Oregon Department of Transportation

MULTIMODAL TRANSPORTATION PROGRAM PROJECT APPLICATION

Transportation Project Sponsors

1. Project Sponsor (must be a public agency)–REQUIRED

Organization Name:	City of Hood River		
Contact Person Name:	Bob Francis	Title:	City Manager
Street Address:	211 2nd Street	Phone:	(541) 387-5252
City, State Zip:	Hood River, OR 97031		
E-mail:	bobf@ci.hood-river.or.us		

2. Co-Sponsor(s)

List the organization names for any Co-Sponsors of this project:

Transportation Project Information

3. Project Name–REQUIRED

Project Name: Oak Street Trafffic Signal

4. Project Budget Summary - This table will automatically fill in.

	Project Funds	% of Project Costs
Total Costs	$450,000	100%
Non-Eligible Costs	$0	0%
Total Transportation Project Cost	$450,000	100%
Matching Funds	$75,000	16.67%
Requested Funds	$375,000	83.33%

5. Provide a brief summary of the project (max 800 characters)**–REQUIRED:**

Construct traffic signal at the intersection of 2nd Street and Oak Street (Historic Highway 30) in Hood River.

6. Is this project a continuation of a previous Statewide Transportation Improvement Program (STIP) Project?

○ Yes ◉ No

If yes, describe the status of the previous STIP project.

7. Does this project complement or enhance an existing or planned STIP project? For example, does it provide a more complete solution for an existing project or is it intended to work with another planned project, including a "Fix-It" STIP project?

○ Yes ◉ No

If yes, describe the relationship of this proposed project to the other, including planned timing of both projects.

8. Project Problem Statement–REQUIRED

Provide a paragraph explaining the problem or transportation need the project will address:

The built environment in the downtown limits the ability to implement further capacity improvements, such as separate turning lanes, without the elimination of on-street parking. Therefore, no new turning lanes are recommended at this time. The primary operational concerns for this intersection should be focused on managing queues so they don't compromise interchange safety and on pedestrian crossing safety.

9. Transportation Project Location–REQUIRED

City:	Hood River	County:	Hood River
MPO:	NA	Special District:	NA

Project Location Detail: (include as appropriate: road and milepost range, rail line and milepost range, GPS coordinates, bus route and stops, bike path or multipurpose trail locations, sidewalk locations, or other location detail)

Intersection of 2nd Street and US Route 30 (Historic Columbia River Highway) in Hood River

10. Maps and Plans (Project Site and Vicinity Maps are required for all construction projects. Include other applicable maps or drawings, if available.)

◉ Attached/Upload ○ Not Applicable	Vicinity Map (8.5x11) (may be inset on site map page)
○ Attached/Upload ○ Not Applicable	Site map/air photo (showing existing site) (8.5x11)

◉ Attached/Upload ○ Not Applicable	Site map (showing proposed construction area clearly marked) (8.5x11)
○ Attached/Upload ○ Not Applicable	Typical Cross Section Drawings (showing proposed construction funded by the requested funds clearly marked) (8.5x11)

11. Project Description–REQUIRED

Clearly describe the work to be funded and describe what will be built, any services that will be provided, what equipment will be purchased, or project planning or environmental document efforts that will be paid for with Requested Funds. Include whether Practical Design considerations have been applied to the proposed project. Identify if the project can be completed in phases, and whether the project or phase will provide a complete, useful product or service. (Maximum 4000 characters)

Construct Traffic Signal at the intersection of 2nd Street and US Route 30 (Historic Columbia River Highway) in Hood River.

12. Primary Project Mode(s)

☐ Passenger Rail	☐ Light Rail	☐ Bus/Transit
☒ Pedestrian	☐ Bike	☒ Highway/Road
☐ Other:		

13. Project Activities

☒ Infrastructure Engineering, Design, or Construction	☐ Project Planning and Development	☐ Operations/Service Delivery
☐ Capital Equipment Purchases	☐ Transportation Demand Management	☐ Other

Timetable and Readiness Information

14. Indicate anticipated timing for the following activities, as applicable. Provide a date, if known, or year–REQUIRED.

Anticipated Dates	Activity
2016	Requested STIP Funding Year (e.g. 2016, 2017, 2018) **- REQUIRED**
January 15, 2016	Bid Let Date
February 15, 2016	Construction Contract Award
May 15, 2016	Construction Complete
NA	Capital Equipment Purchase
May 15, 2016	Operations/Service Begin
	Other Major Milestone:
June 1, 2016	Project Completion/End of Activities funded through this request - **REQUIRED**

15. Is the proposed project consistent with adopted plans? (Plans may include, for example, transportation plans, mode plans such as bike/ped or transit plans, economic development plans, comprehensive plans, corridor plans or facility plans.)–REQUIRED

◉ Yes ○ No

Describe how the proposed project is consistent with adopted plans. List plans that include the project (with page numbers if possible) or describe how the project meets plan intent. If the project is not consistent, explain how and when plans will be amended to include the project.

City of Hood River Transportation System Plan; ODOT Interchange Access Management Plan (IAMP). Oak Street in downtown Hood River is also US 30 (Historic Columbia River Highway) and under the jurisdiction of ODOT. Therefore, the mobility standards defined in the Oregon Highway Plan (OHP) for a District level highway apply. Also, because the portion of 2nd Street between Oak Street and I-84 is also under the jurisdiction of ODOT, the same District level mobility standard applies. IAMP, page 31: The built environment in the downtown limits the ability to implement further capacity improvements, such as separate turning lanes, without the elimination of on-street parking. Therefore, no new turning lanes are recommended at this time. The primary operational concerns for this intersection should be focused on managing queues so they don't compromise interchange safety and on pedestrian crossing safety.

16. Is the proposed Transportation Project consistent with Major Improvement Policies including OTP Strategy 1.1.4 and OHP Action 1G.1?–REQUIRED

◉ Yes ○ No

Describe how the proposed investment is consistent with OTP Strategy 1.1 and for highway projects, OHP Action 1G.1. If the project corresponds to a later priority in these strategies, describe how higher priority solutions have already been tried or why they are not applicable or not appropriate to the location.

The goals and objectives of this IAMP reflect the intentions and interests of ODOT, the City of Hood River, Hood River County, and other key stakeholders for the interchanges and transportation operations in the area. The goals and objectives are guided by, but not re-statements of, Oregon Highway Plan policies and OAR language. The operational objective for District Highways is to allow safe and efficient moderate to low-speed travel in urban and urbanizing areas for traffic flow, as well as bicycle and pedestrian movements.

Project Benefit Information

Questions 17 through 26: Describe how the proposed solution will help achieve the outcomes listed below. Describe the benefits that the proposed solution is expected to achieve and provide documentation of those benefits where available, such as summaries of data analysis or modeling results, or letters of commitment from participants or employers. Where appropriate, also include in the description whether the proposal will mitigate or prevent a negative impact to the desired outcome.

This information and information throughout the application will be used as input to the STIP decision process. It is not expected that every solution will help achieve every benefit. Different types of solutions are likely to have different kinds of benefits and no type of solution or benefit is assumed to be more important than others. Please provide a realistic description of expected benefits of the proposed solution and feel free to use N/A where the benefit or outcome listed does not apply to the proposal.

17. Benefits to State-Owned Facilities

Outcome sought: preserve public investment by maintaining efficient operation of state-owned highways and other facilities through operational improvements, local connectivity, congestion-reducing projects and activities, etc.

For example, will the solution:

- Provide an alternative to travel on state owned facilities?
- Cost less than a state facility improvement with equal benefits?
- Include local efforts to protect the investment such as an Interchange Area Management Plan?
- Plan for or contribute to development of a seamless multimodal transportation system?
- Complete or extend a critical system or modal link?

Protect the function and operation of the interchanges and the state highways. Provide for an adequate system of local roads and streets for access and circulation within the interchange areas that minimizes local traffic through the interchanges and on the interchange crossroads.

18. Mobility

Outcome sought: provide mobility for all transportation system users and a balanced, efficient, cost-effective and integrated multimodal transportation system.

For example, will the solution:

- Improve or better integrate passenger or freight facilities and connections, including multimodal connections, to expedite travel and provide travel options?
- Improve or provide a critical link in the transportation system or connection between modes for travelers or goods?

Provide safe and efficient multi-modal travel between the connecting roadways. The project alternatives will improve bicycle and pedestrian safety by providing upgraded bikeways and walkways that meet current standards and include facility infill and extensions where needed to provide a continuous network while respecting the historic streetscape.

19. Accessibility

Outcome sought: ensure appropriate access to all areas with connectivity among modes and places and enable travelers and shippers to reach and use various modes with ease.

For example, will the solution:

- Improve connections within residential areas and/or to schools, services, transit stops, activity centers and open spaces, such as by filling a gap in bicycle, pedestrian, or transit facilities?
- Improve or expand access to employers, businesses, labor sources, goods or services?
- Plan for or contribute to expanding transportation choices for all Oregonians?

The project alternatives would facilitate access to, through, and from businesses in Hood River, while protecting the function and livability of downtown Hood River. The project alternatives are expected to reduce delay for vehicles, including commercial vehicles, accessing the freeway and increase safety

20. Economic Vitality

Outcome sought: expand and diversify Oregon's economy by efficiently transporting people, goods, services and information.

For example, will the solution:

- Support, preserve, or create long-term jobs and capital investment? Will it do so in an economically distressed area?
- Enhance opportunities for tourism and recreation?
- Plan for or contribute to linking workers to jobs?

The project alternatives would facilitate freight access to and from the many industrial, agricultural, and forest products freight destinations in the interchange areas. The project alternatives would facilitate access to, through, and from businesses in Hood River, while protecting the function and livability of downtown Hood River. The project alternatives recognize the importance of recreation and tourism to the regional economy.

21. Environmental Stewardship

Outcome sought: provide an environmentally responsible transportation system that does not compromise the ability of future generations to meet their needs and encourage conservation of natural resources.

For example, will the solution:

- Use design, materials or techniques that will more than meet minimum environmental requirements or mitigate an existing environmental problem in the area?
- Help meet air or water quality, energy or natural resource conservation, greenhouse gas reduction or similar goals?
- Plan for or contribute to the use of sustainable energy sources for transportation?

NA

22. Land Use and Growth Management

Outcome sought: support existing land use plans and encourage development of compact communities and neighborhoods that integrate land uses to help make short trips, transit, walking and biking feasible.

For example, will the solution plan for or contribute to:

- Efficient development and use of land as designated by comprehensive or other land use plans?
- Community revitalization including downtowns, economic centers and main streets?
- Compact urban development and mixed land uses?

Ensure future changes to the planned land use system are consistent with protecting the long-term function of the interchange and the surface street system and the integration of future transportation projects and land use changes.

23. Livability

Outcome sought: promote solutions that fit the community and physical setting, enable healthy communities and serve and respond to the scenic, aesthetic, historic, cultural and environmental resources.

For example, will the solution:

- Enhance or serve unique characteristics of the community?
- Use context sensitive principles in design and minimize impacts on the built and natural environment?
- Encourage a healthy lifestyle and enable active transportation by enhancing biking and walking networks and connections to community destinations or public transit stops or stations?
- Include elements that will make the facility or service more attractive, enjoyable, comfortable or convenient for potential users?

A. Provisions for safe bicycle travel are needed through the downtown. Shared lane markings on Cascade Avenue, Oak Street, and State Street have been proposed as part of an update to the City of Hood River Transportation System Plan.

24. Safety and Security

Outcome sought: Investment improves the safety and security of the transportation system and takes into account the needs of potential users.

For example, will the solution:

- Improve safety by using designs or techniques that exceed minimum requirements for safety and are likely to reduce the frequency or severity of crashes?
- Help reduce crashes involving vulnerable road users such as bicyclists and pedestrians?
- Improve the ability to respond to an emergency and quickly recover use of the facility or service?

Besides being one of busiest intersections in the city, in terms of traffic, this intersection also experiences high pedestrian activity due to the commercial businesses and shopping opportunities in the area. There are patterned crosswalks on all four intersecting legs, but without signal control, vehicles must yield right-of-way at all times. During periods of high pedestrian activity, vehicle delays and excessive queuing have been known to occur.

25. Equity

Outcome sought: promote a transportation system with multiple travel choices for potential users and fairly share benefits and burdens among Oregonians.

For example, will the solution:

- Benefit a large segment of the community?
- Benefit one or more transportation disadvantaged populations?
- Improve environmental justice or economic equity of the community or region?

The project alternatives were developed in partnership with affected property owners in the interchange area, the City of Hood River, Hood River County, the Oregon Department of Transportation, and other stakeholders, including interchange users.

26. Funding and Finance

Outcome sought: investment uses funding structures that will support a viable transportation system and are fair and fiscally responsible.

For example, will the solution:

- Have ongoing funding available for operations and maintenance?
- Support the continued use of prior investments or reduce the need for future investments?

Normally, on the state system ODOT is responsible for on-going maintenance.

Budget Information

27. Estimated Project Costs–REQUIRED

List estimated costs for the various activities listed below, as applicable to proposed project. Shaded fields are automatically calculated.

	Enter Values in this Column	Total Column
Project Administration	$5,000	
Staff Costs (for Service/Educational Projects)	$0	
Project development and PE	$95,000	
Environmental Work	$2,500	
Coordination and Outreach	$0	
Leased Space		
Building purchase and/or Right of Way		
Capital Equipment	$220,000	
Non-Construction Project Costs Total		**$322,500**
Utility Relocation		
Construction	$127,500	
Construction Project Costs Total		**$127,500**
Total Eligible Project Cost		**$450,000**
Non-Eligible Costs (other project non-transportation expenditures, e.g. un-reimbursable utilities)	$0	

28. Project Participants and Contributions–REQUIRED

List expected project participants and their contributions in the table below. Begin with the amount contributed by the Sponsor and include contributions from Project Co-Sponsor and other participants, if applicable. Sponsor and participant contributions must add to at least 10.27% of Total Transportation Project Costs. This is the amount of matching funds typically required for most federal funding programs. The specific amount of matching funds required for the proposed project may be more or less than 10.27%, depending on its funding eligibility. Specific match requirements will be determined during application review.

Participant Role	Participant Name	Project Funds Contribution	Percent of Transportation Project Total Cost
Sponsor	City of Hood River	$75,000	17%
Co-Sponsor			0%
Participant			0%
Participant			0%
Total		$75,000	17%

If you have more co-sponsors and participants than lines in the table above, list their names and contribution amounts in the box below and enter the totals of Co-Sponsor and Participant contributions in the appropriate spaces in the table above.

Oregon Department of Transportation

Submittal Approval

29. Project Sponsor Signature Authority Information–REQUIRED

The Authorizing Authority identified below approved the submittal of this application on behalf of the Project Sponsor. Project sponsors other then the Oregon Department of Transportation will be required to sign an Intergovernmental Agreement (IGA) with ODOT prior to receiving any project funds. The IGA with the state will detail the requirements for the use and management of requested funds.

Authorizing Authority Name: Robert G. Francis, Jr.

Authorizing Authority Title: City Manager

☒ Electronic submittal was approved by the identified authorizing individual. No signature needed if checked.

Signature: Date: 11/27/2012

30. Co-Sponsor Signature Authority Information

The signature below demonstrates support of this application on behalf of the Co-Sponsor:

Authorizing Authority Name:

Authorizing Authority Title:

Signature: Date:

If you have more than one Co-Sponsor, list further Co-Sponsors' submittal authority names and titles in the box below and ask those named to provide their signatures and the date signed by their names.

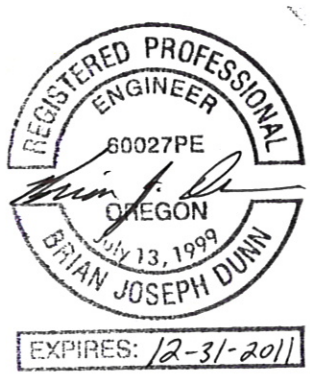
☐ Electronic submittal was approved by the identified authorizing individuals. No signatures needed if checked.

Save Application

GROUP MACKENZIE

2ND STREET/OAK STREET PROPORTIONATE SHARE COST STUDY

Hood River, Oregon



Prepared For
City of Hood River

Completed
September 8, 2011

Submittal To
City of Hood River

Project Number
2110114.00

GROUP MACKENZIE
Since 1960

RiverEast Center | PO Box 14310 | Portland, OR 97293
1515 SE Water Ave, Suite 100 | Portland, OR 97214
T 503.224.9560 | F 503.228.1285 | www.grpmack.com

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I. INTRODUCTION

This report was prepared at the request of the City of Hood River and represents a proportionate share cost collection strategy for a planned traffic signal installation at the 2nd Street/Oak Street intersection in Hood River. Specifically, this report documents expected traffic growth patterns along the 2nd Street corridor over a ten-year period, the cost for the planned traffic signal installation, and an appropriate proportionate share cost allocation plan to apply towards future development activities in the City.

PROJECT DESCRIPTION

Over the past several years, a series of transportation studies have identified a long-term need to install a traffic signal installation at the 2nd Street/Oak Street intersection in downtown Hood River. These studies include transportation impact analyses prepared in 2008 and 2009 to support the successful rezone of the Nichols Boatworks property and subsequent plan to develop a condominium project, the draft 2010 Hood River Interchange Access Management Plan (IAMP) for the I-84/2nd Street interchange, and the on-going efforts by the City to update its Transportation System Plan (TSP).

Figure 1 in the Appendix shows a vicinity map of the 2nd Street corridor in Hood River, including the location of the 2nd Street/Oak Street intersection, which is the subject of this study, as well as the 2nd Street/Cascade Avenue intersection nearby, which has been a candidate for potential turn movement restrictions to and from Cascade Avenue.

SCOPE OF REPORT

This study was prepared through a scoping discussion with planning staff from the City of Hood River and addresses the following:

- Definition of study area boundary
- Review and usage of historical traffic count information
- Confirmation of critical peak hour period and traffic volumes to serve as basis for study
- Analysis of traffic signal warrants for 2nd Street/Oak Street intersection
- Preparation of a future traffic forecast
- Review the applicable City and ODOT intersection operating standards
- Analysis of existing and future traffic operations and mitigation measures
- Assessment of planned intersection improvement costs
- Development of proportionate share cost collection methodology

STUDY AREA BOUNDARY

Figure 2 shows the study area boundary for which the proportionate share cost assessment should apply, at a minimum. The boundary was developed through discussions with City planning staff and includes the Waterfront District north of I-84 and west of Hood River, as well as the City's Urban Renewal District in the downtown area. These areas were selected because they have high development or re-development potential and are in close proximity to the subject intersection.

The study area boundary should not be considered a fixed boundary. Development activities taking place outside this boundary should be reviewed by City staff on a case-by-case basis and included in the cost assessment if they will have a realistic and measurable impact on traffic entering the 2nd Street/Oak Street intersection.

II. EXISTING TRAFFIC CONDITIONS

STUDY AREA INTERSECTION DESCRIPTIONS

Figure 3 identifies the existing lane configurations and traffic control devices at the 2nd Street/Oak Street and 2nd Street/Cascade Avenue study intersections.

2nd Street/Oak Street

The 2nd Street/Oak Street intersection is located in the Downtown Business District of Hood River. The intersection is under four-way stop control with stop signs and a flashing red beacon. Intersecting streets typically have two-lane cross-sections with on-street parking and continuous sidewalks on both sides of the street. The north leg has a three-lane cross-section where a shared left-through lane and separate right-turn lane are provided on the southbound approach.

Besides being one of busiest intersections in the city, in terms of traffic, this intersection also experiences high pedestrian activity due to the commercial businesses and shopping opportunities in the area. There are patterned crosswalks on all four intersecting legs, but without signal control, vehicles must yield right-of-way at all times. During periods of high pedestrian activity, vehicle delays and excessive queuing have been known to occur.

2nd Street/Cascade Avenue

The 2nd Street/Cascade Avenue intersection is located just north of the Oak Street intersection. The intersection has two-way stop-control with stop signs posted on the eastbound and westbound approaches of Cascade Avenue. The intersecting streets have two-lane cross-sections with on-street parking and continuous sidewalks on both sides of the street, except for the north leg which only has sidewalks.

HISTORICAL TRAFFIC VOLUMES

Back in September 2009, a series of 24-hour road tube counts were conducted on the southbound and eastbound approaches to the 2nd Street/Oak Street intersection to understand how traffic patterns fluctuate on an hourly and daily basis at this intersection. The counts were performed for a one-week period from Saturday, September 12th until Friday, September 18th to capture peak seasonal traffic conditions when temperatures are warm and recreation activity is high on the Columbia River. Based on a review of the tube count data, the peak hour of traffic entering the 2nd Street/Oak Street intersection was observed to occur on a mid-week day from 4:00-5:00 PM.

A series of manual turn movement traffic counts were also conducted previously at the 2nd Street/Oak Street intersection, as well as at the 2nd Street/Cascade Avenue intersection back in August 2008. The counts were conducted on a mid-week day (4:00-6:00 PM) and on a Saturday (12:00-2:00 PM). Based on a review of these counts, the period with the highest hourly traffic flow was, again, the weekday PM peak hour from 4:20-5:20 PM. Both the historical road tube and turn movement counts are provided in the appendix.

BASE TRAFFIC VOLUMES

Due to the economic downturn in state and local business activity, and considering national statistics that show reduced traffic flows during the recession, it is our professional judgment that the historical tube counts from September 2009 and the turn movement counts from August 2008 are still valid and provide an accurate representation of current year 2011 traffic conditions.

Figure 4 illustrates the base weekday PM peak hour volumes utilized in this study for operational analyses at the 2nd Street/Oak Street intersection and the 2nd Street/Cascade Avenue intersection. It should be emphasized that the traffic volumes shown in this figure reflect a 1.6 percent increase over the peak hour volumes observed in the traffic counts. This growth factor was applied to achieve traffic levels which reflect ODOT's policy for analyzing, peak seasonal conditions, or 30th Highest Design Hour Volumes (30 DHV). The growth factor was determined using ODOT seasonal traffic trend information for I-84.

TRAFFIC SIGNAL WARRANTS

A signal warrant analysis was conducted to determine whether or not a traffic signal installation can be constructed at the 2nd Street/Oak Street intersection under current traffic conditions. The analysis was performed using the procedures described in the Manual on Uniform Traffic Control Devices (MUTCD, 2009 Edition). For the analysis, Warrants #1 (Eight Hour Vehicular Volume), #2 (Four Hour Vehicular Volume), and #3 (Peak Hour) were evaluated using the historical 24-hour road tube data collected for the peak day of Thursday, September 17, 2009. It should be emphasized that hourly traffic volumes had to be estimated for the westbound and northbound approaches to the subject intersection. This was done by establishing the proportional relationship between weekday PM peak hour volumes observed from the turn movement counts and the road tube counts.

The results of the analysis indicate Signal Warrants #1 (Eight Hour Vehicular Volume – Condition "A"), #2 (Four-Hour Vehicular Volume), and #3 (Peak Hour) are satisfied at the 2nd Street/Oak Street intersection for an average weekday. Therefore, a traffic signal installation can be constructed per the criteria stated in the MUTCD. All calculations done to support the signal warrant analysis are provided in the appendix.

III. FUTURE TRAFFIC FORECAST

TRAFFIC FORECAST PERIOD

The forecast period selected for this study is ten years. This forecast horizon was selected through close coordination with City planning staff. Initially, a forecast period of five years was discussed but because of the economic slowdown and uncertainty over future development activity in the City, a more-conservative ten year window was selected. This ten-year forecast window is further supported by the results of the future intersection operations analyses presented in this report, which indicate that the 2nd Street/Oak Street intersection will fail with a critical v/c ratio of over 1.0 during the weekday PM peak hour. This means traffic demand will exceed the intersection's capacity as a four-way stop and that a traffic signal installation will be greatly needed.

FUTURE TRAFFIC GROWTH

The 10-year traffic forecast prepared for this study is based on traffic volume projections prepared by DKS Associates for the City's new Transportation System Plan (TSP). The methodology used to prepare the forecast is provided in the appendix, including DKS' traffic volume forecast figures provided at the time this study was being prepared. As shown in the appendix, DKS' PM peak hour traffic projections are for a base year 2010 and a forecast year 2031. Using these projections for a 21-year period, an average 10-year growth rate of 32.4% was calculated for the traffic entering the 2nd Street/Oak Street and 2nd Street/Cascade Avenue intersections. This growth rate was applied to the base PM peak hour traffic volumes to estimate future traffic volumes. The 10-year traffic growth projections for the weekday PM peak hour are shown in Figure 5.

It should be emphasized that DKS' long-range traffic forecast assumed right-turn movement restrictions to and from Cascade Avenue at 2nd Street. These restrictions were not presumed to occur within the 10-year forecast period of this study because they were ultimately not accepted as a planned improvement by the City of Hood River as part the recently adopted Interchange Area Management Plan (IAMP) for the I-84/2nd Street interchange or the City's new TSP. Trips associated with approved, but not-yet-constructed developments in the area were not incorporated into the forecast for this study as the 10-year traffic forecast is expected to capture any approved development activity in the near-term.

FUTURE TRAFFIC VOLUMES

The future traffic volumes forecast for this study are presented in Figure 6, which shows the weekday PM peak hour turn movement volumes for the two study intersections along 2nd Street.

IV. INTERSECTION AND ROADWAY ANALYSIS

OPERATION ANALYSIS DESCRIPTION

To ensure this study reflects reasonable "worst-case" conditions, peak 15-minute flow rates for the weekday PM peak hour were used to evaluate intersection operations. As, such, all analyses reflect conditions likely to occur during the peak 15 minutes of the peak hour. Operations during all other weekday and weekend hours will likely be better than those described in this analysis.

Intersection operation characteristics are generally defined by two measurements: level-of-service (LOS) and volume-to-capacity (v/c) ratio. LOS is a measure of the average control delay (in seconds) experienced by drivers and is described by a letter on the scale from 'A' to 'F.' LOS 'A' represents optimum operating conditions and minimum delay. LOS 'F' indicates over capacity conditions causing unacceptable delay. For reference purposes, the City of Hood River supports a LOS 'C' or better standard for intersections under City control. The v/c ratio is a measurement of capacity utilization for a given traffic movement or for an entire intersection with a typical range between 0.00 and 1.00. It is defined by the rate of traffic flow or traffic demand divided by the theoretical capacity.

For signalized intersections, operations are expressed for the entire intersection, whereas, for unsignalized intersections, operations are typically expressed for the critical movement, which is typically the left-turn or entire approach of the intersecting minor street.

JURISDICTIONAL STANDARDS

Oak Street in downtown Hood River is also US 30 (Historic Columbia River Highway) and under the jurisdiction of ODOT. Therefore, the mobility standards defined in the *Oregon Highway Plan* (OHP) for a *District* level highway apply. Also, because the portion of 2nd Street between Oak Street and I-84 is also under the jurisdiction of ODOT, the same *District* level mobility standard applies.

ODOT uses the v/c ratio as the sole measure of intersection performance. Per the OHP, the applicable mobility standard for both study intersections on 2nd Street is a v/c ratio of 0.85 or less during the peak hour. Because the City of Hood River supports a LOS-based standard, both v/c ratio and LOS measurements are included in this analysis.

OPERATION ANALYSIS

Intersection capacity calculations were conducted using the *Synchro* software program (Version 7), which is based on the methodologies presented in the *2000 Highway Capacity Manual (HCM)*. Operations analysis was conducted for both study intersections on 2nd Street for the following weekday PM peak hour scenarios:

- Base Condition (Current Year 2011)
- Future Condition (Forecast Year 2021)

Analyses results are summarized in the following table with calculation sheets included in the appendix.

TABLE 1 – PM PEAK HOUR INTERSECTION OPERATIONS						
Intersection	Base Condition			Future Condition		
	V/C	LOS	Delay	V/C	LOS	Delay
2nd St/Oak St	0.61*	B	13.8	1.00*	D	27.5
2nd St/Cascade Ave	0.87	F	72.9	>1.00	F	>100.0

* - v/c ratio expressed for critical eastbound approach on Oak Street.

As shown in the previous table, the 2nd Street/Oak Street intersection functions adequately during the weekday PM peak hour of the base condition with a v/c ratio of 0.61 for the critical eastbound approach. However, operations deteriorate in the future condition with the v/c ratio increasing to 1.00, which exceeds the ODOT mobility standard of 0.85 or less.

At the 2nd Street/Cascade Avenue intersection, operations are just above the ODOT mobility standard, with a v/c ratio of 0.87 for the critical eastbound approach on Cascade Avenue. Operations continue to deteriorate in the future condition with the v/c ratio exceeding 1.00.

ANALYSIS OF MITIGATION MEASURES

Given the adverse operating conditions forecast for the 2nd Street/Oak Street intersection and considering traffic signal warrants are satisfied under current conditions and that this intersection is targeted for signalization in the latest version of the City's TSP and I-84/2nd Street IAMP, future intersection operations were re-tested for this intersection under the assumption that a traffic signal would be installed as a mitigation measure. Future operations analysis results indicate that with standard permitted left-turn signal phasing on all approaches, this intersection will operate with a v/c ratio of 0.69, an LOS of "B", and average control delay of 18.2 seconds during the weekday PM peak hour. These results meet both ODOT and City standards.

As stated earlier, the City, through the adoption of the new TSP and I-84/2nd Street IAMP, does not plan to limit or restrict movements at the Cascade Avenue approaches to 2nd Street, even though operating conditions for these movements will exceed normal City and ODOT mobility standards. Therefore, no mitigation measures were evaluated for this intersection.

V. PROPORTIONATE SHARE COST CALCULATION

PROPORTIONATE SHARE COST METHODOLOGY

The proportionate share cost methodology for this study is defined as a cost of the planned traffic signal at the 2nd Street/Oak Street intersection divided by the increased traffic forecast to enter the intersection during the weekday PM peak hour. The following table defines the results of this process.

TABLE 2 – PROPORTIONATE SHARE COST METHODOLOGY (2ND STREET/OAK STREET)	
Base Intersection Volume (TEV)	1,049
10-Year Traffic Growth (TEV)	340
Future Intersection Volume (TEV)	1,389
Estimate Signal Cost	$225,000
Proportionate Cost	**$662 per Trip**

TEV = Total Entering Vehicles during weekday PM peak hour.

As shown in the previous table, the proportionate share cost for this intersection is $662 per trip. This is based on an estimated 340 vehicle increase in traffic entering the 2nd Street/Oak Street intersection during the weekday PM peak hour over the next 10 years. It is also based on an estimated cost of $225,000 to design and construct a traffic signal at this location. It should be emphasized that the cost estimate assumes the traffic signal will be designed in accordance with ODOT standards, and include standard signal equipment and signal phasing (permitted left-turns).

VI. SUMMARY

- The City of Hood River identified a need for a future traffic signal installation at the 2nd Street/Oak Street intersection and would like to begin collecting funds from future development activities to pay for the signal.
- Funds are to be paid based on the proportionate level of a development's traffic impact.
- Funds are to be collected for developments which occur within the City's Waterfront District (north of I-84 and west of Hood River) as well as the City's Urban Renewal District in the downtown area.
- Current traffic volumes warrant a traffic signal at the 2nd Street/Oak Street intersection.
- A traffic signal at 2nd Street/Oak Street will mitigate adverse operating conditions forecasted for the year 2021 and allow this intersection to function at levels which meet the City's and ODOT's mobility standards.
- The estimated cost to build a traffic signal at the 2nd Street/Oak Street intersection is $225,000.
- All future developments within the study area boundary shall be charged $662 per PM peak hour trip that is generated through the 2nd Street/Oak Street intersection until the full cost of the future traffic signal has been collected.

VII. APPENDIX

A. Figures

B. Historical Traffic Count Summaries

C. Signal Warrant Calculations

D. Traffic Forecast Calculations

E. Intersection Capacity Calculations