

MEMORANDUM

DATE: August 21, 2015

TO: Dayna Webb, P.E., City of Oregon City

FROM: Kevin Chewuk, P.T.P., DKS Associates
Nate Schroeder, P.E., PTOE, DKS Associates

SUBJECT: Oregon City Downtown North End Transportation Improvements P15118-000

This memorandum assesses the potential capacity and safety impacts associated with reconfiguring 14th Street to one-way eastbound, and 15th Street to one-way westbound between McLoughlin Boulevard and Washington Street. Included in the following sections is an existing operating conditions analysis, a summary of the assumptions and methodologies utilized to forecast future transportation conditions, a detail of future traffic operating conditions, and a summary of design options and recommendations related to the reconfiguration of 14th and 15th Streets.

Introduction

The north end of downtown Oregon City is relatively disconnected from the neighborhoods to the east. Hindered by the steep topography that rises sharply from the downtown area to the top of the bluff, and railroad tracks bisecting the study area between Main Street and Washington Street. Access is limited to 12th, 14th and 15th Streets between McLoughlin Boulevard and Washington Street.

As currently configured, these routes provide two-way motor vehicle circulation, but lack biking facilities and continuous sidewalks. These routes serve as key walking and biking routes to surrounding destinations, including Clackamette Park, the I-205 shared-use path, Willamette River Trail, Oregon City Transit Center, and Amtrak station. The north end of downtown is also located within one of the focused household and employment growth areas of the city and region, referred to as the Oregon City Regional Center. This growth is expected to further increase the walking and biking demand through the study area.

The Oregon City Transportation System Plan (TSP) recommended safety and circulation improvements for walking, biking, and driving within the study area. This included bike lanes, sidewalk infill, and additional on-street parking stalls along 14th and 15th Streets between McLoughlin Boulevard and Washington Street, and safety enhancements at the 14th Street intersection with Main Street. This memo evaluates alternative configurations of 14th and 15th Streets, including converting them to one-way streets, as a means of addressing the safety and circulation needs identified along these streets.

Study Area

The study area (shown in Figure 1) is generally bounded by 15th Street to the north, 12th Street to the south, Washington Street to the east, and McLoughlin Boulevard (OR 99E) to the west. The following nine intersections have been identified as study area intersections:

1. McLoughlin Blvd/15th Street
2. McLoughlin Blvd/14th Street
3. McLoughlin Blvd/12th Street
4. Main Street/12th Street
5. Main Street/14th Street
6. Main Street/15th Street
7. Washington Street/15th Street
8. Washington Street/14th Street
9. Washington Street/12th Street

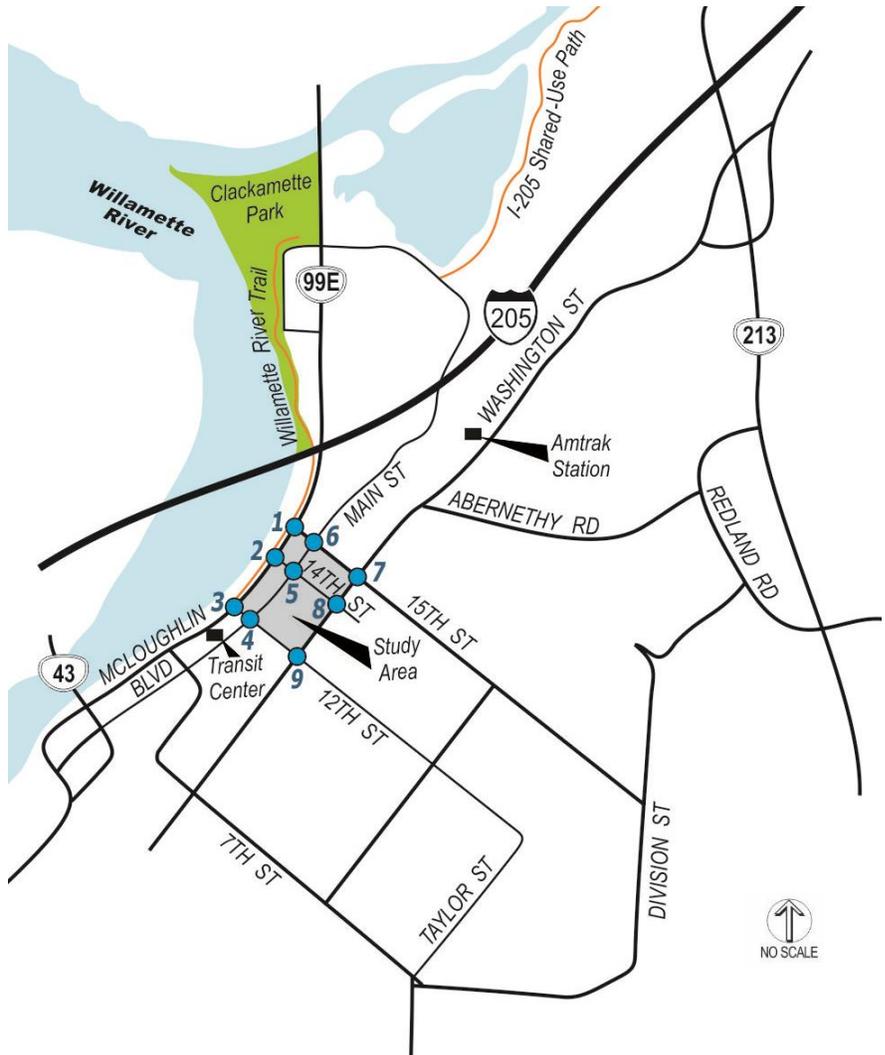


Figure 1: Study Area



Existing Conditions

Walking and Biking

There are existing sidewalks on both sides of Main Street, from 12th Street to 15th Street, and along 14th Street, from McLoughlin Boulevard to Washington Street. The width of the sidewalk generally varies from 5 to 8 feet. However, there are existing features that create undesirable conditions for pedestrians through the study area. First, 15th Street lacks continuous sidewalks. Secondly, there are areas where sidewalks and pedestrian ramps do not meet current Americans with Disabilities Act (ADA) standards.

There are also no dedicated bicycle lanes along 14th or 15th Streets, between McLoughlin Boulevard to Washington Street. As a result, bicyclists must share travel lanes with motorists. This is particularly challenging for eastbound cyclists, who likely will be traveling at much slower speeds than motor vehicles given the upward slopes along these streets. Main Street, north of 15th Street, and Washington Street have dedicated bike lanes, with 14th and 15th Streets creating a gap in bicycle facilities between the two roadways.

The 2013 Oregon City TSP recommended sidewalks and bike facilities along 14th and 15th Streets in the study area.

Transit

Transit service is provided in the study area by TriMet via two fixed bus routes. The Oregon City Transit Center, located at the intersection of Main Street and 11th Street, just south of the south area, offers a transfer point between several TriMet bus lines. TriMet Route 32 travels through the study area, between the Transit Center and Clackamas Community College, while Route 34 travels between the Transit Center and Holcomb Boulevard. Bus stops are located in the study area near the Main Street/13th Street, Main Street/15th Street, and Washington Street/14th Street intersections.

Amtrak provides passenger rail service connecting Oregon City to Seattle and Eugene. The Amtrak station in Oregon City is located just north of the study area, near the intersection of Washington Street and Abernethy Road.

Driving

Motor Vehicle Facilities

The study area is bounded by McLoughlin Boulevard and Washington Street to the east and west, both of which provide for primary north-to-south motor vehicle circulation for the city and region. McLoughlin Boulevard Avenue maintains a continuous five-lane cross-section (i.e. two through lanes in each direction and a left turn lane), while Washington Street maintains a continuous three-lane cross-section (i.e. one through lane in each direction and a left turn lane) adjacent to the study area.

The only other north-to-south street through the study area is Main Street (located one block east of McLoughlin Boulevard), which provides a connection between the south end and north end of downtown,



and provides drivers access to businesses abutting McLoughlin Boulevard. It maintains a continuous two-lane cross-section (i.e. one through lane in each direction), with on-street parking on both sides.

East-to-west travel within the study area is accommodated via 12th, 14th and 15th Streets. These streets maintain a continuous two-lane cross-section (i.e. one through lane in each direction), with sporadic on-street parking on both sides. Currently, neither 14th nor 15th Street offers a continuous two-way connection for drivers between both directions of McLoughlin Boulevard and locations east of Washington Street. Drivers are connected to areas east of Washington Street via 15th Street, however, the 15th Street connection to McLoughlin Boulevard is restricted to right-in, and right-out movements (i.e., the southbound left-turn from McLoughlin Boulevard to 15th Street, and the westbound left-turn from 15th Street to McLoughlin Boulevard are restricted by a raised concrete median). Drivers wanting to make these movements must utilize the signalized 14th Street intersection with McLoughlin Boulevard, and connect to 15th Street via Main Street or Washington Street. While all motor vehicle movements are allowed at the intersection of McLoughlin Boulevard and 14th Street, the street terminates one block east of Washington Street, so drivers must utilize Main Street or Washington Street to access locations outside of the study area.

The 2013 Oregon City TSP classified the street system into a hierarchy organized by function and street type (representative of their places). These classifications ensure that the streets reflect the neighborhood through which they pass, consisting of a scale and design appropriate to the character of the abutting properties and land uses. The classifications also provide for and balance the needs of all travel modes. McLoughlin Boulevard and Washington Street are classified as a major arterial and minor arterial street, respectively. Main Street, 14th Street, and 15th Street are classified as collectors. Each of these streets are further designated with a Mixed-Use street type. Mixed-Use Streets typically have a higher amount of pedestrian activity and are often on a transit route. These streets should emphasize a variety of travel choices such as pedestrian, bicycle and transit use to complement the development along the street. Since mixed-use streets typically serve pedestrian oriented land uses, walking should receive the highest priority of all the travel modes. They should be designed with features such as wider sidewalks, traffic calming, pedestrian amenities, transit amenities, attractive landscaping, on-street parking, pedestrian crossing enhancements and bicycle lanes.

Existing Intersection Operations

To determine intersection operations, turn movement counts were conducted at study area intersections during the weekday evening peak period (4 to 6 P.M.). The raw traffic count data is included in the Appendix. Methodology from the ODOT Analysis Procedures Manual was applied to determine the 30th highest annual hour (30 HV) volumes for the study intersections under state jurisdiction along McLoughlin Boulevard.¹

¹ Analysis Procedures Manual, Version 2, Oregon Department of Transportation, June 2015.



Intersection Performance Measures

Level of service (LOS) and volume-to-capacity (V/C) ratios are two commonly used performance measures that provide a gauge of intersection operations. In addition, they are often incorporated into agency mobility targets. Descriptions are given below:

- **Level of service (LOS):** A “report card” rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays. ODOT and city mobility targets within the study area are based on v/c ratios.
- **Volume-to-capacity (V/C) ratio:** A decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays. LOS was utilized as a secondary performance measure, but is not a standard.

Jurisdictional Mobility Targets

The adopted intersection mobility targets vary by jurisdiction of the street. Three of the study intersections are under state jurisdiction (along McLoughlin Boulevard), while the remaining six intersections are under the jurisdiction of Oregon City. All intersections under State jurisdiction must comply with the v/c ratios in the 1999 Oregon Highway Plan (OHP), while intersections under city jurisdiction must comply with the v/c ratios in the Oregon City Municipal Code, section 12.04.205. Since the study intersections are located within the Oregon City Regional Center, both the OHP and Municipal Code require a v/c ratio of 1.10 to be met during the evening peak hour.

Existing Operating Conditions

The existing traffic operating conditions at the study intersections were determined for the P.M. peak hour based on the *2000 Highway Capacity Manual* methodology² for signalized intersections and *2010 Highway Capacity Manual Methodology*³ for unsignalized intersections. The conditions reported include the

² *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

³ *2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.



estimated average delay, level of service (LOS), and volume-to-capacity (V/C) ratio of the study intersections and can be seen in Table 1.⁴

During the P.M. peak hour, all study intersections operate well within the mobility target, with all intersections operating under a v/c ratio of 0.77 or less. While the 15th Street intersection with McLoughlin Boulevard is expected to meet the existing OHP mobility target for overall intersection performance, the side street will experience a high level of delay (equal to a level of service of ‘F’).

Table 1: Existing 2015 Intersection Operations (P.M. Peak)

Intersection (traffic control)*	Mobility Target	LOS	Delay	V/C
McLoughlin Blvd/15 th Street (unsignalized)	1.10 v/c	F	50.3	0.76
McLoughlin Blvd/14 th Street (signalized)	1.10 v/c	B	15.5	0.77
McLoughlin Blvd/12 th Street (signalized)	1.10 v/c	A	6.9	0.62
Main Street/12 th Street (unsignalized)	1.10 v/c	B	11.0	0.37
Main Street/14 th Street (unsignalized)	1.10 v/c	E	36.6	0.48
Main Street/15 th Street (unsignalized)	1.10 v/c	B	11.7	0.42
Washington Street/15 th Street (signalized)	1.10 v/c	C	24.1	0.68
Washington Street/14 th Street (signalized)	1.10 v/c	B	19.2	0.68
Washington Street/12 th Street (unsignalized)	1.10 v/c	E	48.1	0.74

Note: * V/C ratio, LOS and delay reported as the intersection average at signalized locations and worst stop controlled approach at unsignalized locations.

Existing Safety Conditions

The 2013 Oregon City TSP identified the intersection of Main Street and 14th Street as a high collision location. The intersection is two-way stop controlled, while several of the adjacent intersections along Main Street are all-way stop controlled intersections. Most of the collisions at this intersection were angle type collisions, meaning one vehicle pulled out in front of another. This may indicate that drivers on Main Street are unaware that traffic on 14th Street is not required to stop and consequently often fail to yield the right of way.

In addition, the 2013 Oregon City TSP identified three collisions involving a pedestrian or bicyclist at study areas intersections (at the Main Street/15th Street, McLoughlin Blvd/14th Street, and Washington Street/14th Street intersections). Most of these collisions were caused by motorists failing to yield the right-of-way.

⁴ Detailed intersection analysis worksheets are attached in the technical appendix.

Assumptions and Methodologies

This section explains the underlying assumptions used in forecasting future trip growth and identifying transportation system deficiencies through the year 2040. Areas of interest covered in this section are the future planning scenarios and future traffic volume forecasting.

Planning Scenarios

Future traffic forecasts were prepared for 2040 for two scenarios. The scenarios will allow for the identification of capacity constraints associated with the proposed lane geometry changes on 14th and 15th Streets between McLoughlin Boulevard and Washington Street. Two scenarios were evaluated with the following assumptions:

- 2040 Background Conditions – Existing traffic volumes plus 25 years of traffic growth, with no changes to the existing street network (the lane geometry changes on 14th and 15th Streets between McLoughlin Boulevard and Washington Street were not assumed).
- 2040 Project Conditions – Existing traffic volumes plus 25 years of traffic growth, with the lane geometry changes along 14th and 15th Streets between McLoughlin Boulevard and Washington Street.

Future Street System Improvements

The following lane geometry changes were assumed with the 2040 Project Conditions scenario:

- Convert 14th Street to one-way, with two eastbound travel lanes between McLoughlin Boulevard and Washington Street (TSP project D7).
- Convert 15th Street to one-way, with two westbound travel lanes between Washington Street and McLoughlin Boulevard (TSP project D8).

The assumed improvements can be seen in Figure 2.

Pedestrian and Bicycle Improvements

The recommendations in the 2013 TSP along 14th and 15th Streets would also improve pedestrian and bicycle facilities between McLoughlin Boulevard and Washington Street. The TSP concept included bike lanes, bicycle detection at traffic signals, sidewalk infill, and additional on-street parking stalls. Pedestrian crossings would also include ADA improvements such as curb ramps and detectable warning plates. Design options to address the pedestrian and bicycle needs will be evaluated later in this document.

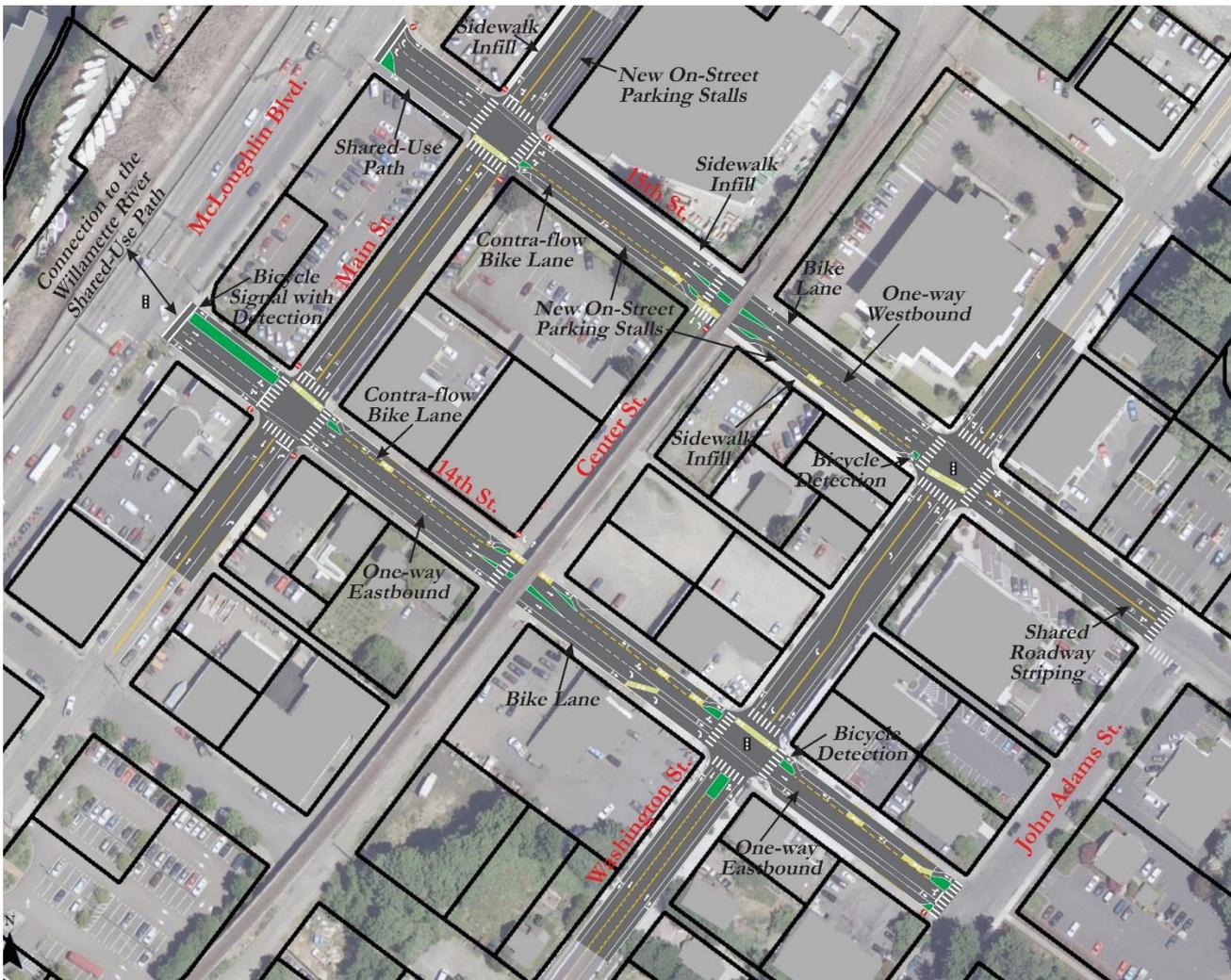


Figure 2: Assumed Study Area Improvements

Future Traffic Growth

A determination of future street network needs requires the ability to accurately forecast travel demand resulting from estimates of future population and employment in the study area, and the rest of the city and Metro region. The objective of the transportation planning process is to provide the information necessary for making decisions about how and where improvements should be made to create a safe and efficient transportation system that provides travel options.

The travel demand forecasting process generally involves estimating travel patterns for new development based on the decisions and preferences demonstrated by existing residents, employers and institutions around the region. Travel demand models are mathematical tools that help us understand future commuter, school and recreational travel patterns including information about the length, mode and time of day a trip will be made. The latest travel models are suitable for motor vehicle and transit planning purposes, and can produce total volumes for autos, trucks and buses on each street and highway in the system. Model forecasts



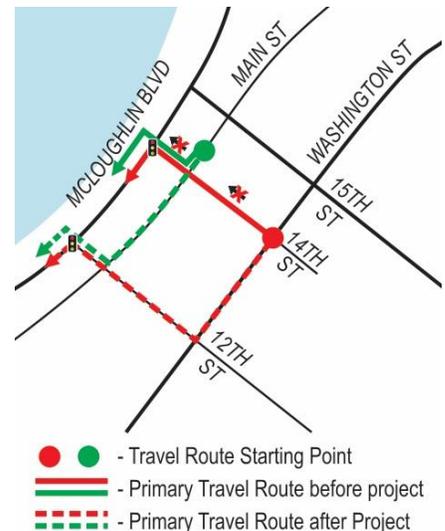
are refined by comparing outputs with observed counts and behaviors on the local. This refinement step is completed before any evaluation of system performance is made. Once the traffic forecasting process is complete, the 2040 volumes are used to determine the areas of the street network that are expected to be congested and that may need future investments to accommodate growth.

The Metro Regional Travel Demand Model was utilized to forecast traffic volumes in the study area for the 2040 Background Conditions scenario. The street network in the Travel Demand Model was modified for the 2040 Project Condition scenario to account for the traffic pattern changes along 14th and 15th Streets between McLoughlin Boulevard and Washington Street.

Traffic patterns through the north end of downtown are expected to shift as a result of the reconfiguration of 14th and 15th Streets between McLoughlin Boulevard and Washington Street. Westbound traffic along 14th Street, and eastbound traffic on 15th Street would reroute to adjacent streets. The major traffic pattern shifts are summarized below.

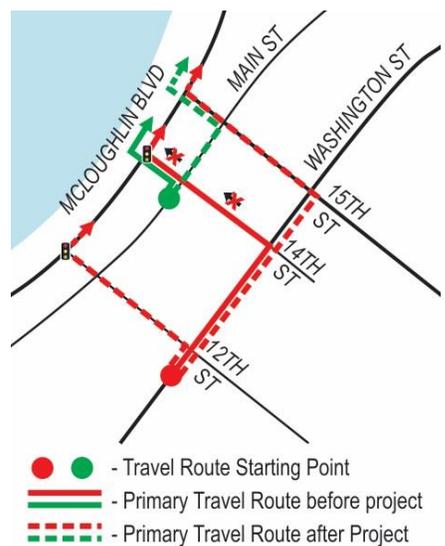
- **Westbound traffic along 14th Street destined for southbound McLoughlin Boulevard.**

Drivers that previously utilized the signalized 14th Street intersection to access southbound McLoughlin Boulevard (shown as a solid red or green line in the image on the right) are expected to primarily reroute to the signalized intersection at 12th Street. As a result, traffic volumes are forecasted to increase along Main and Washington Streets, between 14th and 12th Street, and along 12th Street, between Washington Street and McLoughlin Boulevard (shown as a dashed red or green line in the image on the right).



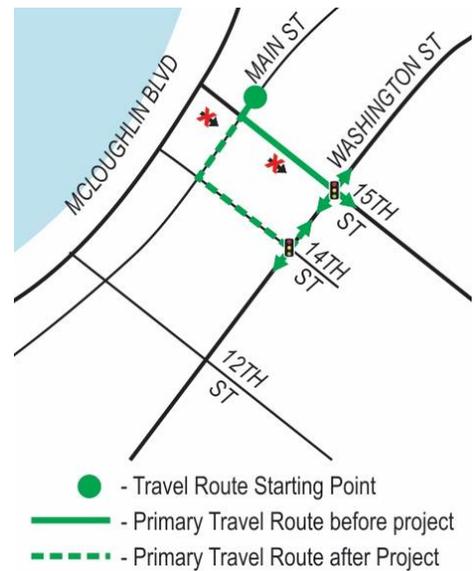
- **Westbound traffic along 14th Street destined for northbound McLoughlin Boulevard.**

Drivers that previously utilized the signalized 14th Street intersection to access northbound McLoughlin Boulevard (shown as a solid red or green line in the image on the right) are expected to primarily reroute to 12th and 15th Streets. As a result, traffic volumes are forecasted to increase along Main and Washington Streets, between 14th and 15th Street, and along 12th and 15th Street, between Washington Street and McLoughlin Boulevard (shown as a dashed red or green line in the image on the right).



■ **Eastbound traffic along 15th Street.**

Drivers that previously utilized the eastbound approach to the signalized 15th Street intersection with Washington Street, primarily traffic from southbound Main Street (shown as a solid green line in the image on the right) are expected to primarily reroute to 14th Street. As a result, traffic volumes are forecasted to increase along Main Street, between 14th and 15th Street, and along 14th Street, between Main Street and Washington Street (shown as a dashed green line in the image on the right).



Trucks

The proposed circulation changes along 14th Street and 15th Street will eliminate the left-turn movement from 14th Street to southbound McLoughlin Boulevard. As a result, vehicles will likely shift to 12th Street to make this movement. In order to identify the potential impacts this change would have on trucks, the vertical clearance and existing truck volumes along 12th Street, 14th Street, and 15th Street were evaluated and are summarized in the following sections.

Vertical Clearance

Vertical clearance for streets under the jurisdiction of a local agency should follow the standards provided by AASHTO, which state that vertical clearance should be at least 14.0 feet⁵ over the entire street width. In cases of new construction, the vertical clearance provided should be at least 16.0 feet. The existing railroad overpasses on 14th Street and 15th Street were measured previously as part of the OR 213: I-205 – Redland Road Overcrossing project, while the 12th Street railroad overpass was observed as part of this study. The vertical clearance for each street was determined to be:

- 12th Street: 13.00 feet
- 14th Street: 14.21 feet⁶
- 15th Street: 14.13 feet⁷

The vertical clearances along 14th Street and 15th Street meet the minimum AASHTO standard of 14.0 feet and would accommodate a WB-67, which has a height of 13.5 feet. Therefore, both 14th Street and 15th

⁵ AASHTO. *Geometric Design of Highways and Streets*. Pg. 399.

⁶ City of Oregon City Public Works Memo regarding “Response to ODOT Region 1 Traffic Recommendations for Acceptance of the Proposed Option #2—Rapid Bridge Construction: Four-Day Closure.” August 5, 2008. To Tony Coleman, ODOT Interim Freight Mobility Liaison.

⁷ Memo regarding “The Rivers at Oregon City: Highway 213.” June 16, 2008. Sent by Hermanus Steyn.

Street provide viable routes for trucks, while 12th Street does not meet the minimum clearance and is not a viable route for trucks.

Rerouting Truck Traffic

A review of vehicle classification counts⁸ for vehicles with at least 5 axles on 14th Street, 15th Street, Main Street, and Washington Street show that most trucks use 14th Street to travel between McLoughlin Boulevard and Washington Street. A maximum of 11 trucks were recorded in one day on 14th Street, while two trucks were recorded in one day on 15th Street (both traveling westbound). A majority of these trucks on 14th Street were traveling eastbound, while both of the trucks on 15th Street were traveling westbound; both of these directions would not be impacted by the one-way configuration. For the westbound trucks along 14th Street destined for southbound McLoughlin Boulevard (five trucks counted in one day), it was assumed they would reroute to OR 213 to reach southbound McLoughlin Boulevard via I-205. This reroute could result in up to a two mile detour for trucks originating south of the study area. However, many of these trucks are likely being generated by the industrial uses located north of the study area, just west of OR 213, so the reroute would have less out of direction travel.

It is worth noting that larger vehicles have historically had difficulty negotiating the northwest corner of the intersection of Washington Street/14th Street, as evidenced by tire tracks on the sidewalk and the installation of tubular markings along the curb face. Eliminating this movement by making 14th Street one-way eastbound as proposed, would improve the safety of the intersection by removing a potential conflict between turning trucks and pedestrians standing on the sidewalk. Also, the potential damage to traffic signal equipment by turning trucks would be eliminated.

Future Conditions

The study area needs through the year of 2040 were projected by building on the inventory and assessment of existing conditions and accounting for the additional impact of forecasted travel demand associated with regional and local growth. Future traffic operating conditions were analyzed at the study intersections to determine if the transportation network can support the traffic pattern changes along 14th and 15th Streets between McLoughlin Boulevard and Washington Street. This analysis will act as a baseline for refining the assumed improvements summarized in the “Planning Scenarios” section of this document.

2040 Intersection Operations

The future 2040 P.M. peak hour study intersection operations are shown in Table 2. After assuming the street system improvement projects summarized earlier in this document, two intersections are expected to exceed mobility targets under each scenario. In fact, the Project Conditions Scenario improves operations at many intersections since traffic patterns are modified from the Baseline Conditions Scenario.

⁸ “Traffic Speed, Volume and Classification Studies.” Oregon City Public Works Department website.

As shown, the McLoughlin Boulevard/15th Street, and Washington Street/12th Street intersections are forecasted to exceed the mobility targets under each scenario, with or without the project. The side street at these intersections (15th Street, and 12th Street, respectively) generally experiences high delay due to steady volumes on the uncontrolled roadway (McLoughlin Boulevard, and Washington Street, respectively). These approaches typically these intersections require more time for an acceptable gap in traffic to make a turn onto the mainline, therefore, the delay of the side street is high and capacity is reduced.

The 2013 TSP recommended installation of a traffic signal at the Washington Street/12th Street intersection (TSP project D28). Subsequent study of the intersection has found that a traffic signal may be warranted by 2017.⁹ This updated system analysis re-affirms the need for an improvement at this location. The reconfiguration of 14th and 15th Streets would be expected to slightly increase traffic through the intersection, primarily for the northbound left-turn, and southbound right-turn from Washington Street to 12th Street.

The McLoughlin Blvd/ 15th Street intersection is generally limited by peak hour queues extending from the I-205 interchange. Today, northbound queues along McLoughlin Boulevard extend to 14th Street from the I-205 interchange. This backs traffic up on the 15th Street approach to McLoughlin Boulevard, with queues extending through the Main Street intersection. This occurrence is expected to worsen as more traffic shifts from 14th Street to 15th Street with the one-way configuration. Due to the uphill grade, and limited sight distance for the 15th Street approach to McLoughlin Boulevard, the approach could not safely accommodate unsignalized dual right-turn lanes, as shown in Figure 2. Because the 15th Street approach is within 350 feet from the existing traffic signals at the I-205 interchange to the north and 14th Street intersection to the south, signalization was not assumed as a viable mitigation. Therefore, the 15th Street approach to McLoughlin Boulevard was assumed to retain a single unsignalized right-turn lane for each design option evaluated later in this document.

In addition, the Main Street/14th Street intersection is expected to operate with a v/c ratio above 1.0, and is forecasted to operate within ten percent of the mobility target under each scenario. The intersection was evaluated with all-way stop control under the Project Conditions Scenario to determine the impact on traffic operations. This control would be consistent with the traffic control at several of the adjacent intersections along Main Street. As shown in Table 2, adding stop control to the 14th Street approach with the one-way configuration would provide a 30 percent improvement to intersection capacity (v/c ratio) during the P.M. peak hour. All-way stop control could not be accommodated with the two-way configuration of 14th Street due to the short block length, and the potential for vehicle queues to extend to McLoughlin Boulevard. Therefore, the 14th Street approach to Main Street was assumed to remain stop controlled under the design options that assume a two-way configuration, and all-way stop control for those that assume one-way configuration (design options are summarized later in this document).

⁹ Traffic Signal Warrant Evaluation for Washington Street/12th Street Intersection, DKS Associates, September 11, 2014.



Table 2: Forecasted 2040 Intersection Operations (P.M. Peak)

Intersection (traffic control)*	Mobility Target	Baseline Conditions (two-way 14 th and 15 th Streets)			Assumed Improvement for Project Conditions Scenario	Project Conditions (one-way 14 th and 15 th Streets)		
		LOS	Delay	V/C		LOS	Delay	V/C
McLoughlin Blvd/ 15 th Street (unsignalized)	1.10 v/c	F	>150.0	1.46	15 th Street one-way westbound	F	>150.0	>1.50
McLoughlin Blvd/ 14 th Street (signalized)	1.10 v/c	C	21.3	0.94	14 th Street one-way eastbound; signal modification to remove westbound approach	A	7.7	0.85
McLoughlin Blvd/ 12 th Street (signalized)	1.10 v/c	A	7.9	0.79	None	B	13.1	0.82
Main Street/ 12 th Street (unsignalized)	1.10 v/c	C	24.9	0.73	None	F	62.8	0.96
Main Street/ 14 th Street (unsignalized)	1.10 v/c	F	>150.0	1.08	14 th Street one-way eastbound; 14 th Street approach remains a free movement	F	85.1	1.02
					14 th Street one-way eastbound; Stop control added to the 14 th Street approach	C	24.6	0.71
Main Street/ 15 th Street (unsignalized)	1.10 v/c	C	18.9	0.67	15 th Street one-way westbound	E	41.7	0.90
Washington Street/ 15 th Street (signalized)	1.10 v/c	D	52.6	0.93	15 th Street one-way westbound; signal modification to remove eastbound approach	C	24.0	0.86
Washington Street/ 14 th Street (signalized)	1.10 v/c	C	29.5	0.90	14 th Street one-way eastbound; signal modification to remove northbound left-turn	C	27.7	0.88
Washington Street/ 12 th Street (unsignalized)	1.10 v/c	F	>150.0	>1.50	None	F	>150.0	>1.50

Shaded red indicates an intersection is forecasted to exceed the mobility target.

Shaded yellow indicates an intersection is forecasted to operate within ten percent of the mobility target.

Note: * V/C ratio, LOS and delay reported as the intersection average at signalized locations and worst stop controlled approach at unsignalized locations.

14th and 15th Street Design Options

The primary objective of this evaluation is to identify safety and circulation improvements for walking, biking, and driving within the study area, including filling gaps in the bike lane and sidewalk network between Main Street and Washington Street, providing additional on-street parking stalls, and addressing safety concerns at the 14th Street intersection with Main Street.

Both 14th and 15th Street have approximately 60 feet of right-of-way, with around 40 feet of paved width. This includes one travel lane in each direction, with periodic parking along 14th Street (currently there are 12 on-street parking stalls) between McLoughlin Boulevard and Washington Street. There are no on-street parking stalls along 15th Street. The paved width narrows at the railroad overpass near Center Street, with approximately six feet needed for the support columns in the center of both 14th and 15th Street.

The following sections outline three design options considered within the study area that would reconfigure the existing paved width of 14th and 15th Streets. The design options consist primarily of cost effective changes to roadway striping to provide bike facilities and on-street parking, and that could potentially be implemented as interim pilot projects to help assess system impacts. Design Options 1 and 2 assume one-way travel on 14th and 15th Streets, with two eastbound travel lanes on 14th Street, and one westbound travel lane on 15th Street. Design Option 3 assumes two-way travel on 14th and 15th Street, and the existing lane configuration and traffic control at intersections would remain.

Pedestrian and Bicycle Facilities

All of the design options would adequately address the bicycle facility needs in the study area. Bicyclists will have physically separated facilities, such as bike lanes or cycle tracks, connecting to the existing facilities on Main and Washington Streets, and the Willamette River Trail. Bicycle detection should also be provided at traffic signals.

While sidewalks are illustrated in the design options, any sidewalk expansion would require more significant investments. It is recommended that the existing sidewalks along 14th and 15th Street be improved and gaps filled to include a minimum of six feet of unobstructed walkway. Improvements to pedestrian ramps, and street lighting are also recommended. Curb-extensions should be incorporated at intersections and mid-block crossings to improve visibility of pedestrians. Improved wayfinding signage should also be developed to highlight key destinations, such as the Willamette River Trail, and the best routes for pedestrians and bicyclists. These signs will improve destination and route finding for residents and visitors alike, encouraging exploration and activity.

Design Option 1: One-Way Streets, with eastbound and westbound bike facilities on 15th Street.

Design Option 1 converts 14th and 15th Streets to one-way between McLoughlin Boulevard and Washington Street. Bike facilities would be provided along 15th Street only. Approximately 59 on-street parking stalls would be provided, or 47 more than today (no parking was assumed between Main Street and McLoughlin Boulevard). The estimated cost would be \$2,330,000, with the majority spent on sidewalk, and lighting enhancements.

- 14th Street would include two eastbound travel lanes, on-street parking (see Figure 3a), and the intersection with Main Street would become all-way stop control.
- 15th Street would include one westbound travel lane, on-street parking, and bike facilities in the form of a two-way cycle track (see Figure 3b).

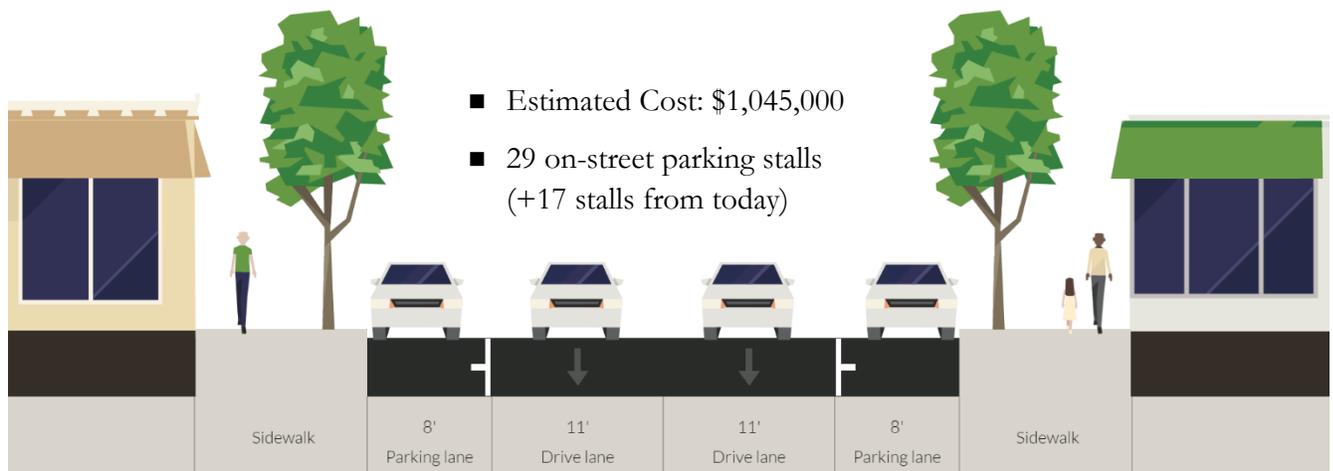


Figure 3a: View of Design Option 1 along 14th Street

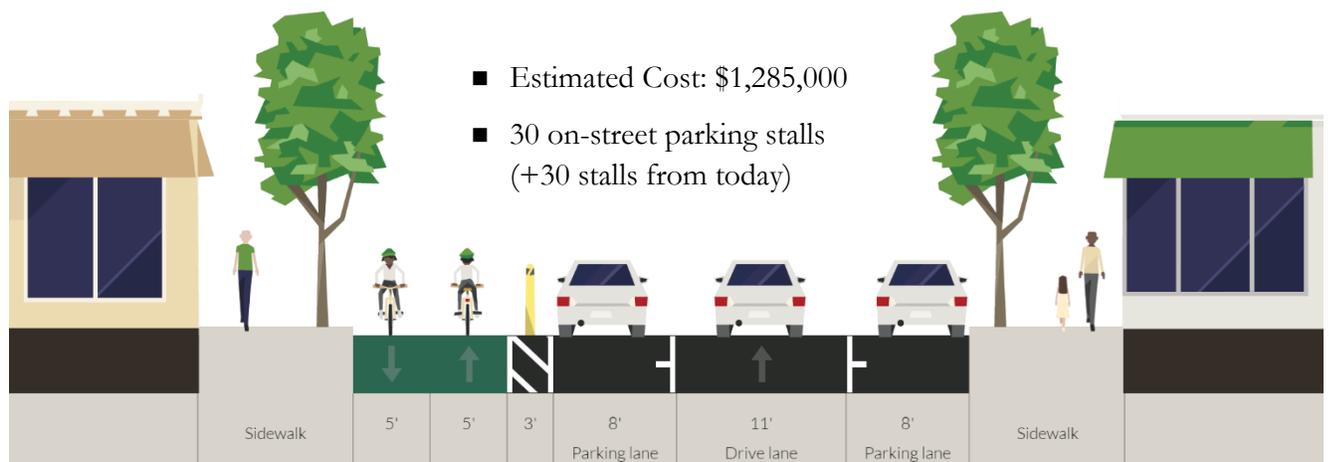


Figure 3b: View of Design Option 1 along 15th Street

Design Option 2: One-Way Streets, with eastbound bike facility on 14th Street and westbound bike facility 15th Street.

Design Option 2 also converts 14th and 15th Streets to one-way between McLoughlin Boulevard and Washington Street. However, eastbound bike facilities would be provided along 14th Street, and westbound bike facilities along 15th Street. Approximately 43 on-street parking stalls would be provided, or 31 more than today (no parking was assumed between Main Street and McLoughlin Boulevard). The estimated cost would be \$2,210,000, with the majority spent on sidewalk, and lighting enhancements.

- **14th Street** would include two eastbound travel lanes, on-street parking on one side, and a buffered bike lane (see Figure 4a).
- **15th Street** would include one westbound travel lane, on-street parking, and a one-way cycle track (see Figure 4b).

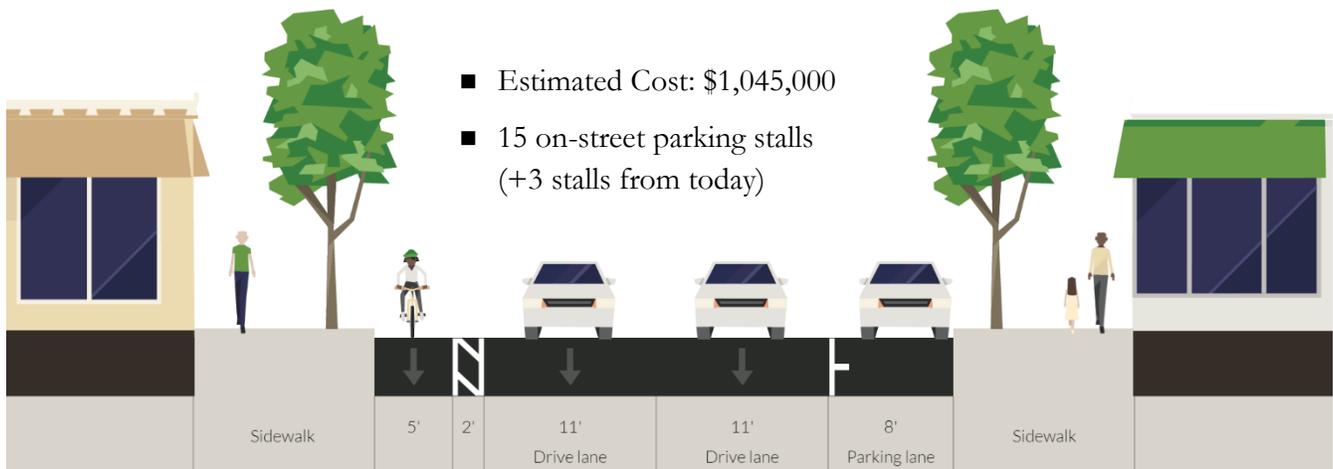


Figure 4a: View of Design Option 2 along 14th Street

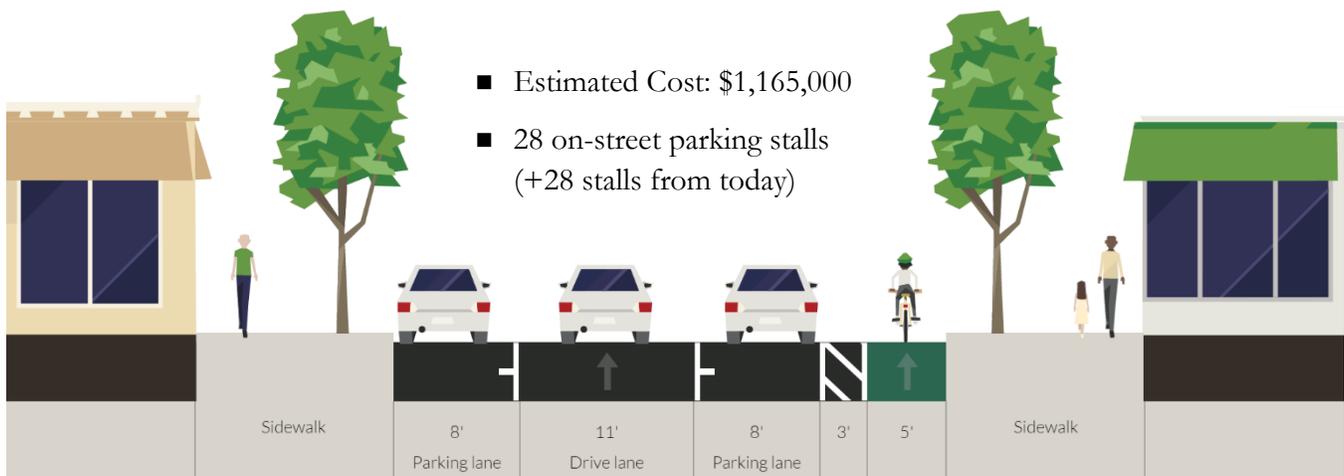


Figure 4b: View of Design Option 2 along 15th Street

Design Option 3: Two-Way Streets, with eastbound and westbound bike facilities on 15th Street.

Under Design Option 3, 14th and 15th Streets remain two-way between McLoughlin Boulevard and Washington Street. Similar to Design Option 1, bike facilities would be provided along 15th Street only. Approximately 38 on-street parking stalls would be provided, or 26 more than today (no parking was assumed between Main Street and McLoughlin Boulevard). The estimated cost would be \$1,990,000, with the majority spent on sidewalk, and lighting enhancements.

- **14th Street** would include one eastbound travel lane, one westbound travel lane, and on-street parking (see Figure 5a). The intersection with Main Street would continue to operate with two-way stop control (14th Street would be a free movement).
- **15th Street** would include one eastbound travel lane, one westbound travel lane, on-street parking on one side, and bike lanes (see Figure 5b).

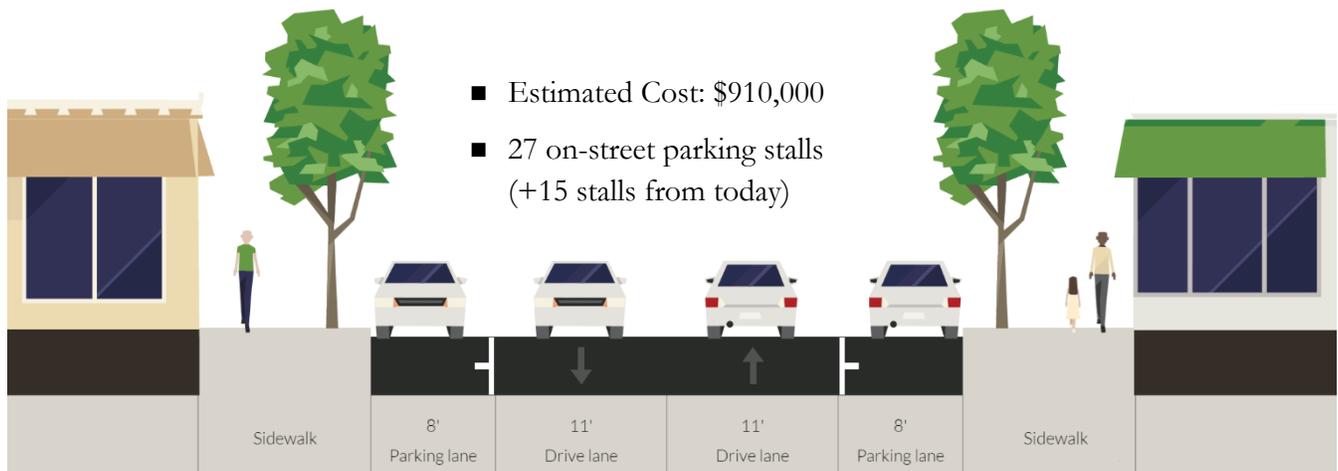


Figure 5a: View of Design Option 3 along 14th Street

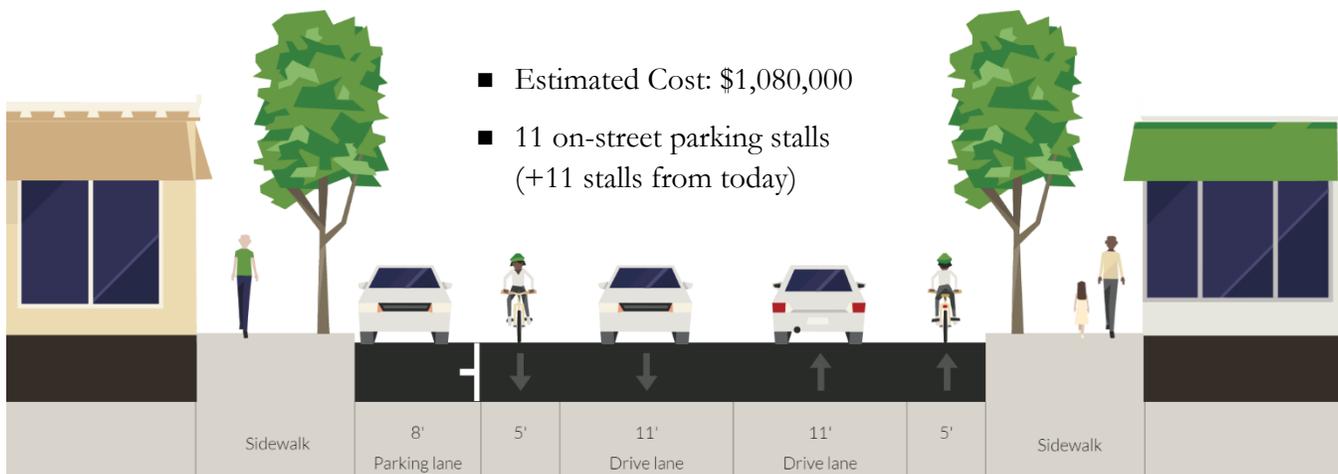


Figure 5b: View of Design Option 3 along 15th Street



Recommendations

The recommended design option for 14th and 15th Streets is Option 3. As noted earlier in this document, northbound queues along McLoughlin Boulevard from the I-205 interchange backs traffic up on the 15th Street approach to McLoughlin Boulevard. Queues extend through the Main Street intersection, and this is expected to worsen as more traffic shifts from 14th Street to 15th Street with the one-way configuration. Due to the uphill grade, and limited sight distance for the 15th Street approach to McLoughlin Boulevard, the approach would retain a single unsignalized right-turn lane. With the one-way eastbound traffic flow along 14th Street, the capacity is effectively cut in half for the westbound movement.

Queuing analysis was conducted using SimTraffic, which estimates the 95th percentile vehicle queue lengths, or the queue length that would not be exceeded in 95 percent of the queues formed during the peak hour. Ultimately, the 95th percentile queue from the 15th Street approach to McLoughlin Boulevard was estimated to extend to nearly Washington Street. One of the main concerns related to the one-way configuration of 14th and 15th Streets (or Design Option 1 and 2) is the potential for significant motor vehicle queuing during peak periods. While peak hour queues will likely worsen by 2040 with the two-way configuration, they will not be as extensive. Therefore, it is recommended that the existing paved width of 14th and 15th Streets be reallocated with the two-way configuration to provide bike facilities and on-street parking. It is worth noting that the changes to roadway striping could be done fairly cost effectively (excluding the sidewalk and lighting enhancements), should the one-way configuration be preferred as a pilot project.

Overall, Option 3 would:

- Be slightly cheaper than the other options, at \$1,990,000.
- Retain the two-way configuration of 14th and 15th Streets; consistent with other streets downtown.
- Provide more motor vehicle capacity in the westbound direction between Washington Street and McLoughlin Boulevard, with one lane on 14th and 15th Street. Motor vehicle queues would be expected to be shorter with the two-way configuration.
- Maintain the existing route along 14th Street for trucks to access southbound McLoughlin Boulevard.
- Provide bike lanes along 15th Street, and connect to the existing facilities on Main and Washington Streets, and the Willamette River Trail.
- Provide approximately 38 on-street parking stalls, or 26 more than today.
- Provide sidewalk and street lighting enhancements along 14th and 15th Streets.