

## 2. UPDATE OF RECOMMENDED TRANSPORTATION IMPROVEMENTS

### 2.1 Introduction

This chapter presents the revised maps and summary tables illustrating the recommended changes to the Battle Ground street Functional Classification Map,

### 2.2 Functional Classification Map Update

Functional classification is a method of defining the types of trips that a given roadway is expected to accommodate in relation to the degree of property access that is also provided by that roadway. On the high end, the classification system includes roads whose primary purpose is to serve long-distance through trips where it is desirable to limit property access or the location of intersecting streets, so as not to impede the higher-speed through-movement of vehicles. Higher end roads typically include freeways and expressways. On the low end, the classification system includes roads whose purpose is to serve local trips within a neighborhood where speeds and traffic volumes are typically low and property access is paramount.

Functional classification is used as a building block in planning future improvements to ensure that all types of trips are accommodated and that, through design, the proper balance is maintained between favoring through trips and providing access. Roadways are classified by agencies depending on what role the facility plays in the agencies' overall transportation system. Functional classifications typically include arterials, collectors, and local roadways. Arterials function to provide mobility, local roadways provide access, and collectors provide a combination of the two.

Definitions of the functional classifications adopted as part of the 2005 Battle Ground TSP are described below:

*Principal Arterials* carry traffic through an urban area and connect major elements of the area including central business districts, regional shopping centers and other major traffic generators. Principal arterials typically carry a high degree of through traffic on a minimum of roadway mileage. They frequently have some degree of access control, although direct access to major land use developments such as shopping centers may be allowed. Traffic signals are generally used for intersection traffic control; although the principal arterial segments of SR 502/W Main Street include a number of unsignalized driveway accesses. Distances between parallel arterials may vary from less than one mile in highly developed areas to five miles or more in lightly developed rural areas.<sup>1</sup>

*Minor Arterials* carry traffic between principal arterials and lesser classified streets or directly to commercial and industrial areas, with direct access to land use development generally permitted. Traffic control is commonly a mix of signalized intersections and stop sign control used on intersecting streets of lesser classification. Minor arterials in urban areas are usually separated by less than two miles.

*Major Collectors* often balance land access and traffic circulation within residential neighborhoods and commercial and industrial areas. They typically form the link between the arterial street system and lesser-classified streets that provide primarily for property access and localized circulation. Major collectors may be used to handle through trips within small communities or between small communities in rural areas, but usually do not serve trips that link these communities to the regional transportation

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<sup>1</sup> "Land Use and Arterial Spacing in Suburban Areas". Federal Highway Administration, 1977.

system. There is often a mix of signalized intersections and stop sign control used on intersecting streets.

Neighborhood Collectors usually do not handle through trips and are often not continuous for any great length. Their function is to collect traffic from local streets or large parcels and funnel it to the major collector and/or arterial street system. Neighborhood collectors are typically stop sign controlled at intersections, have lower speeds, and often provide a significant degree of property access.

Local Streets provide direct access to adjacent property and to higher classified facilities. They offer the lowest degree of mobility and usually have no bus routes. They are not intended to carry through traffic but make up a significant percentage of total roadway mileage within a community.

Since adoption of the last plan update in 2009, it has been determined that SW 20<sup>th</sup> Avenue between W. Main Street and the southerly Urban Growth Boundary should serve as a Minor Arterial street rather than a Major Collector. This change is reflected in Figure 1 and recommended for adoption.

In addition to this proposed change, several other minor changes were made to the city's functional classification system and are reflected in Figure 1. These included:

- Removal of multiple proposed streets from the 2009 classification system where these were determined to be impracticable due to wetland or other constraints, or as a result of land development that has occurred during the intervening years.
- Modification of the proposed general alignment of several streets (largely Neighborhood Collectors) to reflect expected implementation constraints.
- Identification of new Neighborhood Collector street extensions in a few locations to provide previously lacking connectivity.

### 2.3 Complete Streets Inventory

In the summer of 2014, the Clark County Health Department hired Alta Planning and Design to conduct an inventory of existing bicycle and pedestrian facilities along the arterial street system within Battle Ground. This inventory also included several major collector streets which, like the arterials, comprise a backbone circulation system for the city. Figure 2 illustrates key findings for the existing pedestrian system, while Figure 3 presents the existing bikeway system.

As indicated in Figure 2, most arterial streets within the core area of the city currently have sidewalks. This includes W Main Street between approximately NW 30<sup>th</sup> and NE Grace Avenues, portions of SW 20<sup>th</sup> Avenue, N Parkway Avenue, SW Eaton Boulevard, and SE Grace Avenue, and a multiuse path along SR 503 between W Main Street and south of NE 189<sup>th</sup> Street. Locations along the key roadway system that currently lack sidewalks can also be seen in the graphic.

Figure 3 presents information about existing bikeways along the major streets in the City. This figure identifies various types of bikeways including: roadway shoulders, bike lanes and multi-use paths (i.e., along SR 503). As indicated in the graphic, most bikeways in the city consist of widened roadway shoulders with bike lanes limited to portions of N/S Parkway Avenue, NE Grace Avenue, SW/SE Eaton Boulevard and SW Scotton Way.

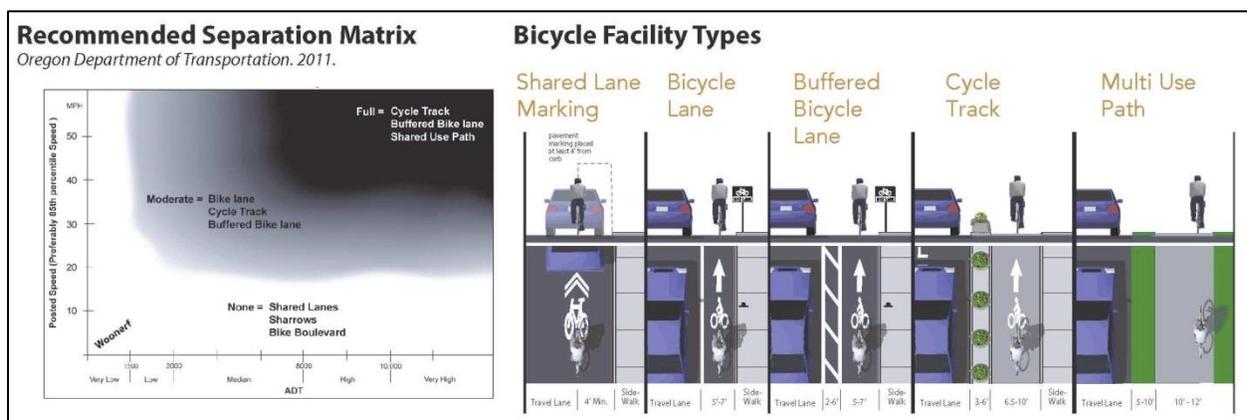
**Figure 1. 2015 Functional Classification System**

**Figure 2. Arterial Complete Streets Inventory – Walkways**

**Figure 3. Complete Streets Inventory – Bikeways**

The information presented in Figures 2 and 3 can be used as a foundation to identify future complete street improvement opportunities that could be developed either independently or in conjunction with improvements to the adjacent roadways. Selecting the best type of bikeway facility for implementation as part of a bikeway system improvement project can be challenging due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on cycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and motor vehicle traffic volumes are high. One example of a way to identify a preferred facility can be seen in the Recommended Separation Matrix of the Oregon *Bicycle and Pedestrian Design Guide*. The matrix is presented below, along with an illustration of each facility type. Engineering judgment, traffic studies, previous municipal planning efforts, community input and local context should be used to refine criteria when developing bicycle facility recommendations for a particular street.

**Figure 4. Bikeway Design Considerations**



## 2.4 Truck Route Plan

Figure 5 illustrates the adopted truck route plan for the Battle Ground Urban Growth Area or UGA (urban routes) and routes in the vicinity of Battle Ground but outside of the UGA (rural routes). As indicated in the graphic, urban routing for through truck movement is typically focused on the city's arterial street system including: SR 503, SR 502/W Main Street, NE 92<sup>nd</sup> Avenue, NE 239<sup>th</sup> Street, NW 25<sup>th</sup> Street, NE 249<sup>th</sup> Street, NE/SE Grace Avenue, SW/SE Eaton Boulevard and SE Rasmussen Boulevard/Commerce Avenue through existing industrial development east of SE Grace Avenue. The rural truck routes shown in the figure largely include extensions of the urban system outside of the UGA including NE 249<sup>th</sup> Street, NE 10<sup>th</sup> Street, NE 219<sup>th</sup> Street, and NE 199<sup>th</sup> Street.

It should be noted that the designated truck routes are intended to address restrictions on the movement of large, through-moving vehicles and not locally-oriented truck traffic which can travel on any available and appropriate street necessary to reach a destination.

## 2.5 Extension of NW 5<sup>th</sup> Way West of SR 503

In 2013/2014, the City commissioned DKS Associates to produce a study that investigated traffic circulation benefits and impacts associated with the extension of NW 5<sup>th</sup> Way eastward from its current terminus to intersect SR 503. This study also addressed impacts associated with the removal of an existing traffic signal at the intersection of SR 502 (W Main Street) and NW 12<sup>th</sup> Avenue, and the need for other improvements in the vicinity to meet short (2019) and long-term (2035) mobility needs.

## Figure 5. Truck Route Plan

### 2.5.1 Scope of the Study

Intersections assessed in this study included:

- SR 503/W Main Street
- W Main Street/W 12<sup>th</sup> Avenue
- W Main Street/W 15<sup>th</sup> Avenue
- NW 12<sup>th</sup> Avenue/NW 1<sup>st</sup> Street
- NW 15<sup>th</sup> Avenue/NW 1<sup>st</sup> Street
- SR 503/NW 5<sup>th</sup> Way (future intersection)

To address the potential impacts associated with the extension of 5<sup>th</sup> Way and/or the removal of the 12<sup>th</sup> Avenue signal on W Main Street, several circulation alternatives were developed and evaluated. These alternatives included changes in motor vehicle routing in the study area resulting from various combinations of potential future roadway extensions and/or turning movement restrictions. Options considered included:

#### ***Potential Roadway Extensions***

- NW 15<sup>th</sup> Avenue (between NW 9<sup>th</sup> Street and NW 4<sup>th</sup> Street)
- NW 4<sup>th</sup> Street (between NW 15<sup>th</sup> Avenue and NW 12<sup>th</sup> Avenue)
- NW 2<sup>nd</sup> Street (between NW 18<sup>th</sup> Avenue and NW 12<sup>th</sup> Avenue)

#### ***Potential Turn Restriction Locations***

- W Main Street/W 12<sup>th</sup> Avenue
- SR 503/NW 5<sup>th</sup> Way (future intersection)

### 2.5.2 Key Findings and Conclusions

The study showed that removal of the traffic signal at the intersection of W Main Street and W 12<sup>th</sup> Avenue and the NW 5<sup>th</sup> Way extension to connect with SR 503 would have minor impacts to the existing study intersections and may even improve conditions at the two worst operating intersections (SR 503/W Main Street and NW 12<sup>th</sup> Avenue/NW 1<sup>st</sup> Street). With the removal of the traffic signal, the W Main Street/W 12<sup>th</sup> Avenue intersection would become a right-in/right-out intersection. Based on traffic operations analysis eastbound and westbound left-in movements could be accommodated at this intersection through 2035. However, due to longer-term concerns, WSDOT has determined that these movements will not be permitted.

The SR 503/NW 5<sup>th</sup> Way intersection would operate as an unsignalized, right-in/right-out intersection. If it were decided to allow full access at this intersection, the intersection may meet signal warrants by 2035. Therefore, the study recommended restricting the intersection to right-in/right-out access at least until the signal warrant is met.

It was found that all study intersections were expected to meet mobility standards in 2019 and in 2035. However, traffic demands at the SR 503/W Main Street intersection were expected to exceed capacity by 2035. Several future queuing issues were also been identified in 2019 and 2035, which include:

- SR 503/W Main Street northbound left movement (2019 and 2035)
- SR 503/W Main Street westbound left movement (2035)
- SR 503/W Main Street eastbound left movement (2035)
- W Main Street/W 15<sup>th</sup> Avenue southbound left movement (2019 and 2035)
- W Main Street/W 15<sup>th</sup> Avenue eastbound left movement (2035)

### 2.5.3 Recommendations

To address the anticipated intersection performance and traffic queuing issues, a series of mitigation strategies were developed and evaluated. The bolded options listed below should be addressed by 2019; all other items should be addressed by 2035.

#### **SR 503/W Main Street Mitigation Strategies**

- *One of the following strategies should be implemented to alleviate congestion:*
  - *Add a second northbound left turn lane; or*
  - *Add separate westbound and southbound right turn lanes; or*
  - *Signalize and provide full access at the SR 503/NW 5th Way intersection*
- *Close the westbound left turn lane to the Shell Gas Station and reallocate the space for extended westbound left turn storage (see Figure 6).*
- *Close the western access at the Safeway parking lot on W Main Street, especially if a westbound right turn lane is provided.*
- ***Extend the northbound left turn lane approximately 180 feet if a second northbound left turn lane is not provided.***
- *Several strategies were considered to accommodate eastbound left queues at the SR 503/W Main Street intersection:*
  - *Remove the westbound left turn lane at W Main Street/W 12th Avenue and extend the eastbound left turn storage at SR 503/W Main Street (see Figure 7); or*
  - *Reduce the westbound left turn lane at W Main Street/W 12th Avenue and extend the eastbound left turn storage at SR 503/W Main Street (see Figure 8).*

*The final recommendation as endorsed by WSDOT would not permit left turns onto W 12<sup>th</sup> Avenue from SR 502.*



**Figure 6. W Main Street Proposed Cross-Section East of SR 503  
(With Elimination of Westbound Left Turns into the Shell Station)**



**Figure 7. Potential W Main Street Cross-Section West of SR 503 – Option 1  
(With Elimination of Westbound Left Turns onto SW 12<sup>th</sup> Avenue)**



**Figure 8. Potential W Main Street Cross-Section West of SR 503 – Option 2  
(With Westbound Left Turn Storage Reduction)**

***W Main Street/W 15<sup>th</sup> Avenue Mitigation Strategies***

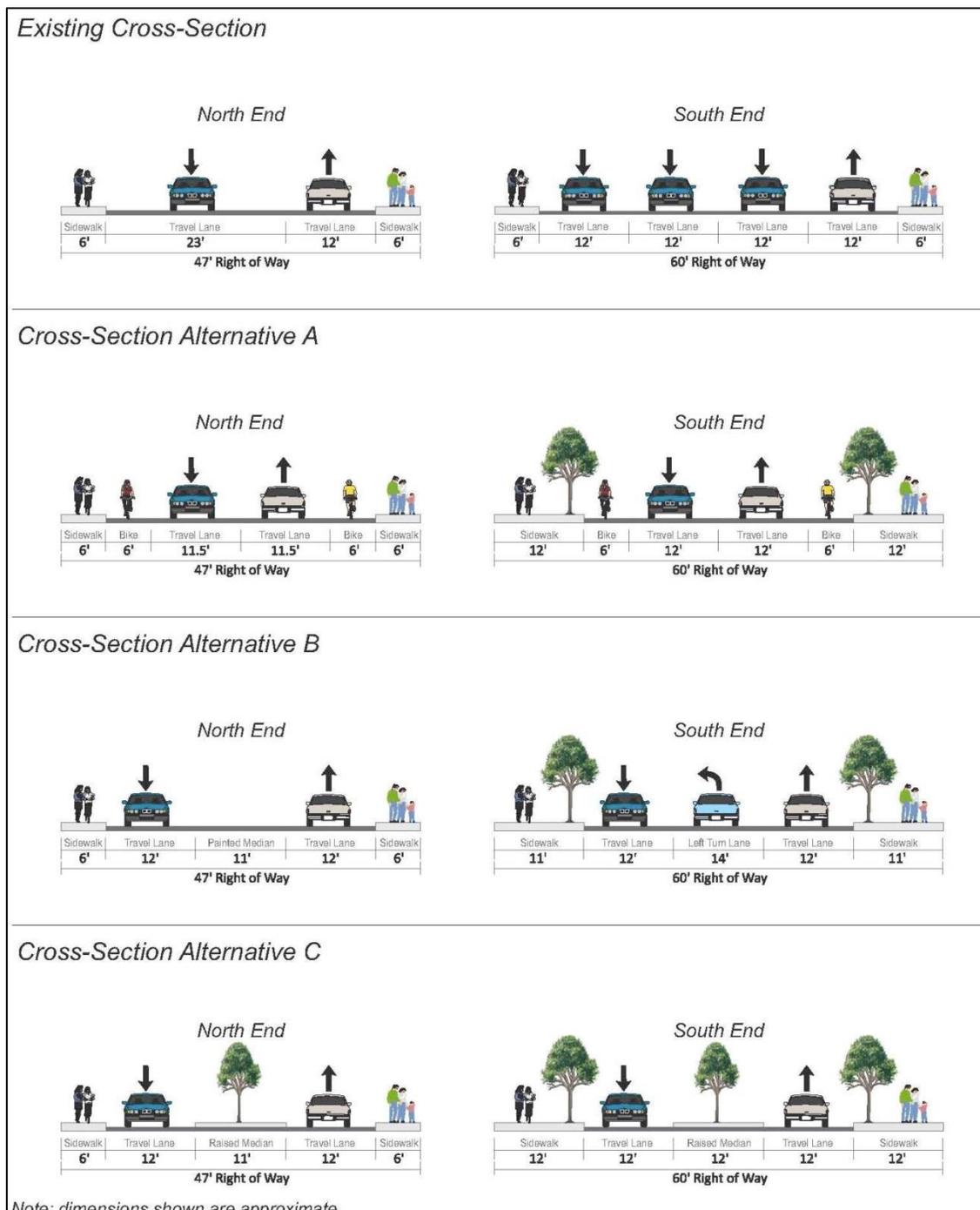
- *Convert NW 15th Avenue from W Main Street to NW 1st Street to a full three lane roadway to provide an extended southbound left turn lane.*
- *Replace the landscape median on W Main Street just west of W 15th Avenue with a median curb to allow extended eastbound left turn storage.*

***NW 12<sup>th</sup> Avenue/NW 1<sup>st</sup> Street Mitigation Strategy***

- *Add a stop sign to the northbound approach only if eastbound lefts are restricted at the W Main Street/W 12th Avenue intersection.*

With the removal of the signal at W Main Street/W 12<sup>th</sup> Avenue, the northbound and southbound approaches would reduce to a single right turn lane. Three alternative cross-sections in which space could be reallocated for the segment of NW 12<sup>th</sup> Avenue between W Main Street and NW 1<sup>st</sup> Street are shown in Figure 9.

**Figure 9. NW 12<sup>th</sup> Avenue Cross-Section Alternatives (W Main Street to NW 1<sup>st</sup> Street)**



- Alternative A—incorporates bike lanes
- Alternative B—incorporates a northbound left turn lane that ends at the gas station
- Alternative C—incorporates a raised median along the street segment, effectively restricting access along the roadway to right-in/right-out only

Sidewalks would be widened where available for all three alternatives.

The potential NW 15<sup>th</sup> Avenue, NW 4<sup>th</sup> Street, and NW 2<sup>nd</sup> Street extensions were evaluated as well. The study found that while the NW 15<sup>th</sup> Avenue extension is expected to draw a moderate amount of traffic to the W Main Street/W 15<sup>th</sup> Avenue and NW 15<sup>th</sup> Avenue/NW 1<sup>st</sup> Street intersections, these intersections would continue to operate at acceptable levels of service. The NW 4<sup>th</sup> Street and NW 2<sup>nd</sup> Street extensions are expected to have little impact on study intersections.

## **2.6 Extension of NE 189<sup>th</sup> Street and/or NE 179<sup>th</sup> Street East of SR 503**

This section presents a reassessment of two recommendations from the original Battle Ground Transportation System Plan (2005 and updated 2009) – the extension of two major collector streets eastward from SR 503 along the alignment of NE 189<sup>th</sup> Street and NE 179<sup>th</sup> Street. The purpose of these streets is to connect future development in the southeastern portion of the Battle Ground UGA with the state highway, providing both regional access and local circulation within this area as it develops. Without these improvements, traffic destined for SR 503 would need to either use NE 122<sup>nd</sup> Avenue (old SR 503) or NE 142<sup>nd</sup> (Grace) Avenue to reach destinations to the south, or to travel north and then use SW Eaton Boulevard to reach SR 503. The diversion of most southeast Battle Ground traffic to SW/SE Eaton Boulevard is expected to place a substantial burden on this facility which would be difficult to mitigate.

In the years since the original TSP was adopted there has been some residential development on the east side of SR 503 at 189<sup>th</sup> Street which will effect implementation of the recommended major collector improvement. Additionally, as a result of the 2008/2009 recession, traffic volumes on local streets and SR 503 have dropped or grown very little. Both these factors indicated a need to revisit the needs for the recommended improvements during the long-term planning horizon (to 2035).

### **2.6.1 Future Traffic Forecasts**

To conduct an analysis of the need for one or both of the two street extension recommendations, it was necessary to develop updated PM peak hour traffic forecasts for the current planning horizon year of 2035 for intersections along SR 503 between Main Street (SR 502) and NE 179<sup>th</sup> Street (study area). The planning horizon year for the original TSP was 2023, and projected intersection traffic volumes for that year were based on output from the regional travel demand model that was consistent with the adopted *Comprehensive Land Use Plan*. The 2023 projections were updated to the new planning horizon year of 2035 as follows:

- Recent intersection traffic counts were obtained at four of the five intersections included in the study area between NE 179<sup>th</sup> Street and Main Street. Growth in traffic volumes at the intersection of SR 503 with NE 189<sup>th</sup> Street were updated from earlier counts. These counts formed the basis for estimating future year traffic volumes.
- As a starting point in developing 2035 traffic projections, the recent 2035 forecast for SR 502 and SR 503 (as documented in the 2013 study discussed in the preceding section) was used. Projections for nearby intersections along SR 503 considered the north/south projected level of traffic from this intersection. Traffic projections also reflected consideration of an annualized traffic volume growth rate from the original travel demand model that was applied to the new

counts. Together, these two estimating approaches were used to develop 2035 PM peak hour traffic projections for the study area.

- 2035 PM peak hour projections were developed for several connectivity alternatives including as baseline condition (no through streets along either the 179<sup>th</sup> or 189<sup>th</sup> alignments), and various “build” options that included extending one or both of these roads. Projections for the “build” alternatives reflected an expected shift in traffic among the various SR 503 intersections based on the patterns modeled as part of the analysis for the original TSP.

2015 PM peak hour traffic counts and 2035 PM peak hour projections for the baseline conditions and the various build alternatives are included in Appendix A.

## 2.6.2 Jurisdictional Operating Standards

Agencies typically have established standards for intersection operations, which are commonly known as mobility standards. In Clark County, the mobility standards for highways of regional significance (set by RTC and WSDOT) are based on the concept of Levels of Service (LOS), which is in turn related to average intersection delay. The mobility standard for Intersections along urban sections of SR 503 is LOS E<sup>2</sup>.

## 2.6.3 Existing Operating Conditions

The existing traffic operating conditions at the study intersections were determined for the PM peak hours based on the *2000 Highway Capacity Manual* methodology<sup>3</sup> for signalized intersections. The conditions include the 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. As indicated in the table, all study area intersections are currently operating within the adopted mobility standard. Intersection operations analysis worksheets are included in Appendix B.

**Table 1. Existing PM Peak Hour Intersection Operations**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	LOS E	Signal	0.97	36.7	D
SR 503 at SW Scotton Way	LOS E	Signal	0.53	12.5	B
SR 503 at SW Eaton Boulevard	LOS E	Signal	0.86	31.2	C
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	0.61	7.2	A
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	0.51	14.0	B

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

During field observations in the PM peak period<sup>4</sup>, cycle failures (i.e., queues that are not fully served within a traffic signal cycle) were observed for the northbound left movement at the SR 503/W Main Street intersection—for example, only 12 vehicles of a 21 vehicle queue were served in an observed cycle. The turn pocket for northbound left vehicles was not adequate for all observed queues. However, queued vehicles utilized the painted median and through moving vehicles passed without delay. While

<sup>2</sup> *Metropolitan Transportation Plan for Clark County*, 2014 Update, Southwest Washington Regional Transportation Council, December 2014.

<sup>3</sup> *Highway Capacity Manual 2000*, Transportation Research Board, Washington DC, 2000.

<sup>4</sup> DKS Associates field observations, May 22, 2013.

eastbound queues in the outside lane were observed to extend to the W Main Street/W 12<sup>th</sup> Avenue intersection, it did not negatively impact the operations of the W Main Street/W 12<sup>th</sup> Avenue intersection. Queuing was not an issue for other movements at this intersection.

## 2.6.4 2035 Operating Conditions

### **Baseline Conditions**

Table 2 presents a summary of 2035 PM peak hour traffic operations at the five study area intersections without either the NE 189<sup>th</sup> or NE 179<sup>th</sup> Street extensions. As indicated in the table, the intersections of SR 503 with W Main Street and SW Eaton Boulevard are both expected to fail prior to 2035 with their existing lane geometry. Improvements to these intersections will be needed to accommodate expected traffic volumes. It should be noted that this analysis does not assume the extension of NW 5<sup>th</sup> Way north of Fred Meyer to connect with SR 503. This connection would reduce eastbound right turns by approximately 200 vehicles, while increasing the southbound through movement. Based on the DKS study of NW 5<sup>th</sup> Way, this would help to reduce traffic congestion and the SR 503/SR 502 intersection. The other three study area intersections are expected to meet adopted mobility standards. Intersection analysis worksheets are included in Appendix C.

**Table 2. 2035 PM Peak Hour Intersection Operations Baseline**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	LOS E	Signal	1.33	137.8	F
SR 503 at SW Scotton Way	LOS E	Signal	0.67	24.5	C
SR 503 at SW Eaton Boulevard	LOS E	Signal	1.69	217.7	F
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	0.80	14.3	B
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	0.80	25.6	C

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

### **Conditions with the Extension of NE 189<sup>th</sup> Street**

With the extension of NE 189<sup>th</sup> Street eastward from SR 503 to serve developing areas in southeast Battle Ground, a significant volume of PM peak hour traffic would be diverted away from SW Eaton Boulevard east of SR 503 (estimated to be approximately 500 westbound and 900 eastbound vehicles). This diversion will have significant benefits for traffic operations at the intersection of SR 503 at SW Eaton Boulevard and for the entire roadway segment along SW Eaton Boulevard east of the state highway. No change in traffic projections at the intersections of SR 503 with W Main Street or SW Scotton Way is expected with the extension of NE 189<sup>th</sup> Street. Some improvements will be required at the intersections of SR 503 with W Main Street and SW Eaton Boulevard. Improvements at the intersection of SR 502 with NE 189<sup>th</sup> Street should be considered as the expected level of services is a very high E bordering on F. Intersection analysis worksheets are included in Appendix D.

**Table 3. 2035 PM Peak Hour Intersection Operations with 189<sup>th</sup> Street Connection**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	LOS E	Signal	1.33	140.6	F
SR 503 at SW Scotton Way	LOS E	Signal	0.67	20.8	C
SR 503 at SW Eaton Boulevard	LOS E	Signal	1.27	109.3	F
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	1.13	78.4	E
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	0.80	25.6	C

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

#### **Conditions with the Extension of NE 179<sup>th</sup> Street**

Without development of the NE 189<sup>th</sup> Street extension, the extension of NE 179<sup>th</sup> Street eastward from SR 503 would result in a lower, but still substantial, volume of PM peak hour traffic on SW Eaton Boulevard east of SR 503 (estimated to be approximately 250 westbound and 600 eastbound vehicles). This diversion will have benefits for traffic operations at the intersection of SR 503 at SW Eaton Boulevard and for the entire roadway east of the state highway. No change in traffic projections at the intersections of SR 503 with W Main Street or SW Scotton Way is expected with the extension of NE 179<sup>th</sup> Street. Some improvements will be required at the intersections of SR 503 with W Main Street, SW Eaton Boulevard, and NE 179<sup>th</sup> Street. Intersection analysis worksheets are included in Appendix E.

**Table 4. 2035 PM Peak Hour Intersection Operations with 179<sup>th</sup> Street Connection**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	LOS E	Signal	1.33	140.6	F
SR 503 at SW Scotton Way	LOS E	Signal	0.67	21.4	C
SR 503 at SW Eaton Boulevard	LOS E	Signal	1.39	137.4	F
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	0.73	17.8	B
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	1.17	85.0	F

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

#### **Conditions with the Extension of Both NE 189<sup>th</sup> and NE 179<sup>th</sup> Streets**

The extension of both NE 179<sup>th</sup> and 189<sup>th</sup> Streets eastward from SR 503 would result in a significant reduction of PM peak hour traffic from SW Eaton Boulevard east of SR 503 (estimated to be approximately 600 westbound and over 900 eastbound vehicles). This diversion will have the highest benefits for traffic operations at the intersection of SR 503 at SW Eaton Boulevard of any build alternative. Some improvements will be required at the intersections of SR 503 with W Main Street, SW Eaton Boulevard, and NE 179<sup>th</sup> Street. Intersection analysis worksheets are included in Appendix F.

**Table 5. 2035 PM Peak Hour Intersection Operations with Both 179<sup>th</sup> and 189<sup>th</sup> Street Connections**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	LOS E	Signal	1.33	140.1	F
SR 503 at SW Scotton Way	LOS E	Signal	0.67	20.8	C
SR 503 at SW Eaton Boulevard	LOS E	Signal	1.19	97.1	F
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	0.97	50.0	D
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	1.09	63.4	E

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

### 2.6.5 Potential Intersection Improvements

An investigation was conducted into potential intersection improvements along SR 503 that could address the congestion problems expected with implementation of both the NE 189<sup>th</sup> and NE 179<sup>th</sup> Street extension projects. If only one or neither of these projects is implemented additional improvements would be required at the intersection of SR 503 with SW Eaton Boulevard, resulting in a very large intersection at this location and very high traffic volumes along SW/SE Eaton Boulevard, likely necessitating widening of this street. The results of this investigation are presented in Table 6. Intersection analysis worksheets are included in Appendix G. Consistent with these results, it is recommended that the intersection improvements described below be implemented.

**Table 6. 2035 PM Peak Hour Operations with both 179<sup>th</sup> and 189<sup>th</sup> Street Connections and Mitigation**

Intersection	Mitigation	Operating Standard	Traffic Control	PM Peak Hour		
				Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at Main Street (SR 502)	Add: EBR, SBR, WBR, WBL	LOS E	Signal	1.07	69.6	E
SR 503 at SW Eaton Boulevard	Add: EBR, WBL	LOS E	Signal	0.95	50.7	D
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	Add: WBL	LOS E	Signal	1.04	51.9	D
	Add: WBL, NBR	LOS E	Signal	0.99	32.3	C

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.

#### **SR 503 at W Main Street (SR 502)**

Consistent with the recommendations identified in the 2013 DKS study, the following improvements should be implemented.

- Add right turn lanes on all intersection legs where these improvements are not currently provided. This would include the eastbound, southbound and westbound directions. A right turn lane currently exists in the northbound direction.

It should be noted that these recommendations do not assume that the NW 5<sup>th</sup> Way connection to SR 503 (north of Fred Meyer) would be constructed. If this improvement is also made, the addition of a right turn lane in the eastbound direction should be reconsidered in light of the expected shift in traffic with this new roadway connection. With these improvements, traffic operations at this location would

improve from LOS F with 140 seconds of average delay to LOS E with approximately 70 seconds of average delay. This would allow traffic to meet the adopted mobility standard for this location.

### **SR 503 at SW Eaton Boulevard**

Recommended improvements at this location would include a new eastbound right turn lane to accommodate heavy eastbound traffic movement, and a second westbound left turn lane. With these improvements, traffic operations would improve from LOS F with 97 seconds of average delay to LOS D with about 51 seconds of average delay. The mobility standard for this location would be met.

### **SR 503 at NE 179<sup>th</sup> Street**

While this intersection is expected to meet the adopted mobility standard (LOS E) with the extension of both NE 189<sup>th</sup> and NE 179<sup>th</sup> Streets eastward, some improvement is recommended to ensure that the intersection operates as efficiently and safely as possible. Recommended improvements at this location would include separating the existing westbound through/left movements by providing a new left turn lane to accommodate the additional traffic expected when this road is connected through southeast Battle Ground. Due to relatively high expected northbound right-turning traffic, the addition of a northbound right turn lane should also be considered. With the addition of the westbound left turn lane, traffic operations would improve from LOS E with 63 seconds of average delay to LOS D with about 52 seconds of average delay. The addition of a northbound right turn lane would improve traffic operations to LOS C with approximately 32 seconds of average delay.

## **2.6.6 Recommendations**

Based on the analysis conducted for this TSP Update the following improvements are recommended for enhancing a “backbone” transportation system in southeast Battle Ground:

- **Street Extensions** - Consistent with federal guidelines on the spacing of arterial and major collector streets in developing areas of a community, it is recommended that both NE 189<sup>th</sup> /SW 30<sup>th</sup> Street and NE 179<sup>th</sup> / SW 40<sup>th</sup> Street be extended eastward from SR 503 to at least SE Grace Avenue. Based on the street spacing illustrated in Figure 1, it is also recommended that NE 189<sup>th</sup> Street be extended further eastward to connect with a future recommended extension of NE 152<sup>nd</sup> Avenue.
- **Intersections** – It is recommended that the intersection improvements be made to accommodate growth traffic volumes along SR 503 at both W Main Street/SR 502, and SW Eaton Boulevard. It is also recommended that, when the NE 179<sup>th</sup> Street is extended that improvements are made to the intersection with SR 503 to accommodate the increased traffic activity associated with this extension. While, the intersection of SR 503 at NE 189<sup>th</sup> Street is expected to meet the LOS E mobility standard, consideration should also be given to extending the westbound left turn lane to provided added vehicle storage space.

## **2.7 Extension of NW 5<sup>th</sup> Street, SR 503 to N Parkway Avenue**

Section 2.5 presents a discussion of the benefits and impacts of connecting NW 5<sup>th</sup> Way (north of Fred Meyers) to the west side of SR 503 as a right-turn-in/right-turn-out (RIRO) intersection. In this section, a short discussion is presented of impacts and potential benefits associated with building a new NW 5<sup>th</sup> Street between N Parkway Avenue and SR 503, to connect with the state highway on the east side. Current discussions with WSDOT have indicated that NW 5<sup>th</sup> Way/Street would not connect across the highway due to the interruption another full intersection would have on north/south traffic passing through Battle Ground. Thus, this connection was only evaluated as a RIRO intersection.

Figure 10 presents an illustration of potential alignment options for NW 5<sup>th</sup> Street between N Parkway Avenue and SR 503. The red lines show the alignment originally proposed in the 2005 Battle Ground TSP. This alignment had the advantage of connecting NE 5<sup>th</sup> Street on the east side of N Parkway Avenue, thus providing increased local connectivity with no additional intersections along Parkway. Some concern was expressed by the Battle Ground School District about the disruption of this alignment to existing playing field. As a result, the yellow alignment option was adopted.

**Figure 10. Alignment Options for NW 5<sup>th</sup> Street**



Table 7 presents a summary of traffic operations analysis for conditions with no connections either on the east or west side of SR 503. The quantifiable benefits of the extension of NW 5<sup>th</sup> Street between N Parkway Avenue and SR 503 can be seen in this table and include:

- Providing some relief to existing traffic levels along W. Main Street, particularly at the intersection with SR 503. Some traffic that currently comes down N Parkway to W Main to reach destinations to the north will likely divert and use NW 5<sup>th</sup> Street. Additionally, some of the northbound traffic that would have turned right off SR 503 onto W. Main Street would likely continue north and divert onto NW 5<sup>th</sup> Street. As shown in a comparison of the data in Table 7 between the 2035 PM peak hour baseline condition (LOS F with average vehicular delay of 137.8 seconds) and conditions with a relatively modest diversion of northbound and westbound right turning traffic to NW 5<sup>th</sup> Street (still LOS F but with 119.7 seconds of average vehicle delay). This change would reduce average vehicle delay at the intersection of SR 503 at W Main Street by nearly 18 seconds.
- This diversion of traffic would also improve traffic operations at the intersections along W. Main to approximately as far east of N Parkway Avenue.

- Additional benefits include increased options for local traffic circulation and improved pedestrian and bicycle access to and from the schools in the vicinity.

Disadvantages of the street connection would include adding vehicular traffic in the location where none currently exists. PM peak hour vehicles along NW 5<sup>th</sup> Street east of SR 503 are expected to be approximately 200 vehicles in both directions.

**Table 7. 2035 PM Peak Hour Intersection Operations with NW 5<sup>th</sup> Street/NW 5<sup>th</sup> Way Extensions**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
<u>2035 Baseline Condition</u>					
SR 503 at Main Street (SR 502)	LOS E	Signal	1.33	137.8	F
<u>With Extension of NW 5<sup>th</sup> Street to the East of SR 503</u>					
SR 503 at NW 5 <sup>th</sup> Street (RIRO on 5 <sup>th</sup> )	LOS E	Stop	0.23	20.5	C
SR 503 at Main Street (SR 502)	LOS E	Signal	1.19	119.7	F
<u>With Extension of NW 5<sup>th</sup> Street to the East and West of SR 503</u>					
SR 503 at NW 5 <sup>th</sup> Street (RIRO on 5 <sup>th</sup> )	LOS E	Stop	0.65	22.9	C
SR 503 at Main Street (SR 502)	LOS E	Signal	1.12	125.2	F
SR 503 at Main Street (SR 502) Mitigated	LOS E	Signal	1.02	78.4	E

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology. Reflects worst movement for unsignalized intersections and the sum of all movements for signalized intersections.

Analysis was also conducted of traffic effects related to the addition of the NW 5<sup>th</sup> Way extension on the west side of SR 503 which was more fully discussed in Section 2.5. In combination with access to/from the east, 2035 traffic operations at SR 503/W Main Street would improve over the baseline condition. Implementation of the intersection improvements suggested in the DKS study would improve traffic operations to an acceptable LOS E (with approximately 78 seconds of average vehicle delay). However, as noted in Section 2.6, operating performance at this intersection would improve more substantially with the addition of the NE 179<sup>th</sup> and NE 189<sup>th</sup> Street extensions. With all of the street improvements discussed in Sections 2.5, 2.6 and 2.7, the greatest level of traffic volume relief would be seen at the intersection of SR 503 and W Main Street and long-term performance would be maximized.

## 2.8 Extension of NE 179<sup>th</sup> Street west of SR 503

The evaluation of various options for extending NE 179<sup>th</sup> and NE 189<sup>th</sup> Streets east of SR 503 assumed improvement to NE 179<sup>th</sup> Street west of SR 503 to ultimately connect with SW 20<sup>th</sup> Avenue. This connection allowed for a shifting of traffic between NE 179<sup>th</sup> and NE 189<sup>th</sup> Streets as connection options to the east were evaluated. However, a full connection of NE 179<sup>th</sup> Street westerly to NE 102<sup>nd</sup> Avenue (and, thus, all the way to I-5) was not included in the analysis. This section documents the results of assessing such a connection.

Analysis was conducted using 2035 PM peak hour travel forecasts from the RTC regional travel demand model which identified the magnitude of potential traffic shift that could be associated with the full extension of NE 179<sup>th</sup> Street to the west. Two modeling scenarios were produced including a 2035 baseline condition (which included extension of NE 189<sup>th</sup> Street from SR 503 to NE 142<sup>nd</sup> Avenue) and a scenario that connected NE 179<sup>th</sup> from SR 503 westward to NE 102<sup>nd</sup> Avenue. Based on the addition of

this connection, approximately 230 vehicles would use NE 179<sup>th</sup> Street west of SR 503 (99 eastbound and 133 westbound). This increase in traffic volumes included both a small diversion from W Eaton Boulevard, a slightly larger diversion from NE 189<sup>th</sup> Street, and new traffic drawn to the corridor as a result of improved connectivity.

Table 8 summarizes the results of intersection operations analysis for 2035 PM peak hour conditions with complete connections along NE 189<sup>th</sup> and NE 179<sup>th</sup> Streets east and west of SR 503. Analysis worksheets are included in Appendix I. As indicated in the table, 2035 PM peak hour traffic operations are expected to be acceptable at the intersection of SR 503 and NE 189<sup>th</sup> Street, while failing at the intersection with NE 179<sup>th</sup> Street. If the mitigation recommended earlier in this chapter is implemented at SR 503/179<sup>th</sup> Street, intersection operations would improve from LOS F to LOS D, meeting the adopted performance standard.

**Table 8. 2035 PM Peak Hour Intersection Operations with NE 179<sup>th</sup> Street Connection between NE 102<sup>nd</sup> and NE 142<sup>nd</sup> Avenues**

Intersection	Operating Standard	Traffic Control	PM Peak Hour		
			Volume/ Capacity <sup>1</sup>	Average Delay <sup>1</sup>	LOS <sup>1</sup>
SR 503 at SW 30 <sup>th</sup> / NE 189 <sup>th</sup> Street	LOS E	Signal	0.96	39.9	D
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street	LOS E	Signal	1.15	84.6	F
SR 503 at SW 40 <sup>th</sup> / NE 179 <sup>th</sup> Street - Mitigated	LOS E	Signal	1.02	39.0	D

<sup>1</sup> Results estimated using Highway Capacity Manual (HCM) 2000 methodology.