

N Wenatchee Avenue Improvement Project Transportation Analysis Report



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N Wenatchee Avenue Transportation Analysis Report

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City of Wenatchee

In association with

WSDOT

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Introduction

The City of Wenatchee, in partnership with the Washington State Department of Transportation (WSDOT), is studying potential alternatives to improve the N Wenatchee Avenue segment of State Route 285. This study provides the transportation analysis to support the preliminary design process for the corridor. The study includes an evaluation of existing conditions (as of 2018), including an assessment of non-motorized, transit, and safety needs; an evaluation of future intersection operations based on 2040 travel forecasts from the Chelan-Douglas Transportation Council (CDTC); and recommendations for improvements to specific intersections and roadway segments along the corridor.

Study Area

The study area for this analysis is the N Wenatchee Avenue portion of SR 285 that extends between the Wenatchee River Bridge and the intersection at Miller Street. N Wenatchee Avenue is part of a set of regional roadways that form what has recently been referred to in grant applications as the Apple Capital Loop, which is comprised of US 2/SR 97 on the north side of the loop, Sunset Highway in East Wenatchee (SR 28), and SR 285 on the west side in the City of Wenatchee.

Part of this regional effort is the proposed Confluence Parkway concept, which is a new parallel roadway located between N Wenatchee Avenue and the Wenatchee River that would provide access to adjacent land uses and an alternative north-south connection through the North Wenatchee area. Construction of the new Confluence Parkway alignment coupled with improvements along North Wenatchee Ave is the preferred transportation solution for North Wenatchee. The recommendations found in this document are focused on improvements to N Wenatchee Avenue, with consideration for how these improvements will support the addition of Confluence Parkway in the future. **Figure 1** shows the N Wenatchee Avenue study area.

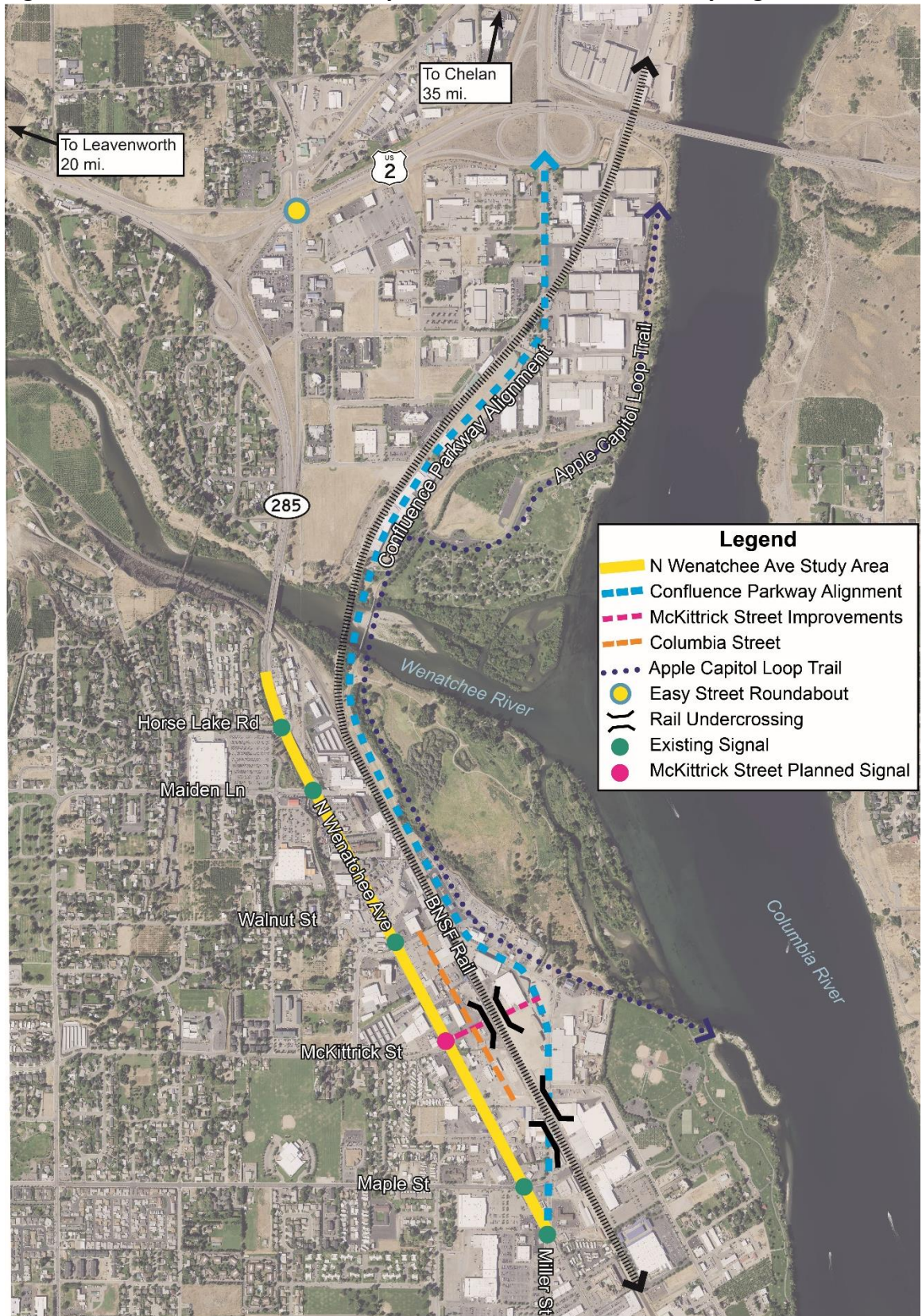
Previous Studies

This analysis builds upon previous studies of the N Wenatchee Avenue corridor that identified improvements to address congestion, safety and mobility issues for all travel modes. These previous efforts focused on evaluating alternatives and investigating the corridor at a planning level. The following provides a brief summary of each of these plans:

North Wenatchee Transportation Master Plan (February 2011). This plan identified the need for future vehicle capacity improvements to address forecasted traffic demand. Recommendations in the plan included improvements to N Wenatchee Avenue, improvements to US 2 in Olds Station, and the construction of Confluence Parkway.

Transportation 2040 (September 2015). Transportation 2040 is the Regional Transportation Plan for Chelan and Douglas counties prepared by the Chelan-Douglas Transportation Council (CDTC). In its list of projects, the N Wenatchee Avenue corridor is listed as a Phase 1 (2016-2027) project and Confluence Parkway is listed as a Phase 2 (2028-2040) project.

Figure 1. N Wenatchee Avenue Study Area and Confluence Parkway Alignment



North Wenatchee Master Plan (October 2016). This document focused on the redevelopment of the east side of N Wenatchee Avenue between Hawley Street and Maple Street. The plan included the extension of McKittrick Street under the BNSF rail line to connect to the future Confluence Parkway as part of the effort to open up the east side of the railroad tracks for future development.

North Wenatchee Avenue Concept Study (April 2017). This study, also known as the Form and Function Study, provided conceptual ideas for N Wenatchee Avenue and recommended a five-lane roadway with a continuous center median with U-turns at intersections for property access as the preferred alternative. The recommendation included shared bus/right turn lanes at intersections with queue jump signals to improve transit travel times.

North Wenatchee Avenue Capacity Improvements Risk Assessment (October 2017). This pre-NEPA study compared No Action, a six-lane N Wenatchee Avenue, and the Confluence Parkway alternatives. The analysis assessed each alternative based on consistency with City goals and policies, identified the potential risks related to permitting and approvals, mitigation complexity and costs, and evaluated how well the alternative met the project's purpose and need. The analysis concluded that Confluence Parkway provides high-levels of mobility benefits, but also has moderate-to-high risk related to permitting and mitigation.

Study Objectives

The primary objectives of this study include the following.

- Evaluate existing traffic conditions (vehicle volumes, travel times, and crash data) and evaluate existing traffic operations during the PM peak hour.
- Describe the 2040 traffic forecasts and evaluate the future traffic conditions on N Wenatchee Avenue.
- Discuss potential improvement strategies for the corridor that could improve congestion, safety, and operations for vehicle, non-motorized and transit travel.
- Describe the preliminary engineering recommendations for the corridor and evaluate traffic operations with the improvements.
- Identify the next steps related to implementing the recommended improvements for N Wenatchee Avenue.

Summary of Recommendations

The preliminary recommendations for N Wenatchee Avenue are designed to improve the safety and mobility along the corridor. In general, the corridor will remain as a 5-lane facility with added center medians and designated U-turn locations to manage access to local businesses and address left turn collisions. Improvements will happen mainly at intersections, where changes to signal phasing and intersection channelization will improve traffic operations. At the north end of the corridor, a 7-lane facility will provide multi-purpose outside lanes for business

access, transit, and U-turns. Improvements include new sidewalks and landscaping, new pedestrian crosswalks, and far-side bus stops to enhance transit operations.

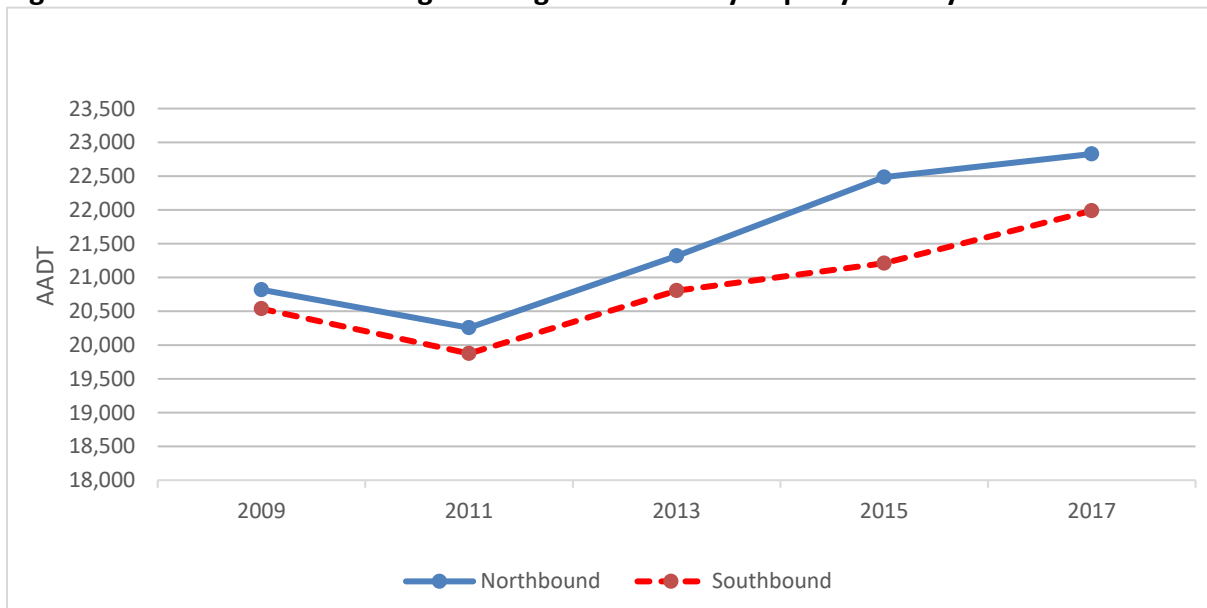
Existing Conditions

Vehicle travel along N Wenatchee Avenue has increasingly become a source of frustration for residents, businesses, and commerce interests. Factors, including the southbound transition from a limited access highway to a city street, adjacent large retail developments, frequent driveways and access points, and high vehicle volumes, have resulted in traffic congestion, inefficient intersection operations, travel time delays, and reduced non-motorized mobility. This section provides an overview of existing transportation conditions along the corridor.

Vehicle Volumes

Wenatchee is currently experiencing rapid growth along the corridor. A WSDOT permanent traffic counter on the Wenatchee River Bridge, which serves all traffic entering or exiting the City to the north, shows a trend of increasing vehicle volumes. **Figure 2** shows the average weekday daily traffic volumes driving over the bridge over the last nine years. Since 2009, the number of vehicles crossing the bridge has increased by nearly 3,500 vehicles per day, a 12 percent increase. On a daily basis, northbound volumes are typically 1 to 5 percent higher than southbound volumes, which shows that southbound drivers are using alternative routes to SR 285. This may also indicate that driver behavior is being affected by southbound congestion on the corridor.

Figure 2. Wenatchee River Bridge Average Annual Daily Trips by Year by Direction



Source: WSDOT

Within the study corridor, vehicle volumes are greatest at the northern end, in the vicinity of the Horse Lake Road and Maiden Lane intersections. In addition, Walmart and Home Depot are major destinations and are located to the west of these intersections. Traffic volumes have risen to the point where the capacity of the intersections is being exceeded, resulting in frequent queues and congestion.

Trucks, Freight, and Rail

Wenatchee's agricultural industries and associated commercial activities such as packaging, processing, and distribution, account for a considerable amount of the truck traffic along the corridor. Medium and heavy trucks make up about 4 percent of vehicle traffic on the corridor, approximately 1,700 of the 43,000 daily vehicles, with large monthly variations reflecting the harvest and other seasonal activities.

The BNSF rail line operates parallel to N Wenatchee Avenue, to the east. Within the city limits, there are five railroad crossings: three at-grade and two grade-separated. Approximately 25 trains per day travel through Wenatchee. The BNSF rail yard and Amtrak station are located in downtown Wenatchee, 1.5 miles southeast of the study area. Amtrak's Empire Builder line provides service between Seattle and Chicago, and makes a stop in Wenatchee. This train runs once per day in each direction.

Transit Service

Link Transit is the regional transit provider for Chelan and Douglas counties. On N Wenatchee Avenue, there are four southbound and three northbound bus stops that serve six regularly scheduled routes and one seasonal route.

- Route 8 connects riders from Wenatchee to East Wenatchee and runs 30-minute headways Monday through Friday and one-hour headways on Saturdays. This route is the only route that does not use the bus stop in front of the Exxon/Circle K gas station on Maple Street between N Miller Street and N Wenatchee Avenue.
- Route 20 provides intercity service from Wenatchee to Chelan and Manson. It runs on the east side of the Columbia River, stopping in Orondo. It runs five times per day, Monday through Friday.
- Route 21 also provides intercity service from Wenatchee to Chelan and Manson, but on the west side of the Columbia River, stopping in Entiat. It runs twelve buses each day Monday through Friday, and five buses on Saturdays.
- Route 22 serves riders traveling between the North Wenatchee area and Leavenworth. During the week, it operates at 30 minute headways from 5:00 am to 8:00 pm. On Saturdays there are six buses, approximately one every two hours.
- Route 26 connects Wenatchee with the town of Ardenvoir, and operates four buses per day, Monday through Friday.



- Route 28 connects Wenatchee with Cashmere, and operates on 1.5 hour headways Monday through Saturday, totaling seven buses per day.
- Route 40 (seasonal) operates during mid-November to April to connect Wenatchee and the Mission Ridge Ski Area.

During the PM peak hour (4:30-5:30 pm), there are five scheduled southbound buses and six scheduled northbound buses that travel through the N Wenatchee Avenue corridor. These bus routes are often delayed due to congestion along the corridor, affecting the bus arrivals and schedules. Identified needs for Link Transit include consistency in travel speeds and reliability of maintaining scheduled stop times on N Wenatchee Avenue. Other priorities for transit improvements are pedestrian connectivity and access to transit, increasing transit mode share, and supporting transit-oriented development along the corridor.

Non-Motorized Travel

The corridor currently has 5 to 6 foot wide sidewalks on both sides of the street. Each signalized intersection on the corridor provides at least one marked crosswalk of N Wenatchee Avenue, except at Miller Street, which does not have crosswalks of either N Wenatchee Avenue or Miller Street. The distances between crosswalks are also an issue, resulting in infrequent crossing opportunities and pedestrians crossing at unmarked locations. The distance between the crosswalks at the Maiden Lane and Walnut Street-Hawley Street intersection is more than 0.35 miles, and between the crosswalks at Walnut Street-Hawley Street and Maple Street is more than 0.5 miles. Some transit stops are not located near crosswalks, requiring pedestrians to travel out-of-direction to reach a marked crosswalk or cross at locations without a marked crosswalk to access a bus stop. Frequent curb cuts for access to commercial properties further reduce pedestrian comfort and safety.

There are no bicycle facilities along N Wenatchee Avenue. The nearest bikeway is the Apple Capitol Loop Trail that is located approximately 0.1 miles east of the corridor, on the east side of the BNSF railroad corridor. There are bicycle lanes running east-west on Maple Street, Maiden Lane (west of Stella Avenue) and on segments of Walnut Street. The 2018 *Wenatchee Valley Bicycle Master Plan* called for further analysis of N Wenatchee Avenue without proposing a particular treatment for bicycles. However, the City has begun evaluating a route identified by previous planning studies that would create a pathway along a separate alignment extending from the Wenatchee River bridge to Walnut Street along the west side of N Wenatchee Avenue.



Apple Capitol Loop Trail, looking south

Intersection Operations

KPG analyzed the PM peak hour intersection operations using Synchro 10 traffic operation modeling and analysis software. The Synchro model includes lane geometry, turning vehicle volumes, and signal timing and phasing information that provides a detailed analysis of intersection operating conditions. This model also allows traffic operations along the corridor to be simulated using SimTraffic software, a micro simulation model and an extended feature of Synchro. The traffic operations model was calibrated to match intersection delays and queue lengths observed in the field.

Synchro was used to calculate intersection delay and level of service (LOS). The intersection level of service (LOS) ranges from A to F, with LOS A assigned when minimal delays are present and LOS F when lengthy delays occur. **Table 1** shows the LOS criteria for signalized and stop controlled intersections.

Table 1. LOS Criteria for Intersections

Level of Service	Signalized Intersections Average Delay per Vehicle (seconds)	Stop-Sign Controlled Intersections Average Delay per Vehicle (seconds)
A	0 to 10	0 to 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	> 80	> 50

2010 Highway Capacity Manual.

The study analyzes the PM peak hour, typically between 4:30-5:30 PM, when traffic volumes are highest along N Wenatchee Avenue. **Table 2** shows the existing PM peak hour intersection LOS and delay in seconds at six intersections along N Wenatchee Avenue. During the PM peak hour, two intersections operate at LOS E. The intersection at Horse Lake Road is frequently congested, resulting in southbound queues that back up onto the Wenatchee River Bridge. The close spacing between the Horse Lake Road and Maiden Lane signals causes the queue from one intersection to affect the adjacent intersection. The stop-sign controlled intersection at McKittrick Street operates at LOS E and has long delays for vehicles turning left on to N Wenatchee Avenue.

Table 2. Existing PM Peak Hour LOS and Delay (Seconds)

Intersection	Intersection Control	Existing LOS (Delay)
Horse Lake Road	Signal	E (57)
Maiden Lane	Signal	D (46)
Walnut Street-Hawley Street	Signal	D (38)
McKittrick Street	Stop Sign	E (47)*
Maple Street	Signal	D (39)
Miller Street	Signal	B (14)

Highway Capacity Manual, 6th Edition. *Stop Control Delay is reported for the worst approach to the intersection.

Travel Times

Travel times provide an easy way to understand corridor operations. Components of travel time include distance, travel speeds and the delay experienced at intersections. Travel times vary depending on a variety of factors including vehicle volumes, signal timing, turning movements, and bus operations. Travel times were collected in the field on January 30, 2018 during the PM peak hour for the 1.3 mile study corridor (from the Wenatchee River Bridge to Miller Street). Travel times were found to be between 4 and 6 minutes traveling southbound and between 4 and 5 minutes traveling northbound. Travel times can vary and backups can frequently extend across the Wenatchee River Bridge into the US 2/SR 285 interchange. During off-peak hours, the travel time are less than 4 minutes in either direction.

Collision History

There were 290 reported collisions resulting in 124 injuries along N Wenatchee Avenue between Horse Lake Road and Miller Street during the five-year period between November 1, 2012 and October 31, 2017. The Maiden Lane intersection experienced the highest number of collisions with 43 during the 5-year period; mainly rear-end collisions. Other high collision intersections include Maple Street (40 collisions) and Horse Lake Road (32 collisions).

The street segment with the highest number of collisions is between Maiden Lane and Walnut Street-Hawley Street, where 65 collisions occurred. Thirty of these collisions were related to drivers making left turns onto or off of N Wenatchee Avenue from adjacent driveways. There are a number of businesses along this segment, including EZ's, Starbucks, Claudio's and Wendy's that generate high volumes of turning vehicles throughout the day. **Figure 3** illustrates the distribution of reported collisions along the corridor.

Figure 3. N Wenatchee Avenue Five-Year Collision History (11/1/2012 to 10/31/2017)



Future 2040 Forecasts

The CDTC updated its 2040 PM peak hour travel demand model in 2018. This model uses traffic counts, roadway characteristics and land use assumptions to forecast future traffic volumes throughout the region. The updated model reflects the latest data and assumptions for the region and provides new forecasts.

The CDTC provided two separate model runs: 2040 Baseline conditions without Confluence Parkway and 2040 with Confluence Parkway.

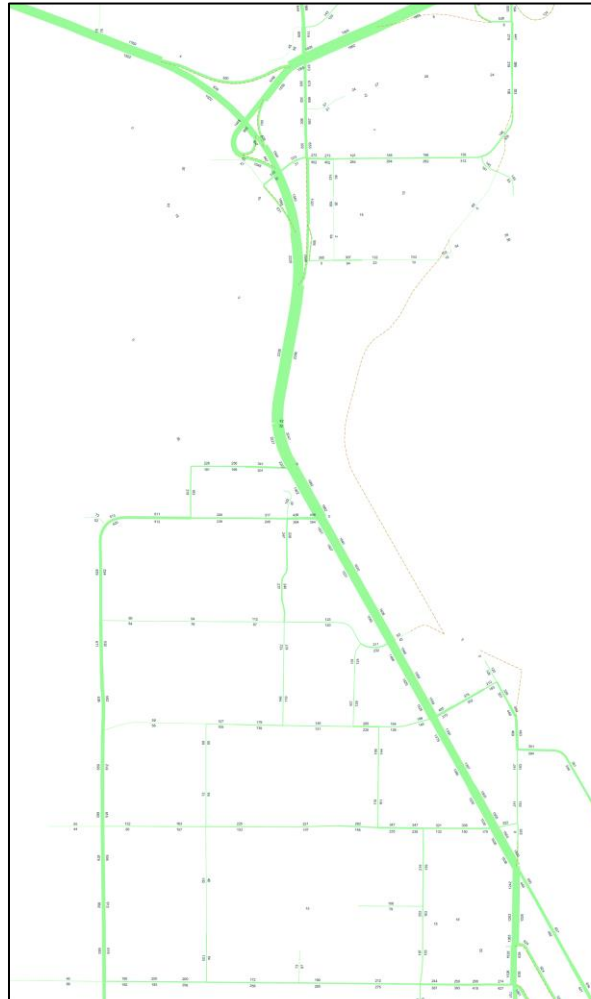
Figure 4 shows an example of the output from the CDTC model. The street network in the model runs include:

- 2040 Baseline: Completion of McKittrick Street rail undercrossing and closure of the rail crossing at Hawley Avenue.
- 2040 with Confluence Parkway: Completion of Confluence Parkway, McKittrick Street rail undercrossing, Miller Avenue rail undercrossing, and elimination of the rail crossing at Hawley Avenue.

The model indicates that with the addition of Confluence Parkway, approximately 1,600 peak hour vehicles would use Confluence Parkway, including a shift of approximately 900 vehicles from N Wenatchee Avenue.

The 2040 Baseline forecast was used to create a 2040 Synchro traffic operations model of the N Wenatchee Avenue corridor. This model was used to identify and refine the recommended corridor improvements for N Wenatchee Avenue. The 2040 with Confluence Parkway forecast was used to show how the addition of Confluence Parkway would affect the N Wenatchee Avenue corridor.

Figure 4. 2040 Forecast Model of N Wenatchee Avenue



2040 Baseline Conditions

The 2040 Baseline alternative reflects the forecasted traffic on N Wenatchee Avenue without new capacity improvements or the completion of Confluence Parkway. The CDTC’s 2040 Baseline model assumes completion of the McKittrick Street extension and rail undercrossing, closure of the Hawley Street at-grade rail crossing, and assumed levels of new property development along McKittrick Street.

Vehicle Volumes

Forecasts by the Chelan-Douglas Transportation Council show that vehicle volumes are expected to increase by 15 to 20 percent along the N Wenatchee Avenue corridor by 2040.

Intersection Operations

Traffic operations will continue to degrade along the corridor, with the Horse Lake Road intersection operating at LOS F and the Maiden Lane intersection operating at LOS E during 2040 PM peak hour. The intersection operation improvement at Walnut Street-Hawley Street is due to traffic shifts caused by the addition of the McKittrick Street signal and closure of the railroad crossing on Hawley Street. Table 3 summarizes the existing and 2040 Baseline intersection operations along the study corridor.

Table 3. Existing and 2040 Baseline PM Peak Hour LOS and Delay (Seconds)

Intersection	Intersection Control	Existing LOS (Delay)	2040 Baseline LOS (Delay)
Horse Lake Road	Signal	E (57)	F (87)
Maiden Lane	Signal	D (46)	E (63)
Walnut Street-Hawley Street	Signal	D (38)	C (28)
McKittrick Street	Signal	E (47)*	D (44)
Maple Street	Signal	D (39)	D (45)
Miller Street	Signal	B (14)	C (23)

Highway Capacity Manual, 6th Edition. *Stop Control Delay is reported for the worst approach to the intersection.

Transit Operations

Link Transit is expecting continued growth in transit ridership and operations. The frequency of local bus service along N Wenatchee Avenue is expected to increase, as are regional bus routes serving destinations throughout the service area. The agency’s future success is dependent on providing a high-quality transit experience that includes reliable travel times, frequent service and schedule adherence. Under 2040 Baseline Conditions, corridor delays at intersections are expected to increase transit travel times for both local and regional routes.

Non-Motorized Mobility

Under 2040 Baseline Conditions, the pedestrian and bicycle facilities would remain similar to today with 5 to 6-foot wide sidewalks on both sides of the street. The planned signal at McKittrick Street will include crosswalks on all legs, and will provide a new crossing location along N Wenatchee Avenue. Bicycle facilities are not planned along N Wenatchee Avenue under 2040 Baseline Conditions.

Improvement Strategies

KPG developed a set of transportation improvements that could be applied to the N Wenatchee Avenue corridor to address the existing issues and meet future mobility needs. Strategies include improvements to streets, intersections, transit, and non-motorized facilities and implementation of intelligent transportation systems (ITS).

Street Elements

Street elements primarily address safety and access issues along the corridor. Below are strategies that are applicable to the N Wenatchee Avenue corridor.

Access Management

Access management consists of different strategies that reduce delays caused by vehicle movements to and from side streets and driveways. Potential strategies include reducing the frequency of driveways, consolidating driveways, and prioritizing access to properties from side streets rather than directly from N Wenatchee Avenue.

Medians and U-Turn Locations

Uncontrolled left turns have resulted in a numerous collisions along N Wenatchee Avenue. Much of the existing corridor along N Wenatchee Avenue has a two-way left turn lane that vehicles use to access driveways and minor side streets. Using medians and designated U-turn locations, either at an intersection or at a mid-block location, can serve to consolidate turn locations and reduce left turn conflicts. These medians can be landscaped to provide visual interest and add a green dimension to the corridor. Signals or pedestrian beacons at mid-block U-turn locations can also provide an opportunity for additional pedestrian crossing locations along the corridor.

Intersection Elements

From a traffic operations standpoint, N Wenatchee Avenue has inadequate capacity at its north end to serve both the through traffic and the high levels of cross traffic. Elements applied to the corridor intersections include:

Signal Simplification

Reducing the number of phases allows more of a traffic signal's green time to serve its major movements. Typically, this strategy would seek to identify if there are low-volume movements that could possibly be served at a nearby intersection, thereby eliminating a signal phase.

Protected Left Turn Movements

Locations with high numbers of left turn movements may require a protected left turn phase to avoid long queues that may cause congestion and delay at an intersection. A fully-protected left turn phase or a protected-permissive phase at a signal can reduce this type of delay. Analysis of left turn volumes and overall intersection traffic operations can identify whether providing a protected left turn phase may reduce overall delays.

Signal Coordination

Currently, the signals between Horse Lake Road and Walnut Street-Hawley Street are coordinated, but these signals are not coordinated with the signals to the south of Maple Street and do not run on the same cycle length. With the addition of the McKittrick Street signal, it may be possible to coordinate the signals along the entire length of N Wenatchee Avenue. Improving coordination can allow a platoon of cars to travel along the corridor with fewer delays. Typically, signal coordination is easiest to establish in one direction, but analysis using a traffic model can optimize the corridor's operation and improve travel times in both directions.

Intelligent Transportation Systems (ITS) Elements

Intelligent Transportation Systems (ITS) are comprised of interrelated operational, communication, data collection, and infrastructure design components that work together to improve the efficiency and reliability of the transportation network. The N Wenatchee Avenue project will include several ITS improvements to maximize the existing corridor capacity and make traffic more predictable. ITS components are tailored to address specific transportation issues and include elements such as upgraded traffic signal controllers, red light photo enforcement, traffic cameras to view current conditions, incident management and rerouting, dissemination of traveler information, parking availability signs, and transit-priority strategies. While ITS is normally applied at a regional or subregional level, some ITS strategies for possible implementation for the N Wenatchee Avenue corridor are described below.

Data Capture and Management (DCM) – An important component of ITS strategies is the collection of real-time data. Information including automatic vehicle identifiers (transit); radar, video and loop detectors (vehicle speed, counts); cameras; and mobile device and bluetooth readers that can be used to provide travel information, allow responses to incidents or events, and reviewed for corridor analysis.

Adaptive Signal Control – This technology allows intersection signals to automatically adjust signal timing throughout the day to maximize efficiency and to meet unexpected demands that occur such as special events. These specialized controllers can improve traffic operations and reduce delay.

Dynamic Messaging Signs – Installation of messaging signs could allow for incident management, to notify drivers of delays ahead, and of possible travel time savings from alternative routes.

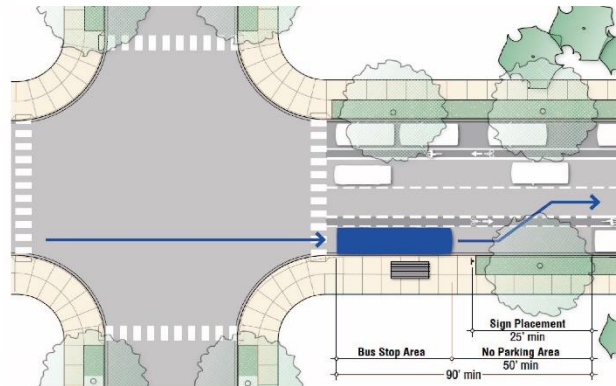
Decision Support System (DSS) – This technology can use real-time analysis of traffic conditions to recommend appropriate response plans. For example, it can be used to notify drivers of delays using dynamic messaging signs or providing driver online information or alerts when a traffic incident occurs. Signs to the north and the south of the city could be installed to show the relative travel times between SR 285 and SR 28, and in the future, when Confluence Parkway is constructed, DSS technologies could inform drivers between N Wenatchee Avenue and Confluence Parkway.

Transit Elements

Link Transit is looking at a number of new strategies to improve traffic operations along N Wenatchee Avenue to accommodate future growth in transit operations. Link Transit is considering plans to add pre-boarding bus fare payment systems, improved bus stop design, and automatic vehicle location and identification technologies to its fleet to improve corridor transit operations and efficiency and allow for real-time arrival information. The following describes some of the transit-related improvement that can be applied to the N Wenatchee Avenue corridor to provide an operational advantage for transit.

Transit Bypass Lanes

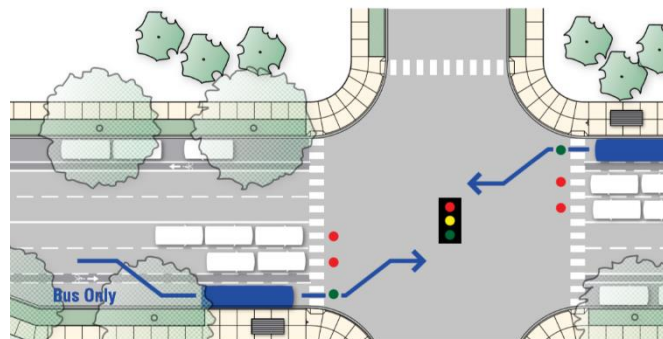
Transit bypass lanes allow buses to travel through an intersection on the green interval using a dedicated bus lane or transit/right turn lane and bypass intersection queues (buses are allowed to travel straight from the right turn lane). Transit stops are normally located on the far side of the intersection when using bypass lanes. Bypass lanes require widening of the roadway for buses on the far-side of the intersection and creating a shared transit/right turn lane on the near-side if a dedicated right turn lane does not exist. Transit bypass lanes do not require special vehicle or signal equipment, but the travel time savings can be dependent on the volume of right turning traffic in a shared transit/right turn lane. Transit bypass lanes can be used alone or can incorporate the queue jump and transit signal priority strategies, described below.



Source: Modified from Pace Transit Design Guidelines

Queue Jumps

Queue jumps are a similar concept to transit bypass lanes where buses bypass queues by traveling in the right turn lane or a dedicated bus lane, but adds a special bus signal to allow buses to pull ahead of traffic. With this treatment, transit stops are usually located on the near side of the intersection, and far-side widening of the roadway for bus stops is not required. Queue jumps work best at intersections where there are low right-turn volumes or where a dedicated bus lane can be constructed approaching the intersection. In some cases, right turn overlap signals can be used to clear out right turning vehicles queued in front of a bus.



Source: Pace Transit Design Guidelines

Queue jumps can also be used at signalized intersections between bus stop locations to allow buses to bypass congestion. Buses are typically equipped with special technology to notify the signal controller device to trigger a queue jump signal phase. Where right turn volumes are

high, queue jumps may only offer small travel time savings to transit and may cause large delays to right-turning vehicles, which may be tempted to drive around a near-side stopped bus, creating a potential safety issue.

Bus Merge Signal or Red Hold Phase

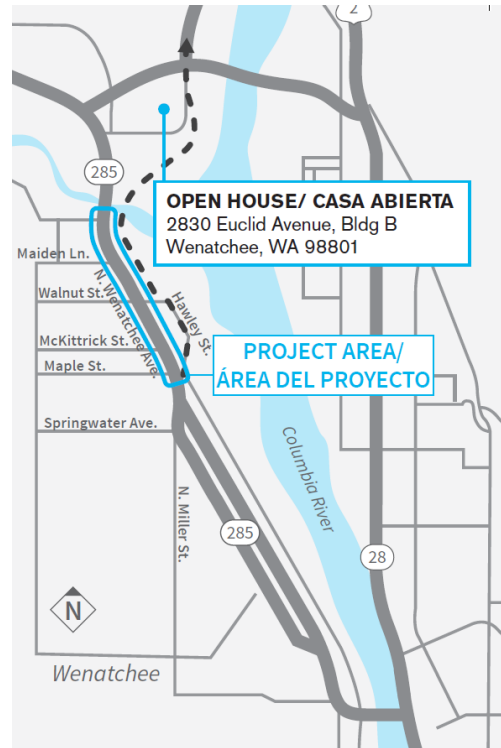
Under state law (RCW 46.61.220), buses have the right of way when merging back into traffic, and usually buses can maneuver back into the flow of traffic without the aid of a signal. On congested corridors, where there is limited space for bus acceleration, or where driver compliance with bus merging is an issue, a bus merge signal or “red hold” phase assists a bus using a far-side stop to merge back into traffic. A bus merge phase works similarly to a queue jump, giving buses a “head start” before traffic traveling in the same direction. Red hold phases provide a similar benefit by extending the all-red phase and allowing buses an opportunity to merge prior to the next signal phase. These changes in the signal phasing would be tied to a non-conflicting signal phase and may require restrictions to right turns on red on the adjacent side street. Application of these strategies are within the capabilities of most modern traffic signal controllers, but are typically only applied where there are bus merging issues.

Transit Signal Priority (TSP)

TSP modifies the signal timing at an intersection to provide preference to transit operations. This ITS strategy can make bus operations more reliable and improve travel times by as much as 15 percent. However, the implementation of TSP can be complicated because of the need to balance competing transit and traffic demands. The most common method is to extend the green interval at a signal to allow an approaching bus to get through the signal prior to the signal change. The additional green time required for TSP is typically taken from the green times for side street phases. In systems with TSP, bus stops are typically located on the far side to maximize the benefits of the extended green interval. Buses are equipped with technology to communicate with specialized signal controller systems at the intersections. Options include using TSP for schedule adherence only, where the TSP phase is given only to vehicles that are running behind schedule.

Public Involvement

A public involvement process was conducted to gather input on the corridor and identify community priorities and concerns. Actions included meetings with property owners, an online open house, a survey, and a workshop held on November 14, 2018 that had 118 community members in attendance. This effort included extensive outreach to the Spanish-speaking community through flyers, social media, newspapers, and radio. In total, the online open house had more than 2,300 visits and 766 surveys were completed either online or at the workshop. Results of the survey showed that the highest priority was to reduce congestion and improve corridor safety. A majority of respondents also prioritized improving business access, pedestrian facilities, and the visual appearance of the roadway. Only about half of the respondents felt that bicycle facilities were an important priority for the corridor.



Recommended Improvements

Based on analysis of the data and community input, KPG developed a set of preliminary recommended improvements along the N Wenatchee Avenue corridor to address the existing and future safety, access and mobility needs. Recommendations are focused on individual projects along the corridor that can be implemented in the near-term, are coordinated with planned future projects such as Confluence Parkway and the McKittrick Street Extension projects, and provide for flexibility to meet long-term corridor needs under multiple scenarios for the timing of other projects. Recommended improvements address traffic operations, access and safety, while providing benefits to pedestrians, transit and bicycles.

Improvements will utilize available funding from the state's Connecting Washington program, a gas-tax funded program focuses on providing safe, reliable and cost-effective solutions that improve the economic vitality and livability of communities. However, these funds are limited and will not address all recommended improvements. It is anticipated that multiple additional funding sources will be needed.

Improvements along the corridor are divided into four main segments – The North End Improvements, Walnut & Hawley Intersection, McKittrick Intersection, and Maple Intersection.

The North End Improvements are made up of several components. Improvements to the intersection of Horse Lake Road-Duncan Road, the intersection of Maiden Lane, the proposed Frontage Road, and the proposed extension of Duncan Road are focused on improving corridor congestion and safety. To the south of Maiden Lane, improvements are focused on improving safety and business access by establishing median access control and U-turns.

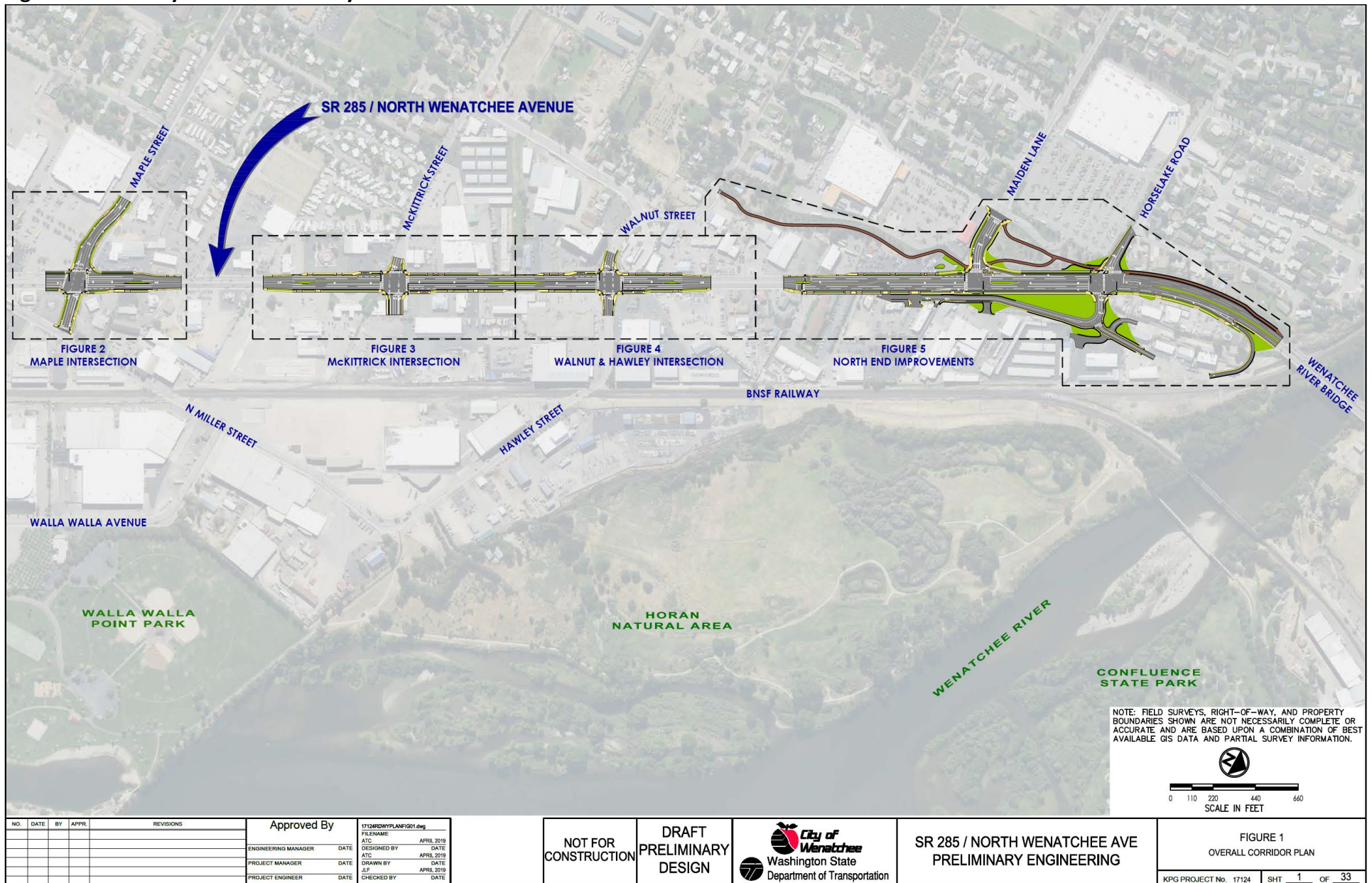
The Walnut & Hawley Street Intersection and **McKittrick Street Intersection** improvements are focused on providing median access control and limited intersection widening to accommodate far-side transit stops and U-turns. In between the intersections N Wenatchee Avenue will be maintained as a 5-lane facility and the addition of shoulders to provide emergency vehicle clearances where solid medians are proposed.

The Maple Street Intersection improvements, along with the improvements at the Miller Street intersection, are tied to the future design of Confluence Parkway. The recommendations in this report provide near-term improvements at the Maple Street intersection that address existing transportation needs. These near-term improvements may need to be refined as the design of Confluence Parkway progresses, to maintain compatibility with the long-term design for the intersection.

Figure 5 provides an overview of the improvements. **Appendix A** includes the preliminary recommended design for each segment along the corridor.

The following describes the recommended improvements for each segment of the corridor and the individual intersections within the segment.

Figure 5. Summary of the Preliminary Recommendations for the N Wenatchee Avenue Corridor



North End Improvements

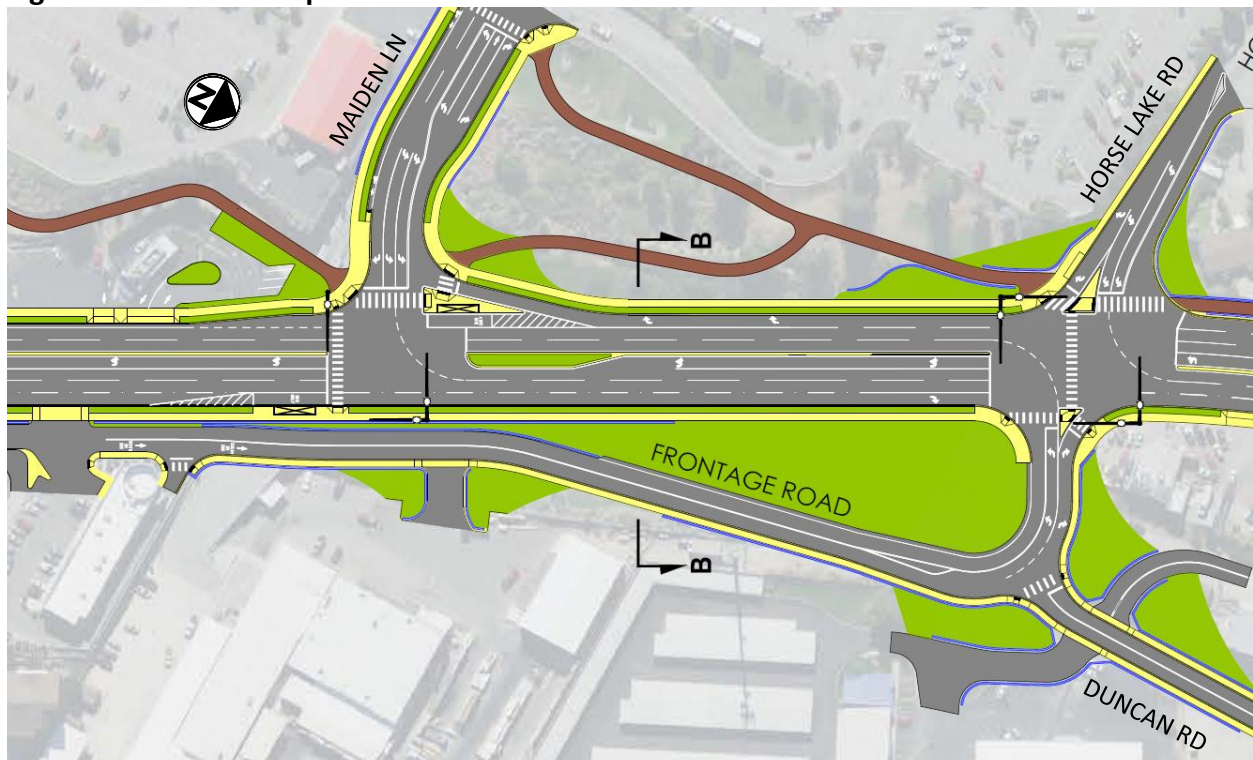
The north end improvements run from the Wenatchee River Bridge to near the La Quinta Inn & Suites and includes major changes at the Horse Lake Road/Duncan Road and Maiden Lane intersections.

Wenatchee River Bridge and Horse Lake Road/Duncan Road Segment

Improvements will add a northbound right turn lane and new roadway extension to the north end of Duncan Road to provide access to businesses located east of N Wenatchee Avenue and to provide a northbound transit bypass lane at the Horse Lake Road intersection.

Improvements to this segment will also construct access control using medians and implement U-turn locations. **Figure 6** details the North End improvements for the corridor.

Figure 6. North End Improvements – Maiden Lane and Horse Lake Road-Duncan Road



Horse Lake Road Intersection

The east leg of the intersection is revised as part of a new frontage/circulation roadway that would run along the east side of N Wenatchee Avenue between Duncan Road and Maiden Lane, providing new access to Marson & Marson's Lumber, Starbucks, and other businesses. To simplify traffic operations, the intersection is constructed without eastbound and westbound through movements in order to allow simultaneous eastbound and westbound left turn movements. A single east-west crosswalk between the islands formed to channelize the east-west turning movements provides for a protected pedestrian crossing that will operate during the eastbound-westbound left turn phases. The northbound right turn lane at Horse Lake Road

is extended south through Maiden Lane to provide a continuous northbound transit bypass lane.

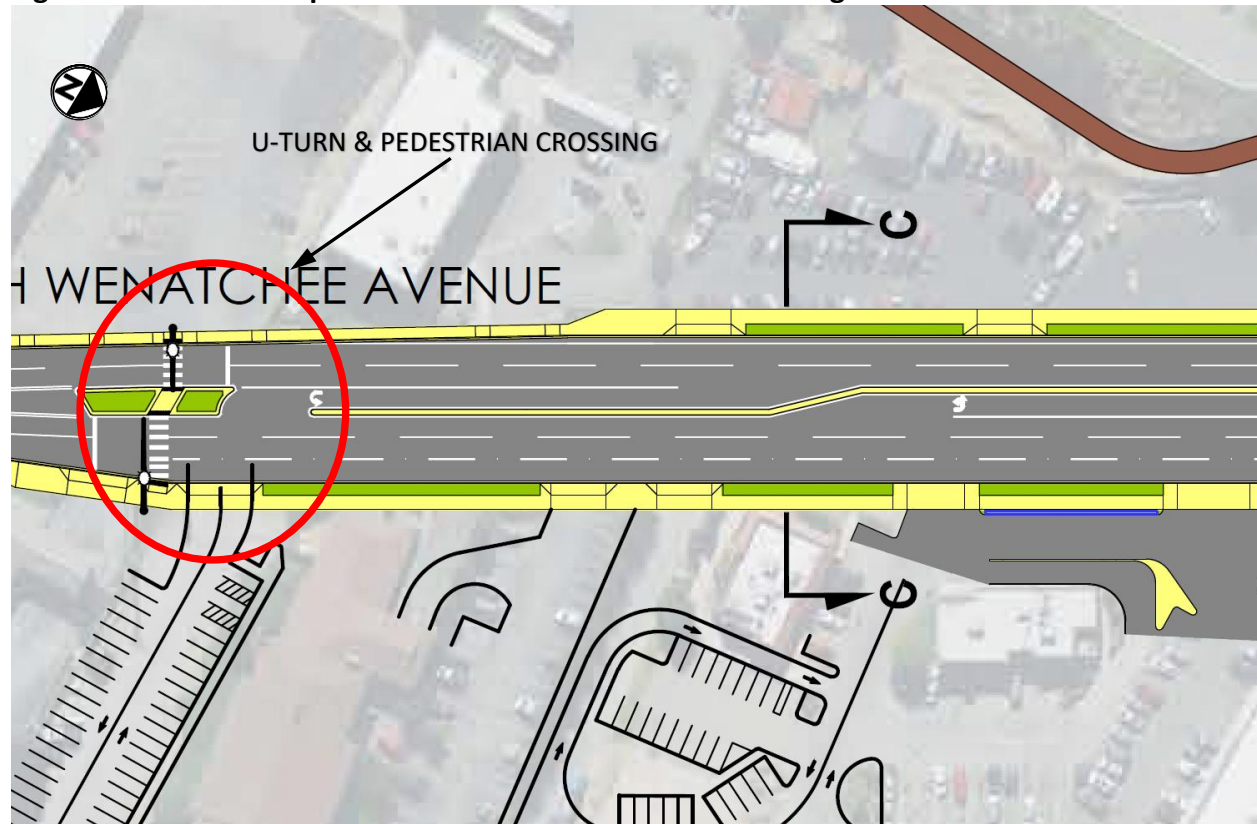
Maiden Lane Intersection

The east leg of the intersection is eliminated by the proposed frontage road to Duncan Road, allowing for simpler signal phasing. A southbound receiving lane is added to create a bus bypass lane and to allow for northbound U-turn movements. To control access, a center median is added to the south of the intersection. The eastbound approach is striped with dual left turn lanes. The bus stop is relocated to the island formed by the southbound right turn lane. A signalized transit queue jump could be provided at the intersection for southbound buses.

South of Maiden Lane Segment

Because of the history of collisions along this segment, a center median will be constructed along the northern portion of the segment, with U-turns allowed at adjacent intersections. Approximately halfway between Maiden Lane and Walnut Street-Hawley Street (near La Quinta Inn & Suites), a midblock signal or HAWK-controlled crosswalk is recommended to provide an additional pedestrian crossing along this segment. This location also includes a turn pocket for southbound U-turn movements and could be converted to a future signal as the corridor develops. The southern portion of this segment would remain as a 5-lane section with a median two-way-left turn lane for access to properties. **Figure 7** shows the recommended improvements for the segment to the south of Maiden Lane.

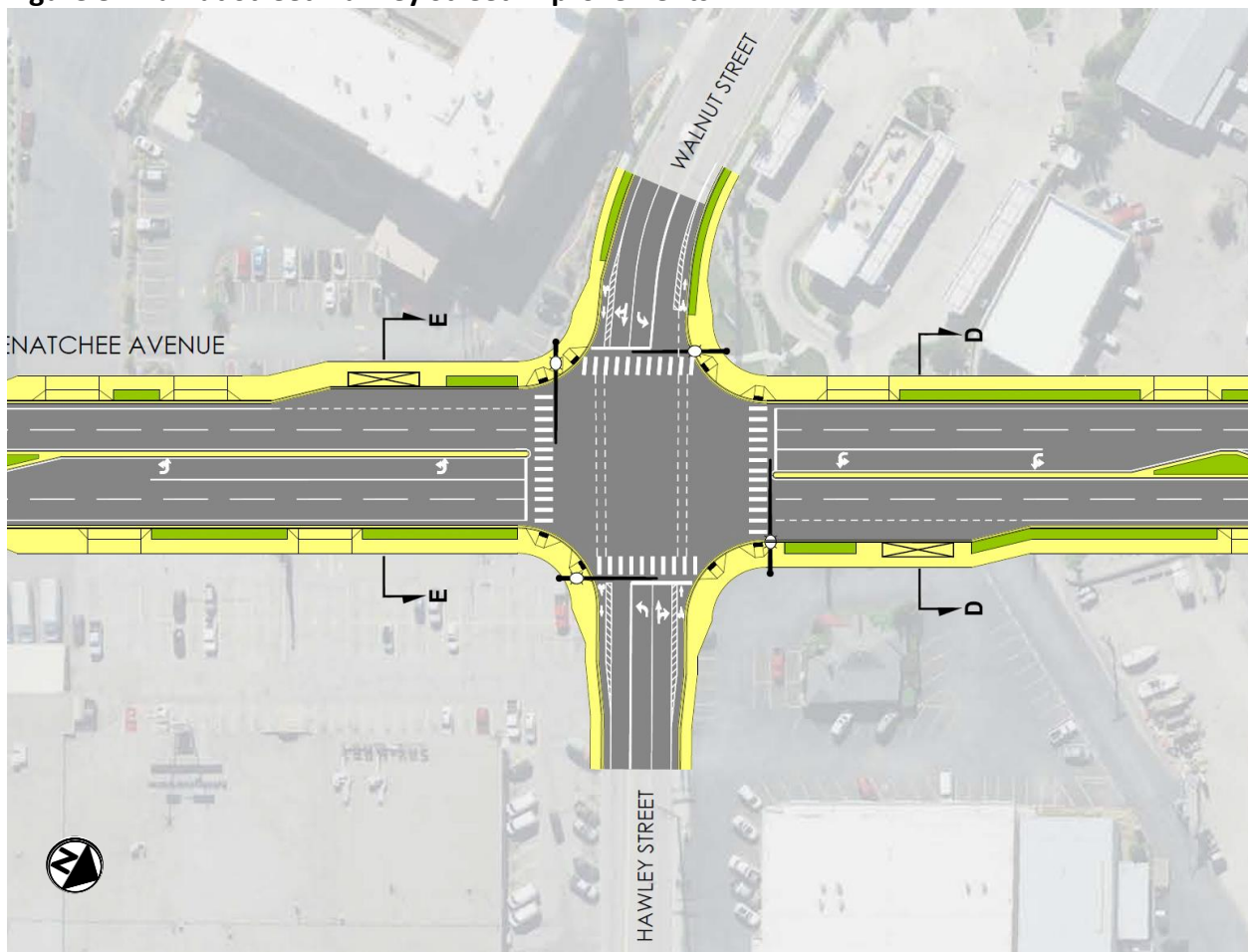
Figure 7. North End Improvements – South of Maiden Lane Segment



Walnut Street-Hawley Street Intersection Improvements

The recommended improvements changes the eastbound (Walnut Street) and westbound (Hawley Street) channelization to having dedicated left turn lanes and shared through-right turn movements. For the northbound and southbound approaches on N Wenatchee Avenue, new receiving lanes for northbound and southbound will be added to accommodate northbound and southbound U-turns at the intersection. These new receiving lanes will be sized to accommodate far-side bus stops. A bus merge phase may be included at the signal, so that buses can initiate a 1-2 second red hold during a signal phase change to facilitate bus merging onto N Wenatchee Avenue. **Figure 8** shows the Walnut Street-Hawley Street Improvements.

Figure 8. Walnut Street-Hawley Street Improvements

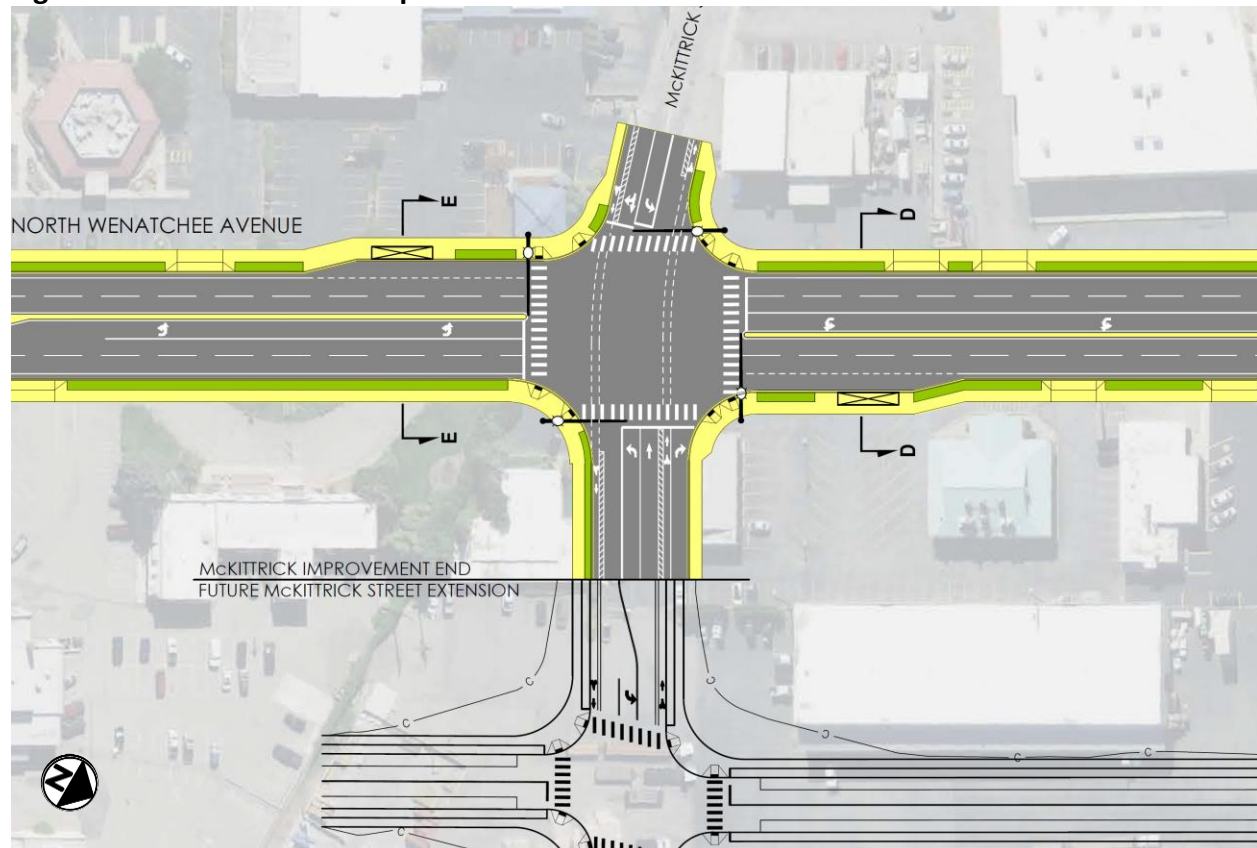


McKittrick Street Improvements

A new signal is planned for the McKittrick Street intersection and will be constructed as an independent project by the City. Using a phased approach, McKittrick Street will be constructed as smaller intersection until the street is extended under the BNSF tracks. The westbound and eastbound approaches will have a dedicated left turn lane and a combined lane for through and right movements. Northbound and southbound will have dedicated left turn lanes and receiving lanes to accommodate U-turn movements and to provide a far-side bus stops at the intersection. To the south of the intersection, this segment is kept as a 5-lane section with a median two-way left-turn lane for access to properties and left turn lanes at intersections. ITS strategies could include a red hold phase at the intersection to facilitate bus merging back into the traffic flow on N Wenatchee Avenue.

With the extension of McKittrick Street under the BNSF tracks and the closure of the Hawley Street crossing, the 2040 forecasts indicate that a dedicated westbound right turn lane may be needed. The City has decided to take a phased approach to this intersection because of the need to design, fund and approve the undercrossing may take a number of years. The timing of the completion of Confluence Parkway and the level of redevelopment in the area may also dictate whether the westbound right turn lane will be required. **Figure 9** shows the McKittrick Street improvements with the westbound right turn lane.

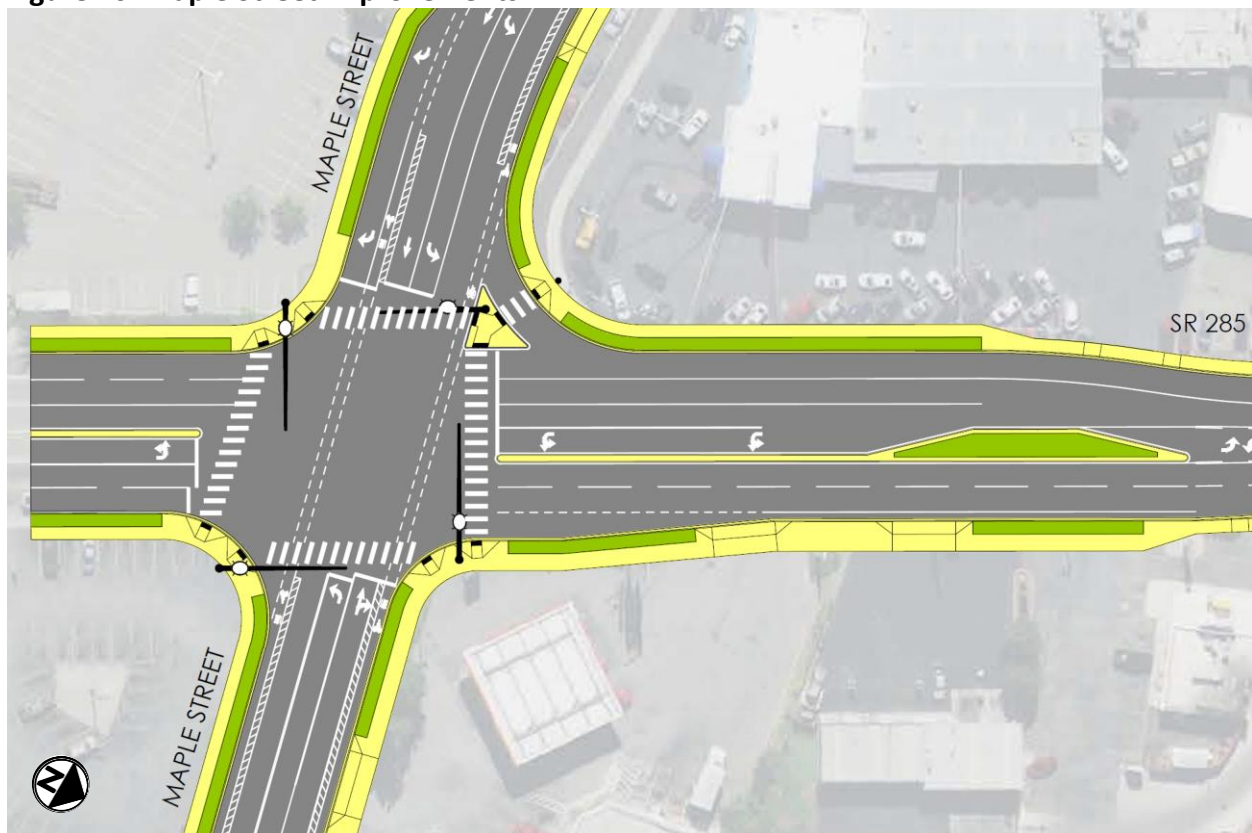
Figure 9. McKittrick Street Improvements



Maple Street Intersection Improvements

The Confluence Parkway project will establish the future design for the Maple Street intersection. The recommended near-term improvements include realigning the west leg and adding a 125-foot dedicated eastbound right turn lane. Eastbound and westbound bike lanes would also be added through the intersection. Left turn phasing on the eastbound and westbound approaches would be upgraded to flashing yellow arrow (protected and permissive) left turn phasing. The northeast corner would also be revised to improve the turning radius for westbound transit vehicles turning to the north from Maple Street (buses stop on Maple Street) and to provide a width to accommodate southbound U-turn movements. **Figure 10** shows the near-term improvements proposed for Maple Street.

Figure 10. Maple Street Improvements



Miller Street Intersection Improvements

The Confluence Parkway project will establish the future design of the Miller Street intersection. As part of the N Wenatchee Avenue project, several roadway and intersection configurations were developed and analyzed including a number of different roundabouts, reconfigured streets, redirected traffic flows and revised signal timing plans. This information will be used to inform the design of the intersection during the development of Confluence Parkway. No near-term changes are recommended at Miller Street as part of the N Wenatchee Avenue project.

Transit Improvements

Most of the intersection improvements will also improve transit operations and travel times along the corridor. Many of these improvements will serve multiple functions, such as the added receiving lanes allow for buses to bypass queues, provide space for far-side transit stops and accommodate U-turn movements. Other improvements such as added pedestrian crosswalks and the new signal at McKittrick Street will reduce the distance between crosswalks and improve access to bus stops for transit passengers.

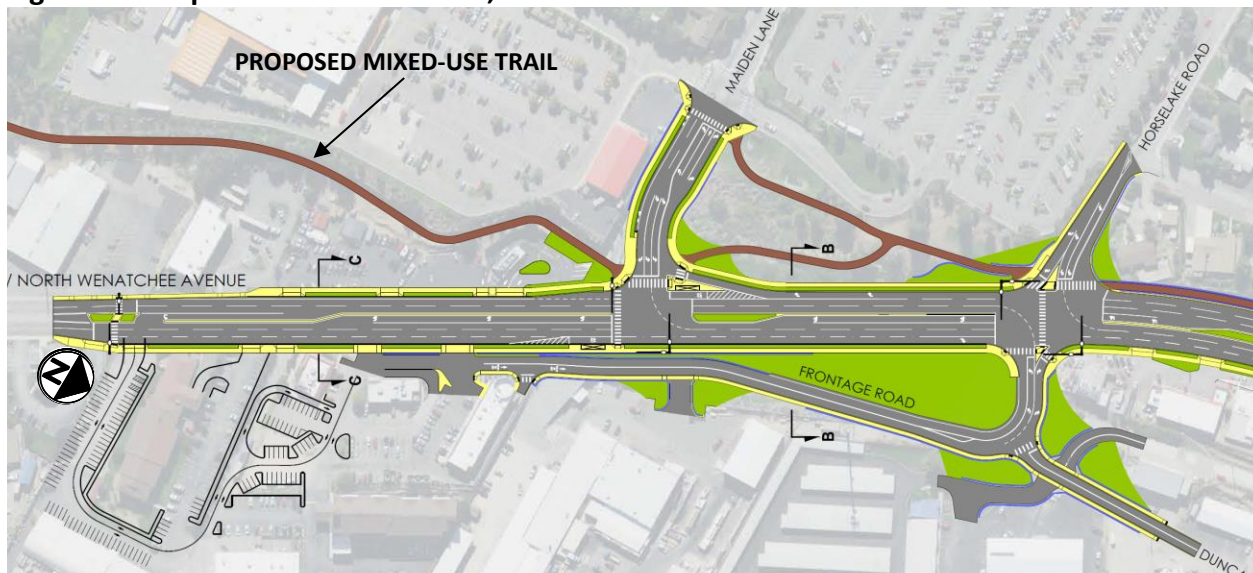
Non-Motorized Improvements

The general design for N Wenatchee Avenue calls for 8'-wide continuous sidewalks with 6'-wide landscaped buffers on both sides of the roadway. Some sidewalk sections will include transitions that tie back into the portions of the corridor where improvements are not being made as part of this project or to avoid impacts to existing structures.

The recommended improvements include the addition of signalized pedestrian crosswalks to reduce the distance between pedestrian crossing locations. New crosswalks will include the north leg of the Walnut Street-Hawley Street intersection, all legs of the new McKittrick Street signal, the north leg of the Maple Street intersection, and a new mid-block location between Maiden Lane and Walnut Street-Hawley Street.

Bicycle facilities are not planned on N Wenatchee Avenue. However, a 12'-wide mixed-use pathway is envisioned that will connect between the Wenatchee River Bridge and the existing lanes on Walnut Street. This new pathway will be constructed along an existing utility corridor with at-grade crossings at Maiden Lane and Horse Lake Road. In addition, WSDOT is exploring if the west bridge span across the Wenatchee River can be modified to provide an improved non-motorized crossing on the existing bridge. **Figure 11** shows the proposed alignment of the trail connection.

Figure 11. Proposed Mixed-Use Trail, West of N Wenatchee Avenue



2040 Future Conditions with Recommended Improvements

The recommended design addresses many of the corridor’s existing issues and provides flexibility in its design to accommodate future projects such as the McKittrick Street Extension and Confluence Parkway. This section describes the 2040 traffic operations with the completion of the recommended improvements.

Intersection Operations

Traffic operations are expected to improve at intersections with the addition of the recommended improvements. At the Horse Lake, Maiden Lane and Maple Street intersections, the addition of more efficient signal phasing and channelization will improve operations. Some minor degradation in traffic operations is anticipated at the Walnut Street and McKittrick Street intersections due to the addition of U-turns at the signals. **Table 4** summarizes the 2040 PM peak hour operations for Baseline conditions and with the recommended improvements.

Table 4. 2040 PM Peak Hour LOS and Delay (Seconds) for Baseline and with Recommended Improvements

Intersection	2040 Intersection Control	2040 Baseline Conditions LOS (Delay)	2040 With Recommended Improvements LOS (Delay)
Horse Lake Road	Signal	F (87)	E (57)
Maiden Lane	Signal	E (63)	C (28)
Walnut Street-Hawley Street	Signal	C (28)	C (34)
McKittrick Street	Signal	D (44)	D (48)
Maple Street	Signal	D (45)	D (35)
Miller Street	Signal	C (23)	C (23)

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Travel Time Analysis

Using traffic modeling software, travel times were modeled for northbound and southbound traffic lanes for 2018 existing conditions, 2040 baseline conditions and 2040 with recommended improvements. Transit travel times were modeled to show the benefits of the transit-related corridor improvements. **Table 5** shows the PM peak hour travel times for each scenario.

Table 5. Existing and 2040 PM Peak Hour Travel Times (Minutes)

Direction	2018	2040 Baseline	2040 With Recommended Improvements
Northbound General Purpose	4.7	5.9	4.7
Southbound General Purpose	4.8	6.5	5.7
Northbound Transit	4.7	5.9	4.0
Southbound Transit	4.8	6.5	5.3

*Transit travel time does not include dwell times at bus stops.

For 2040 baseline conditions, without any corridor improvements, the model forecasts a 5.9 minute northbound travel time from (but excluding) Miller Street through the Horse Lake Road intersection. Travel in the southbound direction will take 6.5 minutes. With the recommended intersection and transit improvements to N Wenatchee Avenue (described above), these travel times are reduced to 4.7 minutes for northbound travel and 5.7 minutes southbound travel, for total savings of 1.2 minutes and 0.8 minutes, respectively.

The recommended improvements along the corridor were also intended to benefit transit speed and reliability. Transit stops would generally be relocated to the far-side of intersections, locating bus stops out of the flow of traffic and allowing buses to bypass queues at intersections with right turn lanes. As proposed, 2040 transit travel times would be reduced to 4.0 minutes in the northbound direction and 5.3 minutes in the southbound direction. A total time savings of 1.8 minutes northbound and 1.2 minutes southbound is expected with the improvements. Transit travel times do not include dwell times, the spent at a stop for passenger boarding and alighting.

2040 Future Conditions with Confluence Parkway

The construction of Confluence Parkway will provide additional roadway capacity and travel route options that will benefit vehicle, transit, and non-motorized travelers on N Wenatchee Avenue. The preliminary design for Confluence Parkway will include two travel lanes, bicycle lanes, sidewalks and landscaped planted areas. At the Wenatchee River, a new bridge will be constructed between the existing BNSF Rail Bridge and Apple Capitol Loop Trail Bridge.

Figure 12 shows the preliminary route and cross-section for the corridor.

The Confluence Parkway Project is currently undergoing an environmental review under the National Environmental Policy Act (NEPA). As part of this process, preliminary designs for Confluence Parkway will be developed for the corridor, including the potential intersection changes to the Miller Street and Maple Street intersections needed to connect N Wenatchee Avenue, SR 285, and Downtown Wenatchee at the south end to the Confluence Parkway corridor.

N Wenatchee Avenue Traffic Operations with Confluence Parkway

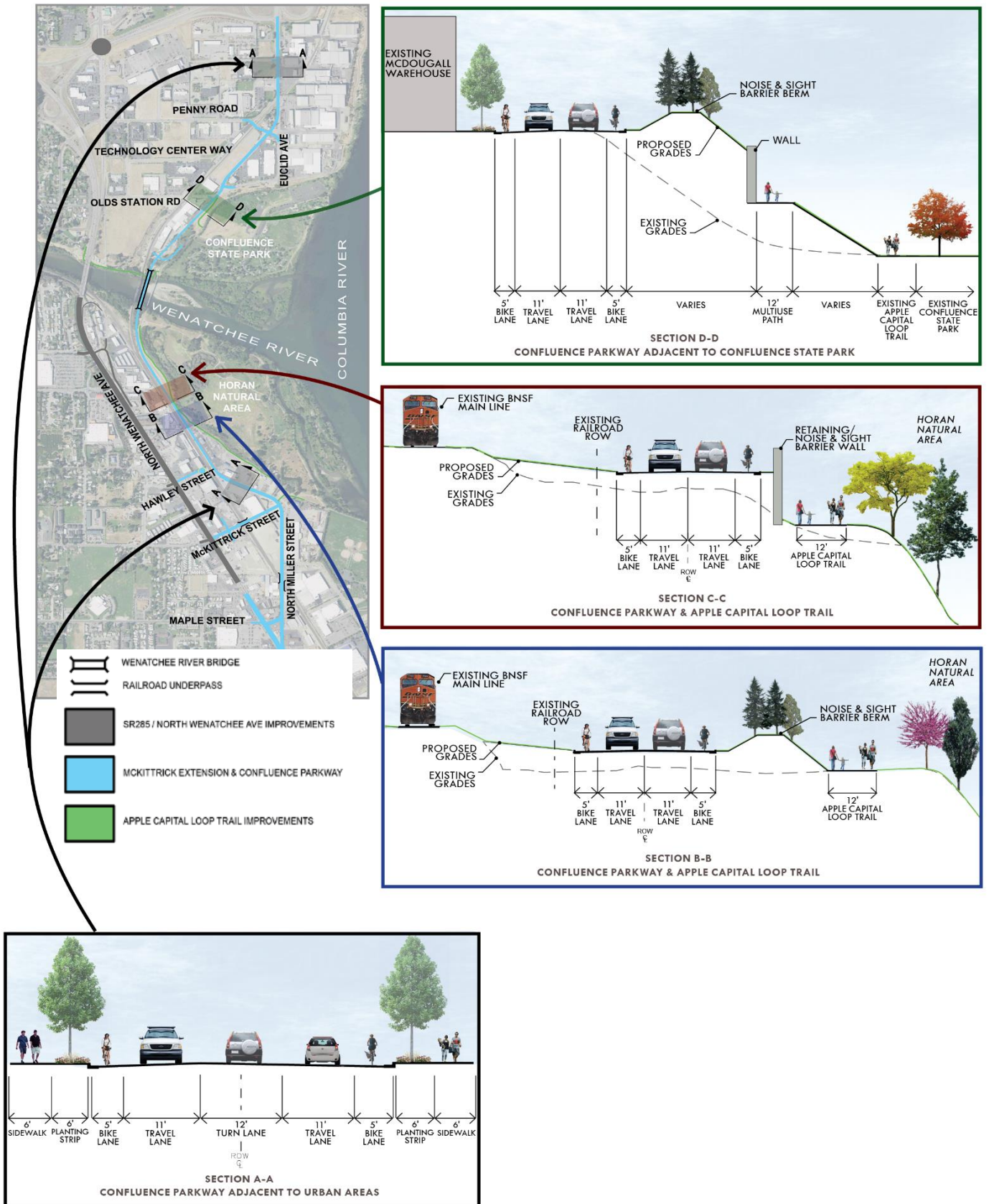
Model forecasts show that the addition of Confluence Parkway would reduce the 2040 forecasted volumes on N Wenatchee Avenue by approximately 20 percent, to a level that is similar to existing volumes. The signal improvements identified for N Wenatchee Avenue would continue to benefit area travel by providing improved operations and safety along the corridor. **Table 6** shows the 2040 traffic operations with the completion of Confluence Parkway. Traffic operations at the N Wenatchee Avenue intersections would improve as drivers are provided an alternative north-south route. The operation of the Miller Street and Maple Street intersections is not reported in the table, as the configuration of these two intersections will be determined as part of the preliminary design process for Confluence Parkway.

Table 6. 2040 LOS and Delay (seconds) with Confluence Parkway

Intersection	2040 Intersection Control	2040 With Recommended Network LOS/Delay	2040 With Confluence Parkway LOS/Delay
Horse Lake Road	Signal	E (57)	D (45)
Maiden Lane	Signal	C (28)	C (27)
Walnut Street-Hawley Street	Signal	C (34)	C (31)
McKittrick Street	Signal	D (48)	C (32)
Maple Street	Signal	D (35)	
Miller Street	Signal	C (23)	

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Figure 12. Confluence Parkway Alternative



Next Steps

This section summarizes the next steps related to the implementation of the recommended improvements for N Wenatchee Avenue.

- **SEPA/NEPA Requirements** – Complete environmental documentation consistent with SEPA and/or NEPA requirements.
- **Public Outreach** – The project will have ongoing communication to inform the public and stakeholders about the development and implementation of the recommended improvements.
- **Engineering Design** – The design for the N Wenatchee Avenue improvements will be refined as part of the design process. When ROW limits are identified, plans for ROW can be prepared and acquisition initiated. Final design and review will be conducted leading to the completion of the Plans, Specification and Estimate package.
- **Funding** – For projects of this scale, obtaining multiple funding sources will likely be required for design and construction. Funding sources typically include state contributions, federal grants and local funds, but may include contributions from developers, stakeholders and other jurisdictions. Project phasing will allow the corridor improvements to be funded and constructed over time.
- **Construction** – The project will modify intersections, widen roadway segments, and include improvements to sidewalks and ADA-compliant facilities. At the same time, signal poles and mast arms, utility and street lighting will be upgraded, stormwater systems revised and landscaping and other features added. During construction, traffic control plans and detour routes will maintain traffic movements through the corridor.

Appendix A. Preliminary Designs