Arterial	**Arterial**
Kruger Road	-	-	-	**Local**
Handley Street	**Collector**	-	-	Collector
Bushong Terrace	**Local**	-	-	-
Cedar Brook Way	**Local[c]**	-	-	Local
Meinecke Road	**Collector**	-	-	Collector

[a] Not all jurisdictions have functional classifications for every study area road, as indicated by the "-" in the table.
[b] NHS = National Highway System
[c] There may be some inconsistency with the functional classification referenced for Cedar Brook Way in the City TSP.
Shaded Box indicates roadway jurisdiction.

Access

As previously described, the functional classification of a street describes how it should be managed and operated with respect to mobility and access. Therefore, the functional classifications of area roadways and each jurisdiction's associated policies and standards will impact the development of connectivity options for the study area. The City of Sherwood, Washington County, and ODOT all have access spacing standards for roadways under their jurisdiction that indicate the desired separation between street and driveway intersections.

City of Sherwood

Table 3 shows the access spacing standards for roadways under City of Sherwood jurisdiction.[3] As noted in Table 2, the City only maintains jurisdiction over collector and local streets within the study area. On collector streets, intersections should be spaced at least 100 feet apart. There is no access spacing standard for local streets.

Table 3: City of Sherwood Access Spacing Standards

Street Facility	Spacing of Roadways and Driveways[a]	
	Maximum	*Minimum*
Arterial	1,000 feet	600 feet
Collector	400 feet	100 feet

[a] In addition, all roads require an access report stating that the driveway/roadway is safe as designed meeting adequate stacking, sight distance and deceleration requirements as set by ODOT, Washington County and AASHTO.

Source: Sherwood Transportation System Plan, March 2005, Table 8-12

Washington County

Washington County access spacing standards for arterials, such as Elwert Road, require a minimum of 600 feet between intersections.[4] In addition, Washington County's Community Development Code specifies that arterial roadways shall only be intersected by collectors or other arterials.[5]

There is approximately 1,700 feet of separation between the existing intersections on Elwert Road with Orchard Hill Lane and Highway 99W. Therefore, it would be feasible to create a new intersection on Elwert Road from a future extension of Cedar Brook Way that would comply with Washington County access spacing standards. However, doing so would require moving the existing driveway to the Elks Lodge from Elwert Road to the new Cedar Brook Way extension. Furthermore, because the Cedar Brook Way extension would likely be connected to Elwert Road opposite the relocated intersection with Kruger Road, the ultimate location will be limited by constraints associated with that improvement project.

In addition, to connect to Elwert Road, the Cedar Brook Way extension must be classified by the City of Sherwood as a collector street or higher. Compared to classifying this roadway as a local street, the collector classification could result in a wider roadway design requiring as much as 14 feet of additional right of way. The total length of the proposed road from Elwert Road to at least Handley Street would align with the recommended collector street length in the City's TSP and the traffic volumes using the road to access the commercial properties may be of a magnitude commonly associated with collector streets (2,000 vehicles per day or greater). However, the proposed

[3] Sherwood Transportation System Plan, March 2005, Table 8-12
[4] Washington County Community Development Code, Article V: Public Facilities and Services, 501-8.5 (A).
[5] Article V: Public Facility and Service Requirements; Section 501-8.5(B)(4) (Access to County and Public Roads), Washington County, printed 11/24/05.

Cedar Brook Way extension is currently shown in the City TSP as a local street, so an amendment would be required to change the functional classification to a collector.

ODOT

ODOT access spacing standards are documented in the 1999 Oregon Highway Plan (as amended December 2011) and OAR 734-051. Given Highway 99W's classification as a Statewide Highway and Freight Route on the National Highway System and posted speed of 45 mph through the study area, the resulting access spacing standard requires a minimum of 990 feet between driveways and intersections. There are relatively few driveways or intersections on the northwest side of Highway 99W in the study area, so it would be feasible to create a new roadway connection that would comply with ODOT's access spacing standards.

ODOT has also purchased access rights from properties abutting Highway 99W through the study area. This means that applications for new intersection or driveway connections cannot be accepted unless the applicant is in possession of a "reservation of access" (a location where access rights have been retained) or a "grant of access" has been applied for and approved by ODOT. In review of existing access rights along the northwest side of Highway 99W with ODOT staff, there are no reservations of access that could be used to establish a new public street connection. Therefore, the City would be required to apply for a grant of access to Highway 99W. It is likely that approval for such a grant of access would include a requirement that all existing driveways to Highway 99W between Meinecke Road and Elwert Road be removed when properties redevelop, with all future access being taken from the proposed Cedar Brook Way extension. Also, while ODOT does not prohibit the connection of local streets to highways, proposals to connect streets that are classified as collectors or higher in local TSPs are given preference when considering applications for a grant of access.

Traffic Operations

Traffic operations were analyzed at the study intersections and compared to the applicable jurisdiction's adopted mobility standards or targets. The mobility standards and existing traffic volumes are used as the basis for the intersection operations.

Mobility Standards

The City of Sherwood, Washington County, and ODOT each have mobility standards that must be met by roadways and intersections under their jurisdiction. These standards measure performance through either level of service or volume-to-capacity ratios:

- The **intersection level of service (LOS)** is similar to a "report card" rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of service D and E are progressively worse operating conditions. Level of service F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.
- The **volume-to-capacity (V/C) ratio** represents the level of saturation of the intersection or individual movement. It is determined by dividing the peak hour traffic volume by the maximum hourly capacity of an intersection or turn movement. When the V/C ratio approaches 0.95, operations become unstable and small disruptions can cause the traffic flow to break down, as seen by the formation of excessive queues.

Table 4 lists mobility standards (referred to as "targets" for ODOT facilities) for the study area roadways. It also lists the roadways' applicable designations, which were used to determine the corresponding mobility standard.

Table 4: Applicable Mobility Standards/Targets[a] for Study Area Roadways

Roadway(s)	Location Designation (Source)	Mobility Standard[a]
Highway 99W	Other Principal Arterial Route inside Metro[b]	V/C ≤ 0.99
Elwert Road	Other Urban Areas (Table 5, Washington County TSP, 3/31/2003)	V/C ≤ 0.99 LOS E or better
Kruger Road	Rural Areas[c]	V/C ≤ 0.90 LOS D or better
Handley Street, Cedar Brook Way, and Meinecke Road	City of Sherwood	LOS D or better

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Table 7, 1999 Oregon Highway Plan, Policy 1F (as amended 12/21/2011).
[c] Table 5, Washington County TSP, 3/31/2003.

Existing Traffic Volumes

Turn movement traffic counts were performed at the study area intersections for the weekday p.m. peak period on April 11, 2012. Figure 3 shows the peak hour traffic volumes measured at each intersection. This data was used to analyze the performance of each intersection for comparison against adopted mobility standards/targets, as described in the following section.

Intersection Operations

The existing p.m. peak hour study intersection operations were determined based on the *2000 Highway Capacity Manual* methodology.[6] The estimated average delay, level of service (LOS), and volume to capacity (V/C) ratio are shown in Table 5. All study intersections currently meet applicable mobility standards and targets.

Table 5: 2012 Existing Study Intersection Operations (P.M. Peak Hour)

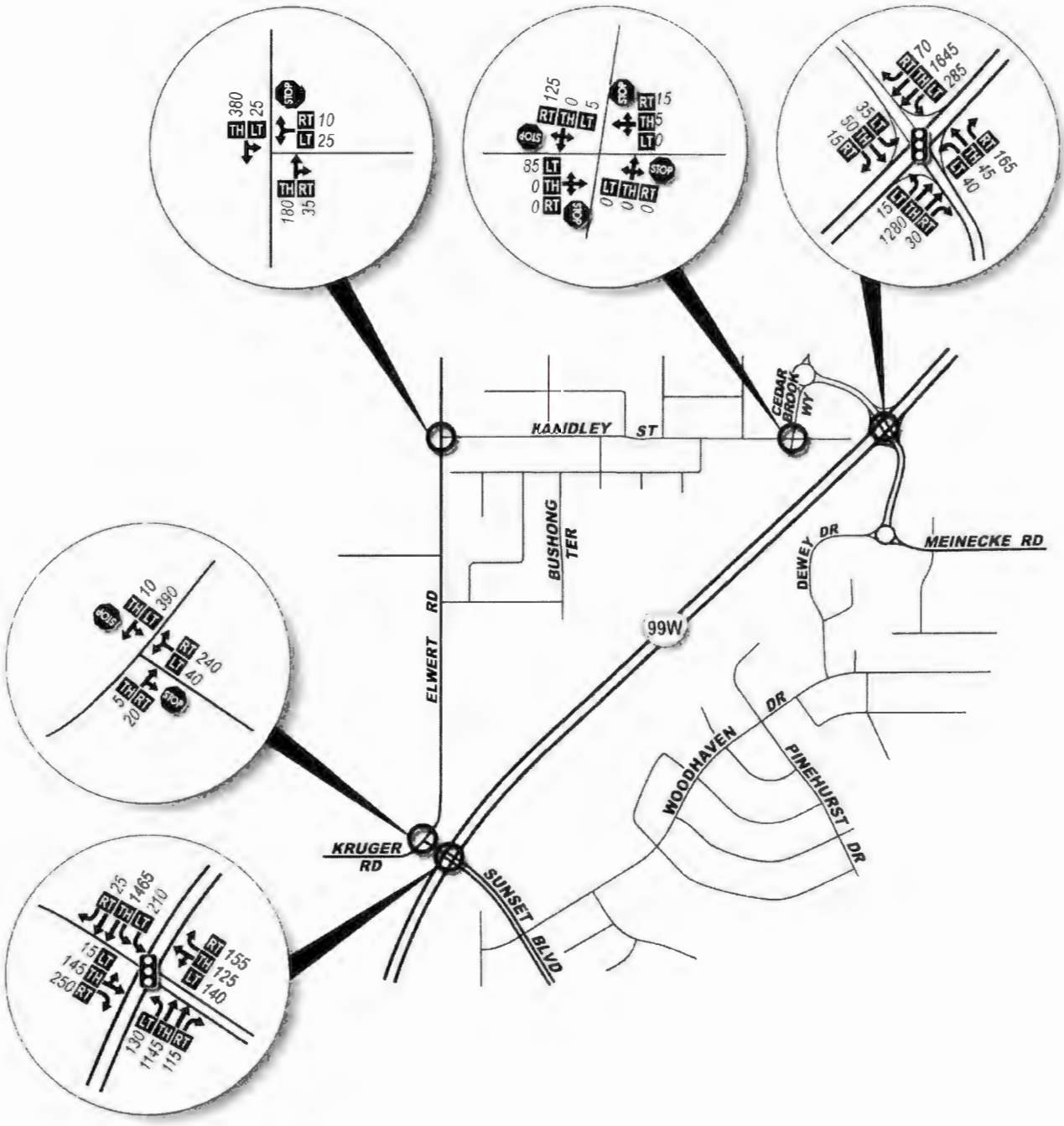
Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	32.9	C	0.83
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	18.0	B	0.66
Handley St/Cedar Brook Way	All-Way Stop	LOS D	7.5	A	0.15
Elwert Rd/Kruger Rd	Two-Way Stop	V/C ≤ 0.90, LOS D	21.7	A/C	0.69
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	13.1	A/B	0.13

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection

Two-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

[6] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.



LEGEND

- Study Intersection
- Stop Sign
- Traffic Signal
- Lane Configuration
- 000 - PM Peak Hour Traffic Volumes
- LT TH RT (Left-Thru-Right) - Volume Turn Movements

DKS

No Scale

Figure 3

EXISTING 2012 PM PEAK HOUR TRAFFIC VOLUMES & LANE GEOMETRY

Future Connectivity Options (2035)

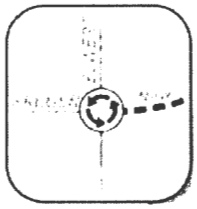
An evaluation was performed of future connectivity options using 2035 traffic volumes. The analysis assumptions and methodology used to evaluate all connectivity options are described first, followed by the evaluation of each option.

Future Analysis Assumptions and Methodology

The future analysis assumptions and methodology used to evaluate all connectivity options relate to the planned improvements, functional classification, access, traffic volume forecasts, future intersection operations, and development sensitivity.

Planned Improvements

The future Washington County project that may construct a new single-lane roundabout at the Kruger Road/Elwert Road intersection, with the intersection relocated farther north from Highway 99W, was assumed to be in place by the year 2035. While the exact location of this improvement is not yet known, all four connectivity options assume that a fourth leg will be added to the east side of the roundabout to provide connectivity for future development.



Functional Classification

Washington County classifies Elwert Road as an arterial and requires that only collectors or other arterials have access to arterial roadways. For this reason, the new roadway connecting to the Kruger Road/Elwert Road roundabout (i.e., in Options 2, 3, and 4) should function as a collector roadway instead of a local street, as was indicated in the Sherwood TSP.[7]

Common criteria used to assess a roadway's appropriate functional classification include the extent of connectivity to the City and the region, the frequency of the facility type, and the volume of traffic being served. Cities usually benefit from having a typical collector spacing of a quarter-mile to a half-mile, but this is not a requirement. The Sherwood TSP indicates that collector streets provide both access and circulation within and between residential and commercial/industrial areas in the City of Sherwood. Their primary purpose is to accommodate circulation for the City neighborhoods where they are located rather than connecting to the surrounding region or serving cross-city traffic. They connect to arterials and penetrate residential neighborhoods to distribute trips to/from the neighborhoods and local street system. Collectors are typically greater than one-half to one mile in length and do not require as extensive control of access as arterials.

Considering these criteria, reclassifying the new roadway from a local street to a collector street may be appropriate in the case of a Cedar Brook Way extension from Handley Street to Elwert Road. This new roadway would be about one-half mile in length, would be spaced approximately one-quarter mile on average from the adjacent arterials and collectors (i.e., Highway 99W and Handley Street), and would connect to arterial streets (Elwert Road and Highway 99W under Options 3 and 4). In addition, the volume of traffic anticipated to be served by the Cedar Brook Way extension would be within the range expected for a collector street (more than 2,000 vehicles per day). The collector classification for Cedar Brook Way could be extended as far north as the Meinecke Road roundabout. However, the northern segment of Cedar Brook Way between the Meinecke Road roundabout and Highway 99W could remain as a local street because its function is providing access to a limited number of properties.

[7] *Sherwood Transportation System Plan (TSP)*, March 15, 2005

Access

Each connectivity option was evaluated to determine how it would impact the roadway network's ability to provide access to the nearby land uses, while also meeting applicable access management policies and standards (which are described previously in the Existing Conditions section of this memorandum).

Traffic Volume Forecasts

Future 2035 traffic volume forecasts were prepared for each of the connectivity options using a refined travel demand model that was developed based on Metro's 2010 (base) and 2035 (future) regional travel demand model. The refined model applies trip generation and trip distribution data taken directly from the Metro model, but adds additional roadway network detail to better represent local circulation in the study area.

The future model roadway network was adjusted for each connectivity option to account for the corresponding connectivity changes and different levels of access to Highway 99W. Future intersection volumes used for the operational analysis of each option were estimated by applying the increment of growth observed between the base and future year models to the existing traffic counts at study intersections. Figure 4 shows the 2035 traffic volume forecasts for Connectivity Option 1 (Partial Cedar Brook Way Extension). The 2035 traffic volumes for the other connectivity options are provided in the appendix on the operations analysis output sheets.

Future Intersection Operations

Future 2035 p.m. peak hour intersection operations analysis was performed for the study area intersections to determine how well each connectivity option and its associated intersection improvements accommodate vehicular traffic. The estimated average delay, level of service (LOS), and volume to capacity (V/C) ratio of each intersection or critical movement were determined and are documented for the connectivity options.

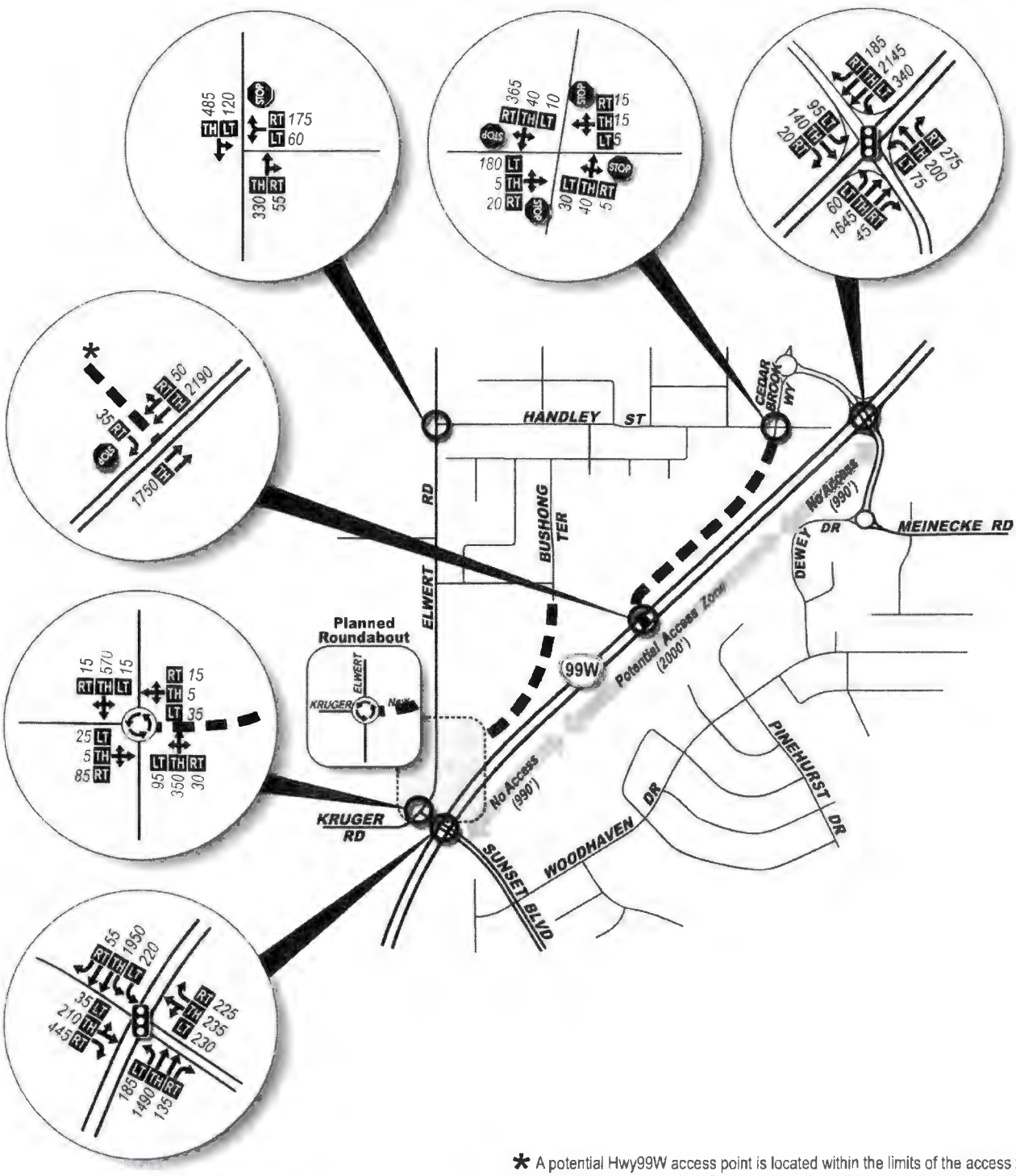
The signalized and unsignalized two-way stop controlled intersection performance measures were based on the *2000 Highway Capacity Manual* methodology,[8] while the roundabout intersection performance measures were determined using the methodology from the National Cooperative Highway Research Program (NCHRP) Project 3-65.[9]

Development Sensitivity

While the Metro travel demand model applied does account for a reasonable build-out scenario for future development within the study area, a sensitivity analysis was conducted for each connectivity option to assess the amount of additional development that could be accommodated without incurring major transportation improvements. This additional future development was limited to the undeveloped properties adjacent to the north side of Highway 99W between Meinecke Road and Elwert Road.

The analysis consisted of increasing the number of 2035 vehicular trips generated by these properties until major system improvements were triggered. Trip routing was determined for each connectivity option using the traffic patterns from the travel demand model.

[8] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.
[9] See NCHRP Report 572.



* A potential Hwy99W access point is located within the limits of the access zone delineated on the exhibit. The actual location will be based on transportation design standards and will take place when development occurs.

LEGEND

- Study Intersection
- Stop Sign
- Traffic Signal
- New Roadway - Option 1 *(Alignment to be Determined)*
- Lane Configuration
- 000 - PM Peak Hour Traffic Volumes
- LT TH RT (Left-Thru-Right) - Volume Turn Movements

DKS

No Scale

Figure 4

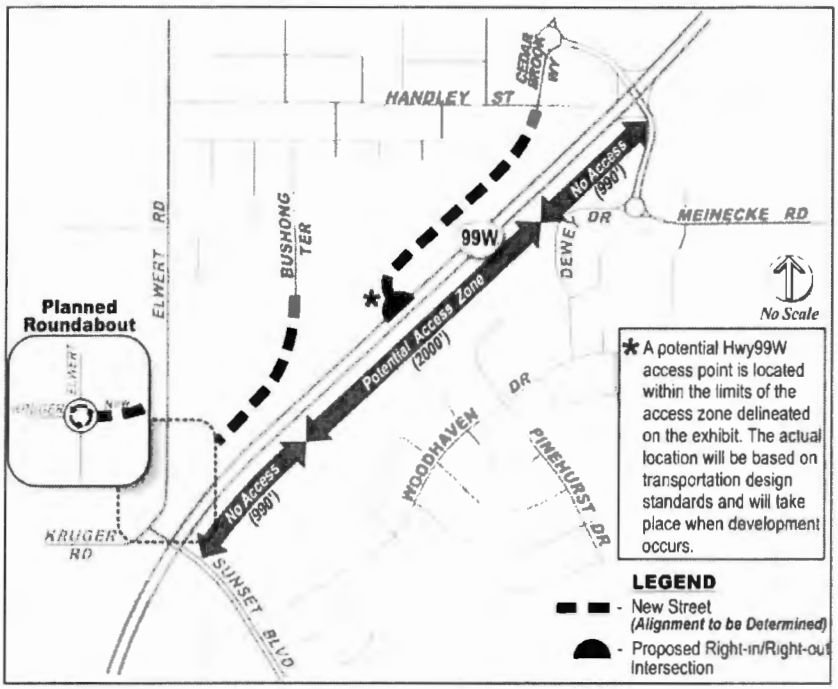
FUTURE 2035 PM PEAK HOUR TRAFFIC VOLUMES (Connectivity Option 1)

DKS

Option 1 (Partial Cedar Brook Way Extension)

Description of Roadway Connectivity:

Street connectivity for this option is shown at right and would be consistent with the Sherwood TSP Figure 8-8 (see Figure 1 earlier in this memorandum). This includes a new roadway that connects the Handley Street/Cedar Brook Way intersection to Highway 99W at a new intersection that is assumed to be limited to serve right-in/right-out movements only. A second new roadway, as suggested in the Sherwood TSP, would connect Bushong Terrace to the planned Kruger Road/Elwert Road roundabout.



Access to Properties:

The two new roadways would serve the properties along the north side of Highway 99W between Elwert Road and Handley Street, but they would only provide partial east-west connectivity. The properties to the east, which are primarily zoned for commercial use, would have a direct connection to westbound Highway 99W at the new right-in/right-out intersection. The properties to the west, which are primarily residentially zoned, would not be able to connect to this new intersection but would instead load onto Elwert Road.

Assuming all future access to Highway 99W from abutting properties is redirected to the local street network, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

Connecting the extension of Bushong Terrace to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, Bushong Terrace is a local street, so Washington County's requirement of not allowing local streets to intersect with arterials would not be met. However, the County does allow for exceptions to this requirement through a Type II process when collector access is found to be unavailable and impracticable by the Director.[10]

[10] Article V: Public Facility and Service Requirements; Section 501-8.5(B)(4) (Access to County and Public Roads), Washington County, printed 11/24/05.

Mobility at Study Intersections:

Most study intersections will operate adequately in 2035 under this connectivity option. However, the Highway 99W/Elwert Road-Sunset Boulevard intersection would not meet the applicable ODOT mobility target (see Table 6). Therefore, intersection improvements would be needed.

Compared to operations under existing conditions, operations in the future at the intersection of Highway 99W/Elwert Road-Sunset Boulevard deteriorate significantly (from a V/C ratio of 0.83 to a V/C ratio greater than 2.0). However, the share of this added congestion associated with growth in development within Sherwood is fairly small. When identifying the origins of future users of this intersection using the regional travel demand model, it was found that less than 10% of the added traffic would be associated with trips beginning or ending within the Sherwood urban growth boundary. The remaining contributors to this increase in congestion would come from either the nearby urban reserves to the west and south of Sherwood (approximately 35%) or other parts of the region (approximately 55%).

Table 6: Option 1 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	**>2.0**
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	39.5	D	0.91
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.7	B	0.50
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	13.4	B	0.64
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	25.5	A/D	0.59
Hwy 99W/New Access	Two-Way Stop[b]	V/C ≤ 0.99	28.4	A/D	0.89

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable mobility target, significant widening would be needed for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would have a heavy left-turn volume and would also need to be widened to four lanes (dual lefts, through, and right). Table 7 provides the study intersection operations with the recommended improvements.

Table 7: Option 1 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	51.8	D	0.93

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

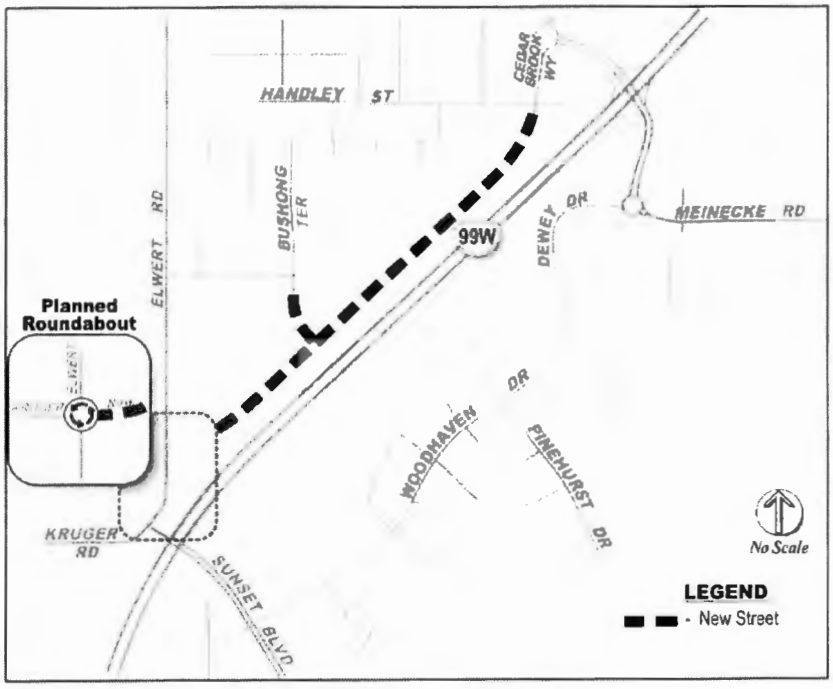
Ability to Accommodate Future Development:

Connectivity Option 1 is expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 2 (No Highway 99W Access)

Description of Roadway Connectivity:

Under this option, the new roadway would travel the full distance between Elwert Road and Handley Street, but would not include a connection to Highway 99W. Towards the west end, an extension of Bushong Terrace would connect to the new roadway from the north and the new roadway would connect to Elwert Road as the fourth leg of the future roundabout with Kruger Road.



While there would be very good east-west connectivity under this option, without a direct access to Highway 99W there would be more reliance on the intersections on Highway 99W with Elwert Road and Meinecke Road.

Access to Properties:

The new roadway would serve all properties along the north side of Highway 99W between Elwert Road and Handley Street, but there would not be a direct connection to Highway 99W. Instead, traffic to/from the west would likely use the Highway 99W/Elwert Road-Sunset Boulevard intersection and traffic to/from the east would likely use the Highway 99W/Meinecke Road intersection. The connection to the new roadway from Bushong Terrace would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods). However, it should be noted that the Bushong Terrace extension to the south may be difficult or infeasible to construct given the area topography. If it is not feasible, pedestrian and bicycle connections to the north should still be constructed.

Assuming all future access to Highway 99W from abutting properties is redirected to the local street network, this option would remove all access to the highway between Meinecke Road and Elwert Road. Therefore, there would be no conflict with ODOT access management policies and standards. In addition, the connection of Bushong Terrace to the new roadway could meet City access spacing standards as well.

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations would be very similar between Options 1 and 2, with some minor differences at the Highway 99W/Elwert Road-Sunset Boulevard intersection. Under Option 2, this intersection would still not meet the applicable ODOT mobility target (see Table 8); however, it would have slightly improved operations due to the improved east-west connectivity.

Table 8: Option 2 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	**1.76**
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	37.9	D	0.90
Handley St/Cedar Brook Way	All-Way Stop	LOS D	11.9	B	0.58
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	13.2	B	0.64
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	22.2	A/C	0.52

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for Option 1 would be needed. These improvements include significant widening of the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 9 provides the study intersection operations with the improvements.

Table 9: Option 2 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	51.5	D	0.92

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

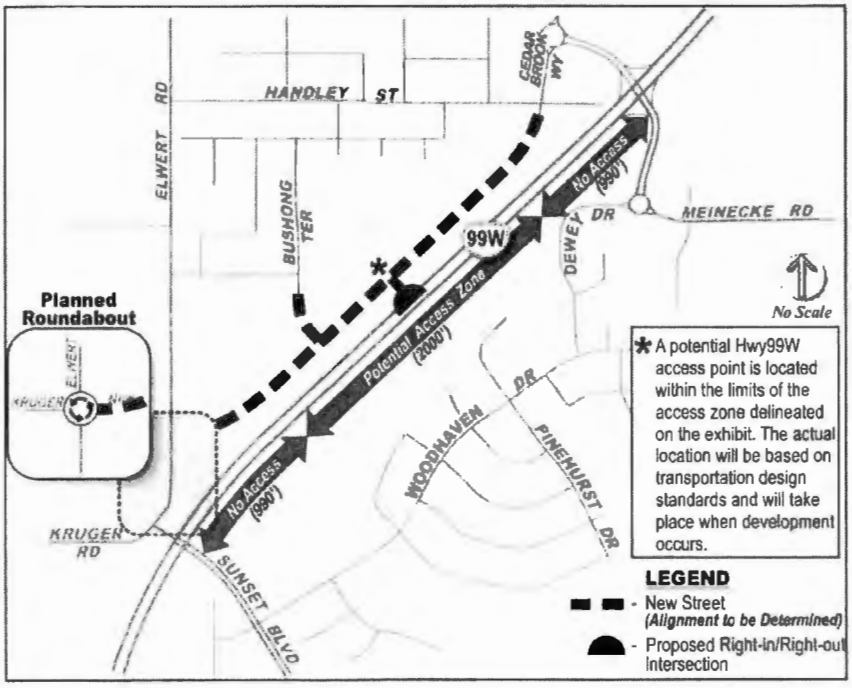
Ability to Accommodate Future Development:

Similar to Option 1, Connectivity Option 2 is also expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 3 (Right-In/Right-Out Highway 99W Access)

Description of Roadway Connectivity:

Under this option, the new roadway would travel the full distance between Elwert Road and Handley Street, but unlike Option 2, would include a connection to Highway 99W. This connection would include an intersection to Highway 99W that is assumed to allow only right-in and right-out turning movements. Towards the west end, an extension of Bushong Terrace would connect to the new roadway from the north and the new roadway would connect to Elwert Road as the fourth leg of the future roundabout with Kruger Road.



Similar to Option 2, this option would provide very good east-west connectivity. However, with the inclusion of the access to Highway 99W, overall connectivity in this area would be significantly improved.

Access to Properties:

The new roadway would serve all properties along the north side of Highway 99W between Elwert Road and Handley Street and would also provide a direct connection to westbound Highway 99W at the new right-in/right-out intersection. Therefore, it would provide better overall accessibility and connectivity than Options 1 and 2. One limitation of the right-in/right-out intersection is that to head eastbound on Highway 99W, traffic would be required to use either the Highway 99W/Meinecke Road intersection or the Highway 99W/Elwert Road-Sunset Boulevard intersection. Alternatively drivers could also use the new right-in/right-out intersection to head westbound but then perform a U-turn at the Sunset Boulevard intersection. The connection to the new roadway from Bushong Terrace, if feasible, could meet City access spacing standards and would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods).

Assuming all future access to Highway 99W from abutting properties is redirected to the new roadway, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations would be nearly identical between Options 2 and 3 (which are both slightly better than Option 1). The Highway 99W/Elwert Road-Sunset Boulevard intersection would still not meet the applicable ODOT mobility target (see Table 10) and would need additional intersection improvements.

Table 10: Option 3 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	**1.78**
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	39.6	D	0.92
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.7	B	0.50
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	12.3	B	0.61
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	21.0	A/C	0.50
Hwy 99W/New Access	Two-Way Stop[b]	V/C ≤ 0.99	32.0	A/D	0.89

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for Options 1 and 2 would be needed. These improvements include significant widening for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 11 provides the study intersection operations with the improvements.

Table 11: Option 3 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	52.2	D	0.93

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec) V/C = Volume-to-Capacity Ratio of Intersection
LOS = Level of Service of Intersection Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

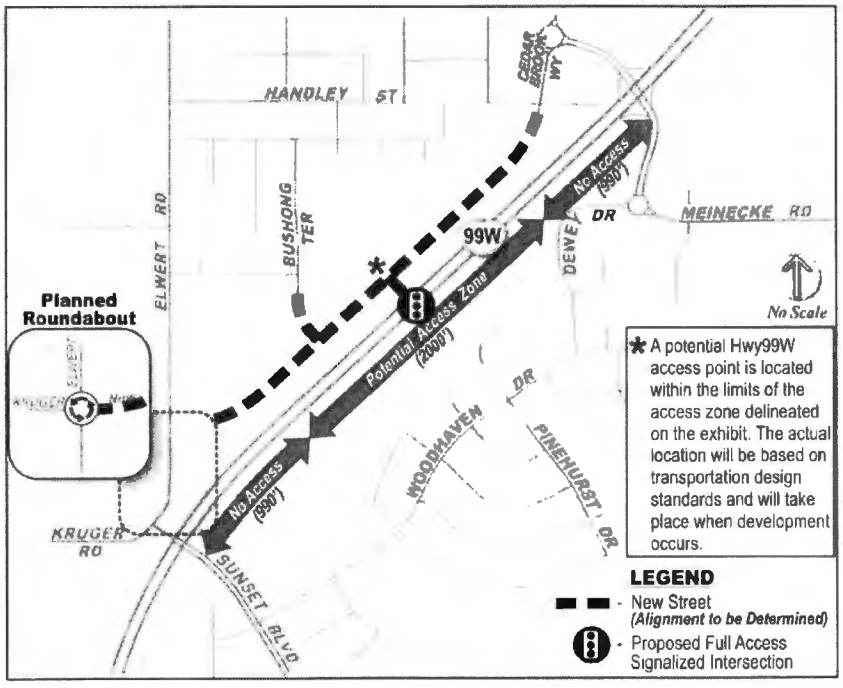
Ability to Accommodate Future Development:

Similar to Options 1 and 2, Connectivity Option 3 is also expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 4 (Full Highway 99W Access)

Description of Roadway Connectivity:

Option 4 provides the maximum amount of connectivity. It is similar to Option 3, but the new intersection with Highway 99W serves all turning movements. Due to the high volume of traffic on Highway 99W, it was assumed that this new intersection would be signalized. For analysis purposes, the new approach to the highway was assumed to have separate left and right turning lanes. It should be noted that the new roadway alignment shown is conceptual and that further development of this option will need to consider how vehicle queues can be safely accommodated between the new roadway and the new signalized intersection on the highway.



Because Highway 99W is a state highway, ODOT approval of a new signal would be necessary prior to construction. To estimate future signalization needs, preliminary signal warrants were evaluated using Signal

Warrants 1, Case A and Case B (MUTCD), which deal primarily with high volumes on the intersecting minor street and high volumes on the major-street. This analysis indicated that signalization may be warranted (the preliminary signal warrant worksheet is attached in the appendix). Meeting preliminary signal warrants does not guarantee that a signal shall be installed. The new signal should also be compatible with the existing signal system. Before a signal can be installed, a field warrant analysis is conducted by the Region. If warrants are met, the State Traffic Engineer will make the final decision on the installation of a signal.

Access to Properties:

As previously noted, with a full signalized intersection to Highway 99W, a connection to Bushong Terrace, and connectivity reaching from Elwert Road to Handley Street, Connectivity Option 4 provides the highest level of connectivity and the most direct accessibility of any of the options considered. The connection to the new roadway from Bushong Terrace, if feasible, could meet City access spacing standards and would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods).

Assuming all future access to Highway 99W from abutting properties is redirected to the new roadway, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations are much improved for Option 4 compared to the other options. However, the Highway 99W/Elwert Road-Sunset Boulevard intersection would still not meet the applicable ODOT mobility target (see Table 12) and would need additional intersection improvements.

Table 12: Option 4 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	**1.49**
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	36.2	D	0.87
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.0	A	0.46
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	12.0	B	0.60
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	21.0	A/C	0.50
Hwy 99W/New Access	Traffic Signal	V/C ≤ 0.99	10.9	B	0.85

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for each of the other options would be needed. These improvements include significant widening for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 13 provides the study intersection operations with the improvements.

Table 13: Option 4 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	52.2	D	0.92

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

Ability to Accommodate Future Development:

Connectivity Option 4 is expected to have the capacity to accommodate 750 more weekday p.m. peak hour trips than assumed to occur in the regional travel demand model before additional major improvements would be triggered at one of the study intersections. This would be roughly equivalent to 750 single-family homes or a

128,000 square-foot shopping center. The other connectivity options only accommodate 200 additional trips. Therefore, this option has the potential to accommodate a significantly higher level of development in the study area.

The reason for the higher capacity is the new signalized access to Highway 99W that serves traffic to and from both the east and the west. This intersection is also expected to be the critical location where additional improvements would be needed first (beyond the single left and right turning lanes on the new approach) before more trips beyond this could be accommodated.

Findings

This study represents the first step toward refining the ultimate roadway connectivity plan for the study area north of Highway 99W. Further refinement will be required, including discussions with affected property owners, the Oregon Department of Transportation, Washington County, and other stakeholders. The key findings of this study are summarized below:

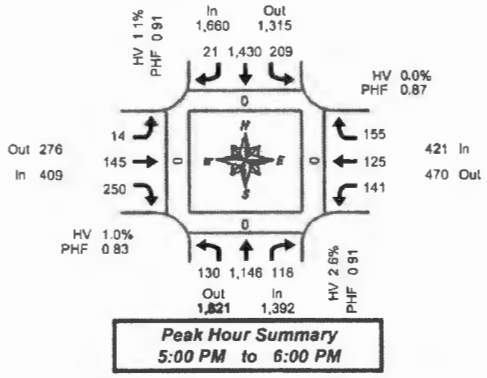
- Two improvements will be needed at the intersection on Highway 99W with Elwert Road-Sunset Boulevard by the year 2035 to meet adopted performance targets, regardless of which local connectivity option for the study area is chosen:
    - Widen the Elwert Road approach to include a left turn lane, a through lane, and dual right turn lanes.
    - Widen the Sunset Boulevard approach to include dual left turn lanes, a through lane, and a right turn lane.
- Options 3 and 4, which include new intersections with Highway 99W, provide higher degrees of connectivity. Option 4, which includes the new signalized intersection to Highway 99W, provides the greatest degree of connectivity and the most direct accessibility for area properties.
- All options considered have a fair amount of flexibility for supporting future development. However, Option 4 may be able to support more than three times the amount of development than the other options due to the assumed traffic signal that would accommodate all turning movements.
- Under Options 2, 3, and 4, classifying the new roadway paralleling Highway 99W (Cedar Brook Way extension) as a collector street would be appropriate.
- All options are capable of meeting City/County/ODOT access spacing requirements.
- Under Option 1, approval from Washington County for an exception from their access management requirement to connect a local street (Bushong Terrace) to an arterial street (Elwert Road) would be needed.
- Establishing a new intersection on Highway 99W would require approval from ODOT for a grant of access to the highway.
- Prior to constructing a traffic signal on Highway 99W, approval must be obtained from the State Traffic Engineer.
- While non-auto modes of travel were not assessed as part of this study, the creation of a new signalized intersection on Highway 99W could have significant benefits for pedestrian and bicycle travel by

maximizing connectivity and providing a controlled crossing of the highway. Furthermore, if Bushong Terrace cannot be extended to the south to connect to the Cedar Brook Way extension, opportunities to provide pedestrian and bicycle accessways should be explored as an alternative.

Appendix

Total Vehicle Summary

All Traffic Data
Service Inc
Clay Carney
(503) 833-2740



Hwy 99 W & SW Elwert Rd

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	9	41	7	0	14	109	3	0	3	6	23	0	10	10	11	0	246	0	0	0	0
4:05 PM	6	112	8	0	10	151	1	0	1	3	17	0	8	4	11	0	332	0	0	0	0
4:10 PM	6	75	7	0	21	134	2	0	2	13	15	0	10	10	13	1	308	0	0	0	0
4:15 PM	11	91	8	0	12	108	1	0	2	5	18	0	7	6	6	0	272	0	0	0	0
4:20 PM	13	102	1	0	6	100	0	0	1	15	15	0	10	7	10	0	280	0	0	0	0
4:25 PM	3	68	6	0	11	132	2	0	1	8	23	0	9	8	10	0	279	0	0	0	0
4:30 PM	7	76	6	0	17	97	2	0	1	19	17	0	20	7	12	0	281	0	0	0	0
4:35 PM	11	104	8	0	12	152	2	0	0	10	18	0	11	9	9	0	344	0	0	0	0
4:40 PM	7	75	5	0	15	144	0	0	2	17	24	0	17	9	9	0	324	0	0	0	0
4:45 PM	12	117	8	0	15	134	3	0	2	9	27	1	7	2	18	0	354	0	0	0	0
4:50 PM	7	82	5	0	19	107	2	0	1	22	30	0	8	10	9	0	282	0	0	0	0
4:55 PM	9	78	5	0	13	83	1	0	2	16	21	0	12	5	9	0	252	0	0	0	0
5:00 PM	6	103	2	0	15	136	3	0	1	8	21	0	12	12	8	0	327	0	0	0	0
5:05 PM	12	119	13	2	13	114	0	0	0	6	18	0	20	9	15	0	339	0	0	0	0
5:10 PM	7	98	6	0	18	116	1	0	1	6	15	0	12	5	12	0	297	0	0	0	0
5:15 PM	11	85	13	0	11	115	3	0	3	7	29	0	20	11	17	0	325	0	0	0	0
5:20 PM	13	85	18	0	25	152	1	0	2	14	17	0	10	8	14	0	359	0	0	0	0
5:25 PM	13	103	5	0	14	91	1	0	1	17	23	0	8	18	9	0	303	0	0	0	0
5:30 PM	12	79	12	0	24	138	2	0	0	14	17	0	9	7	18	0	332	0	0	0	0
5:35 PM	11	91	7	0	13	101	0	0	1	19	31	0	18	4	8	0	302	0	0	0	0
5:40 PM	9	126	13	0	23	153	3	0	1	8	10	0	7	12	9	0	374	0	0	0	0
5:45 PM	12	84	9	0	17	101	3	0	1	17	30	0	10	9	20	0	313	0	0	0	0
5:50 PM	13	105	10	0	14	99	1	0	2	18	15	0	8	14	13	0	312	0	0	0	0
5:55 PM	11	68	8	0	22	114	3	0	1	11	24	0	7	16	14	0	299	0	0	0	0
Total Survey	231	2,145	188	2	374	2,881	40	0	32	288	496	1	270	209	282	1	7,436	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	21	228	22	0	45	394	6	0	6	22	55	0	28	24	35	1	886	0	0	0	0
4:15 PM	27	261	13	0	29	340	3	0	4	28	56	0	26	18	26	0	831	0	0	0	0
4:30 PM	25	255	19	0	44	393	4	0	3	46	57	0	48	25	30	0	949	0	0	0	0
4:45 PM	28	255	18	0	47	324	6	0	5	47	78	1	27	17	36	0	888	0	0	0	0
5:00 PM	25	320	21	2	46	366	4	0	2	20	54	0	44	26	35	0	963	0	0	0	0
5:15 PM	37	273	36	0	50	358	5	0	6	38	69	0	38	37	40	0	987	0	0	0	0
5:30 PM	32	296	32	0	60	392	5	0	2	41	56	0	34	23	33	0	1,008	0	0	0	0
5:45 PM	36	257	27	0	53	314	7	0	4	46	69	0	25	39	47	0	924	0	0	0	0
Total Survey	231	2,145	188	2	374	2,881	40	0	32	288	496	1	270	209	282	1	7,436	0	0	0	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound Hwy 99 W In	Out	Total	Bikes	Southbound Hwy 99 W In	Out	Total	Bikes	Eastbound SW Elwert Rd In	Out	Total	Bikes	Westbound SW Elwert Rd In	Out	Total	Bikes	Total
Volume	1,392	1,821	3,213	2	1,660	1,315	2,975	0	409	276	685	0	421	470	891	0	3,882
%HV		2.6%				1.1%				1.0%				0.0%			1.5%
PHF		0.91				0.91				0.83				0.87			0.96

Pedestrians Crosswalk North	South	East	West
0	0	0	0

By Movement	Northbound Hwy 99 W L	T	R	Total	Southbound Hwy 99 W L	T	R	Total	Eastbound SW Elwert Rd L	T	R	Total	Westbound SW Elwert Rd L	T	R	Total	Total
Volume	130	1,146	116	1,392	209	1,430	21	1,660	14	145	250	409	141	125	155	421	3,882
%HV	1.5%	2.8%	1.7%	2.6%	0.5%	1.1%	4.8%	1.1%	0.0%	0.0%	1.6%	1.0%	0.0%	0.0%	0.0%	0.0%	1.5%
PHF	0.86	0.90	0.76	0.91	0.83	0.91	0.75	0.91	0.58	0.73	0.88	0.83	0.68	0.80	0.82	0.87	0.96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	101	999	72	0	165	1,451	19	0	18	143	246	1	129	84	127	1	3,554	0	0	0	0
4:15 PM	105	1,091	71	2	168	1,423	17	0	14	141	245	1	145	86	127	0	3,631	0	0	0	0
4:30 PM	115	1,103	94	2	187	1,441	19	0	16	151	258	1	157	105	141	0	3,787	0	0	0	0
4:45 PM	122	1,144	107	2	203	1,440	20	0	15	146	259	1	143	103	144	0	3,846	0	0	0	0
5:00 PM	130	1,146	116	2	209	1,430	21	0	14	145	250	0	141	125	155	0	3,882	0	0	0	0

Total Vehicle Summary

All Traffic Data
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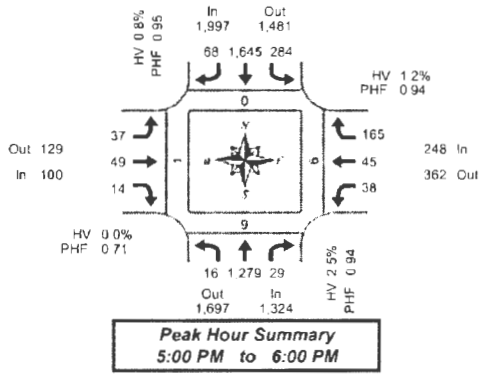


Hwy 99 W & SW Meinecke Pkwy

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Meinecke Pkwy L	T	R	Bikes	Westbound SW Meinecke Pkwy L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	0	83	2	0	16	125	7	0	1	3	0	0	1	2	7	0	247	0	3	3	0
4:05 PM	2	111	9	0	12	171	2	1	3	3	2	0	5	2	8	0	330	0	2	1	0
4:10 PM	0	71	1	0	29	125	2	0	3	6	0	0	6	1	12	0	256	0	3	0	0
4:15 PM	0	109	2	0	12	145	4	0	1	6	0	0	0	0	11	0	290	0	1	0	0
4:20 PM	0	110	2	0	20	121	5	0	2	5	0	0	2	3	20	0	290	0	1	1	0
4:25 PM	2	84	2	0	26	134	4	0	1	7	0	0	1	6	14	0	281	0	1	0	0
4:30 PM	1	107	3	0	18	130	3	0	2	0	2	0	0	3	16	0	285	0	1	1	0
4:35 PM	1	83	2	0	20	163	2	0	3	1	1	0	1	4	11	0	292	0	0	1	0
4:40 PM	0	69	1	0	27	132	3	0	6	6	3	0	6	6	13	0	272	0	0	0	0
4:45 PM	0	155	2	0	19	148	1	0	3	4	1	0	4	4	9	0	350	0	1	0	0
4:50 PM	0	89	3	0	16	117	3	0	4	7	0	0	3	1	6	0	251	0	0	0	0
4:55 PM	1	88	6	0	14	124	5	0	4	2	0	0	1	3	5	0	253	0	0	0	0
5:00 PM	0	99	3	2	27	114	6	0	2	5	0	0	4	5	24	0	289	0	0	0	0
5:05 PM	1	108	3	0	19	149	7	0	1	4	0	0	4	3	8	0	307	0	0	0	0
5:10 PM	1	117	2	0	15	146	0	0	1	2	1	0	1	0	13	0	299	0	4	5	0
5:15 PM	5	90	6	0	27	128	9	0	4	9	1	0	5	8	17	0	309	0	0	0	0
5:20 PM	2	100	1	0	27	141	6	0	3	2	1	0	4	7	9	0	303	0	0	0	0
5:25 PM	0	127	2	0	17	154	3	0	1	2	3	0	4	1	11	0	325	0	1	0	0
5:30 PM	1	82	1	0	29	135	7	0	2	2	1	0	5	5	20	0	290	0	0	0	0
5:35 PM	2	125	2	0	24	152	4	0	5	5	0	0	2	5	13	0	339	0	0	0	0
5:40 PM	0	101	0	0	25	145	4	0	5	7	2	0	2	0	7	0	298	0	0	0	0
5:45 PM	1	118	3	0	27	124	10	0	3	1	4	0	2	4	15	0	312	0	0	1	0
5:50 PM	1	107	3	0	23	117	6	0	4	8	1	0	3	2	14	0	289	0	2	0	1
5:55 PM	2	105	3	0	24	140	6	0	6	2	0	0	2	5	14	0	309	0	2	0	0
Total Survey	23	2,438	64	2	515	3,280	109	1	70	99	23	0	68	80	297	0	7,066	0	22	13	1

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Meinecke Pkwy L	T	R	Bikes	Westbound SW Meinecke Pkwy L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	2	265	12	0	57	421	11	1	7	12	2	0	12	5	27	0	833	0	8	4	0
4:15 PM	2	303	6	0	58	400	13	0	4	18	0	0	3	9	45	0	861	0	3	1	0
4:30 PM	2	259	6	0	65	425	8	0	11	7	6	0	7	13	40	0	849	0	1	2	0
4:45 PM	1	332	11	0	51	389	9	0	11	13	1	0	8	8	20	0	854	0	1	0	0
5:00 PM	2	324	8	2	61	409	13	0	4	11	1	0	9	8	45	0	895	0	4	5	0
5:15 PM	7	317	9	0	71	423	18	0	8	13	5	0	13	16	37	0	937	0	1	0	0
5:30 PM	3	308	3	0	78	432	15	0	12	14	3	0	9	10	40	0	927	0	0	0	0
5:45 PM	4	330	9	0	74	381	22	0	13	11	5	0	7	11	43	0	910	0	4	1	1
Total Survey	23	2,438	64	2	515	3,280	109	1	70	99	23	0	68	80	297	0	7,066	0	22	13	1

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound Hwy 99 W In	Out	Total	Bikes	Southbound Hwy 99 W In	Out	Total	Bikes	Eastbound SW Meinecke Pkwy In	Out	Total	Bikes	Westbound SW Meinecke Pkwy In	Out	Total	Bikes	Total	Pedestrians Crosswalk North	South	East	West
Volume	1,324	1,697	3,021	2	1,997	1,481	3,478	0	100	129	229	0	248	362	610	0	3,869	0	9	6	1
%HV		2 5%				0 8%				0 0%				1 2%			1 4%				
PHF		0 94				0 95				0 71				0 94			0 96				

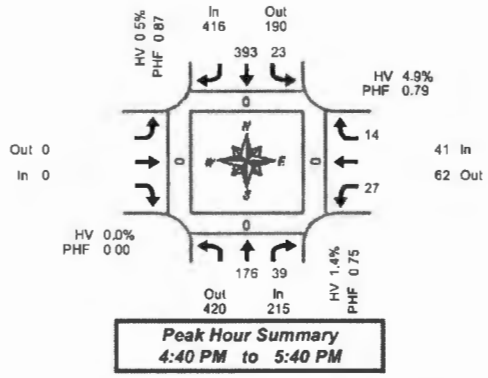
By Movement	Northbound Hwy 99 W L	T	R	Total	Southbound Hwy 99 W L	T	R	Total	Eastbound SW Meinecke Pkwy L	T	R	Total	Westbound SW Meinecke Pkwy L	T	R	Total	Total
Volume	16	1,279	29	1,324	284	1,645	68	1,997	37	49	14	100	38	45	165	248	3,669
%HV	0 0%	2 8%	0 0%	2 5%	0 0%	0 9%	0 0%	0 8%	0 0%	0 0%	0 0%	0 0%	2 6%	2 2%	0 6%	1 2%	1 4%
PHF	0 50	0 93	0 66	0 94	0 91	0 93	0 77	0 95	0 71	0 77	0 50	0 71	0 73	0 70	0 92	0 94	0 96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Meinecke Pkwy L	T	R	Bikes	Westbound SW Meinecke Pkwy L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	7	1,159	35	0	231	1,635	41	1	33	50	9	0	30	35	132	0	3,397	0	13	7	0
4:15 PM	7	1,218	31	2	235	1,623	43	0	30	49	8	0	27	38	150	0	3,459	0	9	8	0
4:30 PM	12	1,232	34	2	248	1,646	48	0	34	44	13	0	37	45	142	0	3,535	0	7	7	0
4:45 PM	13	1,281	31	2	261	1,653	55	0	35	51	10	0	39	42	142	0	3,613	0	6	5	0
5:00 PM	16	1,279	29	2	284	1,645	68	0	37	49	14	0	38	45	165	0	3,669	0	9	6	1

Total Vehicle Summary

All Traffic Data
Clay Carney
(503) 833-2740



SW Elwert Rd & SW Handley St

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	15	2	0	1	25	0	0	0	4	0	47	0	0	0	0
4:05 PM	12	3	0	3	18	0	0	3	0	0	39	0	0	0	0
4:10 PM	15	1	0	0	33	0	0	1	1	0	51	0	0	0	0
4:15 PM	10	1	0	1	20	0	0	1	0	0	33	0	0	0	0
4:20 PM	15	4	0	3	25	0	0	2	1	0	50	0	0	0	0
4:25 PM	16	3	0	2	27	0	0	0	1	0	49	0	0	0	0
4:30 PM	11	1	0	0	38	0	0	2	1	0	53	0	0	0	0
4:35 PM	10	0	0	0	23	0	0	1	0	0	34	0	0	0	0
4:40 PM	19	3	0	1	36	0	0	4	0	0	63	0	0	0	0
4:45 PM	8	6	0	3	39	0	0	2	0	0	58	0	0	0	0
4:50 PM	13	0	0	3	38	0	0	2	3	0	59	0	0	0	0
4:55 PM	15	5	0	0	32	0	0	4	2	0	58	0	0	0	0
5:00 PM	6	2	0	2	33	0	0	1	0	0	44	0	0	0	0
5:05 PM	16	5	0	1	29	0	0	1	1	0	53	0	0	0	0
5:10 PM	13	2	0	1	21	0	0	2	3	0	42	0	0	0	0
5:15 PM	12	2	0	5	34	0	0	2	1	0	56	0	0	0	0
5:20 PM	10	5	0	1	28	0	0	1	0	0	46	0	0	0	0
5:25 PM	24	5	0	1	35	0	0	2	1	0	68	0	0	0	0
5:30 PM	18	1	0	1	28	0	0	3	2	0	53	0	0	0	0
5:35 PM	22	2	0	4	40	0	0	3	1	0	72	0	0	0	0
5:40 PM	7	2	0	4	34	0	0	2	1	0	50	0	0	0	0
5:45 PM	19	5	0	3	30	0	0	5	0	0	62	0	0	0	0
5:50 PM	15	2	0	2	38	0	0	0	0	0	57	0	0	0	0
5:55 PM	19	2	0	2	29	0	0	2	0	0	54	0	0	0	0
Total Survey	340	65	0	44	733	0	0	46	23	0	1,251	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	42	6	0	4	76	0	0	4	5	0	137	0	0	0	0
4:15 PM	41	8	0	6	72	0	0	3	2	0	132	0	0	0	0
4:30 PM	40	4	0	1	97	0	0	7	1	0	150	0	0	0	0
4:45 PM	36	11	0	6	109	0	0	8	5	0	175	0	0	0	0
5:00 PM	35	9	0	4	83	0	0	4	4	0	139	0	0	0	0
5:15 PM	46	13	0	7	97	0	0	5	2	0	170	0	0	0	0
5:30 PM	47	5	0	9	102	0	0	8	4	0	175	0	0	0	0
5:45 PM	53	9	0	7	97	0	0	7	0	0	173	0	0	0	0
Total Survey	340	65	0	44	733	0	0	46	23	0	1,251	0	0	0	0

Peak Hour Summary
4:40 PM to 5:40 PM

By Approach	Northbound SW Elwert Rd In	Out	Total	Bikes	Southbound SW Elwert Rd In	Out	Total	Bikes	Eastbound SW Handley St In	Out	Total	Bikes	Westbound SW Handley St In	Out	Total	Bikes	Total
Volume	215	420	635	0	416	190	606	0	0	0	0	0	41	62	103	0	672
%HV		1.4%				0.5%				0.0%				4.9%			1.0%
PHF		0.75				0.87				0.00				0.79			0.87

Pedestrians Crosswalk North	South	East	West
0	0	0	0

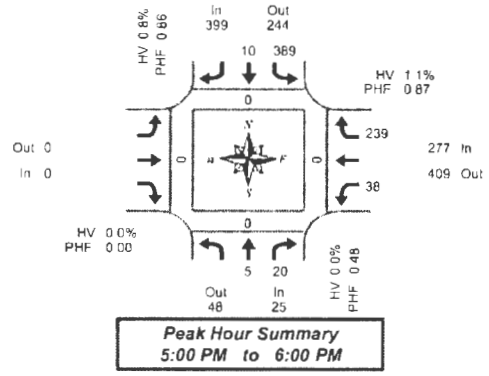
By Movement	Northbound SW Elwert Rd T	R	Total	Southbound SW Elwert Rd L	T	Total	Eastbound SW Handley St Total	Westbound SW Handley St L	R	Total	Total
Volume	176	39	215	23	393	416	0	27	14	41	672
%HV	1.1%	2.6%	1.4%	4.3%	0.3%	0.5%	0.0%	3.7%	7.1%	4.9%	1.0%
PHF	0.69	0.75	0.75	0.82	0.87	0.87	0.00	0.84	0.70	0.79	0.87

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	159	29	0	17	354	0	0	22	13	0	594	0	0	0	0
4:15 PM	152	32	0	17	361	0	0	22	12	0	596	0	0	0	0
4:30 PM	157	37	0	18	386	0	0	24	12	0	634	0	0	0	0
4:45 PM	164	38	0	26	391	0	0	25	15	0	659	0	0	0	0
5:00 PM	181	36	0	27	379	0	0	24	10	0	657	0	0	0	0

Total Vehicle Summary

All Traffic Data
Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SW Kruger Rd & SW Elwert Rd

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes	L	R	Bikes		North	South	East	West
4:00 PM	2	2	0	27	0	0	0	2	19	0	52	0	0	0	0
4:05 PM	0	1	0	25	1	0	0	1	13	0	41	0	0	0	0
4:10 PM	0	1	0	24	1	0	0	1	12	0	39	0	0	0	0
4:15 PM	3	2	0	26	1	0	0	2	19	0	53	0	0	0	0
4:20 PM	1	2	0	26	0	0	0	0	20	0	49	0	0	0	0
4:25 PM	0	0	0	37	0	0	0	1	9	0	47	0	0	0	0
4:30 PM	1	0	0	33	1	0	0	1	12	0	48	0	0	0	0
4:35 PM	0	0	0	32	0	0	0	3	22	0	57	0	0	0	0
4:40 PM	0	0	0	36	0	0	0	1	13	0	50	0	0	0	0
4:45 PM	0	2	0	40	0	0	0	3	18	0	63	0	0	0	0
4:50 PM	0	2	0	47	1	0	0	1	18	0	69	0	0	0	0
4:55 PM	0	2	0	39	0	0	0	0	15	0	56	0	0	0	0
5:00 PM	0	0	0	29	1	0	0	3	18	0	51	0	0	0	0
5:05 PM	0	0	0	25	1	0	0	1	21	0	48	0	0	0	0
5:10 PM	0	1	0	23	0	0	0	1	12	0	37	0	0	0	0
5:15 PM	0	1	0	41	0	0	0	7	19	0	68	0	0	0	0
5:20 PM	0	4	0	30	0	0	0	0	22	0	56	0	0	0	0
5:25 PM	0	0	0	36	0	0	0	2	30	0	68	0	0	0	0
5:30 PM	1	0	0	32	1	0	0	4	16	0	54	0	0	0	0
5:35 PM	1	1	0	47	0	0	0	1	15	0	65	0	0	0	0
5:40 PM	2	1	0	22	2	0	0	1	24	0	52	0	0	0	0
5:45 PM	0	2	0	42	1	0	0	2	21	0	68	0	0	0	0
5:50 PM	0	5	0	35	3	0	0	6	23	0	72	0	0	0	0
5:55 PM	1	5	0	27	1	0	0	10	18	0	62	0	0	0	0
Total Survey	12	34	0	781	15	0	0	54	429	0	1,325	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes	L	R	Bikes		North	South	East	West
4:00 PM	2	4	0	76	2	0	0	4	44	0	132	0	0	0	0
4:15 PM	4	4	0	89	1	0	0	3	48	0	149	0	0	0	0
4:30 PM	1	0	0	101	1	0	0	5	47	0	155	0	0	0	0
4:45 PM	0	6	0	126	1	0	0	1	51	0	188	0	0	0	0
5:00 PM	0	1	0	77	2	0	0	5	51	0	136	0	0	0	0
5:15 PM	0	5	0	107	0	0	0	9	71	0	192	0	0	0	0
5:30 PM	4	2	0	101	3	0	0	6	55	0	171	0	0	0	0
5:45 PM	1	12	0	104	5	0	0	18	62	0	202	0	0	0	0
Total Survey	12	34	0	781	15	0	0	54	429	0	1,325	0	0	0	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Kruger Rd				Southbound SW Kruger Rd				Eastbound SW Elwert Rd				Westbound SW Elwert Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	25	48	73	0	399	244	643	0	0	0	0	0	277	409	686	0	701
%HV		0.0%				0.8%				0.0%				1.1%			0.9%
PHF		0.48				0.85				0.00				0.87			0.87

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

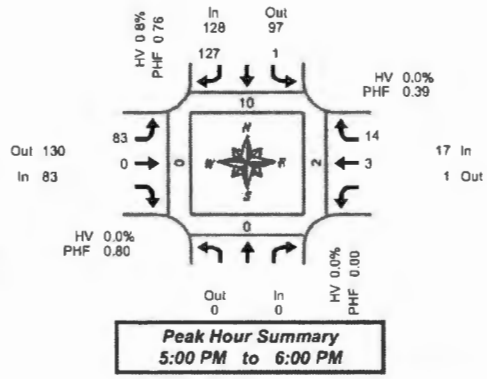
By Movement	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd			Westbound SW Elwert Rd			Total
	T	R	Total	L	T	Total			Total	L	R	Total	
Volume	5	20	25	389	10	399			0	38	239	277	701
%HV	NA	0.0%	0.0%	0.0%	0.8%	0.0%	NA	0.8%	NA	NA	0.0%	0.0%	1.3%	1.1%	0.9%
PHF		0.31	0.42	0.48	0.85	0.42		0.86			0.00	0.53	0.84	0.87	0.87

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes	L	R	Bikes		North	South	East	West
4:00 PM	7	14	0	392	5	0	0	16	190	0	624	0	0	0	0
4:15 PM	5	11	0	393	5	0	0	17	197	0	628	0	0	0	0
4:30 PM	1	12	0	411	4	0	0	23	220	0	671	0	0	0	0
4:45 PM	4	14	0	411	6	0	0	24	228	0	687	0	0	0	0
5:00 PM	5	20	0	389	10	0	0	38	239	0	701	0	0	0	0

Total Vehicle Summary

All Traffic Data
Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SW Cedar Brook Way & SW Handley St

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way				Southbound SW Cedar Brook Way				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	3	8	0	0	3	0	0	0	0	0	0	0	12	3	1	0	0
4:05 PM	0	0	0	0	2	6	0	0	7	0	0	0	0	3	0	0	18	0	0	0	0
4:10 PM	0	0	0	0	0	2	0	0	6	0	0	0	1	1	0	0	10	4	1	0	0
4:15 PM	0	0	0	0	1	3	0	0	8	0	0	0	0	0	0	0	12	0	0	0	0
4:20 PM	0	0	0	0	1	5	0	0	5	0	0	0	0	1	0	0	12	1	0	0	0
4:25 PM	0	0	0	0	2	7	0	0	6	0	0	0	0	0	0	0	15	0	1	0	0
4:30 PM	0	0	0	0	3	5	0	0	2	0	0	0	1	2	0	0	13	0	0	0	0
4:35 PM	0	0	0	0	0	7	0	0	3	0	0	0	1	2	0	0	13	0	0	0	0
4:40 PM	0	0	0	0	1	6	0	0	13	0	0	0	0	0	0	0	20	0	0	0	0
4:45 PM	0	0	0	0	0	9	0	0	9	0	0	0	0	1	0	0	19	0	0	0	0
4:50 PM	0	0	0	0	0	5	0	0	9	1	0	0	0	2	0	0	17	0	0	0	0
4:55 PM	0	0	1	0	1	8	0	0	5	0	0	0	0	1	0	0	12	0	0	0	0
5:00 PM	0	0	0	0	0	14	0	0	5	0	0	0	0	0	0	0	19	0	0	0	0
5:05 PM	0	0	0	0	0	7	0	0	5	0	0	0	0	2	0	0	14	2	0	2	0
5:10 PM	0	0	0	0	0	7	0	0	4	0	0	0	0	0	0	0	11	0	0	0	0
5:15 PM	0	0	0	0	0	15	0	0	14	0	0	0	0	0	0	0	29	7	0	0	0
5:20 PM	0	0	1	0	1	19	0	0	6	0	0	0	1	0	0	0	27	0	0	0	0
5:25 PM	0	0	0	0	0	6	0	0	3	0	0	0	0	1	0	0	10	1	0	0	0
5:30 PM	0	0	0	0	0	8	0	0	6	0	0	0	0	1	0	0	15	0	0	0	0
5:35 PM	0	0	0	0	0	12	0	0	6	0	0	0	2	3	0	0	23	0	0	0	0
5:40 PM	0	0	0	0	0	8	0	0	8	0	0	0	0	5	0	0	19	0	0	0	0
5:45 PM	0	0	0	0	0	10	0	0	7	0	0	0	0	1	0	0	18	0	0	0	0
5:50 PM	0	0	0	0	0	14	0	0	11	0	0	0	0	0	0	0	25	0	0	0	0
5:55 PM	0	0	0	0	0	9	0	0	8	0	0	0	0	1	0	0	18	0	0	0	0
Total Survey	0	0	15	0	193	0	0	0	159	1	0	0	6	27	0	0	401	18	3	2	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way				Southbound SW Cedar Brook Way				Eastbound SW Handley St				West bound SW Handley St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	5	14	0	0	16	0	0	0	1	4	0	0	40	7	2	0	0
4:15 PM	0	0	0	0	4	15	0	0	19	0	0	0	0	1	0	0	39	1	1	0	0
4:30 PM	0	0	0	0	4	18	0	0	18	0	0	0	2	4	0	0	46	0	0	0	0
4:45 PM	0	0	0	0	1	19	0	0	23	1	0	0	0	4	0	0	48	0	0	0	0
5:00 PM	0	0	0	0	0	26	0	0	14	0	0	0	0	2	0	0	44	2	0	2	0
5:15 PM	0	0	0	0	1	40	0	0	23	0	0	0	1	1	0	0	66	8	0	0	0
5:30 PM	0	0	0	0	0	26	0	0	20	0	0	0	2	9	0	0	57	0	0	0	0
5:45 PM	0	0	0	0	0	33	0	0	26	0	0	0	0	2	0	0	61	0	0	0	0
Total Survey	0	0	15	0	193	0	0	0	159	1	0	0	6	27	0	0	401	18	3	2	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Cedar Brook Way				Southbound SW Cedar Brook Way				Eastbound SW Handley St				Westbound SW Handley St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	128	97	225	0	83	130	213	0	17	1	18	0	228	10	0	2	0
%HV		0.0%				0.8%				0.0%				0.0%			0.4%				
PHF		0.00				0.76				0.80				0.39			0.85				

By Movement	Northbound SW Cedar Brook Way				Southbound SW Cedar Brook Way				Eastbound SW Handley St				Westbound SW Handley St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume				0	1		127	128	83	0		83		3	14	17	228
%HV	NA	NA	NA	0.0%	0.0%	NA	0.8%	0.8%	0.0%	0.0%	NA	0.0%	NA	0.0%	0.0%	0.0%	0.4%
PHF				0.00	0.25		0.77	0.76	0.80	0.00		0.80		0.38	0.39	0.39	0.85

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way				Southbound SW Cedar Brook Way				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	14	66	0	0	76	1	0	0	3	13	0	0	173	8	3	0	0
4:15 PM	0	0	0	0	9	80	0	0	74	1	0	0	2	11	0	0	177	3	1	2	0
4:30 PM	0	0	0	0	6	105	0	0	78	1	0	0	3	11	0	0	204	10	0	2	0
4:45 PM	0	0	0	0	2	113	0	0	80	1	0	0	3	16	0	0	215	10	0	2	0
5:00 PM	0	0	0	0	1	127	0	0	83	0	0	0	3	14	0	0	228	10	0	2	0

TRAFFIC LEVELS OF SERVICE

Analysis of traffic volumes is useful in understanding the general nature of traffic in an area, but by itself indicates neither the ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of *level of service* has been developed to subjectively describe traffic performance. Level of service can be measured at intersections and along key roadway segments.

Level of service categories are similar to report card ratings for traffic performance. Intersections are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is generally diminished in their vicinities. Levels of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection. Most urban communities set level of service D as the minimum acceptable level of service for peak hour operation and plan for level of service C or better for all other times of the day. The *Highway Capacity Manual* provides level of service calculation methodology for both intersections and arterials.[1] The following two sections provide interpretations of the analysis approaches.

[1] *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2000, Chapters 16 and 17

UNSIGNALIZED INTERSECTIONS (Two-Way Stop Controlled)

Unsignalized intersection level of service is reported for the major street and minor street (generally, left turn movements). The method assesses available and critical gaps in the traffic stream which make it possible for side street traffic to enter the main street flow. The *2000 Highway Capacity Manual* describes the detailed methodology. It is not unusual for an intersection to experience level of service E or F conditions for the minor street left turn movement. It should be understood that, often, a poor level of service is experienced by only a few vehicles and the intersection as a whole operates acceptably.

Unsignalized intersection levels of service are described in the following table.

Level of Service	Expected Delay	(Sec/Veh)
A	Little or no delay	0-10.0
B	Short traffic delay	>10.1-15.0
C	Average traffic delays	>15.1-25.0
D	Long traffic delays	>25.1-35.0
E	Very long traffic delays	>35.1-50.0
F	Extreme delays potentially affecting other traffic movements in the intersection	> 50

Source: 2000 *Highway Capacity Manual*, Transportation Research Board Washington, D C

SIGNALIZED INTERSECTIONS

For signalized intersections, level of service is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay (or signal delay) includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In previous versions of this chapter of the HCM (1994 and earlier), delay included only stopped delay. As delay increases, the level of service decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control. The *2000 Highway Capacity Manual* provides the basis for these calculations.

Level of Service	Delay (secs)	Description
A	≤10 00	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication Most vehicles do not stop at all Progression is extremely favorable and most vehicles arrive during the green phase
B	10 1-20 0	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized Many drivers begin to feel somewhat restricted within platoons of vehicles This level generally occurs with good progression, short cycle lengths, or both
C	20.1-35 0	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized Most drivers feel somewhat restricted Higher delays may result from fair progression, longer cycle lengths, or both Individual cycle failures may begin to appear at this level, and the number of vehicles stopping is significant
D	35 1-55 0	**Approaching Unstable/Tolerable Delays:** The influence of congestion becomes more noticeable Drivers may have to wait through more than one red signal indication Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios The proportion of vehicles not stopping declines, and individual cycle failures are noticeable
E	55 1-80 0	**Unstable Operation/Significant Delays:** Volumes at or near capacity Vehicles may wait though several signal cycles Long queues form upstream from intersection These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios Individual cycle failures are a frequent occurrence
F	≥80 0	**Forced Flow/Excessive Delays:** Represents jammed conditions Queues may block upstream intersections This level occurs when arrival flow rates exceed intersection capacity, and is considered to be unacceptable to most drivers Poor progression, long cycle lengths, and v/c ratios approaching 1 0 may contribute to these high delay levels

Source: *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2012 Existing (P.M. Peak Hour)

Lane Configurations						
Volume (veh/h)	25	10	160	35	25	360
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	11	191	37	27	404
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	668	210			229	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	668	210			229	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	94	99			98	
cM capacity (veh/h)	412	810			1328	

Volume Total	37	229	431
Volume Left	27	0	27
Volume Right	11	37	0
cSH	479	1700	1328
Volume to Capacity	0.08	0.13	0.02
Queue Length 95th (ft)	6	0	2
Control Delay (s)	13.1	0.0	0.7
Lane LOS	B		A
Approach Delay (s)	13.1	0.0	0.7
Approach LOS	B		

Average Delay		1.1	
Intersection Capacity Utilization		46.3%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2012 Existing (P.M. Peak Hour)

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	85	0	0	0	5	15	0	0	0	5	0	125
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	100	0	0	0	6	18	0	0	0	6	0	147
Volume Total (vph)	100	24	0	153								
Volume Left (vph)	100	0	0	6								
Volume Right (vph)	0	18	0	147								
Hadj (s)	0.20	-0.45	0.00	-0.55								
Departure Headway (s)	4.4	3.9	4.3	3.6								
Degree Utilization, x	0.12	0.03	0.00	0.15								
Capacity (veh/h)	785	888	808	961								
Control Delay (s)	8.0	7.0	7.3	7.3								
Approach Delay (s)	8.0	7.0	0.0	7.3								
Approach LOS	A	A	A	A								

Delay		7.5	
HCM Level of Service		A	
Intersection Capacity Utilization		26.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
3. Meinecke Rd & Hwy 99W — 2012 Existing (P.M. Peak Hour)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1280	30	285	1645	70	40	45	165	35	50	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1555	1805	3574	1579	1752	1863	1549	1792	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)	1805	3505	1555	1805	3574	1579	1334	1863	1549	1370	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	1333	31	297	1714	73	42	47	172	36	52	16
RTOR Reduction (vph)	0	0	14	0	0	21	0	0	148	0	0	14
Lane Group Flow (vph)	16	1333	17	297	1714	52	42	47	24	36	52	2
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	2.3	48.0	48.0	20.9	66.6	66.6	11.2	11.2	11.2	11.2	11.2	11.2
Effective Green, g (s)	2.8	50.0	50.0	21.4	68.6	68.6	13.2	13.2	13.2	13.2	13.2	13.2
Actuated g/C Ratio	0.03	0.52	0.52	0.22	0.71	0.71	0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	52	1814	805	400	2538	1121	182	255	212	187	260	221
v/s Ratio Prot	0.01	c0.38		c0.16	0.48			0.03			0.03	
v/s Ratio Perm			0.01			0.03	c0.03		0.02	0.03		0.00
v/c Ratio	0.31	0.73	0.02	0.74	0.68	0.05	0.23	0.18	0.11	0.19	0.20	0.01
Uniform Delay, d1	46.0	18.1	11.4	35.0	7.8	4.2	37.2	36.9	35.6	37.0	37.0	36.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	1.8	0.0	6.7	0.9	0.0	0.5	0.3	0.2	0.4	0.3	0.0
Delay (s)	47.9	19.9	11.4	41.7	8.7	4.2	37.6	37.2	36.7	37.3	37.3	36.1
Level of Service	D	B	B	D	A	A	D	D	D	D	D	D
Approach Delay (s)		20.1			13.2			37.0			37.1	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM Average Control Delay	16.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.66			
Actuated Cycle Length (s)	96.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.1%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
4: Kruger Rd & Elwert Rd — 2012 Existing (P.M. Peak Hour)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	40	240	5	20	390	10
Sign Control	Free		Stop			Stop
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	46	276	6	23	448	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)	196					
pX, platoon unblocked						
vC, conflicting volume	0		368	0	256	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		368	0	256	230
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	97		99	98	33	98
cM capacity (veh/h)	1636		548	1091	665	654

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	322	29	460
Volume Left	46	0	448
Volume Right	276	23	0
cSH	1636	911	664
Volume to Capacity	0.03	0.03	0.69
Queue Length 95th (ft)	2	2	138
Control Delay (s)	1.2	9.1	21.7
Lane LOS	A	A	C
Approach Delay (s)	1.2	9.1	21.7
Approach LOS		A	C

Intersection Summary			
Average Delay	13.1		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd — 2012 Existing (P.M. Peak Hour)

Lane Configurations												
Volume (vph)	15	145	250	140	125	155	130	1145	115	210	1465	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1891	1583		1851	1615	1770	3505	1563	3502	3574	1538
Flt Permitted		0.74	1.00		0.66	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1414	1583		1250	1615	1770	3505	1563	3502	3574	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	151	260	146	130	161	135	1193	120	219	1526	26
RTOR Reduction (vph)	0	0	177	0	0	127	0	0	37	0	0	12
Lane Group Flow (vph)	0	167	83	0	276	34	135	1193	83	219	1526	14
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	2%	3%	2%	0%	1%	5%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.4	20.4		19.9	19.9	12.4	44.2	44.2	23.0	54.8	54.8
Effective Green, g (s)		20.4	22.4		21.9	21.9	12.9	46.2	46.2	23.5	56.8	56.8
Actuated g/C Ratio		0.20	0.21		0.21	0.21	0.12	0.44	0.44	0.22	0.54	0.54
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		276	339		262	338	218	1548	690	787	1941	835
v/s Ratio Prot							0.08	c0.34		0.06	c0.43	
v/s Ratio Perm		0.12	0.05		c0.22	0.02			0.05			0.01
v/c Ratio		0.61	0.25		1.05	0.10	0.62	0.77	0.12	0.28	0.79	0.02
Uniform Delay, d1		38.4	34.1		41.4	33.4	43.5	24.7	17.2	33.5	19.1	11.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.1	0.3		70.3	0.1	5.2	2.9	0.2	0.2	2.6	0.0
Delay (s)		41.6	34.4		111.7	33.5	48.7	27.7	17.4	33.8	21.7	11.0
Level of Service		D	C		F	C	D	C	B	C	C	B
Approach Delay (s)		37.2			82.9			28.8			23.0	
Approach LOS		D			F			C			C	

Intersection Summary			
HCM Average Control Delay	32.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	104.6	Sum of lost time (s)	8.5
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 1 (Minimum Connectivity)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	60	175	330	55	120	485
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	62	182	344	57	125	505
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1128	372			401	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1128	372			401	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	69	72			89	
cM capacity (veh/h)	200	656			1147	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	245	401	630
Volume Left	62	0	125
Volume Right	182	57	0
cSH	414	1700	1147
Volume to Capacity	0.59	0.24	0.11
Queue Length 95th (ft)	92	0	9
Control Delay (s)	25.5	0.0	2.8
Lane LOS	D		A
Approach Delay (s)	25.5	0.0	2.8
Approach LOS	D		

Intersection Summary			
Average Delay	6.2		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	180	5	20	5	15	15	30	40	5	10	40	365
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	188	5	21	5	16	16	31	42	5	10	42	380

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	214	36	78	432
Volume Left (vph)	188	5	31	10
Volume Right (vph)	21	16	5	380
Hadj (s)	0.12	-0.23	0.04	-0.51
Departure Headway (s)	5.2	5.2	5.1	4.2
Degree Utilization, x	0.31	0.05	0.11	0.50
Capacity (veh/h)	637	609	646	822
Control Delay (s)	10.5	8.4	8.8	11.3
Approach Delay (s)	10.5	8.4	8.8	11.3
Approach LOS	B	A	A	B

Intersection Summary			
Delay	10.7		
HCM Level of Service	B		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	1645	45	340	2145	185	75	200	275	95	140	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1546	1805	3574	1577	1752	1863	1557	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.52	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1805	3505	1546	1805	3574	1577	952	1863	1557	701	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	1714	47	354	2234	193	78	208	286	99	146	21
RTOR Reduction (vph)	0	0	17	0	0	56	0	0	210	0	0	17
Lane Group Flow (vph)	62	1714	30	354	2234	137	78	208	76	99	146	4
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	7.7	67.3	67.3	25.1	84.7	84.7	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	8.2	69.3	69.3	25.6	86.7	86.7	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.19	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1850	816	352	2360	1041	177	348	289	130	353	300
v/s Ratio Prot	0.03	0.49		c0.20	c0.63			0.11			0.08	
v/s Ratio Perm			0.02			0.09	0.08		0.05	c0.14		0.00
v/c Ratio	0.55	0.93	0.04	1.01	0.95	0.13	0.44	0.60	0.26	0.76	0.41	0.01
Uniform Delay, d1	59.8	28.6	14.9	52.9	20.2	8.3	47.4	49.0	45.8	50.7	47.1	43.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	8.8	0.0	49.4	9.1	0.1	1.3	2.5	0.4	21.9	0.6	0.0
Delay (s)	63.5	37.4	15.0	102.3	29.3	8.4	48.7	51.5	46.1	72.6	47.7	43.6
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.7			37.1			48.4			56.6	
Approach LOS		D			D			D			E	

Intersection Summary				
HCM Average Control Delay	39.5	HCM Level of Service		D
HCM Volume to Capacity ratio	0.91			
Actuated Cycle Length (s)	131.3	Sum of lost time (s)		8.0
Intersection Capacity Utilization	93.4%	ICU Level of Service		F
Analysis Period (min)	15			

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd/New Local Road

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Intersection	
Intersection Delay (sec/veh)	10.8
Intersection LOS	B

Approach	EB			
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	57	495	626
Demand Flow Rate (pc/h)	120	58	496	632
Vehicles Circulating (pc/h)	653	490	47	141
Vehicles Exiting (pc/h)	120	53	726	407
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.7	6.2	8.5	13.4
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	58	496	632
Capacity, Entry Lane (pc/h)	588	692	1078	981
Entry HV Adjustment Factor	0.999	0.981	0.998	0.991
Flow Rate, Entry (vph)	120	57	495	626
Capacity, Entry (vph)	588	679	1076	972
Volume to Capacity Ratio	0.204	0.084	0.460	0.644
Control Delay (sec/veh)	8.7	6.2	8.5	13.4
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	5

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	210	445	230	235	225	185	1490	135	220	1950	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1887	1615		1854	1599	1805	3610	1594	3467	3610	1615
Flt Permitted		0.11	1.00		0.34	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		217	1615		640	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	219	464	240	245	234	193	1552	141	229	2031	57
RTOR Reduction (vph)	0	0	168	0	0	150	0	0	31	0	0	20
Lane Group Flow (vph)	0	255	296	0	485	84	193	1552	110	229	2031	37
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.7	58.5	58.5	28.9	73.7	73.7
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.2	60.5	60.5	30.4	75.7	75.7
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		35	283		110	274	219	1742	769	840	2179	975
v/s Ratio Prot							0.11	c0.43		0.07	c0.56	
v/s Ratio Perm		c1.18	0.18		0.76	0.05			0.07			0.02
v/c Ratio		7.29	1.05		4.41	0.31	0.88	0.89	0.14	0.27	0.93	0.04
Uniform Delay, d1		52.7	51.7		52.0	45.4	54.2	29.5	18.0	38.5	22.5	10.1
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2887.0	65.8		1555.0	0.5	31.1	6.7	0.2	0.2	6.4	0.0
Delay (s)		2939.7	117.5		1606.9	45.9	85.4	36.2	18.3	38.7	30.9	10.1
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		1118.4			1098.9			39.9			31.2	
Approach LOS		F			F			D			C	

Intersection Summary				
HCM Average Control Delay	308.7	HCM Level of Service	F	
HCM Volume to Capacity ratio	2.09			
Actuated Cycle Length (s)	125.4	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	118.1%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Hwy 99W & New Access

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1750	2190	50	0	35
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	1823	2281	52	0	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2333				3219	1167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2333				3219	1167
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	81
cM capacity (veh/h)	215				8	190

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	911	911	1521	812	36
Volume Left	0	0	0	0	0
Volume Right	0	0	0	52	36
cSH	1700	1700	1700	1700	190
Volume to Capacity	0.54	0.54	0.89	0.48	0.19
Queue Length 95th (ft)	0	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	0.0	28.4
Lane LOS					D
Approach Delay (s)	0.0		0.0		28.4
Approach LOS					D

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	72.1%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity) + Imps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	210	445	230	235	225	185	1490	135	220	1950	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	219	464	240	245	234	193	1552	141	229	2031	57
RTOR Reduction (vph)	0	0	272	0	0	192	0	0	30	0	0	19
Lane Group Flow (vph)	36	219	192	240	245	42	193	1552	111	229	2031	38
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.1	18.7	18.7	9.0	21.1	21.1	14.2	68.1	68.1	17.9	71.8	71.8
Effective Green, g (s)	8.1	18.7	20.7	11.0	23.1	23.1	14.7	70.1	70.1	18.4	73.8	73.8
Actuated g/C Ratio	0.06	0.14	0.15	0.08	0.17	0.17	0.11	0.52	0.52	0.14	0.55	0.55
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	109	264	437	286	326	274	197	1879	830	474	1978	885
v/s Ratio Prot	0.02	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.56	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.33	0.83	0.44	0.84	0.75	0.15	0.98	0.83	0.13	0.48	1.03	0.04
Uniform Delay, d1	60.7	56.4	51.7	61.0	53.1	47.5	59.9	27.2	16.6	53.8	30.4	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	18.6	0.5	18.9	9.0	0.2	57.5	3.6	0.2	0.9	27.4	0.0
Delay (s)	62.5	75.0	52.3	79.9	62.0	47.7	117.4	30.7	16.8	54.7	57.9	14.2
Level of Service	E	E	D	E	E	D	F	C	B	D	E	B
Approach Delay (s)		59.7			63.3			38.6			56.5	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM Average Control Delay	51.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	134.7	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 2 (No Highway 99W Access)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	55	160	320	45	110	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	57	167	333	47	115	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	73	75			90	
cM capacity (veh/h)	209	670			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	224	380	630
Volume Left	57	0	115
Volume Right	167	47	0
cSH	429	1700	1167
Volume to Capacity	0.52	0.22	0.10
Queue Length 95th (ft)	74	0	8
Control Delay (s)	22.2	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	22.2	0.0	2.5
Approach LOS	C		

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 2 (No Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	185	5	15	5	10	20	20	60	5	10	65	400
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	193	5	16	5	10	21	21	62	5	10	68	417

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	214	36	89	495
Volume Left (vph)	193	5	21	10
Volume Right (vph)	16	21	5	417
Hadj (s)	0.14	-0.31	0.01	-0.49
Departure Headway (s)	5.4	5.3	5.2	4.3
Degree Utilization, x	0.32	0.05	0.13	0.58
Capacity (veh/h)	610	584	635	815
Control Delay (s)	11.0	8.6	9.0	13.1
Approach Delay (s)	11.0	8.6	9.0	13.1
Approach LOS	B	A	A	B

Intersection Summary			
Delay	11.9		
HCM Level of Service	B		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	1640	40	340	2080	250	75	200	275	100	145	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1546	1805	3574	1577	1752	1863	1557	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1805	3505	1546	1805	3574	1577	931	1863	1557	701	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	1708	42	354	2167	260	78	208	286	104	151	47
RTOR Reduction (vph)	0	0	15	0	0	78	0	0	211	0	0	38
Lane Group Flow (vph)	62	1708	27	354	2167	182	78	208	75	104	151	9
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	7.7	67.2	67.2	25.1	84.6	84.6	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	8.2	69.2	69.2	25.6	86.6	86.6	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.20	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1849	815	352	2359	1041	173	346	290	130	353	300
v/s Ratio Prot	0.03	0.49		c0.20	c0.61			0.11			0.08	
v/s Ratio Perm			0.02			0.12	0.08		0.05	c0.15		0.01
v/c Ratio	0.55	0.92	0.03	1.01	0.92	0.17	0.45	0.60	0.26	0.80	0.43	0.03
Uniform Delay, d1	59.7	28.6	14.9	52.8	19.3	8.6	47.4	48.9	45.7	51.1	47.2	43.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	8.5	0.0	49.4	6.5	0.1	1.4	2.5	0.3	27.9	0.6	0.0
Delay (s)	63.4	37.1	14.9	102.2	25.8	8.7	48.8	51.4	46.0	79.0	47.8	43.7
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.5			33.9			48.4			57.9	
Approach LOS		D			C			D			E	

Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	131.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd/Cedar Brook Way

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access)

Intersection	
Intersection Delay (sec/veh)	10.8
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	46	479	620
Demand Flow Rate (pc/h)	120	47	480	626
Vehicles Circulating (pc/h)	647	479	41	141
Vehicles Exiting (pc/h)	120	42	726	385
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.6	6.0	8.2	13.2
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	47	480	626
Capacity, Entry Lane (pc/h)	592	700	1085	981
Entry HV Adjustment Factor	0.999	0.977	0.998	0.991
Flow Rate, Entry (vph)	120	46	479	620
Capacity, Entry (vph)	591	684	1082	972
Volume to Capacity Ratio	0.203	0.067	0.443	0.638
Control Delay (sec/veh)	8.6	6.0	8.2	13.2
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	5

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	210	455	230	235	225	183	1490	135	220	1940	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1890	1615		1854	1599	1805	3610	1594	3467	3610	1615
Flt Permitted		0.15	1.00		0.37	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		278	1615		687	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	474	240	245	234	193	1552	141	229	2021	42
RTOR Reduction (vph)	0	0	168	0	0	150	0	0	31	0	0	15
Lane Group Flow (vph)	0	245	306	0	485	84	193	1552	110	229	2021	27
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.7	58.4	58.4	29.8	73.5	73.5
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.2	60.4	60.4	30.3	75.5	75.5
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		5.0	5.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		44	284		120	275	219	1742	769	839	2177	974
v/s Ratio Prot							0.11	c0.43		0.07	c0.56	
v/s Ratio Perm		c0.88	0.19		0.70	0.05			0.07			0.02
v/c Ratio		5.57	1.08		4.04	0.31	0.88	0.89	0.14	0.27	0.93	0.03
Uniform Delay, d1		52.6	51.6		51.9	45.3	54.1	29.4	18.0	38.5	22.4	10.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2104.4	75.4		1388.4	0.5	31.1	6.7	0.2	0.2	8.0	0.0
Delay (s)		2157.0	127.0		1440.2	45.8	85.3	36.1	18.2	38.7	30.4	10.1
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		818.7			888.4			39.8			30.9	
Approach LOS		F			F			D			C	

HCM Average Control Delay	257.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.76		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	117.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access) + Imps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	210	455	230	235	225	185	1490	135	220	1940	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	474	240	245	234	193	1552	141	229	2021	42
RTOR Reduction (vph)	0	0	275	0	0	183	0	0	29	0	0	13
Lane Group Flow (vph)	26	219	199	240	245	51	193	1552	112	229	2021	29
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.7	20.6	20.6	8.0	23.4	23.4	16.0	76.0	76.0	20.0	80.0	80.0
Effective Green, g (s)	6.7	20.6	22.6	10.0	25.4	25.4	16.5	78.0	78.0	20.5	82.0	82.0
Actuated g/C Ratio	0.05	0.14	0.16	0.07	0.17	0.17	0.11	0.54	0.54	0.14	0.56	0.56
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	83	269	441	241	331	279	205	1934	854	488	2033	910
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.56	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.31	0.81	0.45	1.00	0.74	0.18	0.94	0.80	0.13	0.47	0.99	0.03
Uniform Delay, d1	67.2	60.6	55.9	67.8	57.0	51.2	64.1	27.5	16.9	57.5	31.6	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	16.6	0.5	56.5	8.2	0.2	46.3	2.9	0.2	0.8	18.5	0.0
Delay (s)	69.4	77.2	56.4	124.2	65.1	51.5	110.4	30.4	17.0	58.4	50.1	14.2
Level of Service	E	E	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		63.2			80.4			37.6			50.3	
Approach LOS		E			F			D			D	

Intersection Summary			
HCM Average Control Delay	51.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	145.6	Sum of lost time (s)	10.5
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 3 (RI/RO Highway 99W Access)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	160	320	45	110	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	52	167	333	47	115	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	75	75			90	
cM capacity (veh/h)	209	670			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	219	380	630
Volume Left	52	0	115
Volume Right	167	47	0
cSH	440	1700	1167
Volume to Capacity	0.50	0.22	0.10
Queue Length 95th (ft)	68	0	8
Control Delay (s)	21.0	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	21.0	0.0	2.5
Approach LOS	C		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 3 (RI/RO Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	170	5	30	10	10	15	20	50	5	10	50	355
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	177	5	31	10	10	16	21	52	5	10	52	370

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	214	36	78	432
Volume Left (vph)	177	10	21	10
Volume Right (vph)	31	16	5	370
Hadj (s)	0.08	-0.20	0.01	-0.49
Departure Headway (s)	5.2	5.2	5.1	4.2
Degree Utilization, x	0.31	0.05	0.11	0.50
Capacity (veh/h)	641	606	650	821
Control Delay (s)	10.5	8.5	8.7	11.3
Approach Delay (s)	10.5	8.5	8.7	11.3
Approach LOS	B	A	A	B

Intersection Summary			
Delay	10.1		
HCM Level of Service	B		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	1640	40	340	2145	185	75	200	275	100	145	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1546	1805	3574	1577	1752	1863	1557	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1805	3505	1546	1805	3574	1577	931	1863	1557	701	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	1708	42	354	2234	193	78	208	286	104	151	21
RTOR Reduction (vph)	0	0	15	0	0	56	0	0	211	0	0	17
Lane Group Flow (vph)	62	1708	27	354	2234	137	78	208	75	104	151	4
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	7.7	67.2	67.2	25.1	84.6	84.6	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	8.2	69.2	69.2	25.6	86.6	86.6	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.20	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1849	815	352	2359	1041	173	346	290	130	353	300
v/s Ratio Prot	0.03	0.49		c0.20	c0.63			0.11			0.08	
v/s Ratio Perm			0.02			0.09	0.08		0.05	c0.15		0.00
v/c Ratio	0.55	0.92	0.03	1.01	0.95	0.13	0.45	0.60	0.26	0.80	0.43	0.01
Uniform Delay, d1	59.7	28.6	14.9	52.8	20.2	8.3	47.4	48.9	45.7	51.1	47.2	43.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	8.5	0.0	49.4	9.1	0.1	1.4	2.5	0.3	27.9	0.6	0.0
Delay (s)	63.4	37.1	14.9	102.2	29.4	8.4	48.8	51.4	46.0	79.0	47.8	43.6
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.5			37.2			48.4			59.2	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	39.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	131.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

Intersection	
Intersection Delay (sec/veh)	10.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	41	474	599
Demand Flow Rate (pc/h)	120	42	474	605
Vehicles Circulating (pc/h)	616	479	41	131
Vehicles Exiting (pc/h)	120	36	695	390
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.3	5.9	8.1	12.3
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	42	474	605
Capacity, Entry Lane (pc/h)	610	700	1065	991
Entry HV Adjustment Factor	0.999	0.974	1.000	0.991
Flow Rate, Entry (vph)	120	41	474	599
Capacity, Entry (vph)	610	682	1065	982
Volume to Capacity Ratio	0.197	0.060	0.437	0.610
Control Delay (sec/veh)	8.3	5.9	8.1	12.3
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	4

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	210	425	230	235	225	185	1490	135	220	1870	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1890	1615		1854	1599	1805	3610	1594	3467	3610	1615
Flt Permitted		0.14	1.00		0.36	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		275	1615		690	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	443	240	245	234	193	1552	141	229	2052	36
RTOR Reduction (vph)	0	0	168	0	0	150	0	0	31	0	0	12
Lane Group Flow (vph)	0	245	275	0	485	84	193	1552	110	229	2052	24
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.8	58.7	58.7	30.2	74.1	74.1
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.3	60.7	60.7	30.7	76.1	76.1
Actuated g/C Ratio		0.16	0.17		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		44	282		118	273	219	1740	769	845	2182	976
v/s Ratio Prot							0.11	c0.43		0.07	c0.57	
v/s Ratio Perm		c0.89	0.17		0.70	0.05			0.07			0.01
v/c Ratio		5.57	0.98		4.11	0.31	0.88	0.89	0.14	0.27	0.94	0.02
Uniform Delay, d1		53.0	51.7		52.2	45.7	54.4	29.6	18.1	38.5	22.6	10.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2104.4	46.7		1419.5	0.5	31.1	6.8	0.2	0.2	9.2	0.0
Delay (s)		2157.3	98.4		1471.7	46.2	85.5	36.4	18.3	38.7	32.0	10.0
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		831.6			1007.7			40.1			32.3	
Approach LOS		F			F			D			C	

Intersection Summary				
HCM Average Control Delay	258.0	HCM Level of Service		F
HCM Volume to Capacity ratio	1.78			
Actuated Cycle Length (s)	125.9	Sum of lost time (s)		14.0
Intersection Capacity Utilization	118.1%	ICU Level of Service		H
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Hwy 99W & New Access

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1740	2170	70	0	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	1812	2260	73	0	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2333				3203	1167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2333				3203	1167
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	70
cM capacity (veh/h)	215				8	190

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	906	906	1507	826	57
Volume Left	0	0	0	0	0
Volume Right	0	0	0	73	57
cSH	1700	1700	1700	1700	190
Volume to Capacity	0.53	0.53	0.89	0.49	0.30
Queue Length 95th (ft)	0	0	0	0	30
Control Delay (s)	0.0	0.0	0.0	0.0	32.0
Lane LOS					D
Approach Delay (s)	0.0		0.0		32.0
Approach LOS					D

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	72.3%	ICU Level of Service		C
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access) + Imps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	210	425	230	235	225	185	1490	135	220	1970	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	443	240	245	234	193	1552	141	229	2052	36
RTOR Reduction (vph)	0	0	277	0	0	180	0	0	30	0	0	11
Lane Group Flow (vph)	26	219	166	240	245	54	193	1552	111	229	2052	25
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.5	19.8	19.8	8.9	23.7	23.7	16.0	76.6	76.6	19.9	80.5	80.5
Effective Green, g (s)	6.5	19.8	21.8	10.9	25.7	25.7	16.5	78.6	78.6	20.4	82.5	82.5
Actuated g/C Ratio	0.04	0.14	0.15	0.07	0.18	0.18	0.11	0.54	0.54	0.14	0.56	0.56
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	80	257	424	261	334	281	204	1941	857	484	2037	911
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.57	
v/s Ratio Perm			0.06			0.03			0.07			0.02
v/c Ratio	0.33	0.85	0.39	0.92	0.73	0.19	0.95	0.80	0.13	0.47	1.01	0.03
Uniform Delay, d1	67.7	61.8	56.2	67.2	57.0	51.4	64.4	27.4	16.8	57.9	31.8	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	22.6	0.4	34.5	7.6	0.2	47.4	2.8	0.2	0.9	21.7	0.0
Delay (s)	70.1	84.4	56.7	101.7	64.7	51.7	111.8	30.2	17.0	58.8	53.6	14.1
Level of Service	E	F	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		66.0			72.8			37.6			53.5	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM Average Control Delay	52.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	146.2	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 4 (Full Highway 99W Access)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	180	320	45	110	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	52	187	333	47	115	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	75	75			90	
cM capacity (veh/h)	209	670			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	219	380	630
Volume Left	52	0	115
Volume Right	187	47	0
cSH	440	1700	1167
Volume to Capacity	0.50	0.22	0.10
Queue Length 95th (ft)	68	0	8
Control Delay (s)	21.0	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	21.0	0.0	2.5
Approach LOS	C		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 4 (Full Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	135	5	30	10	10	15	20	20	5	10	40	350
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	141	5	31	10	10	16	21	21	5	10	42	365

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	177	36	47	417
Volume Left (vph)	141	10	21	10
Volume Right (vph)	31	16	5	365
Hadj (s)	0.05	-0.20	0.02	-0.51
Departure Headway (s)	5.0	5.0	4.9	4.0
Degree Utilization, x	0.25	0.05	0.06	0.46
Capacity (veh/h)	664	644	674	858
Control Delay (s)	9.6	8.2	8.3	10.4
Approach Delay (s)	9.6	8.2	8.3	10.4
Approach LOS	A	A	A	B

Intersection Summary			
Delay	10.0		
HCM Level of Service	A		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	1705	40	340	2145	185	75	200	275	35	145	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1547	1805	3574	1577	1752	1863	1555	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.48	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	1805	3505	1547	1805	3574	1577	890	1863	1555	634	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	47	1776	42	354	2234	193	78	208	286	36	151	21
RTOR Reduction (vph)	0	0	14	0	0	52	0	0	214	0	0	17
Lane Group Flow (vph)	47	1776	28	354	2234	141	78	208	72	36	151	4
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	6.9	67.7	67.7	25.2	86.0	86.0	19.6	19.6	19.6	19.6	19.6	19.6
Effective Green, g (s)	7.4	69.7	69.7	25.7	88.0	88.0	21.6	21.6	21.6	21.6	21.6	21.6
Actuated g/C Ratio	0.06	0.54	0.54	0.20	0.68	0.68	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	104	1894	836	360	2438	1076	149	312	260	108	318	270
v/s Ratio Prot	0.03	0.51		c0.20	c0.63			c0.11			0.08	
v/s Ratio Perm			0.02			0.09	0.09		0.05	0.06		0.00
v/c Ratio	0.45	0.94	0.03	0.98	0.92	0.13	0.52	0.67	0.28	0.34	0.47	0.01
Uniform Delay, d1	58.8	27.6	13.9	51.4	17.4	7.2	49.0	50.3	46.9	47.4	48.6	44.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	9.7	0.0	42.6	6.2	0.1	2.5	4.8	0.4	1.4	0.8	0.0
Delay (s)	60.7	37.4	13.9	94.1	23.6	7.2	51.5	55.1	47.3	48.8	49.4	44.8
Level of Service	E	D	B	F	C	A	D	E	D	D	D	D
Approach Delay (s)		37.4			31.4			50.7			48.8	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	36.2	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	129.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	94.8%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Intersection	
Intersection Delay (sec/veh)	9.9
Intersection LOS	A

Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	31	464	599
Demand Flow Rate (pc/h)	120	31	464	605
Vehicles Circulating (pc/h)	605	474	41	120
Vehicles Exiting (pc/h)	120	31	884	385
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.2	5.6	7.9	12.0
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	31	464	605
Capacity, Entry Lane (pc/h)	617	703	1085	1002
Entry HV Adjustment Factor	0.999	0.997	1.000	0.991
Flow Rate, Entry (vph)	120	31	464	599
Capacity, Entry (vph)	617	701	1085	993
Volume to Capacity Ratio	0.194	0.044	0.428	0.604
Control Delay (sec/veh)	8.2	5.6	7.9	12.0
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	4

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	210	425	230	235	225	175	1500	135	220	1970	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1894	1615		1854	1599	1805	3610	1594	3467	3610	1615
Flt Permitted		0.25	1.00		0.38	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		478	1615		748	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	219	443	240	245	234	182	1562	141	229	2052	36
RTOR Reduction (vph)	0	0	167	0	0	150	0	0	30	0	0	12
Lane Group Flow (vph)	0	235	276	0	485	84	182	1562	111	229	2052	24
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.5	58.7	58.7	29.7	73.9	73.9
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.0	60.7	60.7	30.2	75.9	75.9
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.61	0.61
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		76	283		128	274	216	1747	772	835	2185	978
v/s Ratio Prot							0.10	c0.43		0.07	c0.57	
v/s Ratio Perm		0.49	0.17		c0.65	0.05			0.07			0.01
v/c Ratio		3.09	0.97		3.79	0.31	0.84	0.89	0.14	0.27	0.94	0.02
Uniform Delay, d1		52.7	51.4		52.0	45.4	54.0	29.4	17.9	38.7	22.6	9.9
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		975.2	46.0		1273.9	0.5	24.6	6.9	0.2	0.2	9.0	0.0
Delay (s)		1027.9	97.4		1325.9	45.9	78.7	36.3	18.1	38.9	31.6	9.9
Level of Service		F	F		F	D	E	D	B	D	C	A
Approach Delay (s)		419.9			909.3			39.0			32.0	
Approach LOS		F			F			D			C	

Intersection Summary				
HCM Average Control Delay	194.0	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.49			
Actuated Cycle Length (s)	125.4	Sum of lost time (s)	12.5	
Intersection Capacity Utilization	117.0%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Hwy 99W & New Access

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	25	1715	2170	70	75	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	3505	3559		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	3505	3559		1805	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	1786	2260	73	78	57
RTOR Reduction (vph)	0	0	2	0	0	51
Lane Group Flow (vph)	26	1786	2331	0	78	6
Heavy Vehicles (%)	0%	3%	1%	0%	0%	0%
Turn Type	Prot	NA	NA		NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	1.5	63.8	58.3		8.7	8.7
Effective Green, g (s)	1.5	63.8	58.3		8.7	8.7
Actuated g/C Ratio	0.02	0.79	0.72		0.11	0.11
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	34	2778	2578		195	175
v/s Ratio Prot	0.01	c0.51	c0.66		c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.76	0.64	0.90		0.40	0.04
Uniform Delay, d1	39.3	3.5	8.9		33.5	32.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	66.1	0.5	5.0		1.3	0.1
Delay (s)	105.4	4.0	13.8		34.8	32.2
Level of Service	F	A	B		C	C
Approach Delay (s)		5.5	13.8		33.7	
Approach LOS		A	B		C	

Intersection Summary				
HCM Average Control Delay	10.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	80.5	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	73.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access) + Imps

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	210	425	230	235	225	175	1500	135	220	1970	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	219	443	240	245	234	182	1562	141	229	2052	36
RTOR Reduction (vph)	0	0	257	0	0	189	0	0	29	0	0	11
Lane Group Flow (vph)	16	219	186	240	245	45	182	1562	112	229	2052	25
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.1	21.4	21.4	8.0	25.8	25.8	15.0	76.2	76.2	19.8	81.0	81.0
Effective Green, g (s)	5.1	21.4	23.4	10.0	27.8	27.8	15.5	78.2	78.2	20.3	83.0	83.0
Actuated g/C Ratio	0.03	0.15	0.16	0.07	0.19	0.19	0.11	0.53	0.53	0.14	0.57	0.57
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	63	278	454	239	361	304	191	1928	851	481	2047	916
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.10	0.43		0.07	c0.57	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.25	0.79	0.41	1.00	0.68	0.15	0.95	0.81	0.13	0.48	1.00	0.03
Uniform Delay, d1	68.8	60.3	55.3	68.2	55.1	49.4	65.1	28.0	17.1	58.1	31.7	13.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	13.3	0.4	59.3	4.6	0.2	51.3	3.1	0.2	0.9	20.5	0.0
Delay (s)	70.9	73.6	55.7	127.5	59.7	49.6	116.4	31.1	17.2	59.0	52.2	14.0
Level of Service	E	E	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		61.8			79.0			38.3			52.3	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM Average Control Delay	52.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	146.4	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	Highway 99W	**Minor Street:**	New Access
Project:	Sherwood Elwert Connectivity	**City/County:**	Sherwood
Year:	2035	**Alternative:**	Option 4 (Full Access)

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
	100 percent of standard warrants				
X	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	7400	40300	N
	Minor	1	1850	1250	
Case B	Major	2	11100	40300	Y
	Minor	1	950	1250	
Analyst and Date:			Reviewer and Date:		

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Analysis Procedures Manual
February 2009

Exhibit C

Oregon
John A. Kitzhaber, MD, Governor

Department of Transportation
Region 1 Headquarters
123 NW Flanders Street
Portland, OR 97209
(503) 731.8200
FAX (503) 731.8531

August 6th, 2012

City of Sherwood
22560 SW Pine St
Sherwood, OR 97140

Subject: PA 12-03: Cedar Brook Way extension
Attn: Julia Hajduk, Planning Manager

We have reviewed the applicant's proposal to amend the City Transportation System Plan to change the functional classification of Cedar Brook Way from a local to a collector status and to clarify that the road connection is intended to go from Elwert road to Handley with one connection to Pacific Highway. ODOT is generally supportive of local street connectivity and has determined there will be no significant impacts to state highway facilities and that no additional state review is required.

Thank you for coordinating with the Oregon Department of Transportation.

Sincerely,

Seth Brumley

Seth Brumley
Land Use Review Planner

C: Kirsten Pennington, ODOT Region 1 Planning Manager

Exhibit D

Julia Hajduk

From: Debbaut, Anne <anne.debbaut@state.or.us>
Sent: Thursday, August 02, 2012 8:06 AM
To: Julia Hajduk
Subject: PAPA 003-12 to amend the TSP

Hi Julia,

The department would like to make a comment regarding the subject PAPA amending the Transportation System Plan (TSP) to change the functional classification of Cedar Brook Way from a local road to a collector road from Elwert to Hadley. It is recommended that the city review its collector street standards to ensure that they meet the current needs of the city.

Please let me know if you have any questions.

Regards,
Anne

Anne Debbaut | Metro Regional Representative
Community Services Division
Oregon Department of Land Conservation and Development
1600 SW Fourth Ave., Suite 109 | Portland, OR 97201
Office: 503.725.2182 | Cell: 503.804.0902
anne.debbaut@state.or.us | www.oregon.gov/LCD/

Exhibit E

RECEIVED 8/9/12

Sherwood "Robin Hood" Elks
B.P.O.E. Lodge #2342
PO Box 71
Sherwood, OR 97140

August 5, 2012

Ms. Julia Hajduk, Planning Manaager
City of Sherwood Planning Commission
22560 SW Pine Street
Sherwood, Oregon 97140

Reference: Cedar Brook Way and other road improvements

Sherwood Elks Lodge has reviewed the information included in the Memorandum, prepared by DKS for the Sherwood TSP Connectivity Refinement that was presented and copies handed out at that meeting of June 26, 2012.

After reviewing the proposals we find that the best interest of the Members of the Lodge can best be severed with the adoption of Proposals 3 or 4. It is our understanding that proposal 4 is encumbered by the costs associated with changes to the highway 99 lanes that would be required to level the divided lanes.

Therefore, if the right turn left turn access to Highway 99, as indicated in Proposal 4, cannot be achieved we would agree that proposal 3 would best serve the interest of the Lodge property as contained in Proposal 3 access to the property would be achieved by the improvement of the intersection at the current location at the southwest corner of the property and the addition of access to Bushong would allow access to the north. When Cedar Brook Way is completed access to the east would be achieved.

Additionally we understand that currently there is no direct access south to Highway 99.

Sherwood Elks Lodge supports the adoption of proposal 3 with the understanding that this will include the three access points as outlined above.

Sincerely,

Guy Pabst, Exalted Ruler
Sherwood Robin Hood Elks #2342

GP/plr

CLAUS PROPERTY ISSUES

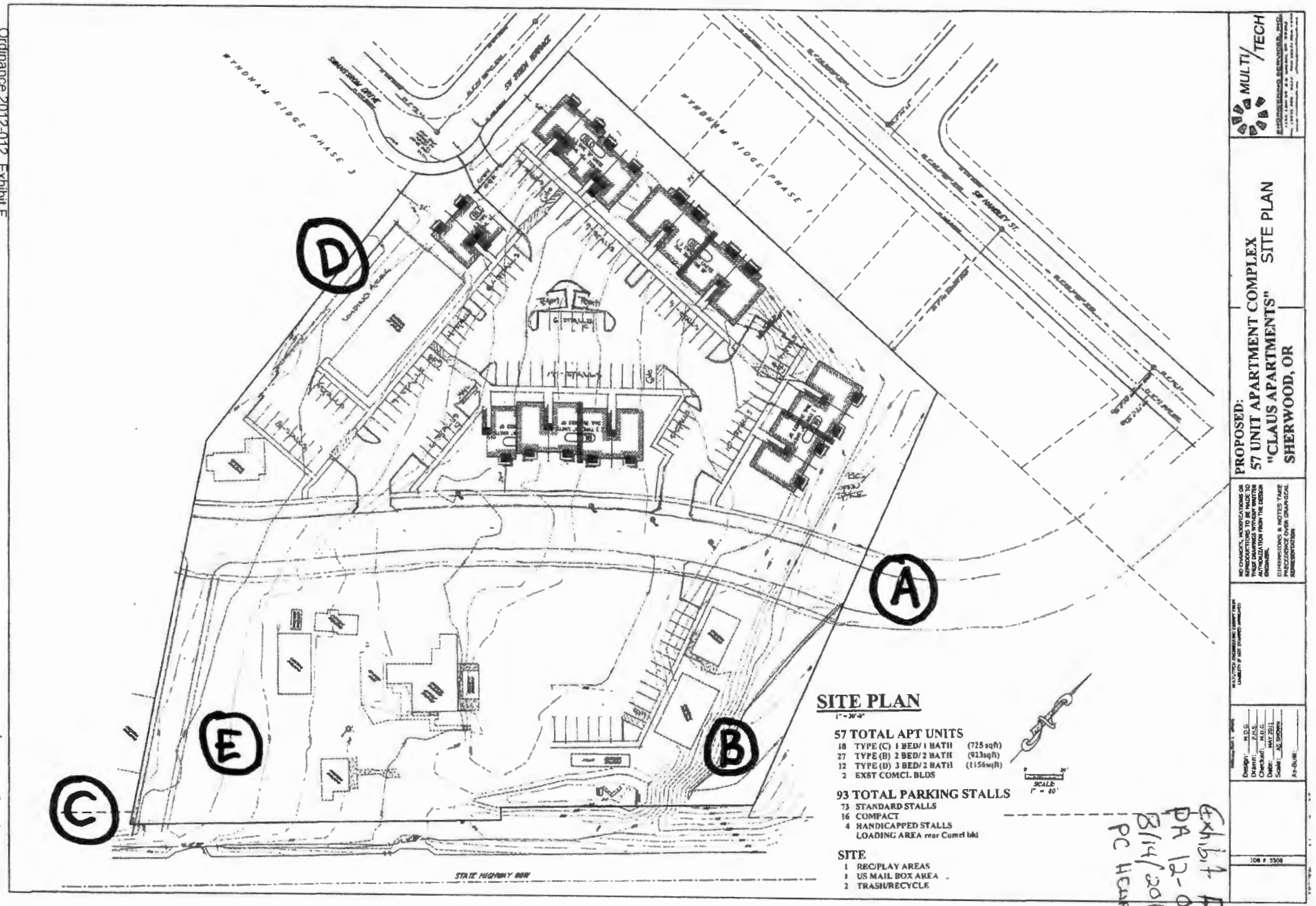


Exhibit F
PA 12-03
8/14/2012
PC Hearing

8/14/12 PC Hearing
Agenda Item 8.C

Questions that Need Answers from city as to requirements and obligations before 22211 SW Pacific Highway can develop

(See Attached Accompanying Map of Claus Property)

A- Cedar Brook Way: the city is demanding that the property is divided or more properly parceled in two because of the city road. Before that request can be met, the city needs to specify the location, the right of way, the width of the street, the construction specifications, water, sewer, power, etc that is to be included in the road. The city must also clearly specify if the city is buying or rebating through SDC credits the land, the right of way, the improvements, and paying for the construction improvements (part or all of the total costs).

B- An area on the subject property is currently being used as a regional storm water facility by the city and other property owners. This includes areas as far away as the Elks Lodge on 99W and some Woodhaven properties on the east side of the highway. These properties are draining into the Claus property. Clauses have given no easement and/or sold this area, no permission for these other properties each annual drainage is a legal trespass. Either all of this drainage and drainage system to the Claus property must be cut off and removed or the Clauses must be paid justly for this storm water facility. It is, in fact, an exaction of the Claus property.

C- The enclosed site plan assumes there will be a 125 foot apron along the 99W frontage. This is reached by taking 25 feet from the subject property, 70 feet from the Shannon property, and 25 feet from the Claus property south of the Shannon property. ODOT representatives have told the Claus family that if there is a question regarding the entrance design, that the Cedar Brook Way entrance design in front of the Cedar Creek condominiums/McFall subdivision. Again, what is the city going to pay for the shared entrance/exit and what is the preferred alignment? A temporary alignment is more harmful and will stop development. The city has to declare the alignment so property owners can develop. Both ODOT v. Hanson and City of Salem v. Truax have precedence for this alignment and must be respected. There are three deeded accesses to 99W that the Claus properties have in spite of the false and misleading representations by DKS these are legally enforceable 99W entrances and exits. Additionally topography is correct for these highway entrances. The topography on the Elks property is not really feasible.

D- The road will split the Claus property. A portion that was 99W property now will lose a great deal of its value because it is not part of the highway property and exposure. What is the compensation to be paid by the city for this direct loss of value? Can the parcels be-redeveloped separately? Also, the lots are then non-conforming after he road parceling. What happens then?

E- The highway frontage portion of this property has a restaurant, office building and several other buildings used for retail/commercial purposes. It is assumed that other than paying for water and sewer hook up fees, these properties will py no other fees and continue to be used. Again, this property has its own storm water facility that is being used y other properties without permission, authorization, or payment.

Jim and Susan Claus 22211 SW Pacific Highway, Sherwood, Oregon 97140

TSP AMENDMENT

CITY OF SHERWOOD **Date: August 7, 2012**

Staff Report

PA 12-03 – Cedar Brook Way Transportation System Plan Amendment

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To: SHERWOOD PLANNING COMMISSION

From: PLANNING DEPARTMENT

Julia Hajduk, Planning Manager

Proposal overview: This is a City initiated Transportation System Plan (TSP) and Comprehensive Plan amendment to change the functional classification of Cedar Brook Way from a local to a collector road connecting Elwert to Handley. This amendment also identifies one connection to Pacific Highway along this Cedar Brook Way extension, the ultimate location to be determined. The access location will be no greater than 990 feet from the Sunset and Meinecke intersections. This amendment would modify Figures 8-1, 8-7 and 8-8 of the TSP to reflect this change. Exhibit A is the proposed amended figures and Exhibit B is an analysis from DKS identifying several options for refinement and the impacts on nearby intersections.

I. OVERVIEW

A. Applicant: This is a City initiated text amendment, therefore the applicant is the City of Sherwood.

B. Location: There are small parts of Cedar Brook Way currently constructed northwest of Pacific Highway and ultimately, it would extend from its current location at Handley southwest to connect at Elwert in the vicinity of the Elks Lodge property.

G. Review Type: The proposed text amendment requires a Type V review, which involves public hearings before the Planning Commission and City Council. The Planning Commission will make a recommendation to the City Council who will make the final decision. Any appeal of the City Council decision would go directly to the Oregon Land Use Board of Appeals.

H. Public Notice and Hearing: Notice of the August 14th Planning Commission hearing on the proposed amendment was published in The Times on 8/2/12 and 8/9/12 and in the August edition of the Archer. Notice was also posted in 5 public locations around town and on the web site on 7/24/12. While this is a legislative amendment, courtesy notice was mailed to immediately affected property owners on 7/25/12.

I Review Criteria:
The required findings for the Plan Amendment are identified in Section 16.80.030 of the Sherwood Zoning and Community Development Code (SZCDC). In addition, the amendment must be consistent with Goals 1, 2 and 12 of the Statewide Planning Goals and Chapter 6 of the Comprehensive Plan.

8/14/12 PC hearing
agenda item 8.c

J. Background:

The TSP was updated in 2005. Since that time, there have been five amendments; four for concept plan areas where changes and a fifth amendment to change the functional classification of Columbia Street (related to Cannery project) from a collector to a local street. The City is planning to begin a comprehensive update of the TSP next year; however the City has determined that several issues need to be addressed sooner to help facilitate development and public infrastructure improvement. Specifically there are conflicts within the TSP related to Cedar Brook Way. It appears the road is designated a local street and the local street connectivity map shows a connection to Elwert; however, the road is identified as a 3 lane road which is generally characteristic of a higher classification road. In addition, the connection to an Arterial (Elwert and Pacific Highway) can only be made by a collector road or higher functional classification, thus creating conflicts between the classification and the connectivity and design for the road. This conflict has created uncertainty for potential developers.

In addition, the City has obtained property at the northwest corner of the Kruger/Elwert intersection to help facilitate the realignment of that intersection. This realignment is identified on the Washington County MSTIP3d list, indicating it will be funded within the next 5 years. It is anticipated that funding for the design and construction of the realignment will be identified in the near future. If that occurs, it would be most efficient and cost effective to identify and provide for a stub connection of Cedar Brook Way off of Elwert at that time. However, as the road is currently identified as a local street, the connection would not be permitted, per County standards.

II. PUBLIC COMMENTS

The City posted notices in five locations around the city and provided courtesy mailed notice to directly related property owners in the vicinity of the road extension. Notice was also published in the Times on August 2nd and 9th and in the August Archer. As of the date of this report, no comments have been provided other than what was provided at the Planning Commission work session held on June 26, 2012 prior to formally initiating the Plan Amendment.

III. AGENCY/DEPARTMENTAL COMMENTS

The City requested comments from affected agencies. All original documents are contained in the planning file and are a part of the official record on this case. The following information briefly summarizes those comments:

- The Department of Land Conservation and Development (DLCD) provided comments recommending that the City look at its Collector Street standards to ensure that they meet the current needs of the City.

  Staff Response: The City plans on beginning an update to the TSP to fully evaluate the transportation system within the next year. In the meantime, as noted within this report, we believe that the amendment will better meet the needs of the City and the intent of the existing TSP policies. We believe that this amendment addresses a conflict and error in the existing TSP that did not clearly identify the connection as a collector.

- Oregon Department of Transportation provided a letter which is attached as Exhibit C stating that they are generally supportive of local street connectivity and that they have determined this amendment will have no significant impacts to the state highway facilities.
- Sherwood Engineering Department has been a partner in the review and processing of this proposal and therefore has not provided formal additional comments.

Washington County, Metro, Clean Water Services, Tualatin Valley Fire and Rescue (TVF&R), Kinder Morgan. Pride Disposal, Bonneville Power Administration, The Sherwood Building Department, Portland General Electric, Northwest Natural Gas, and Raindrops to Refuge were provided the opportunity to comment on this application but did not provide written or verbal comments.

IV. APPLICABLE DEVELOPMENT CODE CRITERA

16.80.030 – Review Criteria

A. Text Amendment

An amendment to the text of the Comprehensive Plan shall be based upon a need for such an amendment as identified by the Council or the Commission. Such an amendment shall be consistent with the intent of the adopted Sherwood Comprehensive Plan, and with all other provisions of the Plan, the Transportation System Plan and this Code, and with any applicable State or City statutes and regulations, including this Section.

The amendment is needed because the existing TSP is not clear regarding the intended status of Cedar Brook Way. The road is identified as a 3 lane road (figure 8-7) which is typically the dimensions of a neighborhood route or larger; however as a local street, it would not be eligible for SDC and TDT credits. This has led to uncertainty from property owners and potential developers in the area regarding whether the road is eligible for SDC and TDT credits. The amendment to clarify the functional classification of Cedar Brook Way as a collector street is consistent with Chapter 6, Section C, Table 1 by aligning the classification to reflect the actual use of the Street. Table 1 states that:

> Collector Streets - Provide both access and circulation within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function and do not require as extensive control of access (compared to arterial). Serve residential neighborhoods, distributing trips from the neighborhood and local street system. Collectors are typically greater than 0.5 to 1.0 miles in length.
>
> Local Streets - Sole function of providing access to immediate adjacent land. Service to "through traffic ~~movement" on local~~ street is deliberately discouraged by design.

As demonstrated in the DKS memo, this road connection will provide for more than local trips because it provides an alternative to 99W and the ability to avoid the Sunset and Meinecke intersections. As envisioned, the road would be about .5 miles in length between Elwert and Handley (Cedar brook Way is already a collector from Handley to Meinecke/99W), consistent with the collector. In addition, the anticipated traffic is within the range of a collector at 2000 vehicles per day.

The amendment is consistent with Chapter 6 of the comprehensive Plan as discussed further in this report under Section V.

The amendment is consistent with the intent of the TSP. As noted earlier, the TSP is not clear regarding the actual intent of Cedar Brook Way but it is clear that the plan was that it would be designed to be larger than a

traditional local street as demonstrated on figure 8-7 and 8-4 (there is no 3 lane local street figure). In addition, the TSP at figure 8-8 shows connections of this road to Elwert, however as a County Arterial, it can only be accessed via a collector level street or higher. Is it clear throughout the TSP that increase connectivity, especially in this area, is desired. The DKS memo demonstrates that traffic operations are improved with the increased connectivity, which can only be accomplished with the collector level road. Alternatively, the TSP could be amended to remove the connections to Elwert and the confirm that the status was a local street; however that negatively impacts the traffic operations and provided limited access options for the properties along the highway that are affected by this road connection.

FINDING: As discussed above, the change is consistent with the intent of the collector road and is consistent with the applicable comprehensive plan goals and policies.

B. Map Amendment

An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

1. **The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.**
2. **There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.**
3. **The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.**
4. **4. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.**

The applicable elements of the above standard are 1 and 3. As discussed in the section below, the proposed amendment is consistent with the comprehensive plan and TSP policy regarding the definition of the functional classification.

Regarding "3", the amendment is timely because it will reduce existing uncertainty which could help the properties develop or re-develop. In addition, the re-alignment of the Kruger/Elwert intersection is anticipated to be funded in the near future at which point it will be necessary to determine definitively whether this will be a collector road connecting to Elwert. If it is not a collector road, according to County standards, a road connection in this vicinity would not be possible which would significantly impact the ability of the properties, especially the property directly east of Elwert, to develop.

FINDING: As discussed above the proposed amendment is consistent with the TSP and comprehensive plan elements.

C. Transportation Planning Rule Consistency

1. Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.

2. "Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan.

3. Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

a. Limiting allowed uses to be consistent with the planned function of the transportation facility.

b. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses.

c. Altering land use designations, densities or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

The analysis by DKS included as Exhibit B demonstrates that the scenario to connect Elwert to Handley via a collector road, which this amendment does, provides the least negative impact to the existing intersections at full build-out. Therefore, this amendment will make the transportation system better than full build-out if the amendment were not approved. Changing the functional classification of Cedar Brook Way to a collector roadway is appropriate based on traffic circulation and function. In addition, as previously noted, while technically this action will amend the TSP, it actually clarifies conflicting elements of the TSP regarding connectivity and design. For all of these reasons noted, this amendment is consistent with the TPR.

The City sent notice of this proposed functional classification modification to the State Department of Land Conservation and Development (DLCD), the Oregon Department of Transportation (ODOT) and Washington County.

FINDING: As noted above, while the proposed amendment would change the transportation system plan, the result would have no negative impact on the transportation system. The amendment would allow a road to be built consistent with its actual intended function.

V. APPLICABLE COMPREHENSIVE PLAN POLICIES

B. GOALS, POLICIES, AND STRATEGIES

Goal 1: Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all neighborhoods and businesses.

Policy 1 – The City will ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within the major land use activities. Existing rights of way shall be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.

Policy 2 – Through traffic shall be provided with routes that do not congest local streets and impact residential areas. Outside traffic destined for Sherwood business and industrial areas shall have convenient and efficient access to commercial and industrial areas without the need to use residential streets.

Policy 3 – Local traffic routes within Sherwood shall be planned to provide convenient circulation between home, school, work, recreation and shopping. Convenient access to major out-of-town routes shall be provided from all areas of the city.

FINDING: The amendment and future extension of Cedar Brook Way will provide for connections to residences and commercial activities within causing congestion on local streets and without requiring additional trips onto the already congested arterial street simply for service within this area. The amendment is consistent with these policies.

Goal 2: Develop a transportation system that is consistent with the City's adopted comprehensive land use plan and with the adopted plans of state, local, and regional jurisdictions.

Policy 5 – The City shall adopt a street classification system that is compatible with Washington County Functional Classification System for areas inside the Washington County

FINDING: The amendment is not inconsistent with the County TSP and would result in a transportation system (in regards to connectivity) that is more consistent with the existing TSP by ensuring that a connection to Elwert road, a County arterial, is possible.

Goal 3: Establish a clear and objective set of transportation design and development regulations that addresses all elements of the city transportation system and that promote access to and utilization of a multi-modal transportation system.

Policy 1 – The City of Sherwood shall adopt requirements for land development that mitigate the adverse traffic impacts and ensure all new development contributes a fair share toward on-site and off-site transportation system improvement remedies.

Policy 2 – The City of Sherwood shall require dedication of land for future streets when development is approved. The property developer shall be required to make full street improvements for their portion of the street commensurate with the proportional benefit that the improvement provides the development.

Policy 4 – The City of Sherwood shall adopt a uniform set of design guidelines that provide one or more typical cross section associated with each functional street classification. For example, the City may allow for a standard roadway cross-section and a boulevard cross section for arterial and collector streets.

Policy 5 – The City shall adopt roadway design guidelines and standards that ensure sufficient right-of-way is provided for necessary roadway, bikeway, and pedestrian improvements.

FINDING: The City has already implemented these policies and the amendment does not change this. The amendment does remove conflicts within the existing TSP regarding lane numbers, connectivity and classification which ensures that the City can better implement these policies when development is proposed.

VI. APPLICABLE STATEWIDE PLANNING GOALS

Goal 1 (Citizen Involvement)

FINDING: Staff utilized the public notice requirements of the Code to notify the public of this proposed plan amendment. The City's public notice requirements have been found to comply with Goal 1 and, therefore, this proposal meets Goal 1. In addition, the City hosted an open house prior to beginning the formal plan amendment process to get input and feedback on potential amendments and held a work session with the Planning Commission on June 26, 2012 for further discussion. At the work session, the Planning Commission allowed the public to speak on the potential amendments prior to providing staff with feedback on proceeding with the public notice for the amendment.

Goal 2 (Land Use Planning)

FINDING: The proposed amendment, as demonstrated in this report is processed in compliance with the local, regional and state requirements.

Goal 3 (Agricultural Lands)
Goal 4 (Forest Lands)
Goal 5 (Natural Resources, Scenic and Historic Areas and Open Spaces)
Goal 6 (Air, Water and Land Resources Quality)
Goal 7 (Areas Subject to Natural Hazards)
Goal 8 (Recreational Needs)
Goal 9 (Economic Development)
Goal 10 (Housing)
Goal 11 (Public Facilities and Services)

FINDING: The Statewide Planning Goals 3-11 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

Goal 12 (Transportation)

FINDING: As discussed earlier in this report, the proposed amendment is consistent with the "Transportation Planning Rule" which implements Goal 12.

Goal 13 (Energy Conservation)
Goal 14 (Urbanization)
Goal 15 (Willamette River Greenway)
Goal 16 (Estuarine Resources)
Goal 17 (Coastal Shorelands)
Goal 18 (Beaches and Dunes)
Goal 19 (Ocean Resources)

FINDING: The Statewide Planning Goals 13-19 do not specifically apply to this proposed plan amendment; however, the proposal does not conflict with the stated goals.

VII. RECOMMENDATION

Based on a review of the applicable code provisions, agency comments and staff review, staff finds that the Plan Amendment is consistent with the applicable criteria and therefore, staff **recommends that the Planning Commission forward a recommendation of APPROVAL** of PA 12-03 – Cedar Brook Way TSP amendment, Handley to Elwert Road.

VIII. EXHIBITS

A. Proposed amendments identified in July 10, 2012 DKS memo
B. Memo from DKS dated June 28, 2012
C. ODOT letter dated August 6, 2012

End of Report

EXHIBIT A

MEMORANDUM (DRAFT)

DKS
720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: July 10, 2012

TO: Bob Galati, City of Sherwood

FROM: Carl Springer, PE; John Bosket, PE; Garth Appanaitis

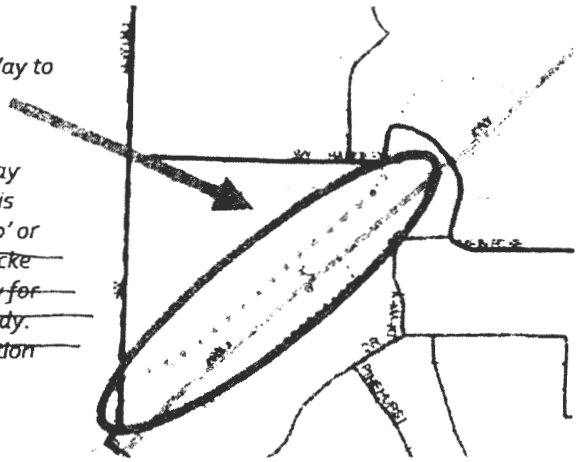
SUBJECT: Sherwood Transportation System Plan Clarifications for Elwert Road Connection P#12051-000

The purpose of this memorandum is to summarize the modifications to the City of Sherwood Transportation System Plan (TSP) needed to clarify the future street network north of Highway 99W between Elwert Road and Cedar Brook Way. Recent documentation[1] summarized the analysis of several connectivity concepts for the area. The following TSP clarifications are proposed as a result of this analysis and feedback received from agency staff and the public[2].

The following modifications would be needed to figures in Chapter 8 to address the proposed clarifications:

- Figure 8-1: Functional Class Map
  - *Extension of collector road from Cedar Brook Way to Elwert Road with intermediate connection to Highway 99W.*

    Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.



Narrow based on connecting Brot on Walnut

[1] Memorandum: Sherwood TSP Connectivity Refinement – Elwert Road to Cedar Brook Way, prepared by DKS Associates, June 28, 2012.
[2] Open House: Thursday May 31, 2012, 5:00-6:00 PM at Sherwood Police Facility Community Room.

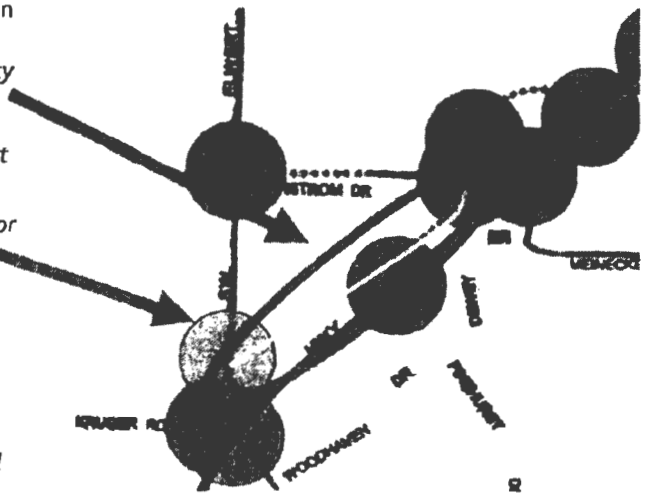
B/S

Sherwood TSP Clarifications for Elwert Road Connection
July 10, 2012
Page 2 of 3

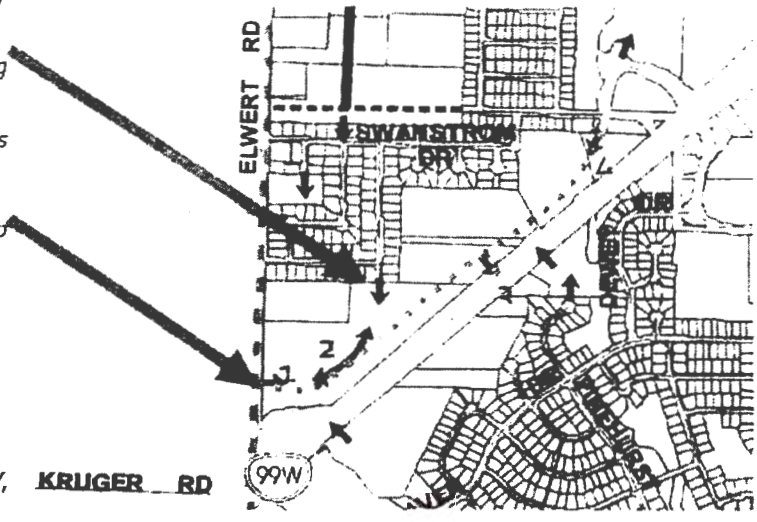
DKS

Figure 8-7: Streets Where ROW is Planned for More Than Two Lanes

- *Modify the designation of the new facility as a 2-lane facility.*
- *Indicate the new intersection with Elwert Road would be an arterial-collector intersection and may include widening for turn pockets within 500 feet of the intersection.*
- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*



- Figure 8-8: Local Street Connectivity
  - *Retain arrow showing local street connection to Bushong Terrace*
  - *Replace (overlay) four arrows on map indicating the local street connections with the proposed collector. Arrows to replace include:*
    1) *connection to Elwert Road,*
    2) *swooping connection from Elwert Road to Bushong Terrace*
    3) *connection to Hwy 99W, and*
    4) *Connection to Cedar Brook Way.*



DKS

- *Add the following note for the potential Highway 99W access: A potential Hwy99W access point is located within the limits of the access zone (990' or greater from both Sunset Boulevard and Meinecke Road provides approximately 2000' of flexibility for access placement) as delineated in the prior study. The actual location will be based on transportation design standards and will take place when development occurs.*

Not typographically possible, are there Clowns, PE, or high school students acting like professionals?

EXHIBIT B

DKS
720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM

DATE: June 28, 2012

TO: Bob Galati, PE - City of Sherwood

FROM: Garth Appanatis
John Bosket, PE
Brad Coy, PE

SUBJECT: **Sherwood TSP Connectivity Refinement - Elwert Road to Cedar Brook Way** P12051-000-000

This memorandum documents the analysis of various street connectivity options for the City of Sherwood in the area on the northwest side of Highway 99W between Elwert Road and Cedar Brook Way. The primary purpose of this effort is to develop connectivity options that are consistent with both the City of Sherwood Transportation System Plan (TSP)[1] and the planned safety improvements at the intersection of Elwert Road and Kruger Road (which include relocating the intersection further north away from Highway 99W and considering a roundabout).

The sections of this memorandum document the background, study area, existing traffic conditions, and an evaluation of connectivity options and street capacity during the 2035 weekday p.m. peak hour. A summary of the findings is provided at the end of the memorandum.

Background

Alignments of future local and collector streets needed to serve developing areas on the northwest side of Highway 99W between Elwert Road and Cedar Brook Way have not yet been identified. However, the City of Sherwood TSP (Figure 8-8) identifies the priority "conceptual street connection[s]" for the local (intracity) transportation system. Figure 1, an excerpt of the TSP figure, shows future street connections at Elwert Road and Bushong Terrace, as well as a connection to the north side of Highway 99W between Elwert

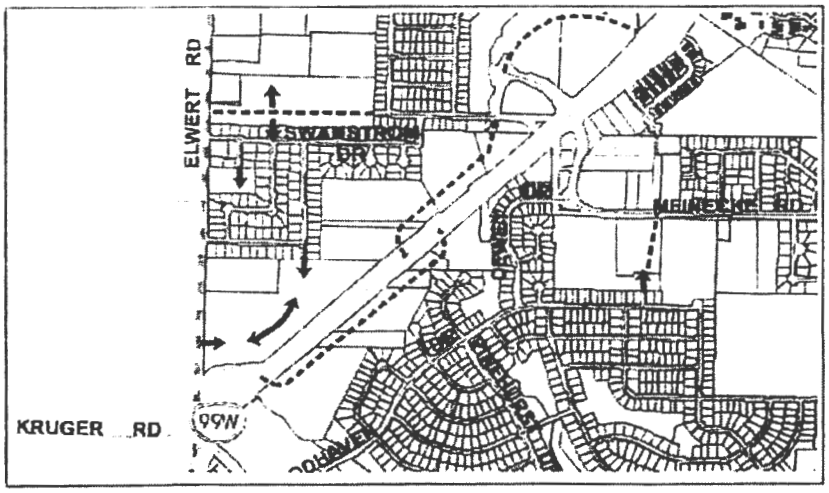


Figure 1: Local Street Connectivity (Enlargement of Sherwood TSP Figure 8-8)

[1] City of Sherwood Transportation System Plan, prepared by DKS Associates, March 2004.

Road and Cedar Brook Way. As noted in the TSP, "specific alignments and design will be better determined upon development review."

The objective of this study is to analyze the ability of various roadway connectivity options to adequately serve existing and future development in the area. Identifying the needed roadway system now will provide the basis for a detailed connectivity plan that future development proposals can follow and incorporate into site plans. This study will not identify a final roadway alignment or design. Future efforts to develop a more detailed plan will require further assessment of area constraints and input from affected property owners.

Creating a new connection to Elwert Road will be an important element of a connectivity plan for this area. However, Washington County classifies Elwert Road as an arterial and requires that only collectors or other arterials have access to arterial roadways.[2] For this reason, the future connection indicated in the City of Sherwood TSP as a local street would need to be a collector roadway. This analysis is an opportunity to clarify the TSP and explore area connectivity of the potential collector road.

Additionally, the Elwert Road/Kruger Road intersection and the proximity to Highway 99W has been identified as an existing safety concern. Exploration of potential safety improvements for this location includes the relocation of the intersection further to the north and consideration of roundabout control. Additional analysis of the system connectivity and local access needs with a realigned intersection would be helpful in pursuit of funding for this project.

Study Area

Figure 2 shows the project study area, which includes five existing study intersections and one potential future study intersection:

- Highway 99W/Elwert Road-Sunset Boulevard
- Elwert Road/Kruger Road
- Elwert Road/Handley Street
- Handley Street/Cedar Brook Way
- Highway 99W/Meinecke Road
- Highway 99W/Potential Future Intersection

Connectivity options being considered for the local/collector street network are limited to the northwest side of Highway 99W between Elwert Road and Cedar Brook Way.

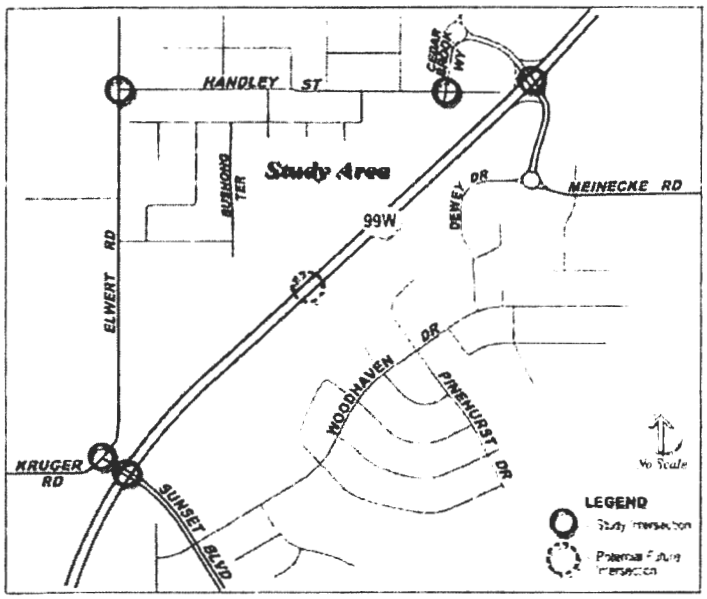


Figure 2: Study Area

[2] Article V: Public Facility and Service Requirements; Section 501-8.5 (Access to County and Public Roads), Washington County, printed 11/24/05.

DKS

Existing Conditions (2012)

This section describes existing opportunities and constraints related to traffic connectivity in the study area, including documentation of the roadway network characteristics, access conditions, and traffic operations during the weekday p.m. peak hour.

Big mistake - equivalent to the topography mistake

Study Area Roadway Network

Table 1 lists various characteristics of key study area roadways, indicating each roadway's capacity for serving auto, pedestrian, and bicycle trips.

Table 1: Existing Study Area Roadway Characteristics

Roadway	Travel Lanes	Speed Limit	On-Street Parking	Side-walks	Bike Lanes
Highway 99W	4-5 Lanes (Divided)	45 mph	No	No	Shoulders
Elwert Road	2 Lanes	35 mph	No	No	No
Kruger Road	2 Lanes	25 mph	No	No	No
Handley Street	2 Lanes	25 mph	Yes	Yes	No
Bushong Terrace	2 Lanes	25 mph	Yes	Yes	No
Cedar Brook Way	2 Lanes	25 mph	No	Yes	Yes
Meinecke Road	2-3 Lanes (Divided)	25 mph	No	Yes	Yes

wrong completely false

Table 2 lists the functional classifications of study area roadways. Highway 99W and Elwert Road are classified as arterials because the efficient movement of traffic is a priority over the provision of direct access to neighboring areas. Handley Street and Meinecke Road are collectors. On these streets the need for efficient movement of traffic is more balanced with the need for access. Local streets, such as Kruger Road, Cedar Brook Way, and Bushong Terrace, are intended to be low-speed roadways where safe and convenient access to properties is a priority.

Table 2: Functional Classifications and Jurisdictions of Study Area Roadways

Roadway	Functional Classification (by Jurisdiction)[a]			
	City of Sherwood	*ODOT*	*Metro*	*Washington Co.*
Highway 99W	Principal Arterial	Statewide, NHS[b], Freight Route	Principal Arterial (Highway)	Principal Arterial
Elwert Road	Arterial	-	Minor Arterial	Arterial
Kruger Road	-	-	-	Local
Handley Street	Collector	-	-	Collector
Bushong Terrace	Local	-	-	-
Cedar Brook Way	Local[c]	-	-	Local
Meinecke Road	Collector	-	-	Collector

[a] Not all jurisdictions have functional classifications for every study area road, as indicated by the "-" in the table.
[b] NHS = National Highway System
[c] There may be some inconsistency with the functional classification referenced for Cedar Brook Way in the City TSP.
[redacted] indicates roadway jurisdiction.

DKS

Access

As previously described, the functional classification of a street describes how it should be managed and operated with respect to mobility and access. Therefore, the functional classifications of area roadways and each jurisdiction's associated policies and standards will impact the development of connectivity options for the study area. The City of Sherwood, Washington County, and ODOT all have access spacing standards for roadways under their jurisdiction that indicate the desired separation between street and driveway intersections.

City of Sherwood

Table 3 shows the access spacing standards for roadways under City of Sherwood jurisdiction.[3] As noted in Table 2, the City only maintains jurisdiction over collector and local streets within the study area. On collector streets, intersections should be spaced at least 100 feet apart. There is no access spacing standard for local streets.

Table 3: City of Sherwood Access Spacing Standards

Street Facility	Spacing of Roadways and Driveways[a]	
	Maximum	*Minimum*
Arterial	1,000 feet	600 feet
Collector	400 feet	100 feet

[a] In addition, all roads require an access report stating that the driveway/roadway is safe as designed meeting adequate stacking, sight distance and deceleration requirements as set by ODOT, Washington County and AASHTO.

Source: Sherwood Transportation System Plan, March 2005, Table 8-12

Washington County

Washington County access spacing standards for arterials, such as Elwert Road, require a minimum of 600 feet between intersections.[4] In addition, Washington County's Community Development Code specifies that arterial roadways shall only be intersected by collectors or other arterials.[5]

There is approximately 1,700 feet of separation between the existing intersections on Elwert Road with Orchard Hill Lane and Highway 99W. Therefore, it would be feasible to create a new intersection on Elwert Road from a future extension of Cedar Brook Way that would comply with Washington County access spacing standards. However, doing so would require moving the existing driveway to the Elks Lodge from Elwert Road to the new Cedar Brook Way extension. Furthermore, because the Cedar Brook Way extension would likely be connected to Elwert Road opposite the relocated intersection with Kruger Road, the ultimate location will be limited by constraints associated with that improvement project.

ROW, 14, Wider

In addition, to connect to Elwert Road, the Cedar Brook Way extension must be classified by the City of Sherwood as a collector street or higher. Compared to classifying this roadway as a local street, the collector classification could result in a wider roadway design requiring as much as 14 feet of additional right of way. The total length of the proposed road from Elwert Road to at least Handley Street would align with the recommended collector street length in the City's TSP and the traffic volumes using the road to access the commercial properties may be of a magnitude commonly associated with collector streets (2,000 vehicles per day or greater). However, the proposed

[3] Sherwood Transportation System Plan, March 2005, Table 8-12
[4] Washington County Community Development Code, Article V: Public Facilities and Services, 501-8.5 (A).
[5] Article V: Public Facility and Service Requirements; Section 501-8.5(B)(4) (Access to County and Public Roads), Washington County, printed 11/24/05.

Cedar Brook Way extension is currently shown in the City TSP as a local street, so an amendment would be required to change the functional classification to a collector.

ODOT

ODOT access spacing standards are documented in the 1999 Oregon Highway Plan (as amended December 2011) and OAR 734-051. Given Highway 99W's classification as a Statewide Highway and Freight Route on the National Highway System and posted speed of 45 mph through the study area, the resulting access spacing standard requires a minimum of 990 feet between driveways and intersections. There are relatively few driveways or intersections on the northwest side of Highway 99W in the study area, so it would be feasible to create a new roadway connection that would comply with ODOT's access spacing standards.

ODOT has also purchased access rights from properties abutting Highway 99W through the study area. This means that applications for new intersection or driveway connections cannot be accepted unless the applicant is in possession of a "reservation of access" (a location where access rights have been retained) or a "grant of access" has been applied for and approved by ODOT. In review of existing access rights along the northwest side of Highway 99W with ODOT staff, there are no reservations of access that could be used to establish a new public street connection. Therefore, the City would be required to apply for a grant of access to Highway 99W. It is likely that approval for such a grant of access would include a requirement that all existing driveways to Highway 99W between Meinecke Road and Elwert Road be removed when properties redevelop, with all future access being taken from the proposed Cedar Brook Way extension. Also, while ODOT does not prohibit the connection of local streets to highways, proposals to connect streets that are classified as collectors or higher in local TSPs are given preference when considering applications for a grant of access.

Traffic Operations

Traffic operations were analyzed at the study intersections and compared to the applicable jurisdiction's adopted mobility standards or targets. The mobility standards and existing traffic volumes are used as the basis for the intersection operations.

Mobility Standards

The City of Sherwood, Washington County, and ODOT each have mobility standards that must be met by roadways and intersections under their jurisdiction. These standards measure performance through either level of service or volume-to-capacity ratios:

- The **intersection level of service (LOS)** is similar to a "report card" rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of service D and E are progressively worse operating conditions. Level of service F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.
- The **volume-to-capacity (V/C) ratio** represents the level of saturation of the intersection or individual movement. It is determined by dividing the peak hour traffic volume by the maximum hourly capacity of an intersection or turn movement. When the V/C ratio approaches 0.95, operations become unstable and small disruptions can cause the traffic flow to break down, as seen by the formation of excessive queues.

Table 4 lists mobility standards (referred to as "targets" for ODOT facilities) for the study area roadways. It also lists the roadways' applicable designations, which were used to determine the corresponding mobility standard.

Table 4: Applicable Mobility Standards/Targets[a] for Study Area Roadways

Roadway(s)	Location Designation (Source)	Mobility Standard[a]
Highway 99W	Other Principal Arterial Route inside Metro[b]	V/C ≤ 0.99
Elwert Road	Other Urban Areas (Table 5, Washington County TSP, 3/31/2003)	V/C ≤ 0.99 LOS E or better
Kruger Road	Rural Areas[c]	V/C ≤ 0.90 LOS D or better
Handley Street, Cedar Brook Way, and Meinecke Road	City of Sherwood	LOS D or better

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Table 7, 1999 Oregon Highway Plan, Policy 1F (as amended 12/21/2011).
[c] Table 5, Washington County TSP, 3/31/2003.

Existing Traffic Volumes

Turn movement traffic counts were performed at the study area intersections for the weekday p.m. peak period on April 11, 2012. Figure 3 shows the peak hour traffic volumes measured at each intersection. This data was used to analyze the performance of each intersection for comparison against adopted mobility standards/targets, as described in the following section.

Intersection Operations

The existing p.m. peak hour study intersection operations were determined based on the *2000 Highway Capacity Manual* methodology.[6] The estimated average delay, level of service (LOS), and volume to capacity (V/C) ratio are shown in Table 5. All study intersections currently meet applicable mobility standards and targets.

Table 5: 2012 Existing Study Intersection Operations (P.M. Peak Hour)

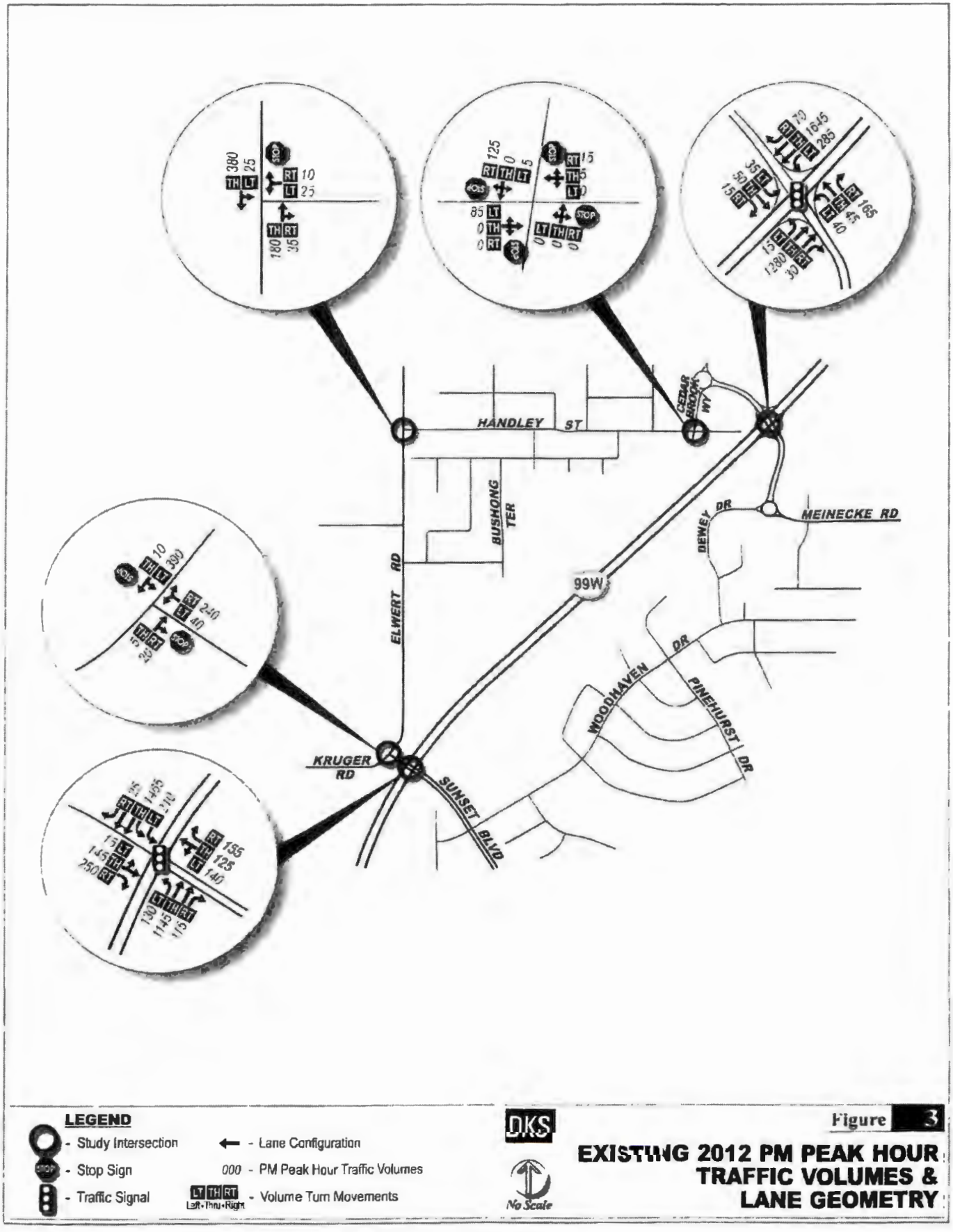
Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	32.9	C	0.83
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	18.0	B	0.66
Handley St/Cedar Brook Way	All-Way Stop	LOS D	7.5	A	0.15
Elwert Rd/Kruger Rd	Two-Way Stop	V/C ≤ 0.90, LOS D	21.7	A/C	0.69
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	13.1	A/B	0.13

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection

Two-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

[6] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.


HANDLEY ST
CEDAR BROOK WY
BUSHONG TER
ELWERT RD
DEWEY DR
MEINECKE RD
99W
WOODHAVEN DR
PINEHURST DR
KRUGER RD
SUNSET BLVD
LEGEND
- Study Intersection
- Stop Sign
- Traffic Signal
- Lane Configuration
000 - PM Peak Hour Traffic Volumes
LT TH RT Left • Thru • Right - Volume Turn Movements
DKS
No Scale
Figure 3
EXISTING 2012 PM PEAK HOUR TRAFFIC VOLUMES & LANE GEOMETRY

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Future Connectivity Options (2035)

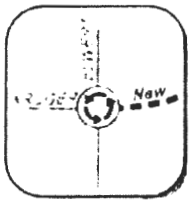
An evaluation was performed of future connectivity options using 2035 traffic volumes. The analysis assumptions and methodology used to evaluate all connectivity options are described first, followed by the evaluation of each option.

Future Analysis Assumptions and Methodology

The future analysis assumptions and methodology used to evaluate all connectivity options relate to the planned improvements, functional classification, access, traffic volume forecasts, future intersection operations, and development sensitivity.

Planned Improvements

The future Washington County project that may construct a new single-lane roundabout at the Kruger Road/Elwert Road intersection, with the intersection relocated farther north from Highway 99W, was assumed to be in place by the year 2035. While the exact location of this improvement is not yet known, all four connectivity options assume that a fourth leg will be added to the east side of the roundabout to provide connectivity for future development.



Functional Classification

Washington County classifies Elwert Road as an arterial and requires that only collectors or other arterials have access to arterial roadways. For this reason, the new roadway connecting to the Kruger Road/Elwert Road roundabout (i.e., in Options 2, 3, and 4) should function as a collector roadway instead of a local street, as was indicated in the Sherwood TSP.[7]

Common criteria used to assess a roadway's appropriate functional classification include the extent of connectivity to the City and the region, the frequency of the facility type, and the volume of traffic being served. Cities usually benefit from having a typical collector spacing of a quarter-mile to a half-mile, but this is not a requirement. The Sherwood TSP indicates that collector streets provide both access and circulation within and between residential and commercial/industrial areas in the City of Sherwood. Their primary purpose is to accommodate circulation for the City neighborhoods where they are located rather than connecting to the surrounding region or serving cross-city traffic. They connect to arterials and penetrate residential neighborhoods to distribute trips to/from the neighborhoods and local street system. Collectors are typically greater than one-half to one mile in length and do not require as extensive control of access as arterials.

Considering these criteria, reclassifying the new roadway from a local street to a collector street may be appropriate in the case of a Cedar Brook Way extension from Handley Street to Elwert Road. This new roadway would be about one-half mile in length, would be spaced approximately one-quarter mile on average from the adjacent arterials and collectors (i.e., Highway 99W and Handley Street), and would connect to arterial streets (Elwert Road and Highway 99W under Options 3 and 4). In addition, the volume of traffic anticipated to be served by the Cedar Brook Way extension would be within the range expected for a collector street (more than 2,000 vehicles per day). The collector classification for Cedar Brook Way could be extended as far north as the Meinecke Road roundabout. However, the northern segment of Cedar Brook Way between the Meinecke Road roundabout and Highway 99W could remain as a local street because its function is providing access to a limited number of properties.

[7] *Sherwood Transportation System Plan (TSP)*, March 15, 2005

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Access

Each connectivity option was evaluated to determine how it would impact the roadway network's ability to provide access to the nearby land uses, while also meeting applicable access management policies and standards (which are described previously in the Existing Conditions section of this memorandum).

Traffic Volume Forecasts

Future 2035 traffic volume forecasts were prepared for each of the connectivity options using a refined travel demand model that was developed based on Metro's 2010 (base) and 2035 (future) regional travel demand model. The refined model applies trip generation and trip distribution data taken directly from the Metro model, but adds additional roadway network detail to better represent local circulation in the study area.

The future model roadway network was adjusted for each connectivity option to account for the corresponding connectivity changes and different levels of access to Highway 99W. Future intersection volumes used for the operational analysis of each option were estimated by applying the increment of growth observed between the base and future year models to the existing traffic counts at study intersections. Figure 4 shows the 2035 traffic volume forecasts for Connectivity Option 1 (Partial Cedar Brook Way Extension). The 2035 traffic volumes for the other connectivity options are provided in the appendix on the operations analysis output sheets.

Future Intersection Operations

Future 2035 p.m. peak hour intersection operations analysis was performed for the study area intersections to determine how well each connectivity option and its associated intersection improvements accommodate vehicular traffic. The estimated average delay, level of service (LOS), and volume to capacity (V/C) ratio of each intersection or critical movement were determined and are documented for the connectivity options.

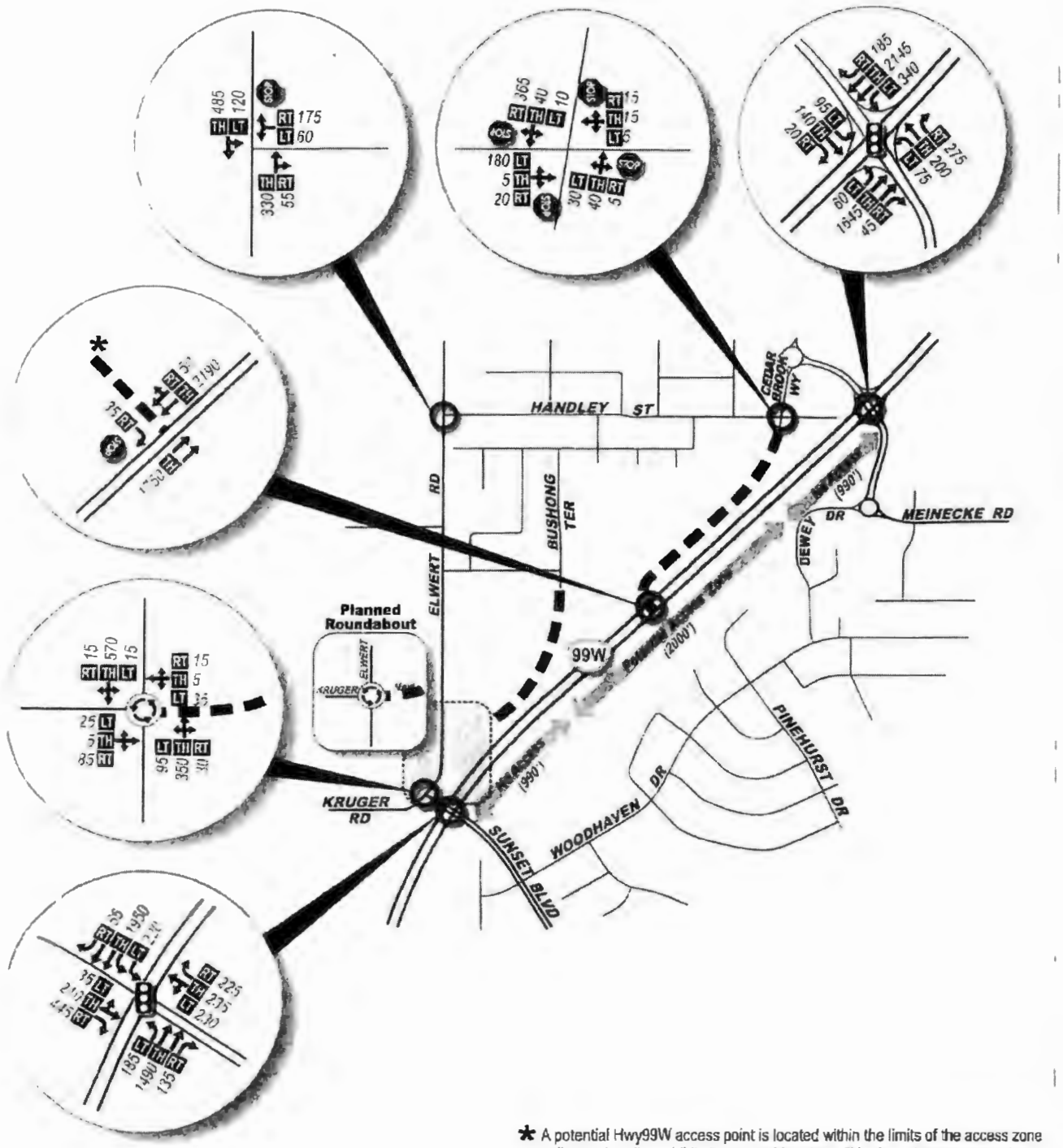
The signalized and unsignalized two-way stop controlled intersection performance measures were based on the *2000 Highway Capacity Manual* methodology,[8] while the roundabout intersection performance measures were determined using the methodology from the National Cooperative Highway Research Program (NCHRP) Project 3-65.[9]

Development Sensitivity

While the Metro travel demand model applied does account for a reasonable build-out scenario for future development within the study area, a sensitivity analysis was conducted for each connectivity option to assess the amount of additional development that could be accommodated without incurring major transportation improvements. This additional future development was limited to the undeveloped properties adjacent to the north side of Highway 99W between Meinecke Road and Elwert Road.

The analysis consisted of increasing the number of 2035 vehicular trips generated by these properties until major system improvements were triggered. Trip routing was determined for each connectivity option using the traffic patterns from the travel demand model.

[8] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.
[9] See NCHRP Report 572.



* A potential Hwy99W access point is located within the limits of the access zone delineated on the exhibit. The actual location will be based on transportation design standards and will take place when development occurs.

LEGEND

- Study Intersection
- Stop Sign
- Traffic Signal
- New Roadway - Option 1 *(Alignment to be Determined)*
- Lane Configuration
- 000 - PM Peak Hour Traffic Volumes
- LT THRU RT - Volume Turn Movements (Left-Thru-Right)

DKS

No Scale

Figure 4

FUTURE 2035 PM PEAK HOUR TRAFFIC VOLUMES (Connectivity Option 1)

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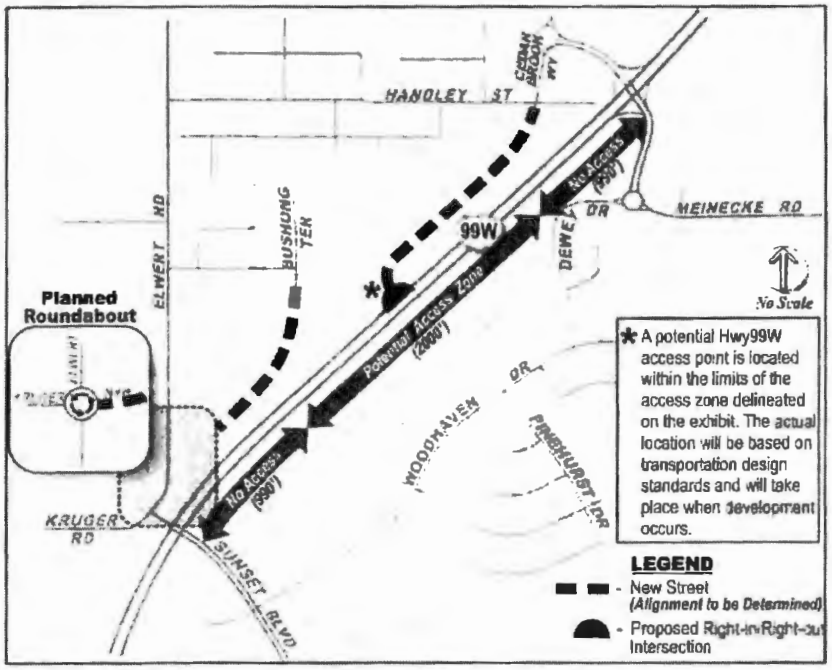
Option 1 (Partial Cedar Brook Way Extension)

Description of Roadway Connectivity:

Street connectivity for this option is shown at right and would be consistent with the Sherwood TSP Figure 8-8 (see Figure 1 earlier in this memorandum). This includes a new roadway that connects the Handley Street/Cedar Brook Way intersection to Highway 99W at a new intersection that is assumed to be limited to serve right-in/right-out movements only. A second new roadway, as suggested in the Sherwood TSP, would connect Bushong Terrace to the planned Kruger Road/Elwert Road roundabout.



Access to Properties:

The two new roadways would serve the properties along the north side of Highway 99W between Elwert Road and Handley Street, but they would only provide partial east-west connectivity. The properties to the east, which are primarily zoned for commercial use, would have a direct connection to westbound Highway 99W at the new right-in/right-out intersection. The properties to the west, which are primarily residentially zoned, would not be able to connect to this new intersection but would instead load onto Elwert Road.

Assuming all future access to Highway 99W from abutting properties is redirected to the local street network, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

Connecting the extension of Bushong Terrace to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, Bushong Terrace is a local street, so Washington County's requirement of not allowing local streets to intersect with arterials would not be met. However, the County does allow for exceptions to this requirement through a Type II process when collector access is found to be unavailable and impracticable by the Director.[10]

[10] Article V: Public Facility and Service Requirements; Section 501-8.5(B)(4) (Access to County and Public Roads), Washington County, printed 11/24/05.

Mobility at Study Intersections:

Most study intersections will operate adequately in 2035 under this connectivity option. However, the Highway 99W/Elwert Road-Sunset Boulevard intersection would not meet the applicable ODOT mobility target (see Table 6). Therefore, intersection improvements would be needed.

Compared to operations under existing conditions, operations in the future at the intersection of Highway 99W/Elwert Road-Sunset Boulevard deteriorate significantly (from a V/C ratio of 0.83 to a V/C ratio greater than 2.0). However, the share of this added congestion associated with growth in development within Sherwood is fairly small. When identifying the origins of future users of this intersection using the regional travel demand model, it was found that less than 10% of the added traffic would be associated with trips beginning or ending within the Sherwood urban growth boundary. The remaining contributors to this increase in congestion would come from either the nearby urban reserves to the west and south of Sherwood (approximately 35%) or other parts of the region (approximately 55%).

Table 6: Option 1 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	>2.0
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	39.5	D	0.91
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.7	B	0.50
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	13.4	B	0.64
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	25.5	A/D	0.59
Hwy 99W/New Access	Two-Way Stop[b]	V/C ≤ 0.99	28.4	A/D	0.89

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable mobility target, significant widening would be needed for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would have a heavy left-turn volume and would also need to be widened to four lanes (dual lefts, through, and right). Table 7 provides the study intersection operations with the recommended improvements.

Table 7: Option 1 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	51.8	D	0.93

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

Ability to Accommodate Future Development:

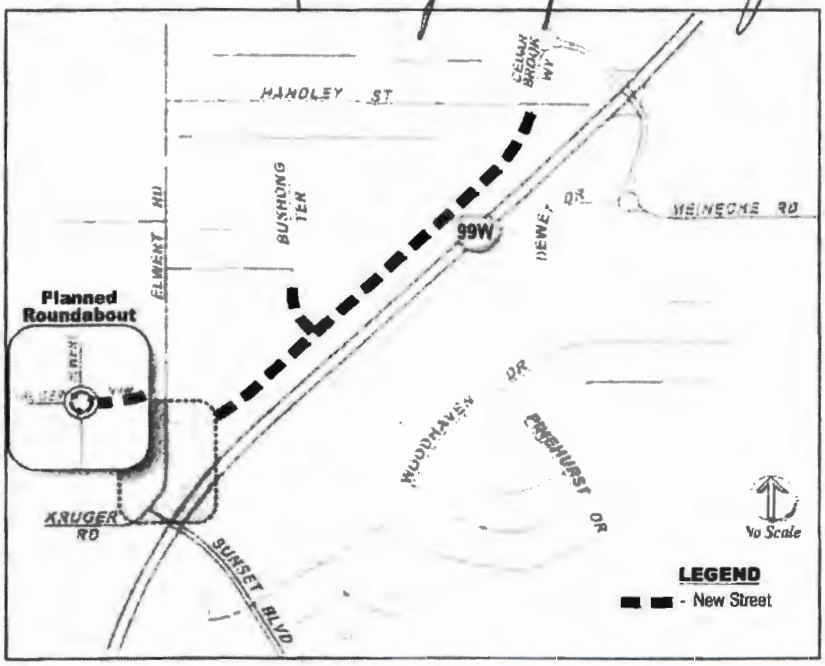
Connectivity Option 1 is expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 2 (No Highway 99W Access)

Completely stops development

Description of Roadway Connectivity:

Under this option, the new roadway would travel the full distance between Elwert Road and Handley Street, but would not include a connection to Highway 99W. Towards the west end, an extension of Bushong Terrace would connect to the new roadway from the north and the new roadway would connect to Elwert Road as the fourth leg of the future roundabout with Kruger Road.



While there would be very good east-west connectivity under this option, without a direct access to Highway 99W there would be more reliance on the intersections on Highway 99W with Elwert Road and Meinecke Road.

Access to Properties:

The new roadway would serve all properties along the north side of Highway 99W between Elwert Road and Handley Street, but there would not be a direct connection to Highway 99W. Instead, traffic to/from the west would likely use the Highway 99W/Elwert Road-Sunset Boulevard intersection and traffic to/from the east would likely use the Highway 99W/Meinecke Road intersection. The connection to the new roadway from Bushong Terrace would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods). However, it should be noted that the Bushong Terrace extension to the south may be difficult or infeasible to construct given the area topography. If it is not feasible, pedestrian and bicycle connections to the north should still be constructed.

Assuming all future access to Highway 99W from abutting properties is redirected to the local street network, this option would remove all access to the highway between Meinecke Road and Elwert Road. Therefore, there would be no conflict with ODOT access management policies and standards. In addition, the connection of Bushong Terrace to the new roadway could meet City access spacing standards as well.

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations would be very similar between Options 1 and 2, with some minor differences at the Highway 99W/Elwert Road-Sunset Boulevard intersection. Under Option 2, this intersection would still not meet the applicable ODOT mobility target (see Table 8); however, it would have slightly improved operations due to the improved east-west connectivity.

Table 8: Option 2 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	1.76
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	37.9	D	0.90
Handley St/Cedar Brook Way	All-Way Stop	LOS D	11.9	B	0.58
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	13.2	B	0.64
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	22.2	A/C	0.52

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for Option 1 would be needed. These improvements include significant widening of the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 9 provides the study intersection operations with the improvements.

Table 9: Option 2 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	51.5	D	0.92

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

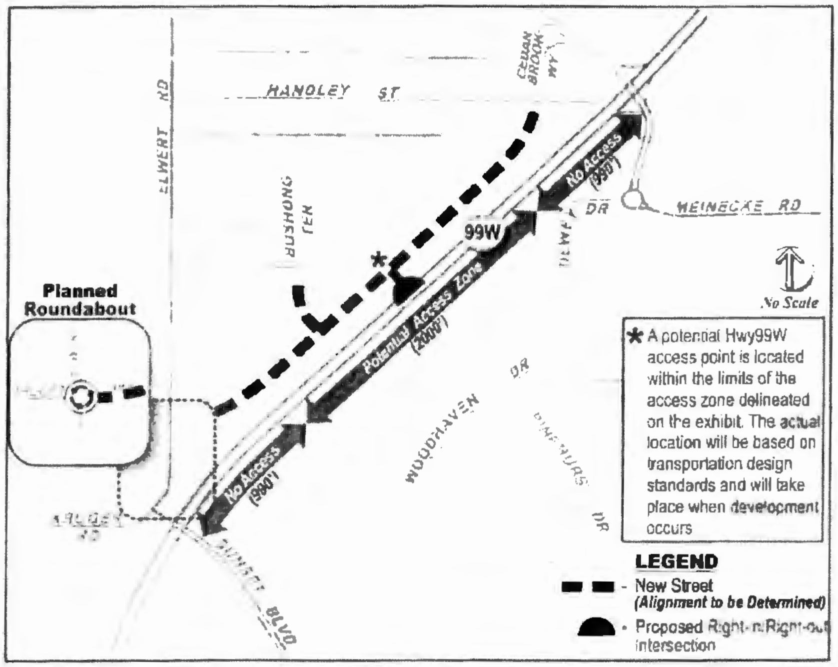
Ability to Accommodate Future Development:

Similar to Option 1, Connectivity Option 2 is also expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 3 (Right-In/Right-Out Highway 99W Access)

Description of Roadway Connectivity:

Under this option, the new roadway would travel the full distance between Elwert Road and Handley Street, but unlike Option 2, would include a connection to Highway 99W. This connection would include an intersection to Highway 99W that is assumed to allow only right-in and right-out turning movements. Towards the west end, an extension of Bushong Terrace would connect to the new roadway from the north and the new roadway would connect to Elwert Road as the fourth leg of the future roundabout with Kruger Road.



Similar to Option 2, this option would provide very good east-west connectivity. However, with the inclusion of the access to Highway 99W, overall connectivity in this area would be significantly improved.

Access to Properties:

The new roadway would serve all properties along the north side of Highway 99W between Elwert Road and Handley Street and would also provide a direct connection to westbound Highway 99W at the new right-in/right-out intersection. Therefore, it would provide better overall accessibility and connectivity than Options 1 and 2. One limitation of the right-in/right-out intersection is that to head eastbound on Highway 99W, traffic would be required to use either the Highway 99W/Meinecke Road intersection or the Highway 99W/Elwert Road-Sunset Boulevard intersection. Alternatively drivers could also use the new right-in/right-out intersection to head westbound but then perform a U-turn at the Sunset Boulevard intersection. The connection to the new roadway from Bushong Terrace, if feasible, could meet City access spacing standards and would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods).

Assuming all future access to Highway 99W from abutting properties is redirected to the new roadway, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

This is another legal conclusion – where is Clarence Darrow
These clowns do not know State law

DKS

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations would be nearly identical between Options 2 and 3 (which are both slightly better than Option 1). The Highway 99W/Elwert Road-Sunset Boulevard intersection would still not meet the applicable ODOT mobility target (see Table 10) and would need additional intersection improvements.

Table 10: Option 3 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	1.76
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	39.6	D	0.92
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.7	B	0.50
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	12.3	B	0.61
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	21.0	A/C	0.50
Hwy 99W/New Access	Two-Way Stop[b]	V/C ≤ 0.99	32.0	A/D	0.89

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for Options 1 and 2 would be needed. These improvements include significant widening for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 11 provides the study intersection operations with the improvements.

Table 11: Option 3 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	52.2	D	0.93

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

Ability to Accommodate Future Development:

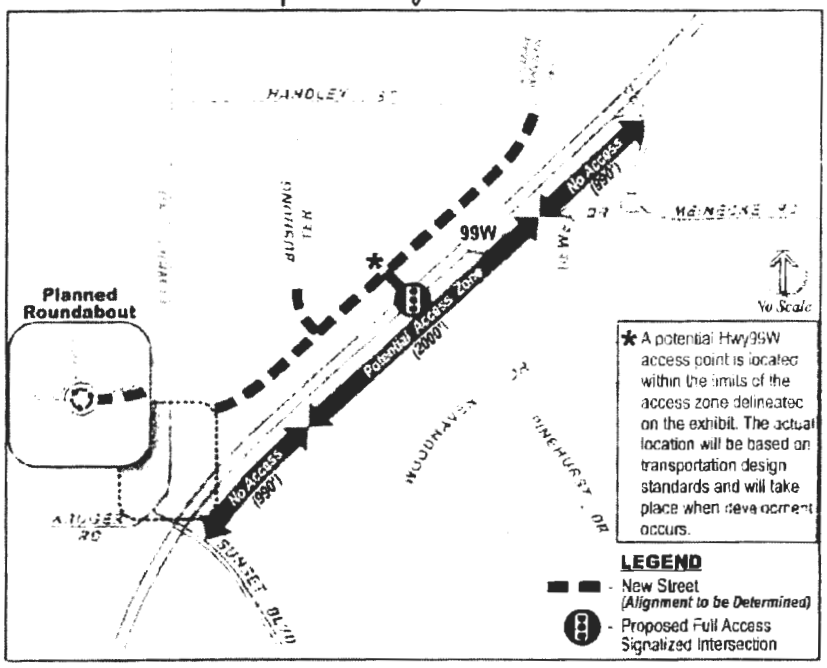
Similar to Options 1 and 2, Connectivity Option 3 is also expected to have the capacity to accommodate 200 more weekday p.m. peak hour trips to/from the study area before additional major improvements would be triggered. This trip level is in addition to what is assumed in the regional travel demand model and would be roughly equivalent to 200 single-family homes or an 18,000 square-foot shopping center. Accommodating more trips beyond this may require improvements at the Highway 99W/Meinecke Road intersection.

Option 4 (Full Highway 99W Access)

Stupid only DKS could do the same.

Description of Roadway Connectivity:

Option 4 provides the maximum amount of connectivity. It is similar to Option 3, but the new intersection with Highway 99W serves all turning movements. Due to the high volume of traffic on Highway 99W, it was assumed that this new intersection would be signalized. For analysis purposes, the new approach to the highway was assumed to have separate left and right turning lanes. It should be noted that the new roadway alignment shown is conceptual and that further development of this option will need to consider how vehicle queues can be safely accommodated between the new roadway and the new signalized intersection on the highway.



Because Highway 99W is a state highway, ODOT approval of a new signal would be necessary prior to construction. To estimate future signalization needs, preliminary signal warrants were evaluated using Signal

Crooked Horn Depot – just show us who pay

Warrants 1, Case A and Case B (MUTCD), which deal primarily with high volumes on the intersecting minor street and high volumes on the major-street. This analysis indicated that signalization may be warranted (the preliminary signal warrant worksheet is attached in the appendix). Meeting preliminary signal warrants does not guarantee that a signal shall be installed. The new signal should also be compatible with the existing signal system. Before a signal can be installed, a field warrant analysis is conducted by the Region. If warrants are met, the State Traffic Engineer will make the final decision on the installation of a signal. Does more of this signal BAH BAA

Access to Properties:

As previously noted, with a full signalized intersection to Highway 99W, a connection to Bushong Terrace, and connectivity reaching from Elwert Road to Handley Street, Connectivity Option 4 provides the highest level of connectivity and the most direct accessibility of any of the options considered. The connection to the new roadway from Bushong Terrace, if feasible, could meet City access spacing standards and would improve access to the highway-adjacent properties to and from other land uses to the north (e.g., the school and residential neighborhoods).

Assuming all future access to Highway 99W from abutting properties is redirected to the new roadway, the anticipated location for the new Highway 99W intersection would meet ODOT access spacing standards because it would be at least 1,500 feet away from the two adjacent signals (the ODOT standard is 990 feet). However, because access rights along the highway have been purchased by ODOT, ODOT approval of a grant of access must be obtained to establish this new intersection to Highway 99W.

Connecting the new roadway to Elwert Road as the fourth leg of the future roundabout with Kruger Road would be ideal for access spacing along Elwert Road. However, to comply with Washington County's requirement of not allowing local streets to intersect with arterials, the new roadway must be classified as a collector street or higher (unless an exception to this requirement can be obtained). Considering the approximate length of this roadway, the fact that it would be providing connectivity between arterial (Elwert Road) and collector (Handley Street) streets, would provide enhanced connectivity to a residential area via an extension of Bushong Terrace, and is estimated to serve more than 2,000 vehicles per day, classification as a collector street would be appropriate.

Mobility at Study Intersections:

Intersection operations are much improved for Option 4 compared to the other options. However, the Highway 99W/Elwert Road-Sunset Boulevard intersection would still not meet the applicable ODOT mobility target (see Table 12) and would need additional intersection improvements.

Table 12: Option 4 Study Intersection Operations (2035 P.M. Peak Hour)

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	>80	F	1.49
Hwy 99W/Meinecke Rd	Traffic Signal	V/C ≤ 0.99	36.2	D	0.87
Handley St/Cedar Brook Way	All-Way Stop	LOS D	10.0	A	0.46
Elwert Rd/Kruger Rd	Roundabout	V/C ≤ 0.90, LOS D	12.0	B	0.60
Elwert Rd/Handley St	Two-Way Stop[b]	V/C ≤ 0.99, LOS E	21.0	A/C	0.50
Hwy 99W/New Access	Traffic Signal	V/C ≤ 0.99	10.9	B	0.85

Signalized and All-Way Stop Intersections:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

Two-Way Stop and Roundabout Intersections:
Delay = Average Stopped Delay per Vehicle (sec) at Worst Movement
LOS = Level of Service of Major Street/Minor Street (Two-Way Stop) or Worst Movement (Roundabout)
V/C = Volume-to-Capacity Ratio of Worst Movement

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."
[b] Even though the intersection is a three-leg intersection and has only one minor street stopped approach, it is analyzed similar to a two-way stop controlled intersection.

Study Intersection Improvements Needed:

For the Highway 99W/Elwert Road-Sunset Boulevard intersection to meet the applicable ODOT mobility target, the same improvements identified for each of the other options would be needed. These improvements include significant widening for the Elwert Road and Sunset Boulevard approaches. Both approaches currently include two lanes (shared through-left and right). The Elwert Road approach would have a heavy right-turn volume and would need to be widened to four lanes (left, through, and dual rights). The Sunset Boulevard approach would also need to be widened to four lanes (dual lefts, through, and right). Table 13 provides the study intersection operations with the improvements.

Table 13: Option 4 Study Intersection Operations (2035 P.M. Peak Hour) – With Improvements

Intersection	Traffic Control	Operating Standard/Target[a]	Intersection Operations with Improvements		
			Delay	*LOS*	*V/C*
Hwy 99W/Elwert Rd-Sunset Blvd	Traffic Signal	V/C ≤ 0.99	52.2	D	0.92

Signalized Intersection:
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Highlighted values do not meet standards.

[a] ODOT has mobility "targets", while other jurisdictions have mobility "standards."

Ability to Accommodate Future Development:

Connectivity Option 4 is expected to have the capacity to accommodate 750 more weekday p.m. peak hour trips than assumed to occur in the regional travel demand model before additional major improvements would be triggered at one of the study intersections. This would be roughly equivalent to 750 single-family homes or a

128,000 square-foot shopping center. The other connectivity options only accommodate 200 additional trips. Therefore, this option has the potential to accommodate a significantly higher level of development in the study area.

The reason for the higher capacity is the new signalized access to Highway 99W that serves traffic to and from both the east and the west. This intersection is also expected to be the critical location where additional improvements would be needed first (beyond the single left and right turning lanes on the new approach) before more trips beyond this could be accommodated.

Findings

Completely - the first leg is the same - it is [illegible] that cause the problem

This study represents the first step toward refining the ultimate roadway connectivity plan for the study area north of Highway 99W. Further refinement will be required, including discussions with affected property owners, the Oregon Department of Transportation, Washington County, and other stakeholders. The key findings of this study are summarized below:

- Two improvements will be needed at the intersection on Highway 99W with Elwert Road-Sunset Boulevard by the year 2035 to meet adopted performance targets, regardless of which local connectivity option for the study area is chosen:
    - Widen the Elwert Road approach to include a left turn lane, a through lane, and dual right turn lanes.
    - Widen the Sunset Boulevard approach to include dual left turn lanes, a through lane, and a right turn lane.
- Options 3 and 4, which include new intersections with Highway 99W, provide higher degrees of connectivity. Option 4, which includes the new signalized intersection to Highway 99W, provides the greatest degree of connectivity and the most direct accessibility for area properties.
- All options considered have a fair amount of flexibility for supporting future development. However, Option 4 may be able to support more than three times the amount of development than the other options due to the assumed traffic signal that would accommodate all turning movements.
- Under Options 2, 3, and 4, classifying the new roadway paralleling Highway 99W (Cedar Brook Way extension) as a collector street would be appropriate.
- All options are capable of meeting City/County/ODOT access spacing requirements.
- Under Option 1, approval from Washington County for an exception from their access management requirement to connect a local street (Bushong Terrace) to an arterial street (Elwert Road) would be needed.
- Establishing a new intersection on Highway 99W would require approval from ODOT for a grant of access to the highway.
- Prior to constructing a traffic signal on Highway 99W, approval must be obtained from the State Traffic Engineer.
- While non-auto modes of travel were not assessed as part of this study, the creation of a new signalized intersection on Highway 99W could have significant benefits for pedestrian and bicycle travel by

This is leap of faith and nonsense and unneeded because of loss of [illegible] to the road unless they are preparing map 17 acres

perhaps this is not true

Stupid statement and the facts - why is the [illegible]

maximizing connectivity and providing a controlled crossing of the highway. Furthermore, if Bushong Terrace cannot be extended to the south to connect to the Cedar Brook Way extension, opportunities to provide pedestrian and bicycle accessways should be explored as an alternative.

Appendix

Total Vehicle Summary

All Traffic Data

Clay Carney
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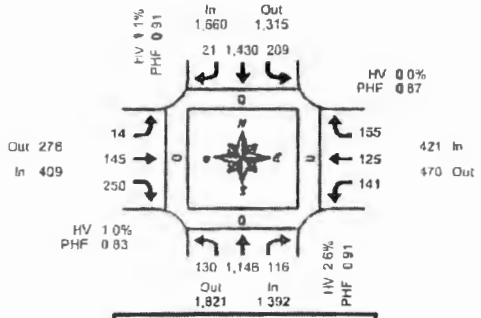


Hwy 99 W & SW Elwert Rd

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	9	41	7	0	14	109	3	0	3	6	23	0	10	10	11	0	246	0	0	0	0
4:05 PM	6	112	8	0	10	151	1	0	1	3	17	0	8	1	11	0	332	0	0	0	0
4:10 PM	6	75	7	0	21	134	2	0	2	13	15	0	10	10	13	1	308	0	0	0	0
4:15 PM	11	91	6	0	12	108	1	0	2	5	18	0	7	9	8	0	272	0	0	0	0
4:20 PM	13	102	1	0	8	100	0	0	1	15	15	0	0	7	10	0	280	0	0	0	0
4:25 PM	3	88	6	0	11	132	2	0	1	3	23	0	9	6	10	0	279	0	0	0	0
4:30 PM	7	79	6	0	17	97	2	0	1	19	17	0	20	7	12	0	281	0	0	0	0
4:35 PM	11	104	8	0	12	152	2	0	0	10	18	0	11	8	8	0	344	0	0	0	0
4:40 PM	7	75	5	0	15	144	0	0	2	17	24	0	17	9	9	0	324	0	0	0	0
4:45 PM	12	117	8	0	16	134	3	0	2	9	27	1	7	2	18	0	354	0	0	0	0
4:50 PM	7	62	5	0	19	107	2	0	1	22	30	0	8	10	9	0	292	0	0	0	0
4:55 PM	9	76	5	0	13	83	1	0	2	16	21	0	12	5	8	0	252	0	0	0	0
5:00 PM	6	103	2	0	15	136	3	0	1	8	21	0	12	12	8	0	327	0	0	0	0
5:05 PM	12	119	13	2	13	114	0	0	0	8	18	0	20	9	15	0	339	0	0	0	0
5:10 PM	7	98	6	0	18	116	1	0	1	6	15	0	12	5	12	0	297	0	0	0	0
5:15 PM	11	85	13	0	11	115	3	0	3	7	29	0	20	11	17	0	325	0	0	0	0
5:20 PM	13	85	18	0	25	152	1	0	2	14	17	0	10	8	14	0	359	0	0	0	0
5:25 PM	13	103	5	0	14	91	1	0	1	17	23	0	8	18	9	0	303	0	0	0	0
5:30 PM	12	79	12	0	24	138	2	0	0	13	17	0	9	7	18	0	332	0	0	0	0
5:35 PM	11	91	7	0	13	101	0	0	1	19	31	0	18	4	6	0	302	0	0	0	0
5:40 PM	9	126	13	0	23	153	5	0	1	8	10	0	7	12	9	0	374	0	0	0	0
5:45 PM	12	84	9	0	17	101	3	0	1	17	30	0	10	9	20	0	313	0	0	0	0
5:50 PM	13	105	10	0	14	99	1	0	2	18	15	0	4	14	13	0	312	0	0	0	0
5:55 PM	11	68	8	0	22	114	3	0	1	11	24	0	7	16	14	0	299	0	0	0	0
Total Survey	231	2,145	188	2	374	2,881	40	0	32	288	496	1	270	209	282	1	7,436	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	21	228	22	0	45	394	6	0	6	22	55	0	28	24	35	1	886	0	0	0	0
4:15 PM	27	281	13	0	29	340	1	0	4	28	56	0	26	18	28	0	831	0	0	0	0
4:30 PM	25	295	19	0	44	393	4	0	3	46	57	0	48	25	30	0	949	0	0	0	0
4:45 PM	28	295	18	0	47	324	6	0	5	47	79	1	27	17	36	0	888	0	0	0	0
5:00 PM	25	320	21	2	46	388	4	0	2	20	34	0	34	28	35	0	983	0	0	0	0
5:15 PM	37	273	36	0	50	358	5	0	6	38	69	0	38	37	40	0	987	0	0	0	0
5:30 PM	32	296	32	0	60	392	5	0	2	41	58	0	34	23	33	0	1,006	0	0	0	0
5:45 PM	36	257	27	0	53	314	7	0	4	48	69	0	25	38	47	0	924	0	0	0	0
Total Survey	231	2,145	188	2	374	2,881	40	0	32	288	496	1	270	209	282	1	7,436	0	0	0	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound Hwy 99 W In	Out	Total	Bikes	Southbound Hwy 99 W In	Out	Total	Bikes	Eastbound SW Elwert Rd In	Out	Total	Bikes	Westbound SW Elwert Rd In	Out	Total	Bikes	Total
Volume	1,392	1,821	3,213	2	1,660	1,315	2,975	0	409	276	685	0	421	470	891	0	3,882
%HV		2.6%				1.1%				1.0%				0.0%			1.5%
PHF		0.91				0.91				0.83				0.87			0.96

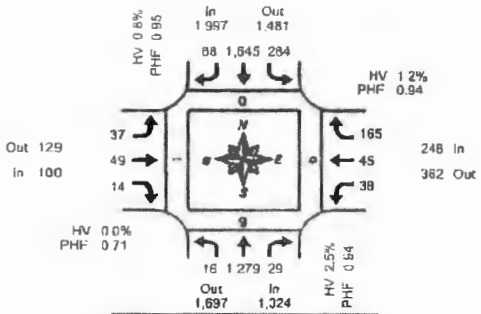
By Movement	Northbound Hwy 99 W L	T	R	Total	Southbound Hwy 99 W L	T	R	Total	Eastbound SW Elwert Rd L	T	R	Total	Westbound SW Elwert Rd L	T	R	Total	Total
Volume	130	1,146	116	1,392	209	1,430	21	1,660	14	145	250	409	141	125	155	421	3,882
%HV	1.5%	2.3%	1.7%	2.6%	0.5%	1.1%	4.8%	1.1%	0.0%	0.0%	1.6%	1.0%	0.0%	0.0%	0.0%	0.0%	1.5%
PHF	0.86	0.90	0.78	0.91	0.83	0.91	0.75	0.91	0.58	0.73	0.88	0.83	0.88	0.80	0.82	0.87	0.96

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W L	T	R	Bikes	Southbound Hwy 99 W L	T	R	Bikes	Eastbound SW Elwert Rd L	T	R	Bikes	Westbound SW Elwert Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	101	999	72	0	165	1,451	10	0	18	143	246	1	129	84	127	1	3,554	0	0	0	0
4:15 PM	105	1,091	71	2	186	1,423	17	0	14	141	245	1	145	86	127	0	3,631	0	0	0	0
4:30 PM	115	1,103	94	2	187	1,441	19	0	16	151	258	1	157	105	141	0	3,787	0	0	0	0
4:45 PM	122	1,144	107	2	203	1,440	20	0	15	146	259	1	143	103	144	0	3,846	0	0	0	0
5:00 PM	130	1,146	116	2	209	1,430	21	0	14	145	250	0	141	125	155	0	3,882	0	0	0	0

Total Vehicle Summary

All Traffic Data
Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

Hwy 99 W & SW Meinecke Pkwy

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W				Southbound Hwy 99 W				Eastbound SW Meinecke Pkwy				Westbound SW Meinecke Pkwy				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	83	2	0	15	126	7	0	1	3	0	0	1	2	7	0	247	0	3	3	0
4:05 PM	2	111	9	0	12	171	2	1	1	3	2	0	5	2	8	0	330	0	2	1	0
4:10 PM	0	71	1	0	29	125	2	0	3	0	0	0	6	1	12	0	256	0	3	0	0
4:15 PM	0	109	2	0	12	145	4	0	1	6	0	0	0	0	11	0	290	0	1	0	0
4:20 PM	0	110	2	0	20	121	5	0	2	5	0	1	2	3	20	0	290	0	1	1	0
4:25 PM	2	84	2	0	26	134	1	0	1	7	0	0	1	6	14	0	281	0	1	0	1
4:30 PM	1	107	3	0	18	130	3	0	2	0	2	1	0	3	16	0	285	0	1	1	0
4:35 PM	1	83	2	0	20	163	2	3	3	1	1	0	1	4	11	0	292	0	0	1	0
4:40 PM	0	89	1	0	27	132	3	0	6	6	3	0	6	6	13	0	272	0	0	0	0
4:45 PM	0	155	2	0	19	144	1	0	3	4	1	0	4	4	3	0	350	0	1	0	0
4:50 PM	0	89	3	0	18	117	3	0	4	7	0	0	3	1	8	0	251	0	0	0	0
4:55 PM	1	88	6	0	14	124	5	0	4	2	0	0	1	3	5	0	253	0	0	0	0
5:00 PM	0	99	3	2	27	114	6	0	2	5	0	0	4	5	24	0	289	0	0	0	0
5:05 PM	1	108	3	0	19	149	7	0	1	4	0	0	4	3	8	0	307	0	0	0	0
5:10 PM	1	117	2	0	15	146	0	0	1	2	1	0	1	0	13	0	299	0	4	5	0
5:15 PM	5	90	6	0	27	129	9	0	4	9	1	0	5	8	17	0	309	0	0	0	0
5:20 PM	2	100	1	0	27	141	6	0	3	2	1	0	4	7	9	0	303	0	0	0	0
5:25 PM	0	127	2	0	17	154	3	0	1	2	3	0	4	1	11	0	325	0	1	0	0
5:30 PM	1	82	1	0	29	135	7	0	2	2	1	0	5	5	20	0	290	0	0	0	0
5:35 PM	2	125	2	0	24	152	4	0	5	5	0	0	2	5	13	0	339	0	0	0	0
5:40 PM	0	101	0	0	25	145	4	0	5	7	2	0	2	0	7	0	298	0	0	0	0
5:45 PM	1	118	3	0	27	124	10	0	3	1	4	0	2	4	15	0	312	0	0	0	0
5:50 PM	1	107	3	0	23	117	6	0	4	8	1	0	3	2	14	0	289	0	2	0	1
5:55 PM	2	105	3	0	24	140	8	0	6	2	0	0	2	5	14	0	309	0	2	0	0
Total Survey	23	2,438	84	2	515	3,280	109	1	70	99	23	0	68	80	297	0	7 066	0	22	13	1

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W				Southbound Hwy 99 W				Eastbound SW Meinecke Pkwy				Westbound SW Meinecke Pkwy				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	2	285	12	0	57	421	11	1	7	12	2	0	12	5	27	0	833	0	3	4	0
4:15 PM	2	309	6	0	58	400	13	0	1	18	0	0	1	9	46	0	961	0	3	1	0
4:30 PM	2	259	6	0	65	423	8	0	11	7	6	0	7	13	40	0	849	0	1	2	0
4:45 PM	1	332	11	0	51	389	9	0	11	13	1	0	8	8	29	0	864	0	1	0	0
5:00 PM	2	324	8	2	91	409	13	0	1	11	1	0	0	9	45	0	899	0	1	3	0
5:15 PM	7	317	9	0	71	423	18	0	3	13	5	0	13	16	37	0	937	0	1	0	0
5:30 PM	3	308	3	0	78	432	15	0	12	11	3	0	9	10	10	0	927	0	0	0	0
5:45 PM	4	330	9	0	74	381	22	0	13	11	5	0	7	11	43	0	910	0	4	1	1
Total Survey	23	2,438	64	2	515	3,280	109	1	70	99	23	0	68	80	297	0	7 066	0	22	13	1

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound Hwy 99 W				Southbound Hwy 99 W				Eastbound SW Meinecke Pkwy				Westbound SW Meinecke Pkwy				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	1 324	1 697	3.021	2	1 997	1 481	3.478	0	100	129	229	0	248	362	610	0	3 689
%HV		2.5%				0.8%				0 0%				1 2%			1 4%
PHF		0 94				0 95				0 71				0 94			0 96

Pedestrians Crosswalk			
North	South	East	West
0	9	6	1

By Movement	Northbound Hwy 99 W				Southbound Hwy 99 W				Eastbound SW Meinecke Pkwy				Westbound SW Meinecke Pkwy				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	16	1,279	29	1 324	284	1 645	68	1 997	37	49	14	100	38	45	165	248	3 669
%HV	0 0%	2 8%	0 0%	2 5%	0 0%	0 9%	0 0%	0 8%	0 0%	0 0%	0 0%	0 0%	2 6%	2 2%	0 6%	1 2%	1 4%
PHF	0 50	0 93	0 86	0 94	0 91	0 93	0 77	0 95	0 71	0 77	0 50	0 71	0 73	0 70	0 92	0 94	0 96

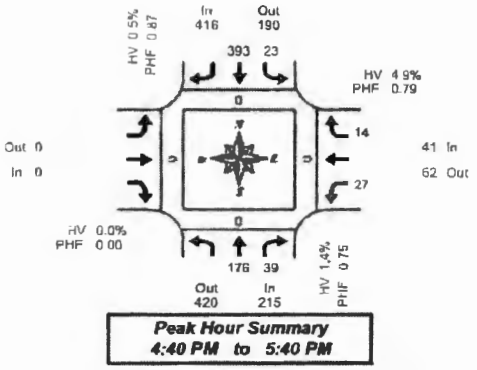
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 99 W				Southbound Hwy 99 W				Eastbound SW Meinecke Pkwy				Westbound SW Meinecke Pkwy				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	7	1 159	35	0	231	1,635	41	1	33	50	9	0	30	35	132	0	3.397	0	13	7	0
4:15 PM	7	1 218	31	2	235	1,623	43	0	30	49	8	0	27	38	150	0	3 459	0	9	3	0
4:30 PM	12	1 232	34	2	248	1 646	48	0	34	44	13	0	37	45	142	0	3.535	0	7	7	0
4:45 PM	13	1,281	31	2	261	1 653	55	0	35	31	10	0	30	42	142	0	3 613	0	6	5	0
5:00 PM	16	1 279	29	2	284	1,645	68	0	37	49	14	0	38	45	165	0	3 689	0	9	6	1

Total Vehicle Summary

All Traffic Data

Clay Comey
(503) 833-2740



Peak Hour Summary
4:40 PM to 5:40 PM

SW Elwert Rd & SW Handley St

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	15	2	0	1	25	0	0	0	4	0	47	0	0	0	0
4:05 PM	12	3	0	3	18	0	0	3	0	0	39	0	0	0	0
4:10 PM	15	1	0	0	33	0	0	1	1	0	51	0	0	0	0
4:15 PM	10	1	0	1	20	0	0	1	0	0	33	0	0	0	0
4:20 PM	15	1	0	3	26	0	0	2	1	0	50	0	0	0	0
4:25 PM	13	3	0	2	27	0	0	0	1	0	48	0	0	0	0
4:30 PM	11	1	0	0	38	0	0	2	1	0	53	0	0	0	0
4:35 PM	10	0	0	0	23	0	0	1	0	0	34	0	0	0	0
4:40 PM	19	3	0	1	36	0	0	4	0	0	63	0	0	0	0
4:45 PM	8	6	0	3	39	0	0	2	0	0	58	0	0	0	0
4:50 PM	13	0	0	3	38	0	0	2	3	0	59	0	0	0	0
4:55 PM	15	5	0	0	32	0	0	4	2	0	58	0	0	0	0
5:00 PM	6	2	0	2	33	0	0	1	0	0	44	0	0	0	0
5:05 PM	16	5	0	1	29	0	0	1	1	0	53	0	0	0	0
5:10 PM	13	2	0	1	21	0	0	2	3	0	42	0	0	0	0
5:15 PM	12	2	0	5	34	0	0	2	1	0	56	0	0	0	0
5:20 PM	10	6	0	1	28	0	0	1	0	0	46	0	0	0	0
5:25 PM	21	5	0	1	35	0	0	2	1	0	68	0	0	0	0
5:30 PM	18	1	0	1	28	0	0	3	2	0	53	0	0	0	0
5:35 PM	22	2	0	4	40	0	0	3	1	0	72	0	0	0	0
5:40 PM	7	2	0	3	34	0	0	2	1	0	50	0	0	0	0
5:45 PM	19	5	0	3	30	0	0	5	0	0	62	0	0	0	0
5:50 PM	15	2	0	2	38	0	0	0	0	0	57	0	0	0	0
5:55 PM	19	2	0	2	29	0	0	2	0	0	54	0	0	0	0
Total Survey	340	65	0	44	733	0	0	46	23	0	1,251	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	42	6	0	4	76	0	0	1	5	0	137	0	0	0	0
4:15 PM	41	4	0	5	72	0	0	3	2	0	132	0	0	0	0
4:30 PM	40	1	0	1	97	0	0	7	1	0	130	0	0	0	0
4:45 PM	36	11	0	8	103	0	0	8	5	0	175	0	0	0	0
5:00 PM	35	9	0	1	83	0	0	4	4	0	139	0	0	0	0
5:15 PM	46	13	0	7	97	0	0	5	2	0	170	0	0	0	0
5:30 PM	47	5	0	9	102	0	0	8	4	0	175	0	0	0	0
5:45 PM	53	4	0	7	97	0	0	7	0	0	173	0	0	0	0
Total Survey	340	65	0	44	733	0	0	46	23	0	1,251	0	0	0	0

Peak Hour Summary
4:40 PM to 5:40 PM

By Approach	Northbound SW Elwert Rd In	Out	Total	Bikes	Southbound SW Elwert Rd In	Out	Total	Bikes	Eastbound SW Handley St In	Out	Total	Bikes	Westbound SW Handley St In	Out	Total	Bikes	Total	Pedestrians Crosswalk North	South	East	West
Volume	215	420	635	0	416	190	606	0	0	0	0	0	41	62	103	0	872	0	0	0	0
%HV		1.4%				0.5%				0.0%				4.9%			1.0%				
PHF		0.75				0.87				0.00				0.79			0.87				

By Movement	Northbound SW Elwert Rd T	R	Total	Southbound SW Elwert Rd L	T	Total	Eastbound SW Handley St			Total	Westbound SW Handley St L	R	Total	Total
Volume	176	39	215	23	393	416				0	27	14	41	872
%HV	NA	1.1%	2.8%	1.4%	4.3%	0.5%	NA	NA	NA	0.0%	3.7%	NA	7.1%	4.9%	1.0%
PHF		0.69	0.75	0.75	0.82	0.87				0.00	0.84		0.70	0.79	0.87

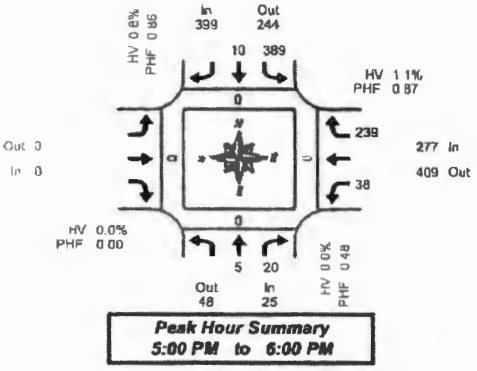
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd T	R	Bikes	Southbound SW Elwert Rd L	T	Bikes	Eastbound SW Handley St Bikes	Westbound SW Handley St L	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	159	29	0	17	354	0	0	22	13	0	594	0	0	0	0
4:15 PM	152	32	0	17	381	0	0	22	12	0	596	0	0	0	0
4:30 PM	157	37	0	18	386	0	0	24	12	0	634	0	0	0	0
4:45 PM	164	38	0	26	391	0	0	25	15	0	659	0	0	0	0
5:00 PM	181	36	0	27	379	0	0	24	10	0	657	0	0	0	0

Total Vehicle Summary

All Traffic Data

Clay Carney
(503) 833-2740



SW Kruger Rd & SW Elwert Rd

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes		L	R	Bikes		North	South	East	West
4:00 PM	2	2	0	27	0	0	0		2	19	0	52	0	0	0	0
4:05 PM	0	1	0	25	1	0	0		1	13	0	41	0	0	0	0
4:10 PM	0	1	0	24	1	0	0		1	12	0	39	0	0	0	0
4:15 PM	3	2	0	26	1	0	0		2	19	0	53	0	0	0	0
4:20 PM	1	2	0	26	0	0	0		0	20	0	49	0	0	0	0
4:25 PM	0	0	0	37	0	0	0		1	9	0	47	0	0	0	0
4:30 PM	1	0	0	33	1	0	0		1	12	0	48	0	0	0	0
4:35 PM	0	0	0	32	0	0	0		3	22	0	57	0	0	0	0
4:40 PM	0	0	0	36	0	0	0		1	13	0	50	0	0	0	0
4:45 PM	0	2	0	40	0	0	0		3	18	0	63	0	0	0	0
4:50 PM	0	2	0	47	1	0	0		1	18	0	69	0	0	0	0
4:55 PM	0	2	0	39	0	0	0		0	15	0	56	0	0	0	0
5:00 PM	0	0	0	29	1	0	0		3	18	0	51	0	0	0	0
5:05 PM	0	0	0	25	1	0	0		1	21	0	48	0	0	0	0
5:10 PM	0	1	0	23	0	0	0		1	12	0	37	0	0	0	0
5:15 PM	0	1	0	41	0	0	0		7	19	0	68	0	0	0	0
5:20 PM	0	4	0	30	0	0	0		0	22	0	56	0	0	0	0
5:25 PM	0	0	0	36	0	0	0		2	30	0	68	0	0	0	0
5:30 PM	1	0	0	32	1	0	0		4	16	0	54	0	0	0	0
5:35 PM	1	1	0	47	0	0	0		1	15	0	65	0	0	0	0
5:40 PM	2	1	0	22	2	0	0		1	24	0	52	0	0	0	0
5:45 PM	0	2	0	42	1	0	0		2	21	0	68	0	0	0	0
5:50 PM	0	5	0	35	3	0	0		5	23	0	72	0	0	0	0
5:55 PM	1	5	0	27	1	0	0		10	18	0	62	0	0	0	0
Total Survey	12	34	0	781	15	0	0		54	429	0	1,325	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes		L	R	Bikes		North	South	East	West
4:00 PM	2	4	0	76	2	0	0		8	44	0	132	0	0	0	0
4:15 PM	4	4	0	89	1	0	0		3	48	0	149	0	0	0	0
4:30 PM	1	0	0	101	1	0	0		5	47	0	155	0	0	0	0
4:45 PM	0	3	0	126	1	0	0		4	51	0	186	0	0	0	0
5:00 PM	0	1	0	77	2	0	0		5	51	0	136	0	0	0	0
5:15 PM	0	5	0	107	0	0	0		9	71	0	192	0	0	0	0
5:30 PM	1	2	0	101	3	0	0		6	55	0	171	0	0	0	0
5:45 PM	1	12	0	104	5	0	0		15	62	0	202	0	0	0	0
Total Survey	12	34	0	781	15	0	0		54	429	0	1,325	0	0	0	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Kruger Rd				Southbound SW Kruger Rd				Eastbound SW Elwert Rd				Westbound SW Elwert Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	25	48	73	0	399	244	643	0	0	0	0	0	277	409	686	0	701	0	0	0	0
%HV		0.0%				0.8%				0.0%				1.1%			0.9%				
PHF		0.48				0.89				0.00				0.87			0.87				

By Movement	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd			Westbound SW Elwert Rd			Total
	T	R	Total	L	T	Total			Total	L	R	Total	
Volume	5	20	25	389	10	399			0	38	239	277	701
%HV	NA	0.0%	0.0%	0.8%	0.0%	0.8%	NA	NA	0.0%	0.0%	1.3%	1.1%	0.9%
PHF		0.31	0.42	0.48	0.85	0.42	0.86		0.00	0.53	0.84	0.87	0.87

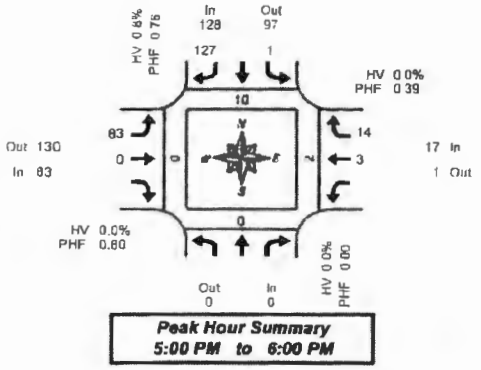
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Kruger Rd			Southbound SW Kruger Rd			Eastbound SW Elwert Rd		Westbound SW Elwert Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes	Bikes		L	R	Bikes		North	South	East	West
4:00 PM	7	14	0	392	5	0	0		16	190	0	624	0	0	0	0
4:15 PM	5	11	0	393	5	0	0		17	197	0	628	0	0	0	0
4:30 PM	1	12	0	411	4	0	0		23	220	0	671	0	0	0	0
4:45 PM	4	14	0	411	6	0	0		24	228	0	687	0	0	0	0
5:00 PM	5	20	0	389	10	0	0		38	239	0	701	0	0	0	0

Total Vehicle Summary

All Traffic Data

Clay Carney
(503) 833 2740



SW Cedar Brook Way & SW Handley St

Wednesday, April 11, 2012
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way Bikes	Southbound SW Cedar Brook Way L	R	Bikes	Eastbound SW Handley St L	T	Bikes	Westbound SW Handley St T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	0	3	6	0	3	0	0	0	0	0	12	3	1	0	0
4:05 PM	0	2	6	0	7	0	0	0	3	0	18	0	0	0	0
4:10 PM	0	0	2	0	6	0	0	1	1	0	10	4	1	0	0
4:15 PM	0	1	3	0	8	0	0	0	0	0	12	0	0	0	0
4:20 PM	0	1	5	0	5	0	0	0	1	0	12	1	0	0	0
4:25 PM	0	2	7	0	6	0	0	0	0	0	15	0	1	0	0
4:30 PM	0	3	5	0	3	0	0	1	2	0	13	0	0	0	0
4:35 PM	0	0	7	0	3	0	0	1	2	0	13	0	0	0	0
4:40 PM	0	1	6	0	13	0	0	0	0	0	20	0	0	0	0
4:45 PM	0	0	3	0	9	0	0	0	1	0	10	0	0	0	0
4:50 PM	0	0	4	0	9	1	0	0	2	0	17	0	0	0	0
4:55 PM	0	1	5	0	5	0	0	0	1	0	12	0	0	0	0
5:00 PM	0	0	14	0	5	0	0	0	0	0	19	0	0	0	0
5:05 PM	0	0	7	0	5	0	0	0	2	0	14	2	0	2	0
5:10 PM	0	0	7	0	4	0	0	0	0	0	11	0	0	0	0
5:15 PM	0	0	15	0	14	0	0	0	0	0	29	7	0	0	0
5:20 PM	0	1	19	0	6	0	0	1	0	0	27	0	0	0	0
5:25 PM	0	0	8	0	3	0	0	0	1	0	10	1	0	0	0
5:30 PM	0	0	8	0	6	0	0	0	1	0	15	0	0	0	0
5:35 PM	0	0	12	0	6	0	0	2	3	0	23	0	0	0	0
5:40 PM	0	0	5	0	8	0	0	0	5	0	19	0	0	0	0
5:45 PM	0	0	10	0	7	0		0	1	0	18	0	0	0	0
5:50 PM	0	0	14	0	11	0	0	0	0	0	25	0	0	0	0
5:55 PM	0	0	9	0	8	0	0	0	1	0	18	0	0	0	0
Total Survey	0	15	193	0	159	1	0	6	27	0	401	18	3	2	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way Bikes	Southbound SW Cedar Brook Way L	R	Bikes	Eastbound SW Handley St L	T	Bikes	Westbound SW Handley St T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	0	5	14	0	16	0	0	1	4	0	40	7	2	0	0
4:15 PM	0	1	15	0	19	0	0	0	1	0	39	1	1	0	0
4:30 PM	0	4	18	0	18	0	0	2	4	0	46	0	0	0	0
4:45 PM	0	1	14	0	23	1	0	0	4	0	48	0	0	0	0
5:00 PM	0	1	28	0	14	0	0	0	2	0	44	2	0	2	0
5:15 PM	0	1	40	0	23	0	0	1	1	0	66	8	0	0	0
5:30 PM	0	0	25	0	20	0	0	2	3	0	50	0	0	0	0
5:45 PM	0	0	33	0	26	0	0	0	2	0	61	0	0	0	0
Total Survey	0	15	193	0	159	1	0	6	27	0	401	18	3	2	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Cedar Brook Way In	Out	Total	Bikes	Southbound SW Cedar Brook Way In	Out	Total	Bikes	Eastbound SW Handley St In	Out	Total	Bikes	Westbound SW Handley St In	Out	Total	Bikes	Total
Volume	0	0	0	0	128	97	225	0	83	130	213	0	17	1	18	0	228
%HV		0.0%				0.8%				0.0%				0.0%			0.4%
PHF		0.00				0.78				0.80				0.39			0.85

Pedestrians Crosswalk North	South	East	West
10	0	2	0

By Movement	Northbound SW Cedar Brook Way Total	Southbound SW Cedar Brook Way L	R	Total	Eastbound SW Handley St L	T	Total	Westbound SW Handley St T	R	Total	Total
Volume	0	1	127	128	83	0	83	3	14	17	228
%HV	NA NA NA 0.0%	0.0%	NA	0.8% 0.8%	0.0%	0.0%	NA 0.0%	NA	0.0%	0.0% 0.0%	0.4%
PHF	0.00	0.25		0.77 0.78	0.80	0.00	0.80		0.38	0.39 0.39	0.85

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Cedar Brook Way Bikes	Southbound SW Cedar Brook Way L	R	Bikes	Eastbound SW Handley St L	T	Bikes	Westbound SW Handley St T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	0	14	66	0	76	1	0	3	13	0	173	8	3	0	0
4:15 PM	0	9	80	0	74	1	0	2	11	0	177	3	1	2	0
4:30 PM	0	8	105	0	78	1	0	3	11	0	204	10	0	2	0
4:45 PM	0	2	113	0	80	1	0	3	16	0	215	10	0	2	0
5:00 PM	0	1	127	0	83	0	0	3	14	0	228	10	0	2	0

TRAFFIC LEVELS OF SERVICE

Analysis of traffic volumes is useful in understanding the general nature of traffic in an area, but by itself indicates neither the ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of *level of service* has been developed to subjectively describe traffic performance. Level of service can be measured at intersections and along key roadway segments.

Level of service categories are similar to report card ratings for traffic performance. Intersections are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is generally diminished in their vicinities. Levels of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection. Most urban communities set level of service D as the minimum acceptable level of service for peak hour operation and plan for level of service C or better for all other times of the day. The *Highway Capacity Manual* provides level of service calculation methodology for both intersections and arterials.[1] The following two sections provide interpretations of the analysis approaches.

[1] *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2000, Chapters 16 and 17.

UNSIGNALIZED INTERSECTIONS (Two-Way Stop Controlled)

Unsignalized intersection level of service is reported for the major street and minor street (generally, left turn movements). The method assesses available and critical gaps in the traffic stream which make it possible for side street traffic to enter the main street flow. The *2000 Highway Capacity Manual* describes the detailed methodology. It is not unusual for an intersection to experience level of service E or F conditions for the minor street left turn movement. It should be understood that, often, a poor level of service is experienced by only a few vehicles and the intersection as a whole operates acceptably.

Unsignalized intersection levels of service are described in the following table.

Level of Service	Expected Delay	(Sec/Veh)
A	Little or no delay	0-10.0
B	Short traffic delay	>10.1-15.0
C	Average traffic delays	>15.1-25.0
D	Long traffic delays	>25.1-35.0
E	Very long traffic delays	>35.1-50.0
F	Extreme delays potentially affecting other traffic movements in the intersection	> 50

Source: 2000 *Highway Capacity Manual*, Transportation Research Board Washington, D C

SIGNALIZED INTERSECTIONS

For signalized intersections, level of service is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay (or signal delay) includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In previous versions of this chapter of the HCM (1994 and earlier), delay included only stopped delay. As delay increases, the level of service decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control. The *2000 Highway Capacity Manual* provides the basis for these calculations.

Level of Service	Delay (secs.)	Description
A	≤10.00	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication. Most vehicles do not stop at all. Progression is extremely favorable and most vehicles arrive during the green phase.
B	10.1-20.0	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles. This level generally occurs with good progression, short cycle lengths, or both.
C	20.1-35.0	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized. Most drivers feel somewhat restricted. Higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, and the number of vehicles stopping is significant.
D	35.1-55.0	**Approaching Unstable/Tolerable Delays:** The influence of congestion becomes more noticeable. Drivers may have to wait through more than one red signal indication. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. The proportion of vehicles not stopping declines, and individual cycle failures are noticeable.
E	55.1-80.0	**Unstable Operation/Significant Delays:** Volumes at or near capacity. Vehicles may wait though several signal cycles. Long queues form upstream from intersection. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are a frequent occurrence.
F	≥80.0	**Forced Flow/Excessive Delays:** Represents jammed conditions. Queues may block upstream intersections. This level occurs when arrival flow rates exceed intersection capacity, and is considered to be unacceptable to most drivers. Poor progression, long cycle lengths, and v/c ratios approaching 1.0 may contribute to these high delay levels.

Source: *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C.

HCM Unsignalized Intersection Capacity Analysis
1: Elwert Rd & Handley St

Sherwood Elwert Connectivity Analysis
2012 Existing (P.M. Peak Hour)

Lane Configurations						
Volume (veh/h)	28	10	180	35	25	360
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	11	191	37	27	404
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	668	218			229	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	668	218			229	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	94	99			98	
cM capacity (veh/h)	412	810			1328	

Volume Total	37	229	431		
Volume Left	27	0	27		
Volume Right	11	37	0		
cSH	479	1700	1328		
Volume to Capacity	0.08	0.13	0.02		
Queue Length 95th (ft)	6	0	2		
Control Delay (s)	13.1	0.0	0.7		
Lane LOS	B		A		
Approach Delay (s)	13.1	0.0	0.7		
Approach LOS	B				

Average Delay	1.1		
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: Cedar Brook Way & Handley St

Sherwood Elwert Connectivity Analysis
2012 Existing (P.M. Peak Hour)

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	85	0	0	0	5	15	0	0	0	5	0	125
Peak Hour Factor	0.85	0.85	0.86	0.85	0.85	0.85	0.85	0.86	0.86	0.85	0.85	0.86
Hourly flow rate (vph)	100	0	0	0	6	18	0	0	0	6	0	147

Volume Total (vph)	100	24	0	153
Volume Left (vph)	100	0	0	0
Volume Right (vph)	0	18	0	147
Hadj (s)	0.20	-0.46	0.00	-0.66
Departure Headway (s)	4.4	3.9	4.3	3.6
Degree Utilization, x	0.12	0.03	0.00	0.15
Capacity (veh/h)	785	868	808	961
Control Delay (s)	8.0	7.0	7.3	7.3
Approach Delay (s)	8.0	7.0	0.0	7.3
Approach LOS	A	A	A	A

Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2012 Existing (P.M. Peak Hour)

Lane Configurations												
Volume (vph)	15	1280	30	285	1645	70	40	45	155	35	50	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1585	1805	3574	1679	1752	1568	1648	1782	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)	1805	3505	1585	1805	3574	1679	1334	1568	1648	1370	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	1333	31	297	1714	73	42	47	172	36	52	16
RTOR Reduction (vph)	0	0	14	0	0	21	0	0	148	0	0	14
Lane Group Flow (vph)	16	1333	17	297	1714	52	42	47	24	36	52	2
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	6		8	4		4
Actuated Green, G (s)	2.3	48.0	48.0	20.9	66.6	66.6	11.2	11.2	11.2	11.2	11.2	11.2
Effective Green, g (s)	2.8	50.0	50.0	21.4	66.6	66.6	13.2	13.2	13.2	13.2	13.2	13.2
Actuated g/C Ratio	0.03	0.52	0.52	0.22	0.71	0.71	0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	4.8	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	82	1818	805	400	2538	1121	182	265	212	187	260	221
v/s Ratio Prot	0.01	c0.38		c0.16	0.48			0.03			0.03	
v/s Ratio Perm			0.01			0.03	c0.03		0.02	0.03		0.00
v/c Ratio	0.31	0.73	0.02	0.74	0.68	0.05	0.23	0.18	0.11	0.19	0.20	0.01
Uniform Delay, d1	48.0	19.1	11.4	36.9	7.8	4.2	37.2	36.9	36.6	37.0	37.0	36.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	1.8	0.0	6.7	0.9	0.0	0.5	0.3	0.2	0.4	0.3	0.0
Delay (s)	47.9	19.9	11.4	41.7	8.7	4.2	37.6	37.2	36.7	37.3	37.3	36.1
Level of Service	D	B	B	D	A	A	D	D	D	D	D	D
Approach Delay (s)		20.1			13.2			37.0			37.1	
Approach LOS		C			B			D			D	

HCM Average Control Delay	18.0	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.66				
Actuated Cycle Length (s)	96.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	70.1%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: Kruger Rd & Elwert Rd

Sherwood Elwert Connectivity Analysis
2012 Existing (P.M. Peak Hour)

Lane Configurations						
Volume (veh/h)	40	240	6	20	390	10
Sign Control	Free		Stop			Stop
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	46	276	6	23	448	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)	198					
pX, platoon unblocked						
vC, conflicting volume	0		368	0	256	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		368	0	256	230
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	97		99	98	33	98
cM capacity (veh/h)	1635		648	1091	685	664

Volume Total	322	29	468			
Volume Left	46	0	448			
Volume Right	276	23	0			
cSH	1636	911	664			
Volume to Capacity	0.03	0.03	0.69			
Queue Length 95th (ft)	2	2	136			
Control Delay (s)	1.2	9.1	21.7			
Lane LOS	A	A	C			
Approach Delay (s)	1.2	9.1	21.7			
Approach LOS		A	C			

Average Delay	13.1		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd — 2012 Existing (P.M. Peak Hour)

Lane Configurations												
Volume (vph)	110	145	260	140	125	155	130	1145	115	210	1465	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1881	1583		1851	1615	1770	3609	1583	3502	3574	1538
Flt Permitted		0.74	1.00		0.66	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1414	1583		1259	1615	1770	3609	1583	3502	3574	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	151	271	146	130	161	135	1193	120	219	1526	26
RTOR Reduction (vph)	0	0	177	0	0	127	0	0	37	0	0	12
Lane Group Flow (vph)	0	187	83	0	276	34	135	1193	83	219	1526	14
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	2%	3%	2%	0%	1%	5%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.4	20.4		19.9	19.9	12.4	44.2	44.2	23.0	54.8	54.8
Effective Green, g (s)		20.4	22.4		21.9	21.9	12.9	46.2	46.2	23.5	56.8	56.8
Actuated g/C Ratio		0.20	0.21		0.21	0.21	0.12	0.44	0.44	0.22	0.54	0.54
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	6.0	6.0	3.5	5.4	5.4
Lane Grp Cap (vph)		276	336		262	338	218	1549	680	787	1941	835
v/s Ratio Prot							0.08	c0.34		0.06	c0.43	
v/s Ratio Perm		0.12	0.05		c0.22	0.02			0.05			0.01
v/c Ratio		0.67	0.25		1.05	0.10	0.62	0.77	0.12	0.28	0.79	0.02
Uniform Delay, d1		38.4	34.1		41.4	33.4	43.5	24.7	17.2	33.5	19.1	11.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.1	0.3		70.3	0.1	5.2	2.9	0.2	0.2	2.6	0.0
Delay (s)		41.6	34.4		111.7	33.5	48.7	27.7	17.4	33.6	21.7	11.0
Level of Service		D	C		F	C	D	C	B	C	C	B
Approach Delay (s)		37.2			82.9			28.6			23.0	
Approach LOS		D			F			C			C	

HCM Average Control Delay	32.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	8.5
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 1 (Minimum Connectivity)

Lane Configurations						
Volume (veh/h)	60	175	330	55	120	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	62	182	344	57	125	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1126	372			401	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1126	372			401	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	69	72			89	
cM capacity (veh/h)	200	666			1147	

Volume Total	244	401	630
Volume Left	62	0	125
Volume Right	182	57	0
cSH	414	1700	1147
Volume to Capacity	0.59	0.24	0.11
Queue Length 95th (ft)	92	0	9
Control Delay (s)	26.5	0.0	2.8
Lane LOS	D		A
Approach Delay (s)	26.5	0.0	2.8
Approach LOS	D		

Average Delay		8.2	
Intersection Capacity Utilization		77.8%	ICU Level of Service D
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 1 (Minimum Connectivity)

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	180	5	20	6	15	15	30	40	5	10	40	365
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	188	5	21	6	16	16	31	42	5	10	42	380
Direction, Lane #												
Volume Total (vph)	214	36	78	432								
Volume Left (vph)	188	5	31	10								
Volume Right (vph)	21	15	5	380								
Hadj (s)	0.12	-0.23	0.04	-0.51								
Departure Headway (s)	5.2	5.2	5.1	4.2								
Degree Utilization, x	0.31	0.05	0.11	0.50								
Capacity (veh/h)	637	609	646	822								
Control Delay (s)	10.5	8.4	8.8	11.3								
Approach Delay (s)	10.5	8.4	8.8	11.3								
Approach LOS	B	A	A	B								

Delay		10.7	
HCM Level of Service		B	
Intersection Capacity Utilization		50.3%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Lane Configurations												
Volume (vph)	80	1945	45	340	2145	185	75	260	275	65	140	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.96	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3506	1646	1805	3574	1677	1762	1863	1587	1783	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.52	1.00	1.00	0.97	1.00	1.00
Satd. Flow (perm)	1805	3506	1646	1805	3574	1677	962	1863	1587	701	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	1714	47	354	2234	193	78	208	286	89	146	21
RTOR Reduction (vph)	0	0	17	0	0	56	0	0	210	0	0	17
Lane Group Flow (vph)	83	1714	30	354	2234	137	78	208	76	89	146	4
Confl. Peds. (#/hr)	1		6	6					9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	7.7	67.3	67.3	25.1	84.7	84.7	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	8.3	69.3	68.3	25.6	86.7	86.7	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.19	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.0	4.5	4.5	2.0	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1859	816	352	2360	1041	177	346	299	130	353	300
v/s Ratio Prot	0.03	0.49		c0.20	c0.63			0.11			0.08	
v/s Ratio Perm			0.02			0.08	0.08		0.05	c0.14		0.00
v/c Ratio	0.55	0.93	0.04	1.01	0.95	0.13	0.44	0.60	0.26	0.76	0.41	0.01
Uniform Delay, d1	59.8	28.6	14.9	52.9	20.2	8.3	47.4	48.0	45.8	50.7	47.1	43.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	8.6	0.0	49.4	9.1	0.1	1.3	2.5	0.4	21.9	0.6	0.0
Delay (s)	63.6	37.4	15.0	102.3	29.3	8.4	48.7	51.6	46.1	72.6	47.7	43.6
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.7			37.1			48.4			58.5	
Approach LOS		D			D			D			E	

HCM Average Control Delay	39.6	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	131.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	93.4%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd/New Local Road

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity)

Intersection Delay (sec/veh)	10.8			
Intersection LOS	B			
Approach	**SB**	**NB**	**SE**	**NE**
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	57	496	628
Demand Flow Rate (pc/h)	120	58	496	632
Vehicles Circulating (pc/h)	653	490	47	141
Vehicles Exiting (pc/h)	120	53	726	407
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.7	6.2	8.5	13.4
Approach LOS	A	A	A	B

Lane				
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	58	496	632
Capacity, Entry Lane (pc/h)	588	692	1078	881
Entry HV Adjustment Factor	0.999	0.981	0.898	0.991
Flow Rate, Entry (vph)	120	57	496	626
Capacity, Entry (vph)	588	679	1076	872
Volume to Capacity Ratio	0.204	0.084	0.460	0.644
Control Delay (sec/veh)	8.7	6.2	8.5	13.4
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	5

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd — 2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↱		↑	↱	↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	38	210	446	230	235	225	185	1460	135	230	1930	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1867	1615		1804	1599	1805	3510	1594	3467	3610	1615
Flt Permitted		0.11	1.00		0.54	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		217	1615		948	1599	1805	3510	1594	3467	3610	1615
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	38	219	454	240	245	234	193	1552	141	229	2031	57
RTOR Reduction (vph)	0	0	358	0	0	156	0	0	31	0	0	20
Lane Group Flow (vph)	0	256	296	0	485	84	193	1552	110	229	2031	37
Confl. Bikes (#/hr)									4			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.7	58.5	58.5	29.9	73.7	73.7
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.2	60.5	60.5	30.4	75.7	75.7
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	3.4	3.4	3.5	5.4	5.4
Lane Grp Cap (vph)		35	283		110	274	219	1742	769	849	2179	975
v/s Ratio Prot							0.11	c0.43		0.07	c0.56	
v/s Ratio Perm		c1.18	0.18		0.76	0.05			0.07			0.02
v/c Ratio		7.29	1.05		4.41	0.31	0.88	0.89	0.14	0.27	0.93	0.04
Uniform Delay, d1		52.7	51.7		52.0	45.4	54.2	29.5	16.0	38.5	22.5	10.1
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2687.0	55.8		1555.0	0.5	31.1	6.7	0.2	0.2	8.4	0.0
Delay (s)		2739.7	107.6		1606.9	45.9	85.4	36.2	16.3	38.7	30.9	10.1
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		1136.4			1098.8			39.9			31.2	
Approach LOS		F			F			D			C	

HCM Average Control Delay	306.7	HCM Level of Service	F	
HCM Volume to Capacity ratio	2.09			
Actuated Cycle Length (s)	125.4	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	119.1%	ICU Level of Service	H	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
6: Hwy 99W & New Access — 2035 PM - Option 1 (Minimum Connectivity)

Movement	EBL	EBT	EBR	WBL	WBT	WBR
Lane Configurations		↑↑	↑↑↱			↱
Volume (veh/h)	0	1750	2160	50	0	35
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	1823	2251	52	0	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2333				3219	1167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2333				3219	1167
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	81
cM capacity (veh/h)	215				8	190

Volume Total	911	911	1521	812	36	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	52	36	
cSH	1700	1700	1700	1700	190	
Volume to Capacity	0.54	0.54	0.89	0.48	0.19	
Queue Length 95th (ft)	0	0	0	0	17	
Control Delay (s)	0.0	0.0	0.0	0.0	28.4	
Lane LOS					D	
Approach Delay (s)	0.0		0.0		28.4	
Approach LOS					D	

Average Delay	0.2		
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 1 (Minimum Connectivity) + Imps

Lane Configurations												
Volume (vph)	35	210	445	230	235	225	185	1490	135	220	1950	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	219	464	240	245	234	193	1552	141	229	2031	57
RTOR Reduction (vph)	0	0	272	0	0	192	0	0	30	0	0	19
Lane Group Flow (vph)	36	219	192	240	245	42	193	1552	111	229	2031	38
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.1	18.7	18.7	9.0	21.1	21.1	14.2	68.1	68.1	17.9	71.8	71.8
Effective Green, g (s)	8.1	18.7	20.7	11.0	23.1	23.1	14.7	70.1	70.1	18.4	73.8	73.8
Actuated g/C Ratio	0.06	0.14	0.15	0.08	0.17	0.17	0.11	0.52	0.52	0.14	0.55	0.55
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	109	264	437	286	326	274	197	1879	830	474	1978	885
v/s Ratio Prot	0.02	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.56	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.33	0.83	0.44	0.84	0.75	0.15	0.98	0.83	0.13	0.48	1.03	0.04
Uniform Delay, d1	60.7	56.4	51.7	61.0	53.1	47.5	59.9	27.2	16.6	53.8	30.4	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	18.6	0.5	18.9	9.0	0.2	57.5	3.6	0.2	0.9	27.4	0.0
Delay (s)	62.5	75.0	52.3	79.9	62.0	47.7	117.4	30.7	16.8	54.7	57.9	14.2
Level of Service	E	E	D	E	E	D	F	C	B	D	E	B
Approach Delay (s)		59.7			63.3			38.6			56.5	
Approach LOS		E			E			D			E	

HCM Average Control Delay	51.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	134.7	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 2 (No Highway 99W Access)

Lane Configurations						
Volume (veh/h)	55	160	320	65	110	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	57	167	333	47	115	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	73	75			90	
cM capacity (veh/h)	209	670			1167	

Volume Total	224	380	639
Volume Left	57	0	115
Volume Right	167	47	0
cSH	426	1700	1167
Volume to Capacity	0.52	0.22	0.10
Queue Length 95th (ft)	74	0	8
Control Delay (s)	22.2	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	22.2	0.0	2.5
Approach LOS	C		

Average Delay	5.3		
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2: Cedar Brook Way & Handley St — 2035 PM - Option 2 (No Highway 99W Access)

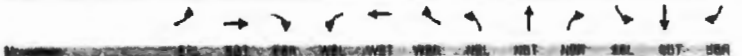
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	185	5	15	5	10	20	20	60	5	10	65	400
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	193	5	16	5	10	21	21	62	5	10	68	417

Volume Total (vph)	214	36	89	495
Volume Left (vph)	193	5	21	10
Volume Right (vph)	16	21	5	417
Hadj (s)	0.14	-0.31	0.01	-0.49
Departure Headway (s)	5.4	5.3	5.2	4.3
Degree Utilization, x	0.32	0.05	0.13	0.58
Capacity (veh/h)	610	594	635	815
Control Delay (s)	11.0	8.6	9.0	13.1
Approach Delay (s)	11.0	8.6	9.0	13.1
Approach LOS	B	A	A	B

Delay	11.9		
HCM Level of Service	B		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↑	↱	↰	↑	↱
Volume (vph)	60	1640	40	340	2080	250	75	200	275	100	145	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3605	1546	1805	3674	1577	1752	1863	1557	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1805	3605	1546	1805	3674	1577	931	1863	1557	701	1900	1615
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	1726	42	358	2187	263	79	208	289	105	153	47
RTOR Reduction (vph)	0	0	15	0	0	75	0	0	211	0	0	38
Lane Group Flow (vph)	63	1726	27	358	2187	182	79	208	78	105	151	9
Confl. Peds. (#/hr)	1		8	8		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	7.7	67.2	67.2	25.1	84.6	84.6	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	8.2	69.2	69.2	25.6	86.6	86.6	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.20	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.0	4.5	4.5	2.0	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1849	815	362	2359	1041	173	346	289	130	353	300
v/s Ratio Prot	0.03	0.48		c0.20	c0.61			0.11			0.08	
v/s Ratio Perm			0.02			0.12	0.08		0.05	c0.15		0.01
v/c Ratio	0.55	0.93	0.03	1.01	0.92	0.17	0.45	0.60	0.26	0.80	0.43	0.03
Uniform Delay, d1	59.7	28.8	14.9	62.6	18.3	9.6	47.4	48.9	45.7	51.1	47.2	43.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	9.5	0.0	49.4	6.5	0.1	1.4	2.5	0.3	27.9	0.6	0.0
Delay (s)	63.4	37.1	14.9	102.2	25.8	9.7	48.8	51.4	46.0	79.0	47.8	43.7
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.5			33.8			48.4			57.9	
Approach LOS		D			C			D			E	

HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	131.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd/Cedar Brook Way

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access)

Intersection Delay (sec/veh)	18.6
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	45	479	820
Demand Flow Rate (pc/h)	120	47	480	826
Vehicles Circulating (pc/h)	647	479	41	141
Vehicles Exiting (pc/h)	120	42	726	385
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.6	8.0	8.2	13.2
Approach LOS	A	A	A	B

Lane				
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	47	480	826
Capacity, Entry Lane (pc/h)	692	700	1085	981
Entry HV Adjustment Factor	0.999	0.977	0.998	0.991
Flow Rate, Entry (vph)	120	46	479	820
Capacity, Entry (vph)	691	684	1082	972
Volume to Capacity Ratio	0.203	0.067	0.443	0.358
Control Delay (sec/veh)	8.8	8.0	8.2	13.2
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	5

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd — 2035 PM - Option 2 (No Highway 99W Access)

Lane Configurations												
Volume (vph)	25	210	455	230	235	925	185	1490	135	220	1940	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.6	4.6	4.6	4.0	4.0	4.6	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bike		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1690	1615		1654	1599	1685	3810	1594	3467	3610	1615
Flt Permitted		0.15	1.00		0.37	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		278	1615		667	1599	1685	3810	1594	3467	3610	1615
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	221	479	242	247	974	195	1568	142	232	2042	42
RTOR Reduction (vph)	0	0	155	0	0	150	0	0	31	0	0	15
Lane Group Flow (vph)	0	246	306	0	488	84	193	1568	110	229	2021	27
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	8%	8%	8%	8%	8%	1%	8%	8%	8%	1%	8%	8%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.7	58.4	58.4	29.8	73.5	73.5
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.2	60.4	60.4	30.3	75.5	75.5
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.0	2.0		2.5	2.0	3.0	6.4	6.4	3.0	6.4	6.4
Lane Grp Cap (vph)		44	284		120	275	218	1742	769	835	2177	974
v/s Ratio Prot							0.11	c0.43		0.07	c0.56	
v/s Ratio Perm			0.19			0.05			0.07			0.02
v/c Ratio		c5.57	1.08		4.04	0.31	0.88	0.89	0.14	0.27	0.93	0.03
Uniform Delay, d1		52.6	51.6		51.9	45.3	54.1	29.4	18.0	38.5	22.4	10.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2104.4	75.4		1388.4	0.5	31.1	6.7	0.2	0.2	8.0	0.0
Delay (s)		2157.0	127.0		1440.2	45.8	85.3	36.1	18.2	38.7	30.4	10.1
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		518.7			988.4			39.8			30.9	
Approach LOS		F			F			D			C	

HCM Average Control Delay	257.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.76		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	119.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 2 (No Highway 99W Access) + Imps

Lane Configurations												
Volume (vph)	25	210	455	230	235	225	185	1490	135	220	1940	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	474	240	245	234	193	1552	141	229	2021	42
RTOR Reduction (vph)	0	0	275	0	0	183	0	0	29	0	0	13
Lane Group Flow (vph)	26	219	199	240	245	51	193	1552	112	229	2021	29
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.7	20.6	20.6	8.0	23.4	23.4	16.0	76.0	76.0	20.0	80.0	80.0
Effective Green, g (s)	6.7	20.6	22.6	10.0	25.4	25.4	16.5	78.0	78.0	20.5	82.0	82.0
Actuated g/C Ratio	0.05	0.14	0.16	0.07	0.17	0.17	0.11	0.54	0.54	0.14	0.56	0.56
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	83	269	441	241	331	279	205	1934	854	488	2033	910
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.56	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.31	0.81	0.45	1.00	0.74	0.18	0.94	0.80	0.13	0.47	0.99	0.03
Uniform Delay, d1	67.2	60.6	55.9	67.8	57.0	51.2	64.1	27.5	16.9	57.5	31.6	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	16.6	0.5	56.5	8.2	0.2	46.3	2.9	0.2	0.8	18.5	0.0
Delay (s)	69.4	77.2	56.4	124.2	65.1	51.5	110.4	30.4	17.0	58.4	50.1	14.2
Level of Service	E	E	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		63.2			80.4			37.6			50.3	
Approach LOS		E			F			D			D	

HCM Average Control Delay	51.5	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.92				
Actuated Cycle Length (s)	145.6	Sum of lost time (s)		10.5	
Intersection Capacity Utilization	96.9%	**ICU Level of Service**		F	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1: Elwert Rd & Handley St — 2035 PM - Option 3 (RI/RO Highway 99W Access)

Lane Configurations						
Volume (veh/h)	58	160	320	46	110	486
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	62	167	333	47	115	506
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	75	75			90	
cM capacity (veh/h)	209	670			1167	

Volume Total	218	380	638
Volume Left	52	0	115
Volume Right	167	47	0
cSH	440	1700	1167
Volume to Capacity	0.50	0.22	0.10
Queue Length 95th (ft)	68	0	8
Control Delay (s)	21.0	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	21.0	0.0	2.5
Approach LOS	C		

Average Delay		5.0	
Intersection Capacity Utilization		74.3%	ICU Level of Service D
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2 Cedar Brook Way & Handley St — 2035 PM - Option 3 (RI/RO Highway 99W Access)

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	170	5	30	10	10	15	20	50	5	10	50	355
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	177	5	31	10	10	16	21	52	5	10	52	370

Volume Total (vph)	214	36	78	432
Volume Left (vph)	177	10	21	10
Volume Right (vph)	31	16	5	370
Hadj (s)	0.08	-0.20	0.01	-0.49
Departure Headway (s)	5.7	5.2	5.1	4.2
Degree Utilization, x	0.34	0.05	0.11	0.50
Capacity (veh/h)	541	606	650	821
Control Delay (s)	10.5	8.5	8.7	11.3
Approach Delay (s)	10.5	8.5	8.7	11.3
Approach LOS	B	A	A	B

Delay		10.7	
HCM Level of Service		B	
Intersection Capacity Utilization		58.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

Lane Configurations												
Volume (vph)	60	1540	40	340	2145	186	75	200	275	180	145	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3586	1646	1805	3674	1677	1752	1863	1557	1793	1800	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1805	3586	1646	1805	3674	1677	931	1863	1557	701	1800	1615
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	1705	42	384	2234	193	78	205	286	186	151	21
RTOR Reduction (vph)	0	0	15	0	0	56	0	0	211	0	0	17
Lane Group Flow (vph)	63	1705	27	384	2234	137	78	205	75	104	151	4
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	1%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	4.7	87.2	87.2	25.1	84.6	84.6	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	5.2	89.2	89.2	26.6	86.6	86.6	24.4	24.4	24.4	24.4	24.4	24.4
Actuated g/C Ratio	0.06	0.53	0.53	0.20	0.66	0.66	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	4.5	6.0	6.0	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.3	4.5	4.5	2.3	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	113	1849	815	352	2359	1041	173	346	290	130	353	300
v/s Ratio Prot	0.03	0.49		c0.20	c0.63			0.11			0.08	
v/s Ratio Perm			0.02			0.09	0.08		0.05	c0.15		0.00
v/c Ratio	0.55	0.92	0.03	1.01	0.95	0.13	0.45	0.60	0.26	0.80	0.43	0.01
Uniform Delay, d1	59.7	28.6	14.9	52.8	20.2	8.3	47.4	46.9	45.7	51.1	47.2	43.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	6.5	0.0	49.4	9.1	0.1	1.4	2.5	0.3	27.9	0.6	0.0
Delay (s)	63.4	37.1	14.9	102.2	29.4	8.4	48.8	51.4	46.0	79.0	47.8	43.6
Level of Service	E	D	B	F	C	A	D	D	D	E	D	D
Approach Delay (s)		37.5			37.2			48.4			59.2	
Approach LOS		D			D			D			E	

HCM Average Control Delay	39.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	131.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access)

Intersection Delay (sec/veh)	10.1
Intersection LOS	B

Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	41	474	599
Demand Flow Rate (pc/h)	120	42	474	605
Vehicles Circulating (pc/h)	818	479	41	131
Vehicles Exiting (pc/h)	120	38	595	390
Follow-Up Headway (s)	3.188	3.188	3.188	3.188
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.3	5.9	8.1	12.3
Approach LOS	A	A	A	B

Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	1.000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pc/h)	120	42	474	605
Capacity, Entry Lane (pc/h)	810	700	1085	991
Entry HV Adjustment Factor	0.999	0.974	1.000	0.991
Flow Rate, Entry (vph)	120	41	474	599
Capacity, Entry (vph)	810	682	1085	982
Volume to Capacity Ratio	0.197	0.060	0.437	0.610
Control Delay (sec/veh)	8.3	5.9	8.1	12.3
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	4

HCM Signalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd — 2035 PM - Option 3 (RVRC Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	26	219	426	230	235	226	186	1463	135	220	1870	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1890	1615		1854	1599	1805	3610	1594	3487	3610	1615
Flt Permitted		0.14	1.00		0.36	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		276	1615		690	1599	1805	3610	1594	3487	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	443	240	245	234	193	1552	141	229	2052	36
RTOR Reduction (vph)	0	0	168	0	0	150	0	0	31	0	0	12
Lane Group Flow (vph)	0	245	275	0	485	84	193	1552	110	229	2052	24
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.6	19.5	14.8	58.7	58.7	30.2	74.1	74.1
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.3	60.7	60.7	30.7	76.1	76.1
Actuated g/C Ratio		0.16	0.17		0.17	0.17	0.12	0.48	0.48	0.24	0.60	0.60
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.5		2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)		44	282		118	273	219	1740	769	845	2182	976
v/s Ratio Prot							0.11	c0.43		0.07	c0.57	
v/s Ratio Perm		c0.89	0.17		0.70	0.05			0.07			0.01
v/c Ratio		5.57	0.98		4.11	0.31	0.88	0.89	0.14	0.27	0.94	0.02
Uniform Delay, d1		53.0	51.7		52.2	45.7	54.4	29.6	18.1	38.5	22.8	10.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2104.4	46.7		1419.6	0.5	31.1	5.8	0.2	0.2	9.2	0.0
Delay (s)		2157.3	98.4		1471.7	46.2	85.6	35.4	18.3	38.7	32.0	10.0
Level of Service		F	F		F	D	F	D	B	D	C	B
Approach Delay (s)		881.6			1007.7			40.1			32.3	
Approach LOS		F			F			D			C	

HCM Average Control Delay	258.0	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.78			
Actuated Cycle Length (s)	125.9	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	116.1%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
6: Hwy 99W & New Access — 2035 PM - Option 3 (RVRC Highway 99W Access)

Movement	EBL	EBT	EBR	WBL	WBT	WBR
Lane Configurations		↑↑	↑↑			↱
Volume (veh/h)	6	1740	2178	70	0	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	1812	2269	73	0	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2333				3203	1167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2333				3203	1167
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	70
cM capacity (veh/h)	215				8	190

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	NB 1	
Volume Total	905	906	1587	626	57	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	73	57	
cSH	1700	1700	1700	1700	190	
Volume to Capacity	0.53	0.53	0.93	0.49	0.30	
Queue Length 95th (ft)	0	0	0	0	30	
Control Delay (s)	0.0	0.0	0.0	0.0	32.0	
Lane LOS					D	
Approach Delay (s)	0.0		0.0		32.0	
Approach LOS					D	

Average Delay	0.4		
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 3 (RI/RO Highway 99W Access) + Imps

Lane Configurations												
Volume (vph)	25	210	425	230	235	225	185	1490	135	220	1970	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	219	443	240	245	234	193	1552	141	229	2052	36
RTOR Reduction (vph)	0	0	277	0	0	180	0	0	30	0	0	11
Lane Group Flow (vph)	26	219	166	240	245	54	193	1552	111	229	2052	25
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.5	19.8	19.8	8.9	23.7	23.7	16.0	76.6	76.6	19.9	80.5	80.5
Effective Green, g (s)	6.5	19.8	21.8	10.9	25.7	25.7	16.5	78.6	78.6	20.4	82.5	82.5
Actuated g/C Ratio	0.04	0.14	0.15	0.07	0.18	0.18	0.11	0.54	0.54	0.14	0.56	0.56
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	80	257	424	261	334	281	204	1941	857	484	2037	911
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.11	0.43		0.07	c0.57	
v/s Ratio Perm			0.06			0.03			0.07			0.02
v/c Ratio	0.33	0.85	0.39	0.92	0.73	0.19	0.95	0.80	0.13	0.47	1.01	0.03
Uniform Delay, d1	67.7	61.8	56.2	67.2	57.0	51.4	64.4	27.4	16.8	57.9	31.8	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	22.6	0.4	34.5	7.6	0.2	47.4	2.8	0.2	0.9	21.7	0.0
Delay (s)	70.1	84.4	56.7	101.7	64.7	51.7	111.8	30.2	17.0	58.8	53.6	14.1
Level of Service	E	F	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		66.0			72.8			37.6			53.5	
Approach LOS		E			E			D			D	

HCM Average Control Delay	52.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	146.2	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
1 Elwert Rd & Handley St — 2035 AM - Option 4 (Full Highway 99W Access)

Lane Configurations						
Volume (vph)	50	160	320	45	110	495
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	52	167	333	47	115	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1102	357			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	357			380	
tC, single (s)	6.4	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.2	
p0 queue free %	75	75			89	
cM capacity (veh/h)	209	670			1167	

Volume Total	219	380	630
Volume Left	52	0	115
Volume Right	167	47	0
cSH	440	1700	1167
Volume to Capacity	0.50	0.22	0.10
Queue Length 95th (ft)	68	0	8
Control Delay (s)	21.0	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	21.0	0.0	2.5
Approach LOS	C		

Average Delay		5.0	
Intersection Capacity Utilization		74.3%	ICU Level of Service D
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis — Sherwood Elwert Connectivity Analysis
2 Cedar Brook Way & Handley St — 2035 PM - Option 4 (Full Highway 99W Access)

Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	135	5	30	10	10	15	20	20	5	10	40	350
Peak Hour Factor	0.96	0.96	0.68	0.96	0.66	0.86	0.88	0.98	0.96	0.86	0.95	0.96
Hourly flow rate (vph)	141	5	31	10	10	16	21	21	5	10	42	365

Volume Total (vph)	177	36	47	417
Volume Left (vph)	141	10	21	10
Volume Right (vph)	31	18	5	365
Hadj (s)	0.05	-0.20	0.02	-0.61
Departure Headway (s)	5.0	5.0	4.9	4.0
Degree Utilization, x	0.25	0.05	0.06	0.45
Capacity (veh/h)	664	644	674	958
Control Delay (s)	9.6	8.2	8.3	10.6
Approach Delay (s)	9.6	8.2	8.3	10.6
Approach LOS	A	A	A	B

Delay		10.0	
HCM Level of Service		A	
Intersection Capacity Utilization		47.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
3: Meinecke Rd & Hwy 99W

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Lane Configurations												
Volume (vph)	95	1705	40	340	2145	185	75	200	270	35	145	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3505	1547	1805	3574	1577	1752	1863	1555	1793	1900	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.48	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	1805	3505	1547	1805	3574	1577	890	1863	1555	634	1900	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	47	1776	42	354	2234	193	78	208	281	36	151	21
RTOR Reduction (vph)	0	0	14	0	0	52	0	0	214	0	0	17
Lane Group Flow (vph)	47	1776	28	354	2234	141	78	208	72	36	151	4
Confl. Peds. (#/hr)	1		6	6		1			9	9		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	3%	0%	0%	1%	0%	3%	2%	1%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8		8	4		4
Actuated Green, G (s)	5.8	67.7	67.7	26.2	88.0	88.0	21.8	21.8	21.8	21.8	18.6	18.6
Effective Green, g (s)	7.4	69.7	69.7	26.7	88.0	88.0	21.8	21.8	21.8	21.8	21.8	21.8
Actuated g/C Ratio	0.08	0.54	0.54	0.20	0.68	0.68	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	4.0	6.0	6.0	4.6	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	2.5	4.5	4.5	2.5	4.5	4.5	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	104	1894	836	360	2438	1076	149	312	269	186	318	270
v/s Ratio Prot	0.03	0.51		c0.20	c0.63			c0.11			0.08	
v/s Ratio Perm			0.02			0.09	0.09		0.05	0.06		0.00
v/c Ratio	0.45	0.94	0.03	0.98	0.92	0.13	0.52	0.67	0.28	0.34	0.47	0.01
Uniform Delay, d1	58.9	27.6	13.9	61.4	17.4	7.2	49.0	50.3	46.9	47.4	48.6	44.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	9.7	0.0	42.6	6.2	0.1	2.5	4.8	0.4	1.4	0.8	0.0
Delay (s)	60.7	37.4	13.9	94.1	23.6	7.2	51.5	55.1	47.3	48.8	49.4	44.8
Level of Service	E	D	B	F	C	A	D	E	D	D	D	D
Approach Delay (s)		37.4			31.4			50.7			48.8	
Approach LOS		D			C			D			D	

HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	129.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Roundabout
4: Elwert Rd & Kruger Rd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Intersection	
Intersection Delay (sec/veh)	9.8
Intersection LOS	A

Approach				
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adjusted Approach Flow (vph)	120	31	484	599
Demand Flow Rate (pcph)	120	31	484	605
Vehicles Circulating (pcph)	605	474	41	120
Vehicles Exiting (pcph)	120	31	684	385
Follow-Up Headway (s)	3.186	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000	1.000
Approach Delay (sec/veh)	8.2	5.6	7.9	12.0
Approach LOS	A	A	A	B

Lane				
Designated moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
Right Turn Channelized				
Lane Utilization	000	1.000	1.000	1.000
Critical Headway (s)	5.193	5.193	5.193	5.193
Entry Flow Rate (pcph)	120	31	484	605
Capacity, Entry Lane (pcph)	617	703	1085	1002
Entry HV Adjustment Factor	0.999	0.997	1.000	0.991
Flow Rate, Entry (vph)	120	31	484	599
Capacity, Entry (vph)	617	701	1085	993
Volume to Capacity Ratio	0.194	0.044	0.429	0.604
Control Delay (sec/veh)	8.2	5.6	7.9	12.0
Level of Service	A	A	A	B
95th-Percentile Queue (veh)	1	0	2	4

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Lane Configurations												
Volume (vph)	15	210	425	230	235	225	175	1665	135	220	1670	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1994	1616		1654	1599	1805	3610	1584	3467	3610	1615
Flt Permitted		0.25	1.00		0.39	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		478	1616		749	1599	1805	3610	1584	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	219	443	240	245	234	182	1552	141	229	2052	36
RTOR Reduction (vph)	0	0	187	0	0	150	0	0	38	0	0	12
Lane Group Flow (vph)	0	236	276	0	485	84	182	1552	111	229	2052	24
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	6%	6%	6%	6%	6%	1%	6%	6%	6%	1%	6%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		20.0	20.0		19.5	19.5	14.5	58.7	58.7	20.7	73.9	73.9
Effective Green, g (s)		20.0	22.0		21.5	21.5	15.9	60.7	60.7	22.2	75.9	75.9
Actuated g/C Ratio		0.16	0.18		0.17	0.17	0.12	0.48	0.48	0.24	0.61	0.61
Clearance Time (s)		6.0	6.0		6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		2.5	2.0		2.0	2.0	3.0	6.4	6.4	3.0	6.4	6.4
Lane Grp Cap (vph)		76	283		128	274	216	1747	772	835	2185	978
v/s Ratio Prot							0.10	c0.43		0.07	c0.57	
v/s Ratio Perm		0.49	0.17		c0.65	0.05			0.07			0.01
v/c Ratio		3.09	0.97		3.79	0.31	0.84	0.89	0.14	0.27	0.94	0.02
Uniform Delay, d1		52.7	51.4		52.0	45.4	54.0	29.4	17.9	38.7	22.6	9.9
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		975.2	46.0		1273.9	0.5	24.8	6.8	0.2	0.2	9.0	0.0
Delay (s)		1027.9	97.4		1325.9	45.8	78.7	36.3	18.1	38.9	31.6	9.9
Level of Service		F	F		F	D	E	D	B	D	C	A
Approach Delay (s)		419.9			906.3			39.0			32.0	
Approach LOS		F			F			D			C	

HCM Average Control Delay		194.9	HCM Level of Service		F
HCM Volume to Capacity ratio		1.48			
Actuated Cycle Length (s)		125.4	Sum of lost time (s)		12.5
Intersection Capacity Utilization		117.0%	ICU Level of Service		H
Analysis Period (min)		15			
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
6: Hwy 99W & New Access

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access)

Lane Configurations						
Volume (vph)	25	1715	2170	70	75	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.85		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	3505	3559		1805	1615
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1805	3505	3559		1805	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	1786	2260	73	78	57
RTOR Reduction (vph)	0	0	2	0	0	51
Lane Group Flow (vph)	26	1786	2331	0	78	6
Heavy Vehicles (%)	0%	3%	1%	0%	6%	0%
Turn Type	Prot	NA	NA		NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases						6
Actuated Green, G (s)	1.5	63.8	68.3		8.7	8.7
Effective Green, g (s)	1.5	63.8	68.3		8.7	8.7
Actuated g/C Ratio	0.02	0.79	0.72		0.11	0.11
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	34	2778	2578		195	175
v/s Ratio Prot	0.01	c0.51	c0.66		c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.76	0.64	0.90		0.40	0.04
Uniform Delay, d1	39.3	3.5	8.9		33.5	32.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	66.1	0.5	5.0		1.3	0.1
Delay (s)	105.4	4.0	13.8		34.8	32.2
Level of Service	F	A	B		C	C
Approach Delay (s)		5.5	13.8		33.7	
Approach LOS		A	B		C	

HCM Average Control Delay	10.9	HCM Level of Service		B
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	80.6	Sum of lost time (s)		12.0
Intersection Capacity Utilization	73.0%	ICU Level of Service		D
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Hwy 99W & Elwert Rd/Sunset Blvd

Sherwood Elwert Connectivity Analysis
2035 PM - Option 4 (Full Highway 99W Access) + Imps

Lane Configurations												
Volume (vph)	15	210	425	230	235	225	175	1500	135	220	1970	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0	4.0	2.0	4.5	4.5	4.5	4.0	4.0	4.5	4.0	4.0
Lane Util. Factor	1.00	1.00	0.88	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1900	2842	3502	1900	1599	1805	3610	1594	3467	3610	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	219	443	240	245	234	182	1562	141	229	2052	36
RTOR Reduction (vph)	0	0	257	0	0	189	0	0	29	0	0	11
Lane Group Flow (vph)	16	219	186	240	245	45	182	1562	112	229	2052	25
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.1	21.4	21.4	8.0	25.8	25.8	15.0	76.2	76.2	19.8	81.0	81.0
Effective Green, g (s)	5.1	21.4	23.4	10.0	27.8	27.8	15.5	78.2	78.2	20.3	83.0	83.0
Actuated g/C Ratio	0.03	0.15	0.16	0.07	0.19	0.19	0.11	0.53	0.53	0.14	0.57	0.57
Clearance Time (s)	4.0	6.0	6.0	4.0	6.5	6.5	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	2.5	2.5	3.0	2.5	2.5	3.0	5.4	5.4	3.5	5.4	5.4
Lane Grp Cap (vph)	63	278	454	239	361	304	191	1928	851	481	2047	916
v/s Ratio Prot	0.01	0.12		c0.07	c0.13		c0.10	0.43		0.07	c0.57	
v/s Ratio Perm			0.07			0.03			0.07			0.02
v/c Ratio	0.25	0.79	0.41	1.00	0.68	0.15	0.95	0.81	0.13	0.48	1.00	0.03
Uniform Delay, d1	68.8	60.3	55.3	68.2	55.1	49.4	65.1	28.0	17.1	58.1	31.7	13.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	13.3	0.4	59.3	4.6	0.2	51.3	3.1	0.2	0.9	20.5	0.0
Delay (s)	70.9	73.6	55.7	127.5	59.7	49.6	116.4	31.1	17.2	59.0	52.2	14.0
Level of Service	E	E	E	F	E	D	F	C	B	E	D	B
Approach Delay (s)		61.8			79.0			38.3			52.3	
Approach LOS		E			E			D			D	

HCM Average Control Delay	52.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	146.4	Sum of lost time (s)	10.5
Intersection Capacity Utilization	97.2%	ICU Level of Seivice	F
Analysis Period (min)	15		

c Critical Lane Group

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	Highway 99W	**Minor Street:**	New Access
Project:	Sherwood Elwert Connectivity	**City/County:**	Sherwood
Year:	2035	**Alternative:**	Option 4 (Full Access)

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
	100 percent of standard warrants				
X	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	7400	40300	N
	Minor	1	1850	1250	
Case B	Major	2	11100	40300	Y
	Minor	1	950	1250	
Analyst and Date:			Reviewer and Date:		

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Analysis Procedures Manual
February 2009

Oregon
John A. Kitzhaber, MD, Governor

Department of Transportation
Region 1 Headquarters
123 NW Flanders Street
Portland, OR 97209
(503) 731.8200
FAX (503) 731.8531

August 6th, 2012

EXHIBIT C

City of Sherwood
22560 SW Pine St
Sherwood, OR 97140

Subject: PA 12-03: Cedar Brook Way extension
Attn: Julia Hajduk, Planning Manager

We have reviewed the applicant's proposal to amend the City Transportation System Plan to change the functional classification of Cedar Brook Way from a local to a collector status and to clarify that the road connection is intended to go from Elwert road to Handley with one connection to Pacific Highway. ODOT is generally supportive of local street connectivity and has determined there will be no significant impacts to state highway facilities and that no additional state review is required.

Thank you for coordinating with the Oregon Department of Transportation.

Sincerely,

Seth Brumley

Seth Brumley
Land Use Review Planner

C: Kirsten Pennington, ODOT Region 1 Planning Manager

Exhibit H

Julia Hajduk

From: claussl@aol.com
Sent: Tuesday, September 04, 2012 8:26 AM
To: PlanningCommission; Joseph Gall; Tom Pessemier; Julia Hajduk; Sylvia Murphy; claussl@aol.com
Subject: Re: TSP Amendment Hearing -- For the Written Record

To: Patrick Allen and All Members of the Planning Commission
From: Jim Claus
Re: Status of the Elwert, Krueger, Sunset and Meinecke Intersection
Date: 24 August 2012

CC: Joseph Gall, Sylvia Murphy (For Planning Commission distribution and TSP Amendment record), Tom Pessemier, and Julie Hyduk

First and foremost, much of the information given to the citizens about the intersection by the staff was, at the kindest description that can be put on it, inaccurate if not misleading. The Sunset-Krueger-Elwert intersection realignment was funded by Washington County some forty five days ago through the County MSTIP 3d program. It is now in the study stage, leading up to a final design that is acceptable. Russ Noble, Washington County Planner, is working on this study and is in the stage of gathering all of the input from those affected-- I suggest that the Planning Commission give him a call at 503-846-7861. At the risk of being redundant, which my wife tells me I am frequently, I will repeat that this project is in the design stage and between now and 2014 it will be built by Washington County. Sherwood is not designing it and other than giving land for the right of way and pre-construction input, will not be contributing.

The construction of Cedar Brook Way is NOT a condition precedent for the above mentioned intersection to be funded or built. The DKS report noting that condition is at the best a figment of someone's vivid imagination. Washington County is NOT requiring Cedar Brook Way to be built. Washington County and ODOT have both told the city staff in person that neither agency will pay for anything associated with Cedar Brook Way-- unless there was some nominal "planning" money available that the city could try to apply for from ODOT or Washington County. Neither agency will pay for road costs or construction, diminution of value to affected properties, right of way acquisition, deeded accesses, or associated litigation that may arise from the city's decision to require Cedar Brook Way--- Cedar Brook Way is Sherwood's idea and cost.

The DKS report also commits slander of title on our property. We have three deeded ingresses and egresses-- two on our property at 22211 SW Pacific Highway and one on our property located south of the Shannon property. The status of those deeded accesses is a legal question-- for DKS at the request of staff to suggest that we do not have those deeded accesses is not factual. We believe that they are a essential property right that DKS, Pessemier and Hyduk have slandered and tried to ignore. In summary, the Sherwood staff is trying to imply that the Commission pick an option on a road that is not even being required for an intersection project that Washington County has already funded. City Manager Joseph Gall is now working to straighten this matter out.

Once again, if you have any doubts on my statements believe that it would be beneficial for you or someone of the Planning Commission would call Mr. Russ Noble to verify what I am saying; his number is 503-846-7861. You will find Mr. Noble to be pleasant, professional and a good listener. I guarantee that he does not have a

hidden agenda. I hope you contact Mr. Noble because he will not try to surprise you with a "fueling" station on a set of plans (like Sentinel Storage), but rather help confirm what really is happening with the project.

What could have prompted a report as inaccurate as DKS's and the wild statements about Cedar Brook Way is honestly anyone's guess. I do not wish be to causal about this, but this is exactly what has prevented the Claus family from developing our property. Hs. Hyduk insisted that a road exists on our property and thus has stopped all attempts to move forward. It is my personal opinion and belief that this attitude extends from Ross Schulz, Tom Pessemier, Jim Patterson, and Keith Mays. I honestly do not view these actions as any more than a hit back to our property for our public opposition to their public policies and actions.

Any form of development is road driven and a residential subdivision development is geared toward that subdivision's improvement and its privacy. That is why collector streets are minimized and feeder streets are maximized in residential neighborhoods. In commercial and retail districts, local collectors should be constructed to protect the residential subdivision's privacy and shouldn't be mixing commercial traffic through residential areas. One of the principal objections to a mass merchandiser is that they will draw area traffic for fifteen miles in urban and over 25 miles in rural areas, and as a result can destroy the privacy in that radius or impacted neighborhoods. The way which you design your streets is both a configuration of the main streets and helps drive the surrounding development. The above mentioned intersection will set the tone of the development of Sherwood's southern town construction for the next fifteen years. It is obvious and attempted to be agenda driven by the planning staff and the development director.

Finally, I would like this to be in the record for the TSP Amendment and to be delivered to the Commission members for their review PRIOR to the scheduled September 11th meeting. I am sending a copy of this memorandum also to city planning and community development staff and the city manager to keep the flow of information constant. Since this is part of the record, I am also requesting that it gets sent to each City Council member as part of the record that they review for the TSP Amendment.

Thank you for your attention and time to this matter.

Exhibit I

City of Sherwood Oregon
Home of the Tualatin River National Wildlife Refuge

Julia — Who Are You Kidding?? Staff has Blocked Any Ideas

MEMORANDUM

and Solutions for More than 6 Years! You have held our properties Hostage and then tried to Blame ODOT + Wash. Co. for your deeds! Now that the City Wants money from WashCo MSTIP and to speculate on their Mortgage ... Now you will ... make this decision to hurt us even more!!

LIES! Never supposed to go to Elwert... Not even a Road but connectivity =

April 27, 2012

Robert James and Susan L Claus
22211 SW Pacific Hwy
Sherwood, OR 97140-9466

Dear Mr. and Mrs. Claus,

As you may be aware, the Sherwood Transportation System Plan calls for an extension of Cedar Brook Way to run generally parallel to Highway 99W. Your property identified as tax lot 2S131BA01700 and your property located addressed as 22211 SW Pacific Hwy have been identified as potentially having this extension through your property as a requirement when your property develops/re-develops. The City is aware that uncertainty about where and how this road will extend through properties and connect to Highway 99W and to Meinecke and Elwert Road has been a concern to the property owners in the area. ?!!

The City has authorized DKS and Associates to study the transportation system connectivity in this area in preparation for a potential amendment to the City's Transportation System Plan (TSP). The scope of this study includes:

- Consider general access constraints for adjacent properties;
- Consider access requirements for connections to City, County and State facilities;
- Analyze impacts to the adjacent transportation system with new connection options; perform sensitivity analysis for potential future needs/impacts if adjacent properties redevelop;
- Configuration of potential connection to Highway 99W between SW Elwert Road and SW Cedar Brook Way; and
- Functional class of future connections

In accordance with this scope, it is anticipated that the consultant will have a draft report for review by mid-May. We anticipate hosting an open house with you and any other interested residents to discuss the initial findings in the draft report. After receiving input from you and other stakeholders, the consultant will finalize their report at which time, it is anticipated that an amendment to the TSP will be prepared to implement the recommendations in the report. If a

FamilyCircle BEST TOWN FOR FAMILIES

2009 Top Ten Selection

Money Magazine 2007 Great American Towns

2007 18th Best Place to Live

Sherwood 2·0·0·6 All-America City Finalist

City of Sherwood
Oregon
Home of the Tualatin River National Wildlife Refuge

MEMORANDUM

TSP amendment is proposed, there will be subsequent public hearings with the Planning Commission and City Council.

You will receive additional notice prior to the open house but we wanted to make sure you were aware about this project, the scope and upcoming opportunity for input. If you have any comments or questions, please feel free to contact us. Julia can be reached at hajdukj@sherwoodoregon.gov or 503-625-4204 and Bob can be reached at galatib@sherwoodoregon.gov or 503-925-2303.

Sincerely,

Julia Hajduk
Planning Manager

Robert Galati, PE
City Engineer

Oh! Please.

2009 Top Ten Selection

2007 18th Best Place to Live

Sherwood
2006
All-America City Finalist

You won't let Landowners in to interact — you are directing DKS like you did at the Cannery Hearings & "traffic" study — Don't try to pretend that your fix isn't in before this process starts.

FOR Exhibit J Hearing Record 9/11/2012

R. James Claus
22211 SW Pacific Highway
Sherwood, Oregon 97140
503-625-5265

11 September 2012

Sherwood Planning Commission
Pine Street
Sherwood, Oregon 97140

RE: TSP Amendment hearing

Planning Commission:

We would like to request that the Planning Commission give a two week extension to allow us to add information to the hearing record and to work on the information provided by the staff yesterday and today. We are also in contact with Washington County, and local engineering and land use professionals to try to find out what the information in the record submitted by staff means to our properties.

We are enclosing several sections of the Sherwood municipal code that we believe apply to this city decision that has direct negative impacts for our property.

We also believe that there has been erroneous information submitted to the record that we need time to follow up on and correct.

We are also submitting for the record, information from former Mayor Walt Hitchcock regarding the accesses along 99W.

Additionally, we would like the Planning Commission to have the information before it submits a recommendation to the City Council.

Thank you--

Jim and Susan Claus

Subj: **99W**
Date: 1/5/2010 1:35:15 P.M. Pacific Daylight Time
From: walt30665@msn.com
To: claussl@aol.com

Jim and Susan,

This e-mail is in response to your request for my recollection of events surrounding City of Sherwood policies and understandings relative to Hwy.99 land use and development. I was Mayor of Sherwood for 3 two year terms ending in Jan. 2001 but with a break in service from Jan 1997 to Jan 1999. I was on the City Council for 5 years including 4 years as Council President and 2 years on the Planning Commission prior to the Council.

There was an understanding between the City, ODOT and Washington County that it was in our collective interest to keep Hwy. 99 flowing freely thru Sherwood. This would be accomplished by controling the number of signaled intersections and limiting them to Tualatin Sherwood Road, Meinecke Road and Sunset Blvd. In addition, large traffic generators including those on Tualatin Sherwood Road would be limited to areas curently zoned for this purpose and served by one of these signals.

In 2000 the City challenged the construction of Home Depot and its related signal in an area we didn't believe the zoning allowed and was in clear violation of our Hwy. 99 agreement. ODOT had approved the Home Depot light. The court ruled that Home Depot did in fact have the right to build. I believed that ODOT had not kept their part of the agreement and met with the Regional Manager. She agreed that their action was inconsistant with our agreement and offered to use her dicresionary money to improve Hwy. 99. The agreed upon project was the construction of the Meinecke Road intersection. In addition, we agreed that the Claus, Shannon and Broadherst properties would be allowed to develop using a right in/right out access. This enterance was to be located at the boundry of the Claus and Shannon property but either property was to be allowed to develop alone as long as a provision was included for the ultimate shared entrance. Access to the Broadherst property would be accomplished by an parking lot connection.

The City completed its planning while I was Mayor however actual implementation occured in Mayor Cottle's term.

=

Chapter 13.24 - PUBLIC IMPROVEMENT REIMBURSEMENT DISTRICTS

Sections:

13.24.010 - Definitions.

The following terms are defined as follows for the purposes of this chapter:

"City" means the City of Sherwood, Oregon.

"Developer" means a person who is required or chooses to finance some or all of the cost of a street, water or sewer improvement which is available to provide service to property, other than property owned by the person, and who applies to the city for reimbursement for the expense of the improvement.

"Development permit" means any final land use decision, limited land use decision, expedited land division decision, partition, subdivision, planned unit development, or driveway permit.

"Person" means a natural person, the person's heirs, executors, administrators or assigns; a firm, partnership, corporation, association or legal entity, its or their successors or assigns; and any agent, employee or representative thereof.

"Public improvement" means any construction, reconstruction or upgrading of public water, stormwater, sanitary sewer or street improvements.

"Public works director" means the public works director of the city of Sherwood.

"Reimbursement agreement" means the agreement between the developer and the city which is authorized by the city council and executed by the city manager, providing for the installation of and payment for reimbursement district public improvements.

"Reimbursement district" means the area which is determined by the city council to derive a benefit from the construction of public improvements, financed in whole or in part by the developer.

"Reimbursement fee" means the fee required to be paid by a resolution of the city council and the reimbursement agreement. The city council resolution and reimbursement agreement shall determine the boundaries of the reimbursement district and shall determine the methodology for imposing a fee which considers the cost of reimbursing the developer for financing the construction of the improvement within the reimbursement district.

(Ord. 01-1114 § 1)

13.24.020 - Application to establish a reimbursement district.

A. A person who is required to or chooses to finance some or all of the cost of a public improvement which will be available to provide service to property other than property owned by the person may by written application filed with the public works director request that the city establish a reimbursement district. The public improvement must be of a size greater than that which would otherwise ordinarily be required in connection with an application for a building permit or development permit or must be available to provide service to property other than property owned by the developer, so that the public will benefit by making the improvement.

B. The application shall be accompanied by an application fee, as set by council resolution which is reasonably calculated to cover the cost of the preparation of the public works director's report and notice pursuant to this chapter.

C. The application shall include the following:

1. A written description of the location, type, size and cost of each public improvement which is to be eligible for reimbursement.
2. A map showing the boundaries of the proposed reimbursement district, the tax account number of each property, its size and boundaries.
3. A map showing the properties to be included in the proposed reimbursement district; the zoning district for the properties; the front footage and square footage of said properties, or similar data necessary for calculating the apportionment of the cost; the property or properties owned by the developer; and the names and mailing addresses of owners of other properties to be included in the proposed reimbursement district.
4. The actual or estimated cost of the public improvements.

D. The application may be submitted to the city prior to the installation of the public improvement but not later than one hundred eighty (180) days after completion and acceptance of the public improvements by the city. This time period may be extended by the city manager for good cause shown.

(Ord. 01-1114 § 3)

13.24.030 - Public works director's report.

The public works director shall review the application for the establishment of a reimbursement district and evaluate whether a district should be established. The public works director may require the submission of other relevant information from the developer in order to

assist in the evaluation. The public works director shall prepare a written report for the city council that considers and makes a recommendation concerning each of the following factors:

A. Whether the developer will finance, or has financed some or all of the cost of the public improvement, thereby making service available to property, other than that owned by the developer.

B. The boundary and size of the reimbursement district.

C. The actual or estimated cost of the public improvement serving the area of the proposed reimbursement district and the portion of the cost for which the developer should be reimbursed for each public improvement.

D. A methodology for spreading the cost among the properties within the reimbursement district and, where appropriate, defining a "unit" for applying the reimbursement fee to property which may, with city approval, be partitioned, subdivided, altered or modified at some future date. City may use any methodology for apportioning costs on properties specially benefited that is just and reasonable.

E. The amount to be charged by the city for an administration fee for the reimbursement agreement. The administration fee shall be fixed by the city council and will be included in the resolution approving and forming the reimbursement district. The administration fee may be a percentage of the total reimbursement fee expressed as an interest figure, or may be a flat fee per unit to be deducted from the total reimbursement fee.

F. Whether the public improvements will or have met city standards.

G. Whether it is fair and in the public interest to create a reimbursement district.

(Ord. 01-1114 § 3)

13.24.040 - Amount to be reimbursed.

A. A reimbursement fee shall be computed by the city for all properties within the reimbursement district, excluding property owned by or dedicated to the city or the state of Oregon, which have the opportunity to use the public improvements, including the property of the developer, for formation of a reimbursement district. The fee shall be calculated separately for each public improvement The developer for formation of the reimbursement district shall not be reimbursed for the portion of the reimbursement fee computed for its own property.

B. The cost to be reimbursed to the developer shall be limited to the cost of construction engineering, construction, and off-site dedication of right of way. Construction engineering shall include surveying and inspection costs and shall not exceed seven and a half (7.5) percent of eligible public improvement construction cost. Costs to be reimbursed for right of way shall be limited to the reasonable market value of land or easements purchased by the developer from a third party in order to complete off-site improvements.

C. No reimbursement shall be allowed for the cost of legal expenses, design engineering, financing costs, permits or fees required for construction permits, land or easements dedicated by the developer, the portion of costs which are eligible for systems development charge credits or any costs which cannot be clearly documented.

D. Reimbursement for the amount of the application fee required by Section 13.24.020 in this chapter.

(Ord. 01-1114 § 4)

13.24.050 - Public hearing.

A. Within forty-five (45) days after the public works director has completed the report required in Section 13.24.030, the city council shall hold an informational public hearing in which any person shall be given the opportunity to comment on the proposed reimbursement district. Developer shall provide the mailing list for all property owners within the proposed district. Because formation of the reimbursement district does not result in an assessment against property or lien against property, the public hearing is for informational purposes only and is not subject to mandatory termination because of remonstrances. The city council has the sole discretion after the public hearing to decide whether a resolution approving and forming the reimbursement district shall be adopted.

B. Not less than ten (10) days prior to any public hearing held pursuant to this chapter, the developer and all owners of property within the proposed district shall be notified of the public hearing and the purpose thereof. Such notification shall be accomplished by either regular and certified mail or by personal service. Notice shall be deemed effective on the date that the letter of notification is mailed. Failure of the developer or any affected property owner to be so notified shall not invalidate or otherwise affect any reimbursement district resolution or the city council's action to approve the same.

(Ord. 01-1114 § 5)

13.24.060 - City council action.

A. After the public hearing held pursuant to Section 13.24.050A, the city council shall approve, reject or modify the recommendations contained in the public works director's report. The city council's decision shall be contained in a resolution. If a reimbursement district is established, the resolution shall include the public works director's report as approved or modified, and specify that payment of the reimbursement fee, as designated for each parcel, is a precondition of receiving any city permits applicable to development of that parcel as provided for in Section 13.24.100

B. The resolution shall establish an interest rate to be applied to the reimbursement fee as a return on the investment of the developer. The interest rate shall be fixed and computed against the reimbursement fee as simple interest and will not compound.

C. The resolution shall instruct the city manager to enter into an agreement with the developer pertaining to the reimbursement district improvements. If the agreement is entered into prior to construction, the agreement shall be contingent upon the improvements being accepted by the city. The agreement shall contain at least the following provisions:

1. The public improvement(s) shall meet all applicable city standards.
2. The total amount of potential reimbursement to the developer shall be specified.
3. The total amount of potential reimbursement shall not exceed the actual cost of the public improvement(s).
4. The developer shall guarantee the public improvement(s) for a period of twelve (12) months after the date of installation.
5. A clause in a form acceptable to the city attorney stating that the developer shall defend, indemnify and hold harmless the city from any and all losses, claims, damage, judgments or other costs or expense arising as a result of or related to the city's establishment of the reimbursement district, including any city costs, expenses and attorney fees related to collection of the reimbursement fee should the city council decide to pursue collection of an unpaid reimbursement fee under Section 13.24.110H.

6. A clause in a form acceptable to the city attorney stating that the developer agrees that the city, cannot be held liable for any of the developer's alleged damages, including all costs and attorney fees, under the agreement or as a result of any aspect of the formation of the reimbursement district, or the reimbursement district process, and that the developer waives, and is stopped from bringing, any claim, of any kind, including a claim in inverse condemnation, because the developer has benefited by the city's approval of its development and the required improvements.
7. Other provisions the city determines necessary and proper to carry out the provisions of this chapter.

C. If a reimbursement district is established by the city council, the date, of the formation of the district shall be the date that the city council adopts the resolution forming the district.

(Ord. 01-1114 § 6)

13.24.070 - Notice of adoption of resolution.

The city shall notify all property owners within the district and the developer of the adoption of a reimbursement district resolution. The notice shall include a copy of the resolution, the date it was adopted and a short explanation specifying the amount of the reimbursement fee and that the property owner is legally obligated to pay the fee pursuant to this chapter.

(Ord. 01-1114 § 7)

13.24.080 - Recording the resolution.

The city recorder shall cause notice of the formation and nature of the reimbursement district to be filed in the office of the Washington County clerk so as to provide notice to potential purchasers of property within the district. Said recording shall not create a lien. Failure to make such recording shall not affect the legality of the resolution or the obligation to pay the reimbursement fee.

(Ord. 01-1114 § 8)

13.24.090 - Contesting the reimbursement district.

No legal action intended to contest the formation of the district or the reimbursement fee, including the amount of the charge designated for each parcel, shall be filed after sixty (60) days following the adoption of a resolution establishing a reimbursement district and any such legal action shall be exclusively by Writ of Review pursuant to ORS 34.0 10 to ORS 34.102.

(Ord. 01-1114 § 9)

13.24.100 - Obligation to pay reimbursement fee.

A. The applicant for a permit related to property within any reimbursement district shall pay the city, in addition to any other applicable fees and charges, the reimbursement fee established by the council, if within ten years after the date of the passage of the resolution forming the reimbursement district, the person applies for and receives approval from the city for any of the following activities:
   1. A building permit for a new building;
   2. Building permits for any addition(s) of a building, which cumulatively exceed twenty-five (25) percent of the existing square footage in any thirty-six (36) month period;

3. A development permit, as that term is defined by this chapter;

4. A city permit issued for connection to a public improvement.

B. The city's determination of who shall pay the reimbursement fee and when the reimbursement fee is due is final.

C. In no instance shall the city, or any officer or employee of the city, be liable for payment of any reimbursement fee, or portion thereof, as a result of the city's determination as to who should pay the reimbursement fee. Only those payments which the city has received from or on behalf of those properties within a reimbursement district shall be payable to the developer. The city's general fund or other revenue sources shall not be liable for or subject to payment of outstanding and unpaid reimbursement fees imposed upon private property.

D. Nothing in this chapter is intended to modify or limit the authority of the city to provide or require access management.

E. Nothing in this chapter is intended to modify or limit the authority of the city to enforce development conditions which have already been imposed against specific properties.

F. Nothing in this chapter is intended to modify or limit the authority of the city, in the future, to impose development conditions against specific properties as they develop.

G. No person shall be required to pay the reimbursement fee on an application or upon property for which the reimbursement fee has been previously paid, unless such payment was for a different type of improvement. No permit shall be issued for any of the activities listed in subsection 10A unless the reimbursement fee, together with the amount of accrued interest, has been paid in full. Where approval is given as specified in subsection 10A, but no permit is requested or issued, then the requirement to pay the reimbursement fee lapses if the underlying approval lapses.

H. The date of reimbursement under this chapter shall extend ten years from the date of the formation of a reimbursement district formation by city council resolution.

I. The reimbursement fee is immediately due and payable to the city by property owners upon use of a public improvement as provided by this chapter in subsection 10A. If connection is made or construction commenced without required city permits, then the reimbursement fee is immediately due and payable upon the earliest date that any such permit was required.

J. Whenever the full reimbursement fee has not been paid and collected for any reason after it is due, the city manager shall report to the city council the amount of the uncollected reimbursement, the legal description of the property on which the reimbursement is due, the date upon which the reimbursement was due and the property owner's name or names. The city council shall then, by motion, set a public hearing date and direct the city manager to give notice of that hearing to each of the identified property owners, together with a copy of the city manager's report concerning the unpaid reimbursement fee. Such notice may be either by certified mail or personal service. At the public hearing, the city council may accept, reject or modify the city manager's report. If the city council determines that the reimbursement fee is due but has not been paid for whatever reason, the city council may, at its sole discretion, act, by resolution, to take any action, it deems appropriate, including all legal or equitable means necessary to collect the unpaid amount. However, nothing in this chapter requires the city to take any action to collect such amounts.

(Ord. 01-1114 § 10)

13.24.110 - Public improvements.

Public improvements installed pursuant to reimbursement district agreements shall become and remain the sole property of the city.

(Ord. 01-1114 § 11)

13.24.120 - Multiple public improvements.

More than one public improvement may be the subject of a reimbursement district.

(Ord. 01-1114 § 12)

13.24.130 - Collection and payment—Other fees and charges.

A. The developer shall receive all reimbursement collected by the city for reimbursement district public improvements. Such reimbursement shall be delivered to the developer for as long as the reimbursement district agreement is in effect. Such payments shall be made by the city within ninety (90) days of receipt of the reimbursements.

B. The reimbursement fee is not intended to replace or limit, and is in addition to, any other existing fees or charges collected by the city.

(Ord. 01-1114 § 13)

13.24.140 - Nature of the fees.

The city council finds that the fees imposed by this chapter are not taxes subject to the property tax limitations of Article XI, Section 11(b) of the Oregon Constitution.

(Ord. 01-1114 § 14)

13.24.150 - Severability.

If any section, phrase, clause, or part of this chapter is found to be invalid by a court of competent jurisdiction, the remaining phrases, clauses, and parts shall remain in full force and effect.

(Ord. 01-1114 § 15)

Sherwood, Oregon, Code of Ordinances >> Title 15 - BUILDINGS AND CONSTRUCTION >> Chapter 15.16 - SYSTEM DEVELOPMENT CHARGES* >>

Chapter 15.16 - SYSTEM DEVELOPMENT CHARGES*

Sections:

15.16.010 - Title.

This chapter shall be known and may be pleaded as the city of Sherwood system development charge (SDC) Ordinance.

(Ord. 07-011 § 1)

15.16.020 - Purpose.

The purpose of the system development charge is to impose an equitable share of the cost of capital improvements for water, sanitary sewer, streets, storm drainage, and parks and open space upon those new or expanded developments that create the need for or increase the demand on capital improvements.

(Ord. 07-011 § 2)

15.16.030 - Scope.

The system development charge imposed under the authority of this chapter is separate from, and in addition to, any applicable tax, assessment, charge, or fee otherwise provided by law or imposed as a condition of development. A system development charge is a charge imposed when a property owner or developer chooses to intensify the use of specific parcel or parcels of

land and is for excess-capacity provided to accommodate the demand created by new or expanded development.

(Ord. 07-011 § 3)

15.16.040 - Definitions.

For purposes of this chapter and any resolutions authorized thereunder:

"Applicant" means the person seeking to obtain a building permit.

"Arterial" means that term as defined in the city comprehensive plan.

"Building permit" means that permit issued by the city building official pursuant to the Uniform Building Code and other applicable codes. In addition, building permit shall mean the manufactured home placement permit issued on a form approved by the Oregon Department of Commerce and relating to the placement of manufactured homes in the city.

"Capital improvements" means facilities or assets used for:

1. Water supply, storage, treatment, and distribution;
2. Waste water collection, transmission, treatment and disposal;
3. Drainage and flood control;
4. Construction, reconstruction, and improvement of transportation facilities described in the city capital improvement plan; or
5. Parks and recreation.

"City manager" means a person employed by the city as the city manager, or a person designated by the city manager for the purpose of administering this chapter.

"Development" means constructing a building or an addition to a structure, making a physical change in the use or appearance of a structure or land, dividing land into two or more parcels (including partitions and subdivisions), or creating or terminating rights of access.

"Improvement charge" means a charge for costs associated with capital improvements to be constructed after the date the charge is adopted pursuant to a relevant system development charge resolution authorized by this chapter.

"Land area" means the area of a parcel of land as measured by projection of the parcel's boundaries upon a horizontal plane, with the exception of a portion of the parcel within a recorded right-of-way or easement subject to a servitude for a public street or scenic or preservation purpose.

"Occupancy permit" means the occupancy permit provided for in the Uniform Building Code or other city ordinances. If an occupancy permit is not provided for a particular structure or use, the final city inspection and approval for that structure or use shall serve as the occupancy permit.

"Owner" means the record owner or owners of fee title, or the purchaser or purchasers under a recorded sale agreement, as shown in the deed records for the county.

"Parcel of land" means a lot, parcel, block or other tract of land that is occupied or may be occupied by a structure or structures or other use, including the yards and other open spaces required under zoning, subdivision, building, and other city development ordinances.

"Qualified public improvement" means a capital improvement that is:

1. Required as a condition of development approval.
2. Identified in the public facility plans adopted pursuant to Section 15.16.050 of this chapter.
3. Except for transportation improvements described in subsection 4 of this definitions, not located on or contiguous to a parcel of land that is the subject of a development approval, except as otherwise specified by this chapter.
4. A transportation improvement located on or contiguous to a parcel of land that is the subject of a development approval, except as otherwise specified in this chapter.

"Reimbursement charge" means a charge for costs associated with capital improvements constructed or under construction on the date the charge is adopted pursuant to a relevant system development charge resolution authorized by this chapter.

"System development charge" means a reimbursement fee, an improvement fee, or a combination thereof, assessed or collected at the time of issuance of a building permit, or at the time of connection to a capital improvement. "System development charge" includes that portion of a sanitary sewer, storm water, or water system connection charge that is greater than the amount necessary to reimburse the city for its average cost of inspecting and installing connections to water, storm water, and sanitary sewer facilities. "System development charge" does not include charges assessed or collected as part of a local improvement district or a charge in lieu of a local improvement district assessment, or the cost of complying with requirements or conditions imposed by a land use decision.

(Ord 07-011 § 4)

15.16.050 - System development charge established.

A. Authority to establish system development charges by resolution of the city council is created.
   1. Each resolution shall be limited to the system development charges for one of the five categories of capital improvements described in Section 15.16.040 of this chapter. The resolution shall include a statement of purpose, and the identification of a designated master plan, public facility plan, capital improvement plan, or comparable plan used to identify authorized expenditures of each system development charge's revenues. Each such plan shall be identified in or appended to the authorizing resolution as Appendix "A."
   2. Each resolution shall describe the methodology used in establishing the system development charge. The methodology shall comply with the requirements of state law and shall be described in or appended to the authorizing resolution as Appendix "B."
   3. Each resolution shall contain a schedule of charges, identified as improvement and/or reimbursement charges.
   4. Each resolution shall identify, to the extent applicable, those portions of capital improvements that are eligible for credit under Section 15.16.100 of this chapter. The resolution may vary the general terms and conditions for credits established under Section 15.16.100 of this chapter, to the extent the terms and conditions are made less restrictive and the variation is expressly allowed by a subsection of Section 15.16.100 of this chapter.

5. Each resolution shall establish appeal fees as per Section 15.16.120 of this chapter.

B. Unless otherwise exempted by subsection C of this section, or other local or state law, system development charges created under the authority of this chapter are imposed upon all parcels of land within the city, and upon all lands outside the boundary of the city that choose to connect to or use the city's capital improvements.

C. Except as provided in subsection D of this section, system development charges do not apply to the following types of development unless the new structure or use replaces a previously existing structure or use that was not assessed system development charges or the system to which the system development charge applies was installed to the previously existing structure or use and needs to be replaced or modified to provide extra-capacity, in which case current system development charges shall apply to the extra-capacity generating portion of the new structure or use:

1. Remodeling or replacement of an existing single-or two-family structure (including manufactured homes on individual lots and those in manufactured home parks);
2. Remodeling or replacement of an existing multi-family structures, except to the extent of dwelling units that are added, in which case current system development charges shall apply to the additional units;
3. Remodeling or replacement of an existing office, business and commercial, industrial, or institutional structure or use, except to the extent additional vehicle trips are generated, or increased usage of water, storm water, or sanitary sewer services result, in which case current system development charges shall apply to the additional trips or usage.

D. System development charges for transportation-related capital improvements do not apply to the uses and development described in subsection C of this section except to the extent the remodeling or replacement creates an additional impact on a transportation facility.

E. Additional exemptions specific to a particular type of system development charge may be established by the authorizing resolution described in subsection A of this section.

F. The city may collect system development charges established by other governmental jurisdictions. The system development charges shall be assessed and collected under the terms of the applicable ordinances and resolutions established by those jurisdictions, and shall be adopted by the city council by the appropriate resolution or intergovernmental agreement.

(Ord. 07-011 § 5)

15.16.060 - Authorized expenditures.

The revenues received from system development charges shall be budgeted and expended for capital improvements as provided by state law. The accounting of revenues and expenditures shall be included in the city's comprehensive annual financial report as required under ORS Chapter 294.

(Ord. 07-011 § 6)

15.16.070 - Expenditure restrictions.

A. System development charges may not be expended for costs associated with the construction of administrative office facilities that are more than an incidental part of other capital improvements.

B.

System development charges may not be expended for costs of the operation or routine maintenance of capital improvements.

(Ord. 07-011 § 7)

15.16.080 - Collection of charges.

A. Unless otherwise provided by this chapter or state law, system development charges are immediately due and payable and shall be collected prior to issuance of any building permits, or in case of a deferral authorized in Section 15.16.090 of this chapter, prior to issuance of an occupancy permit. Resolutions authorizing specific system development charges may identify additional conditions or circumstances triggering collection of each specific charge in those circumstances that otherwise meet the terms of this chapter but where no building permit is required.

B. A building or occupancy permit may not be issued by the city, nor shall connection to any city service be allowed, until system development charges have been paid in full or until provisions for deferred payment have been made as described in Section 15.16.090 of this chapter.

C. The obligation to pay deferred system development charges, and the interest thereon, shall be secured by property, bond, deposits, letter of credit, or other security acceptable to the city manager.

1. Notwithstanding agreement for deferral of payment, the liability for system development charges shall survive if unpaid when the building permit has expired and shall be a personal obligation of the permittee.
2. Failure to pay the system development charges within sixty (60) days of the due date shall result in a penalty equal to ten percent of the charge. Interest shall accrue from the sixty (60) day point at the rate permitted by ORS 82.010.
3. In addition to an action at law and any statutory rights, the city may, when payment of system development charges are delinquent:
    a. Refuse to issue any development permits to the delinquent party;
    b. Refuse to honor any system development charge credits held by the delinquent party for any development;
    c. Condition any development approval requested by the delinquent party on payment in full of the system development charges, including penalties and interest;
    d. Revoke any previous system development charges due, including penalties and interest, from any offset account held by the city for the delinquent party, in which case the system development charges shall immediately be due, and refuse to issue any new deferrals;
    e. Withdraw the amount of system development charges due, including penalties and interest, from any offset account held by the city for the delinquent party.

D. For purposes of this section, the term "delinquent party" includes a person controlling a delinquent corporate permittee and any corporation controlled by a delinquent individual permittee.

(Ord. 07-011 § 8)

15.16.090 - Deferred payment.

A.

When the total of transportation and parks city system development charges due exceed fifty thousand dollars ($50,000.00), the city manager may approve deferred payments until such time as an occupancy permit is issued. An occupancy permit may not be issued until all system development charges are paid.

B. When any category of city system development charges increases by twenty-five (25) percent or more due to legislative action by the city between the time a development application is submitted and the SDC becomes payable, and, as a result, that category of system development charges due and payable exceeds one hundred thousand dollars ($100,000.00), the developer may choose to defer payments for a period not to exceed five years. An occupancy permit may not be issued until the person responsible for payment of the system development charge executes a deferred payment agreement with the city.

C. Notwithstanding subsection B of this section, a person who submitted a development application during the period beginning October 1, 2006 and ending on the effective date of this chapter may choose to defer payments for any single SDC provided the amount due and payable for that SDC exceeds one hundred thousand dollars ($100,000.00). An occupancy permit may not be issued until the person responsible for payment of the system development charge executes a deferred payment agreement with the city.

(Ord. 07-012 § 1: Ord. 07-011 § 9)

15.16.100 - Credits.

A. Credit may be applied to the system development charge to the extent that prior structures or uses existed, city services were established to those structures or uses, and said structures or uses had previously paid the applicable system development charge in effect at the time the structure or use was established. Except as provided in subsection F of this section, credits may not exceed the calculated system development charge. Refunds may not be made on account of such excess credit.

B. Credit shall be given for the cost of a qualified public improvement, as defined by Section 15.16.040 of this chapter. Except for transportation improvements, if a qualified public improvement is located partially on and partially off the parcel or parcels that are the subject of the development approval, the credit shall be given only for the cost of the portion of the improvement not located on or wholly contiguous to the property. For transportation improvements, credit may also be given for the cost of the portion of the improvement located on or contiguous to the property. The terms of this subsection may be modified by the authorizing resolution described in Section 15.16.050 of this chapter to the extent that credit provisions are made less restrictive.

C. The credit provided for by this section shall be only for the improvement charges for the type of improvement being constructed and, except as provided in subsection B of this section, shall not exceed the improvement charge even if the cost of the capital improvement exceeds the applicable improvement charge. Credits shall not be provided for reimbursement charges.

D. The qualified public improvement must be designed and constructed to provide additional capacity to meet projected future capacity needs created by the development. Improvements that address capacity deficiencies existing at the time of development are not eligible for credit. In the case of improvements addressing both future and existing capacity needs, only that portion providing future capacity is eligible for credit. The terms of this subsection may be modified by the authorizing resolution described in Section 15.16.050 of this chapter to the extent that credit provisions may be made less restrictive.

E.

The city manager must determine that the timing, location, design, and scope of the proposed improvement is consistent with and furthers the objectives of the capital improvement programs of the city. The city manager may use priorities established by the city council in the city's capital improvement plan, the information contained in the city's comprehensive plan and various public facility master plans, the advice of the city's engineering, public works, and planning staff, and other relevant information and data in making this determination. The city manager must also determine that the improvement is required to fulfill a condition of development approval issued by the city and is included in the city's adopted public facility plans.

F. Except as provided in this subsection, excess credit may not be transferred from one development to another.

1. In the case of a multi-phased development, excess credit generated in one phase may be used to offset applicable system development charges in subsequent phases.
2. Upon written application to the city manager, excess credits may be reapportioned from one lot or parcel to another lot or parcel within the confines of the property originally eligible for the credit. The reapportionment shall be noted on the original credit form retained by the city.
3. Upon written application to the city manager, excess credits may be transferred to another lot or parcel that is adjacent to and served by the transportation facility that generated the credits.

G. Credit may not be transferred from one of the types of capital improvements defined by Section 15.16.040 of this chapter and authorized by a resolution, to another type of capital improvement authorized by a different resolution.

H. All credit requests must be in writing and filed with the city manager no more than ninety (90) days after acceptance by the city of the qualified public improvement. Improvement acceptance shall be in accordance with the practices, procedures and standards of the city. At the time the city accepts the qualified public improvement, the city shall provide written notice to the person making the improvement that the improvement may qualify for credit under this section. The notice shall state that a credit request must be filed within 90 days of the date of acceptance.

I. The amount of any credit shall be determined by the city manager and based upon the subject improvement's construction contract documents, or other appropriate information provided by the applicant, and verified and accepted by the city. Notwithstanding the contract amount, the credit may not exceed prevailing market rates for similar projects, as determined by the city.

J. In the case of rights-of-way, easements, or other land associated with the improvement, value shall be established by sales documents, formal appraisal provided at the developers cost, by county assessors records, or some other method deemed acceptable to the city. Notwithstanding actual sales price, the credit may not exceed prevailing market rates for similar projects, as determined by the city.

K. Credit shall be provided to the applicant on a form provided by the city. The original of the credit form shall be retained by the city. The credit shall state a dollar amount that may be applied against any applicable system development charge imposed against the subject property. Excess credit may not be redeemed for cash or a cash-equivalent.

L. All requests for redemption of credits must be submitted not later than the issuance of a building permit or, if deferral was permitted pursuant to Section 15.16.090 of this chapter, issuance of an occupancy permit. The permittee is solely responsible for presentation to the city of any credit redemption request and no credit redemption request shall be accepted

after issuance of a building permit or, if deferral was granted, issuance of an occupancy permit. In no event is a subject property entitled to redeem credits in excess of the system development charges imposed.

M. Credits shall not be allowed more than seven years after the acceptance of the applicable improvement by the city. Extensions of this deadline may not be granted.

N. Upon annexation of affected parcels of land, credits previously issued by Washington County will be honored by the city.

(Ord. No. 2012-007, § 1, 5-1-2012; Ord. 07-011, § 10)

15.16.110 - Segregation and use of revenue.

A. All funds derived from each separately authorized system development charge are to be segregated by accounting practices from all other funds of the city. That portion of the system development charge calculated and collected on account of a specific facility system shall not be used for a purpose other than the purpose set forth in this chapter and the specific authorizing resolution.

B. The city manager shall provide the city council with an annual accounting, based on the city's fiscal year, for system development charges that shows the total amount of system development charge revenues collected for each type of facility and the projects funded from each account.

(Ord. 07-011 § 11)

15.16.120 - Appeal procedure.

A. A person challenging the propriety of an expenditure of system development charge revenues may appeal the expenditure to the city council by filing a written appeal with the city recorder. The appeal shall identify with reasonable certainty the particulars of the expenditure, and the relevant facts and specific provisions alleged to have been violated. An appeal of an expenditure must be filed within two years of the date of the alleged improper expenditure.

1. Within thirty (30) days of receipt of the appeal, the city manager shall file a written report with the city council recommending appropriate action. Within fifteen (15) days of receiving the report, the city council shall conduct a hearing to determine whether the expenditure was proper. Notice of the hearing, including a copy of the city manager's report, shall be mailed to the appellant least ten days prior to the hearing. The appellant shall have a reasonable opportunity to present evidence and argument at the hearing.

2. The city council may by resolution adopt rules of procedure governing appeal hearings, including stipulations that the hearing may be continued if necessary to further address issues raised by the appellant. The city council may by resolution establish an appeal fee.

3. The appellant shall have the burden of proof in any appeal hearing. Evidence and argument shall be limited to grounds specified in the written appeal. The city council shall issue a written decision stating the basis for its decision and directing any appropriate action to be taken.

4. If the city council determines that there has been an improper expenditure of system development charge revenues, the city council shall direct that a sum equal to the misspent amount shall be deposited within one year to the credit of the account or fund from which it was spent.

5. Review of the city council decision shall be as provided in ORS 34.010 to 34.100.

B. Review of decisions of the city manager, under this chapter, other than decisions relating to the expenditure of funds as per subsection A of this section, shall be conducted in the following manner:

1. Discretionary decisions of the city manager shall be in writing and mailed by regular mail to the last known address of the appellant.

2. Discretionary decisions by city manager's designee may be written or oral. Any person aggrieved by the decision of the city manager's designee may request in writing that the city manager review such a decision. The city manager's response shall be in writing and shall state the reason for his or her decision. The purpose of appeal, the written response shall be provided to the appellant as described in subsection (B)(1) of this section.

3. Any person aggrieved by discretionary decision of the city manager may appeal the decision to the city council. The appeal shall be in writing and must be filed with the city recorder within fourteen (14) days of the date the city manager's decision was mailed.

4. The appeal shall state the relevant facts, applicable ordinance provisions, and the relief sought. The appeal shall be heard by the city council in the same manner as provided in subsection A of this section.

5. After providing notice to the appellant, the city council shall determine whether the city manager's decision or action is in accordance with this chapter and associated resolutions, and the provisions of ORS 223.297 to 223.314, and may affirm, modify, or overrule the city manager's decision or action. The city council shall issue a written decision stating the council shall issue a written decision stating the basis for its conclusion and directing appropriate action be taken. The city council's decision shall be final and is subject to review as provided in ORS 34.010 to 34.100.

(Ord 07-011 § 12)

15.16.130 - Annual fee review.

A. The city council shall review system development charges at least annually, prior to adoption of a new fiscal year's budget, to determine whether additional revenues should be generated to provide extra-capacity improvements needed to address new development or to ensure that revenues do not exceed identified demands. In so doing, the city council shall consider:

1. Construction of capital improvements by federal, state, county, special districts, or other revenue sources;

2. Receipt of unanticipated funds from other sources for construction of capital improvements;

3. New information adjusting the unit costs or trip rates for capital improvements;

4. The impact of credits and offsets on capacity increasing improvements.

B. Upon completing the review, the city council shall consider such amendments, including adjustment to specific system development charges, as are necessary to address changing conditions.

(Ord. 07-011 § 13)

15.16.140 - Prohibited connection.

A person may not connect to the city's capital improvements or access a city street or right-of-way unless the appropriate system development charges have been paid.

(Ord. 07-011 § 14)

15.16.150 - Transition.

A. Except as otherwise specifically allowed by the authorizing resolution described in Section 15.16.050 of this chapter, this chapter shall apply to issuance of building permits for all development for which a building permit application is received by the city on or after the effective date of the ordinance codified in this chapter. This does not include re-submittal of building permit applications previously deemed incomplete if the requested information is submitted within one hundred eighty (180) days of the date the application was first submitted.

B. Notwithstanding repeal or amendment of any other city ordinances by this chapter, said prior ordinances shall continue to be fully applicable and shall govern all building permit applications received by the city prior to the effective date of the ordinance codified in this chapter. This includes building permit applications previously deemed incomplete if the requested information submitted within one hundred eighty (180) days of the date the application was first submitted.

C. All system development charge deferrals, credits, or similar grants shall continue and be administered under the terms and conditions of the ordinances and resolutions in existence when said deferrals, credits, or similar grants were originally issued. Repeal and enactment of such ordinances and resolutions shall in no way impact any budget or appropriations, contracts, permits, condemnation proceedings, or any other formal city actions.

(Ord. 07-011 § 15)

15.16.160 - Penalty.

Violations of this chapter are subject to civil penalties of no more than five hundred dollars ($500.00) for each offense. Each day that a violation is permitted to exist constitutes a separate offense.

(Ord 07-011 § 16)

15.16.170 - Construction.

The rules of statutory construction contained in ORS Chapter 174 are adopted and by this reference made a part of this chapter.

(Ord. 07-011 § 17)

Sherwood, Oregon, Code of Ordinances >> - SHERWOOD CITY CHARTER >> Chapter X - PUBLIC IMPROVEMENTS >>

Chapter X - PUBLIC IMPROVEMENTS

Section 39. - Procedure.

The council may by ordinance provide for procedures governing the making, altering, vacating, or abandoning of a public improvement. A proposed public improvement may be suspended for one year upon remonstrance by owners of the real property to be specially assessed for the improvement. The number of owners necessary to suspend the action will be determined by ordinance.

(Res. 05-008 § 1 (part))

Section 40. - Special Assessments.

The procedure for levying, collecting and enforcing special assessments for public improvements or other services charged against real property will be governed by ordinance.

(Res 05-008 § 1 (part))

Chapter 12.24 - COUNCIL AUTHORITY - FEES, RATES AND CHARGES

Section:

12.24.010 - Authority to establish fees, rates and other charges related to the construction, maintenance and operation of streets, sidewalks, pedestrian pathways, and other public places.

The City Council may by Resolution establish such fees, rates and other charges as it deems appropriate to fund construction, maintenance and operation of streets, sidewalks, pedestrian pathways and other public places, together with procedures for their imposition and collection. Any fees, rates or charges established pursuant to this Section shall be included on a schedule to be kept in the city recorder's office and available to the public for review. Such fees, rates and other charges may be altered, amended or modified from time to time by Resolution of the City Council. Any adoption or amendment of a fee, rate or charge shall be done consistent with applicable law.

(Ord. No. 2011-007, § 1, 5-17-2011)

Sherwood, Oregon, Code of Ordinances >> Title 12 - STREETS, SIDEWALKS AND PUBLIC PLACES >> Chapter 12.17 - Construction-Limited Streets >>

Chapter 12.17 - Construction-Limited Streets

Sections:

12.17.005 - Purpose.

The provisions of this Chapter are intended to protect the public investment, health and safety, and are intended to maintain the quality, integrity, and service life of recently constructed or reconstructed, paved or repaved, overlaid or surface treated streets within the City, for the longest practicable time period.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.010 - Definition.

A. A "construction-limited street" means any of the following City streets, as identified in the City Transportation System Plan, that has been constructed, reconstructed, paved, repaved, overlaid or surface treated, within the following time periods by the City, a City contractor, or a private party pursuant to a right-of-way or development permit.

TSP Street Classification	Length of Time
Arterial Streets	5 years
Collector Streets	3 years
Local and Neighborhood Streets	2 years
Downtown Streets (Asphalt)	2 years
Downtown Streets (Concrete)	Indefinite (Construction not allowed)

B. The "Engineering Design Manual" means the most recent City of Sherwood *Engineering Design and Standard Details Manual* as amended.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.015 - Duration of Limitation.

Except as provided in Section 12.17.025 and Section 12.17.027 below, the pavement of a construction-limited street may not be ground, drilled through, saw cut, or excavated through within the time period described in Section 12.17.010 above. The restrictions of this section shall commence on the day the street has been accepted by the City, as defined by the commencement of the maintenance period, and shall continue throughout the period described in Section 12.17.010 above.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.020 - Applicability.

Chapter 12.17 applies to all construction activity within the public right-of-way of a construction-limited street whether performed by public or private parties, including private utilities.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.025 - Exceptions.

A. The City Manager or the City Manager's designee may approve an exception to the limitations in Section 12.17.015 in order to facilitate development on adjacent properties, provide for emergency repairs to subsurface facilities, provide for underground connections to adjacent properties, or to allow the upgrading of underground utilities.

An approved exception may include conditions determined necessary by the City Manager or designee to ensure the rapid and complete restoration of the street and surface paving, consistent with the purpose of this Chapter 12.17 to the greatest extent practicable. Pavement restoration requirements may include but are not limited to surface grinding, base and sub-base repairs, trench compaction, or other related work as needed, including up to full-width street pavement removal and replacement.

B. A person seeking an exception under this section shall submit an application to the City Manager or designee in a form acceptable to the city. The application must include sufficient information to demonstrate reasonable compliance with Section 210.20 (*Construction Limited Streets*) of the Engineering Design Manual.

The City Manager or designee will review the application and information and provide a written decision either approving or denying the application. The City Manager's or designee's decision may be appealed in the manner provided for a writ of review under ORS chapter 34.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.027 - Maintenance and Emergency Repairs.

Following notice to the Public Works Director and a demonstration of compliance with Section 210.18 (*Utilities and Other Work in the Public Right of Way)* and Section 210.19 (*Trenching and Street Cuts*) of the Engineering Design Manual, the City may authorize maintenance or emergency repairs to an underground utility service within the right-of-way of a construction-limited street provided the underground utility service is in existence on the effective date of this Ordinance.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.030 - Unauthorized Work and Repairs.

A.

Violations of this Chapter 12.17 may be enforced by the City in the manner of a violation subject to the jurisdiction of the Sherwood Municipal Court. If the pavement of a construction-limited street is ground, drilled through, saw cut, or excavated through for any reason without authorization, the extent of the damages caused by such actions shall be determined by the City in its sole and exclusive discretion.

B. The Municipal Court may order a person responsible for a violation to restore the street surface to the standards described in Section 210.18 (*Utilities and Other Work in the Public Right of Way)* and Section 201.19 (*Trenching and Street Cuts*) of the Engineering Design Manual. The Court may include in the order such other conditions the Court deems necessary to ensure adequate and appropriate restoration of the street pavement section.

C. Alternatively, the Municipal Court may direct the City to perform, either directly or indirectly, the street restoration with the costs of such restoration assessed against the person responsible for the violation.

(Ord. No. 2011-008, § 1, 7-19-2011)

12.17.035 - Technical Requirements.

Any restoration of a construction-limited street shall conform, at a minimum, to the requirements set forth in the most current edition of the City's Engineering Design Manual. The City Manager or designee may impose additional requirements as determined necessary by the City Manager or designee in the person's sole discretion in order to meet the intent of maintaining the quality, integrity, and service life of the affected construction limited street to the greatest extent practicable.

(Ord. No. 2011-008, § 1, 7-19-2011)

City of Sherwood
Oregon
Home of the Tualatin River National Wildlife Refuge

MEMORANDUM

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DATE: September 4, 2012

TO: Sherwood City Planning Commission

FROM: Julia Hajduk, Planning Manager

SUBJECT: Cedar Brook Way TSP amendment (PA 12-03)

At the Planning Commission meeting on August 14, 2012, the Commission held a public hearing on PA 12-03 to consider amending the TSP relating to Cedar Brook Way. After hearing staff testimony and public testimony, the Commission continued the hearing until the September 11, 2012 meeting to allow staff time to provide more information on several items. The Commission has closed the public record portion of this meeting, but agreed that they could decide to re-open it if deemed appropriate. If the Commission determines not to re-open the public testimony portion of the hearing, the public would continue to have an opportunity to provide input at the City Council hearing. The Commission should refer to the packet materials previously provided for the August 14, 2012 meeting in addition to this memorandum.

Response to issues raised/questions asked:

The Commission asked for more information on the process/ability to obtain a variance from the County to connect a local road to Elwert (and arterial road)

Per the County standards (referenced in the DKS memo at footnote 5), "Direct access to arterial roads shall be from collector or other arterial streets. Exceptions for local streets and private accesses may be allowed through a Type II process when collector access is found to be unavailable and impracticable by the Director." It is possible that the County would approve an exception to connect a local street to Elwert; however there is no guarantee and there would be more review documentation required. Because there is already a local street stub to the Elks property, Bushong Terrace, it is possible the County would determine that an alternative access is available and practical and not permit the exception.

How important is this amendment to connectivity?

The DKS analysis Memo looked at the intersection impacts, assuming existing and 2035 traffic volumes with and without Cedar Brook Way connecting from Elwert to Handley and with and without an access to Pacific Highway. Taking the information from the 4 options studied, it is clear that more connectivity between Elwert and Handley is better for the study intersections, especially the Highway 99W/Sunset intersection (the higher the number, the worse the congestion at the intersection.) All of the options, with improvements meet the service standards, but Options 3 and 4 provide more capacity for development of these properties before major off-site improvements are necessary.

Comparison of Volume to Capacity (V/C) for study intersection operations (2035 PM Peak with no additional off-site improvements[1]						
	Hwy 99/ Elwert Rd-Sunset	Hwy 99/ Meinecke	Handley St/ Cedar Brook Way	Elwert Rd./ Kruger Rd	Elwert Rd/ Handley	Hwy 99/ New access
Option 1 – no connection from Elwert to Handley (DKS memo table 6)	>2	.91	.50	.64	.59	.89
Option 2 – connection from Elwert to Handley, no hwy access (DKS memo table 8)	1.76	.90	.58	.64	.52	n/a
Option 3 - connection from Elwert to Handley, right-in/right out hwy access (DKS memo table 10)	1.78	.92	.50	.61	.50	.89
Option 4 - connection from Elwert to Handley, full signalized hwy access (DKS memo table	1.49	.87	.46	.60	.50	.85

Finally, it should be noted that while not having a connection from Elwert to Handley would keep the residential traffic separate from the commercial traffic, it would likely have greater impacts to the residential neighborhood directly north of the Elks property. This is especially true if the County did not allow a local street connection to Elwert in which case the residential development would have only one access out; along Bushong Terrace to the north of the Elks property. In addition, having the residential areas able to access the commercial areas without having to travel over the arterial road network (Elwert to Pacific Highway) is consistent with the intent of connectivity.

[1] Data from Exhibit B of the 8/14/12 packet – Memo from DKS dated June 28, 2012

Who does have access to 99W and will all other accesses be closed when development of the road occurs?

The City does not control access to 99W. When a development is proposed, the Oregon Department of Transportation (ODOT) will apply their access control standards and consideration is given to existing deeded accesses as well as properties with no deeded access or those that have previously given up their access rights. Regardless, according to the DKS memo and confirmed by ODOT, there are no locations along this stretch of 99W that has a "reservation access" (a location where access rights have been retained) which means that when a street location is proposed the City would need to apply for a grant of access.

ODOT has the ultimate say in the creation of new, and the retention or closure of existing access points to the highway. Temporary or permanent access to Pacific Highway will be dependent on the traffic generated by the proposed use and the existing alternate access options available.

Clarification on funding options for the road

While the funding of the road is not a part of the TSP amendment decision process, staff has met with a number of the property owners directly affected by this road alignment and believe that these owners now understand the difference between the proposed TSP amendment and ultimate construction of the road. It is our understanding that a number of people originally testified against the amendment because they did not understand the SDC credits. Attached to this memo is more detail on how the current SDC credits work. This memo is for information only as how the roads are ultimately constructed and paid for are not decided through a TSP and is not part of this project.

That said, it is also our understanding that this amendment, in and of itself, does not remove all uncertainty for these properties and it will not be until a road is actually designed that more certainty regarding location and costs will be provided. The Commission can certainly include in their recommendation to the Council a recommendation that the City take the lead on providing more clarity on the road alignment and design.

Attachments:

1 – Clarification of SDC and TDT Credits from Bob Galati

City of Sherwood Oregon
Home of the Tualatin River National Wildlife Refuge

Attachment 1

MEMORANDUM

TO: City of Sherwood Planning Commission

FROM: Bob Galati, P.E.
City Engineer, Engineering Department

SUBJECT: Cedar Brook Way TSP Amendment

ISSUE: Clarification of City SDC and County TDT Credits

In recent discussions about the Cedar Brook Way TSP Amendment, two main questions were asked concerning credits;

1. At what point is the construction cost of a public road improvement eligible for credits against transportation SDC/TDT charges?
2. What are the criteria for calculating SDC/TDT credits for right-of-way dedication and road construction costs?

The following information provides specific information on the applicable components for both the City Transportation System Development Charge (SDC) and Washington County Transportation Development Tax (TDT).

General Definitions

Municipal Code Section 15.16.020 – Purpose, provides the following:

"The purpose of the system development charge is to impose an equitable share of the cost of capital improvements for water, sanitary sewer, streets, storm drainage, and parks and open space upon those new or expanded developments that create the need for increased demand on capital improvements."

Section 15.16.040 – Definitions, define SDC's as follows:

"System development charge" means a reimbursement fee, an improvement fee, or a combination thereof, assessed or collected at the time of issuance of a building permit, or at the time of connection to a capital improvement. "System development charge" includes that portion of a sanitary sewer, storm water, or water system connection charge that is greater than the amount necessary to reimburse the city for its average cost of inspecting and installing connections to water, storm water, and sanitary sewer facilities. "System development charge" does not include charges assessed or collected as part of a local improvement district or a charge in lieu of a local improvement district assessment, or the cost of complying with requirements or conditions imposed by a land use decision.

Section 1 of the Countywide Transportation Development Tax Procedures Manual provides the following information for the TDT:

"The Countywide TDT program will collect charges from new development based on the development's projected impact on the transportation system. Proceeds from the TDT program will be used to fund road and transit capital improvements as identified in the capital improvements list. These improvements provide additional capacity to the major transportation system."

"The Countywide TDT is based on a uniform rate structure that will be assessed by all jurisdictions. The tax charged to a developing property for a particular use is the same whether the developing property is located within any city or within the unincorporated urban area or within the rural area."

City Transportation SDC Credit Criteria

1) The following criteria are standard for a development project to be eligible for City Transportation SDC Credits:
   a) The proposed transportation improvement must be identified in the City's Capital Improvement Plan (CIP).
   b) The proposed transportation improvement must be for a road designation of collector or higher classification.
   c) The City accepts the full actual road construction cost towards the valuation of the SDC Credit.
   d) Rights-of-way and easement costs are eligible for SDC Credits.
      i) Land valuation may be based on either a City reviewed and approved appraisal valuation, or the County assessors land valuation, whichever is higher. (Section 15.16.100.J)
2) Engineering, surveying, and plan review and inspection fees are not eligible for SDC Credits.
3) Construction costs are based on City review and acceptance of final construction progress payments and related tracking spreadsheets in verifying actual construction costs. (Section 15.16.100.J)
   a) Items identified as not eligible for credits are excluded from SDC Credit analysis.
   b) Eligible credits may not exceed prevailing market rates for similar projects as determined by the City.

Washington County TDT Credit Criteria

1) Information on the Washington County TDT Credit process is identified in the County Wide Transportation Development Tax Procedures Manual (June 2009).
2) The TDT Procedures Manual provides the following criteria to be eligible to receive TDT Credits:
   a) The proposed transportation improvement must be identified on the County's TDT CIP list. (Section 3.17.030.2)
   b) The proposed transportation improvement is built larger or with greater capacity than the local government's minimum standard facility size. (Section 3.17.070.2)
   c) Eligible construction costs for TDT Credits are based solely on the portion of the improvement that: (Section 3.17.030.2)
      i) Exceeds the local government's minimum standard facility size (local road);
      ii) Exceeds the capacity needed to serve the particular development project or property.
3) Valuation of rights-of-way and easement land market value are based on county tax records. (Section 3.17.070.3.b)
4) Total eligible TDT Credit for engineering and survey services shall not exceed 13.5% of total construction costs. (Section 3.17.070.A.11) The City excludes plan and inspection fees from TDT Credit analysis.
5) If developer has taken CWS SDC Credits towards storm water quantity and/or storm water quality infrastructure, then the construction cost of these facilities are not eligible for TDT Credits. (Section 3.17.070.A.12)

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