South Barker Corridor Transportation Impact Fee Rate Study

Prepared for:
City of Spokane Valley, Washington

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SE20-0748

FEHR PEERS

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Introduction

This report documents the methods, assumptions, and findings of a transportation impact fee (TIF) rate study for the South Barker Corridor in Spokane Valley. The need for a TIF is identified in the *South Barker Corridor Study* (Feb 2020), which documented the growth along the corridor, projected how that growth will degrade traffic operations along Barker Road, and identified several transportation capacity projects to support growth and ensure adequate level of service through the year 2040. That study identified the needed future improvements along the corridor, completed project cost estimates, and included a fair share cost analysis to separate project costs between growth in southeast Spokane Valley and growth from other parts of the region. This TIF rate study builds on the *South Barker Corridor Study* and identifies a Growth Management Act (GMA) compliant impact fee rate schedule per development unit. Using this rate schedule, developers in southeast Spokane Valley can quickly identify their fair share contribution toward new transportation projects, facilitating development and reducing the cost and complexity of traffic studies associated with project permitting and transportation concurrency requirements.

Except as otherwise identified herein, the *South Barker Corridor Study* provides the basis for all TIF rates calculated in this rate study. As part of adoption of any TIF rates, both the *South Barker Corridor Study* and this TIF rate study will be adopted as supporting documents.

Study Area

The South Barker Corridor extends along Barker Road from Mission Avenue to the south city limits of Spokane Valley. The *South Barker Corridor Study* defined the impact fee area for the South Barker Corridor as shown in **Figure 1**. Figure 1 shows the portions of Spokane Valley, Liberty Lake, and unincorporated Spokane County near the South Barker Corridor where development would have the greatest impact on traffic in the corridor. The area was defined in that study using a select zone analysis from the Spokane Regional Transportation Council (SRTC) regional travel demand model to quantify the impact of the transportation analysis zones (TAZs) near the corridor. Combined, this area is expected to contribute between 45% and 52% of future traffic on South Barker Road (depending on the segment of Barker Road). It should be noted that the Northeast Industrial Area (north of the Spokane River) was excluded from the analysis as the City of Spokane Valley (COSV) is already utilizing a Planned Action Ordinance to assess SEPA mitigation fees for projects on Barker Road north of I-90.

The South Barker Corridor TIF rate provided in this study would apply to any new development in the Spokane Valley TAZs identified in the *South Barker Corridor Study*, which is the area shaded in pink on Figure 1. This includes the following TAZs: 325, 326, 327, 328, 334, 369, 388, 389, 391, and 392. This area will be referred to in this report as the South Barker Corridor TIF area. Based on the analysis provided in the *South Barker Corridor Study*, future development in the South Barker TIF area of Spokane Valley is expected to contribute between 18% and 26% of future traffic on the South Barker Corridor - depending on the segment of the corridor. Based on the select zone analysis, areas in Spokane Valley outside of this area generate less traffic on South Barker Road and do not need to pay an impact fee.

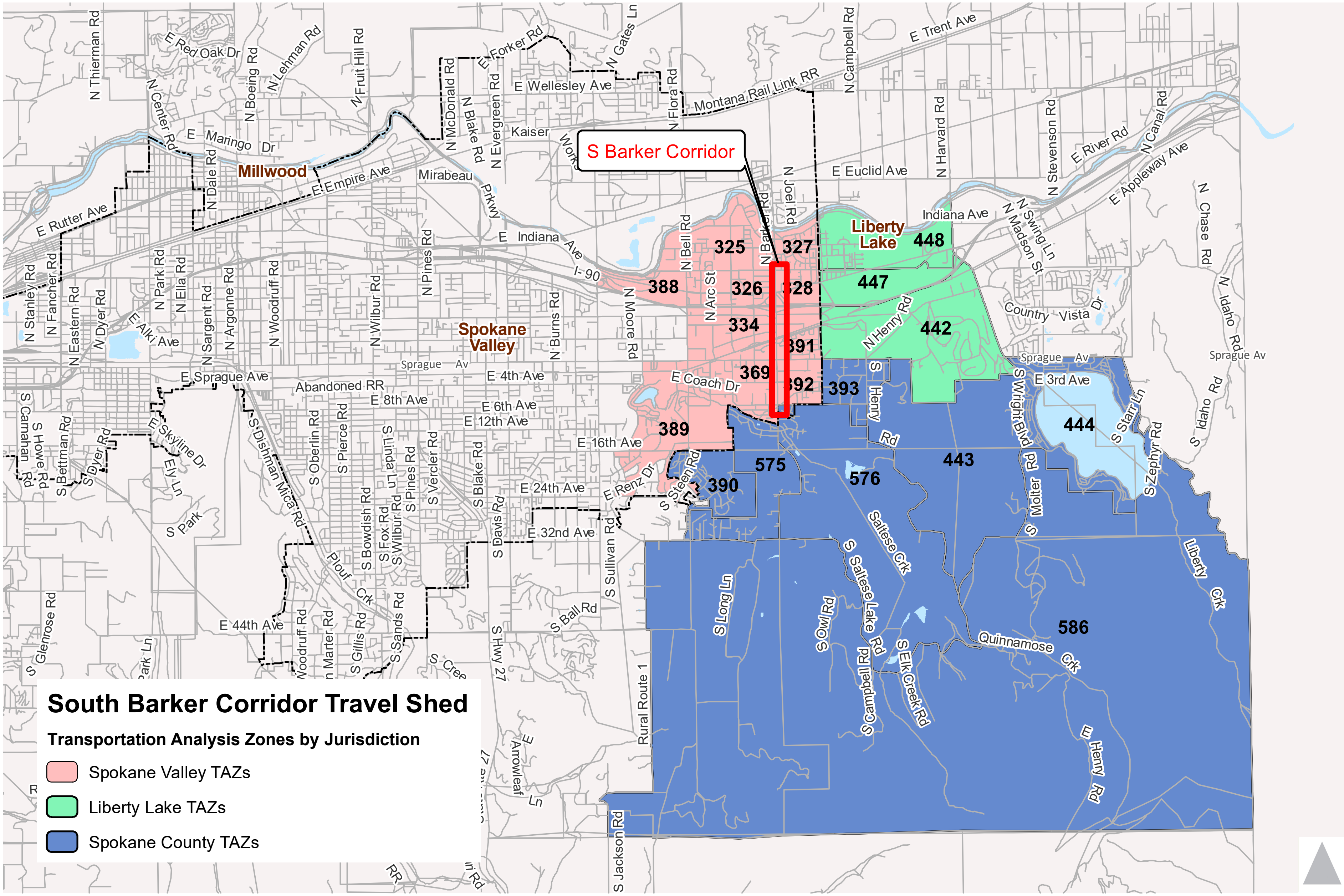


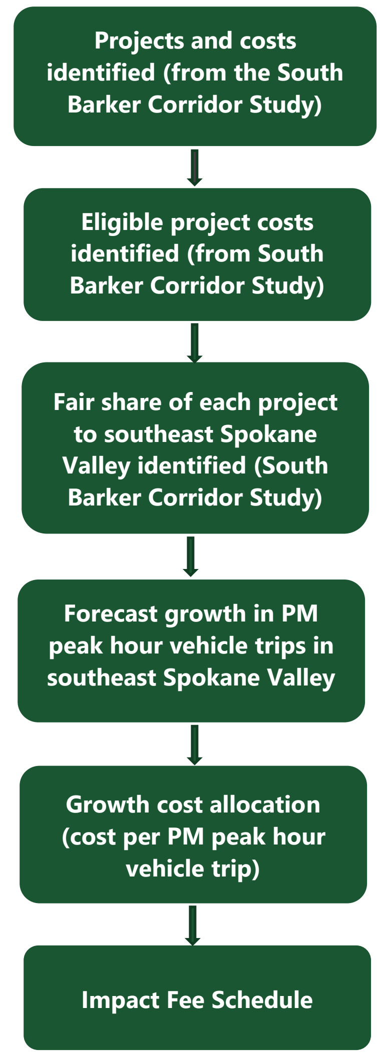
Figure 1

Transportation analysis zones included in the South Barker Corridor Study fair-share cost analysis.

Methodology

The impact fee for the South Barker Corridor was developed to establish the fair share of transportation improvement costs that may be charged to new development in the area. Revised Code of Washington Section 82.02.050 authorizes cities planning under the GMA to impose impact fees for system improvements that are reasonably required to support and mitigate the impacts of new development. Fees may not exceed a proportionate share of the costs of improvements and cannot be used to fund existing deficiencies.

Figure 2. Impact Fee Methodology



The following key points summarize the process for developing the impact fee structure (refer to **Figure 2**):

- The *South Barker Corridor Study* identified a list of future projects and estimated costs along Barker Road that will be needed to support future growth through the year 2040.
- The *South Barker Corridor Study* also accounted for any existing deficiency (intersections/roadway segments that do not meet current level of service standards) or committed outside funding sources by deducting the costs of those deficiencies/external funds from the total project cost.
- The *South Barker Corridor Study* next assigned the fair share of each project to southeast Spokane Valley and nearby areas outside the City.
- The forecast growth in PM peak hour vehicle trips in southeast Spokane Valley was estimated by converting the forecast land use growth in the SRTC regional travel demand model using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition.
- A cost per PM peak hour trip was calculated by dividing the fair share cost of each project by the growth in vehicle trips in southeast Spokane Valley.
- Lastly, a land use-based fee schedule was developed using the cost per PM peak vehicle trip calculated above. Trip rates for multiple land use categories were estimated using vehicle trip generation rates from the ITE Trip Generation Manual, 10th Edition. Using the ITE Trip Generation Manual will provide consistency between a project trip generation letter or traffic impact study and the impact fee rate.

The following sections describe in detail these elements that that are integral to the final impact fee schedule.

Project List

The *South Barker Corridor Study*, completed in July 2019 and updated in February 2020, included an analysis of traffic demand through the year 2040 to identify potential traffic improvement projects on the segment of Barker Road between Mission Avenue and the south City limits of Spokane Valley. That study identified a total of eight projects that will be needed by 2040 along the corridor to accommodate future growth and maintain level of service standards. Those projects, and costs in 2020 dollars, are shown in **Table 1**. Three of the projects include improvements to the Barker Road/I-90 interchange that will primarily be the responsibility of the Washington Department of Transportation (WSDOT). At this time, there are no anticipated costs to the City of Spokane Valley (COSV) for these projects. Therefore, the five projects identified in the *South Barker Corridor Study* for which COSV would be responsible for funding total approximately $18.8 million in 2020 dollars (note: these costs have been updated from the cost estimates in the *South Barker Corridor Study* to account for construction cost inflation and/or more detailed estimates by COSV).

Table 1. South Barker Corridor Project List and Cost Estimates (cont. on next page)

Project	Description	Program	Agency Responsible	COSV Cost Estimate (2020 dollars)
Constructed in 2020				
I-90 Eastbound Ramp/ Barker Road Interchange Interim Improvements	Reconstruct intersection with single-lane roundabout and two eastbound approach lanes; realign east leg of Broadway	Horizon 2040 Plan (#12)	WSDOT	N/A
I-90 Westbound Ramp/ Barker Road Interchange Interim Improvements	Reconstruct intersection with single-lane roundabout and two southbound approach lanes; convert Barker/Boone to right-in/right-out	Horizon 2040 Plan (#12)	WSDOT	N/A
Near-Term (2021-2024)				
Sprague/Barker Intersection Improvements	Reconstruct intersection with single-lane roundabout	2021-2026 TIP (#28)	COSV	$2,139,000
Mid- Term (2025-2030)				
I-90/Barker Road Interchange Long-Term Improvements	Replace Barker Rd. Bridge, widen to 4-lanes from Boone Ave. to Broadway; reconstruct both intersections to 2-lane roundabout; reconstruct Barker/I-90 WB ramp intersection to six-leg roundabout with Boone Avenue	Horizon 2040 Plan (#12)	WSDOT	Not anticipated at this time
Barker Road Improvement Project – Appleway to I-90	Widen and improve to 5-lane urban section; roundabout @ Broadway	2021-2026 TIP (#44)	COSV	$6,501,000

Project	Description	Program	Agency Responsible	COSV Cost Estimate (2020 dollars)
Barker Road Improvement Project – Mission to I-90	Widen and improve to 5-lane urban section	2021-2026 TIP (#61)	COSV	$3,146,000
Long-Term (2031-2040)				
Barker Road Improvement Project – Appleway to South City Limits	Reconstruct and widen north of Sprague to 3-lane urban section, and south of Sprague to 2-lane urban section	2019-2024 TIP (#20)	COSV	$3,500,000
4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements	Reconstruct 4th Ave. and 8th Ave. intersections with single-lane roundabouts	2019-2024 TIP (#21)	COSV	$3,500,000
			TOTAL	**$18,786,000**

Source: *South Barker Corridor Study* (February 2020). Costs were updates to 2020 dollars based on the COSV 2021-2026 TIP for all projects except Barker Road Improvement Project – Mission to I-90. Cost for that project was updated using construction inflation rates.
Note: Horizon 2040: SRTC Long Range Transportation Plan; TIP: City of Spokane Valley Transportation Improvement Plan.

Travel Growth

Determining the growth in travel demand caused by new development is a key requirement for a TIF program. In nearly every TIF program across Washington and the country, the total eligible costs of building new transportation capacity is divided by the total growth in trips to determine a cost per trip. All developments pay the same cost per trip, but larger developments that generate more trips pay a higher total fee than smaller developments. In this way, the cost to provide the new transportation infrastructure is fairly apportioned to new development. Moreover, in setting the boundary for the TIF, a select zone analysis was performed to validate that all the areas within the TIF area contributed a meaningful amount (at least one percent) of total traffic to Barker Road. The amount of traffic varies somewhat based on which segment of Barker Road is evaluated and which TAZ the project resides in, but in all cases each of the ten identified TAZs within the TIF area contribute at least 5% of the total COSV traffic along the corridor.

For the South Barker Corridor TIF, the future growth in PM peak hour vehicle trips was estimated using the change in land use in the study area from the 2015 and 2040 SRTC regional travel demand model as well as trip rates from the ITE Trip Generation Manual, 10th Edition. The SRTC travel demand model includes 11 land use categories: two residential and nine non-residential categories. For each land use in the SRTC model, an associated ITE trip rate was identified. Total PM peak hour vehicle trips within the study area were calculated by multiplying the PM peak hour trip rate identified by ITE by the forecast growth (from 2015 to 2040) in dwelling units, employees, or hotel rooms, depending on the land use. **Table 2** summarizes the calculation. It should be noted that COSV directs developers to apply the trip calculation methodology based on the process detailed in Section 4.4 of the ITE Trip Generation Handbook, 3rd Edition when estimating trip generation for developments. In some situations the best-fit curve would be used instead of average trips rates. That methodology is applicable at the development scale where developments of various sizes can impact trip rates. However, in this situation given growth forecast in the model will occur among developments of various sizes over a 25 year period, using average trip rates is more appropriate and was applied to forecast growth in trips in the Barker TIF area.

Table 2. Growth in Study Area PM Peak Hour Vehicle Trips (2015-2040)

SRTC Land Use (LU)	2015-2040 LU Growth	Unit of Measure	ITE Code	ITE Description	ITE Average Trip Rate [1] (PM peak hr.)	Growth in Trips (LU growth x trip rate)
Single Family Residential	917	Dwelling Units	210	Single-Family Detached Housing	0.99	908
Multi-Family Residential	1,070	Dwelling Units	220	Multifamily Housing (Low-Rise)	0.56	599
Hotel/Motel	200	Rooms	310	Hotel	0.60	120
Agriculture, Forestry, Mining, Industrial, Manufacturing, Wholesale	0	Employees	N/A	N/A	N/A	0
Retail Trade (Non-Central Business District)	280	Employees	820	Shopping Center	1.62	454
Services and Offices	654	Employees	710	General Office Building	0.40	262
Finance, Insurance, and Real Estate Services (FIRES)	62	Employees	710	General Office Building	0.40	25
Medical	503	Employees	630	Clinic	0.85	428
Retail Trade (CBD)	0	Employees	N/A	N/A	N/A	0
Education Employees	35	Employees	520	Elementary School	1.78	62
University Employees	0	Employees	N/A	N/A	0.40	0
					Total Growth in PM Peak Hour Trips	**2,857[2]**

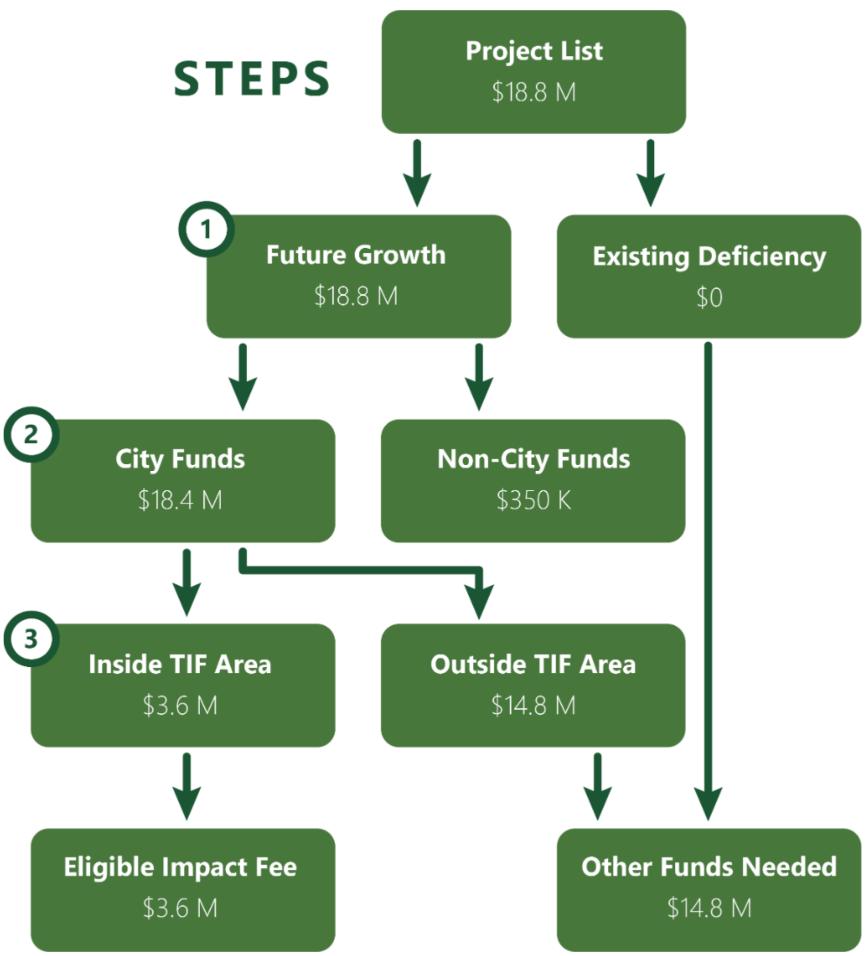
1. ITE Trip Generation Manual, 10th Edition; average trip rate of adjacent street traffic 4-6 PM was used for all land uses given growth will occur among developments of various sizes.
2. Estimated growth in trips differ from the findings in the *South Barker Corridor Study* because estimates in this study are based on the ITE trip generation rates as opposed to trip growth outputs of the SRTC regional travel demand model.

Using this methodology, it is forecast that the South Barker Corridor TIF area would generate about 2,857 new PM peak hour vehicle trips by 2040. This total PM peak hour vehicle trip growth will be used in the calculation of TIF rate. Note: the trip growth by 2040 differs from the trip growth estimated in the *South Barker Corridor Study* as the estimate in this report is based on ITE trip rates derived from forecast land use growth, while for the *South Barker Corridor Study* trip generation was pulled directly from the SRTC regional travel demand model. ITE Trip rates were used to develop the TIF rate in accordance with development requirements defined in the Spokane Valley Street Standards.

Cost Allocation

Three steps were used to allocate costs per PM peak hour trip, see **Figure 3**. First, the TIF methodology must separate the share of project costs that address existing deficiencies from the share of project costs that add transportation capacity and serve new growth. Second, dedicated funding from non-City sources must be removed from the project cost as funds generated by the TIF can only be used for projects identified to have an impact from the development being assessed a fee. Third, resulting growth-related improvement costs are then further separated to identify the share of growth related to land development in Barker Road TIF area.

Figure 3. Impact Fee Cost Allocation



Existing Transportation Deficiencies

An existing conditions analysis was conducted as part of the *South Barker Corridor Study*, which identified existing level of service deficiencies at the Barker Road and I-90 intersections. A deficiency at an intersection is defined as a level of service rating of E or lower at a signalized intersection or level of service F at an unsignalized intersection as established in the Comprehensive Plan. Since the three projects at the Barker Road and I-90 interchange are expected to be funded by WSDOT, the cost of these projects was not included in the total project cost for the South Barker Corridor. No other locations along the corridor were identified as having an existing deficiency. Therefore, no costs were deducted from the total project cost on account of an existing deficiency.

Committed External Funding

Of the five projects whose cost are included in the South Barker Corridor TIF, only one currently has dedicated funding from a non-City source, the Sprague Avenue/Barker Road intersection improvement project. This project has $349,000 dedicated from a Congestion Mitigation/Air Quality grant. Therefore, this cost was deducted from the total cost of this project. **Table 4** (on the following page) illustrates the eligible project costs that were applied to the South Barker Corridor TIF, totaling $18,437,000.

Fair-Share Cost

With deficiencies and external funding accounted for, all the remaining project costs are related to supporting new growth in trips that will be funded by COSV. However, not all the growth comes from development in the South Barker Corridor TIF area – there is a portion of growth that comes from other parts of Spokane Valley and surrounding jurisdictions. To ensure that the costs assessed to development as part of the TIF are fair and proportional to the impact, a fair share percentage was used. The *South Barker Corridor Study* identified the percentage of traffic growth in three different segments of the South Barker Corridor that are expected to be attributable to development in the South Barker Corridor TIF area. This was done using a select zone analysis in the 2040 SRTC travel demand model. The percentage ranges from 18% in the south end of the corridor to 26% in the north end of the corridor as shown in **Table 3**.

Table 3. Percent of 2040 Traffic on Barker Road Attributable to Study Area

Segment of Barker Road	Southeast Spokane Valley Study Area (TIF Area)
North of I-90	26%
I-90 to Appleway Avenue	19%
South of Appleway Avenue	18%

Source: *South Barker Corridor Study*

The fair share percentages were multiplied by the eligible cost of each project in the corridor to get the cost of growth-related transportation improvements on the South Barker Corridor that is expected to be attributable to development in the South Barker Corridor TIF area. This equates to $3,635,350. Lastly, this cost was divided by the forecast new PM peak hour trips generated by new development in this area (2,857) to arrive at a cost per new PM peak hour vehicle trip of $1,272.

Table 4. Cost Per PM Peak Hour Trip Calculations

Project	Project Cost (to COSV)	Cost to Address Existing Deficiencies	Non-City Dedicated Funds	Eligible Project Cost	TIF Area Fair Share Percent	Cost Attributable to Study Area
I-90 Eastbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	N/A	26%	N/A
I-90 Westbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	N/A	26%	N/A
Sprague/Barker Intersection Improvements	$2,139,000	$0	$349,000	$1,790,000	18%	$322,200
I-90/Barker Road Interchange Long-Term Improvements	Not anticipated at this time	$0	$0	None anticipated at this time	26%	None anticipated at this time
Barker Road Improvement Project – Appleway to I-90	$6,501,000	$0	$0	$6,501,000	19%	$1,235,190
Barker Road Improvement Project – Mission to I-90	$3,146,000	$0	$0	$3,146,000	26%	$817,960
Barker Road Improvement Project – Appleway to South City Limits	$3,500,000	$0	$0	$3,500,000	18%	$630,000
4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements	$3,500,000	$0	$0	$3,500,000	18%	$630,00
TOTAL	**$18,786,000**	**$0**	**$0**	**$18,437,000**	**Varies**	**$3,635,350**
					PM Peak Trips	2,857
					Cost Per PM Peak Trip	**$1,272**

When taking all the above calculations into consideration, the South Barker Corridor TIF would contribute up to 20 percent of the total $18.4 million eligible cost of the improvement projects on the South Barker Corridor. City matching funds, new grants, and other sources would provide the remaining 80 percent of the total project costs.

Impact Fee Schedule

The impact fee schedule was developed by adjusting the cost per PM peak hour vehicle trip to reflect differences in trip-making characteristics for the general land use types forecast in the SRTC regional travel demand model within southeast Spokane Valley. The fee schedule is a table where fees are represented as dollars per unit for each land use category which makes it easier for developers to calculate their impact fee rates. **Table 5** shows the various components of the fee schedule.

Trip Generation

Trip generation rates for each land use type in the PM peak hour were derived from average trip rates for selected land uses of the ITE Trip Generation Manual, 10th Edition to ensure consistent and repeatable calculations across all land uses.

Pass-By Trip Adjustment

The ITE trip generation rates represent total vehicles entering and leaving a development. For certain land uses (e.g., retail, convenience stores, etc.), a substantial amount of the motorized travel is already passing by the property and merely turns into and out of the driveway. These pass-by trips do not add trips to the surrounding street system and therefore are subtracted out prior to calculating the impact fee. The resulting trips are considered "new" trips and are therefore subject to the impact fee calculation. The pass-by trip percentages are taken from the ITE Trip Generation Handbook, 3rd Edition (2017).

Schedule of Rates

The proposed impact fee rates are shown in **Table 5**. An expanded table of land uses is provided in **Table 6** in Appendix A. In the fee schedule, fees are shown as dollars per unit of development for various land use categories. The impact fee program is flexible in that if a use does not fit into one of the ITE land use categories listed, an impact fee can be calculated based on the development's projected PM peak hour person trip generation and multiplied by the cost per PM peak hour trip of $1,272 as shown in Table 5. Projects with land uses not in Table 5 or Table 6 shall prepare a trip generation and distribution letter and will be responsible for a fee based on $1,272 per PM peak hour trip.

Table 5. Impact Fee Schedule

City of Spokane Valley South Barker Corridor Transportation Impact Fee Rate Schedule						
ITE Code	ITE Land Use Category	PM Peak Vehicle Trip Rate [1]	Passby % [2]	Adjusted Trips per Unit of Measure [3]	Impact Fee Per Unit [4] @ $1,272 per PM Peak Vehicle Trip	
210	Single Family & Duplex	0.99	0%	0.99	$1,260	per dwelling unit
220	Multi-Family	0.56	0%	0.56	$713	per dwelling unit
310	Hotel (3 or More Levels)	0.70	0%	0.70	$891	per room
520	Elementary School	0.00137	0%	0.00137	$1.74	per sq ft
630	Medical Clinic	0.00328	0%	0.00328	$4.17	per sq ft
710	General Office	0.00115	0%	0.00115	$1.46	per sq ft
820	Shopping Center	0.00381	34%	0.00251	$3.20	per sq ft

[1] ITE Trip Generation Manual (10th Edition): 4-6 PM Peak Hour Vehicle Trip Generation Rates for the Adjacent Street Traffic (weekday 4-6PM); This worksheet represents only the generalized land uses in the SRTC regional travel demand model and is NOT all-inclusive; see Table 6 for a wider variety of uses; Projects with land uses not in Table 5 or 6 shall prepare a trip generation and distribution letter and will be responsible for a fee based on $1,272 per PM peak hour trip.

[2] New trips will exclude "pass-by" trips: see "ITE Trip Generation Handbook 3rd Edition" (2017).

[3] PM peak trip rate excluding passby trips

[4] sq ft = square feet, room = available hotel/motel room

Appendix A – Expanded Impact Fee Schedule

Table 6. Expanded Impact Fee Schedule

City of Spokane Valley South Barker Corridor Transportation Impact Fee Rate Schedule							
Land Use Group	ITE Code	ITE Land Use Category	PM Peak Vehicle Trip Rate [1]	Passby % [2]	Adjusted Trips per Unit of Measure [3]	Impact Fee Per Unit [4] @ $1,272 per PM Peak Vehicle Trip	
Residential	210	Single Family & Duplex	0.99	0%	0.99	$1,260	per dwelling unit
	220	Multi-Family	0.56	0%	0.56	$713	per dwelling unit
Services	310	Hotel (3 or More Levels)	0.70	0%	0.70	$891	per room
	492	Health Club	0.00345	0%	0.00345	$4.39	per sq ft
	912	Bank	0.02045	34%	0.01350	$17.17	per sq ft
Institution	520	Elementary School	0.00137	0%	0.00137	$1.74	per sq ft
	522	Middle School	0.00119	0%	0.00119	$1.51	per sq ft
	530	High School	0.00097	0%	0.00097	$1.23	per sq ft
Restaurant	925	Drinking Establishment	0.01136	43%	0.00648	$8.24	per sq ft
	934	Fast Food Restaurant (with drive-thru)	0.03267	50%	0.01634	$20.79	per sq ft
	937	Coffee Shop with Drive-Thru	0.04338	89%	0.00477	$6.07	per sq ft
Retail	820	Shopping Center	0.00381	34%	0.00251	$3.20	per sq ft
	841	Automobile Sales - Used/New	0.00375	0%	0.00375	$4.77	per sq ft
	853	Convenience Market with Gasoline Pumps	23.04	66%	7.83	$9,968	per pump
Industrial	110	Light Industry/High Technology	0.00063	0%	0.00063	$0.80	per sq ft
	140	Manufacturing	0.00067	0%	0.00067	$0.85	per sq ft
	151	Mini-Storage	0.00017	0%	0.00017	$0.22	per sq ft
Office	710	General Office	0.00115	0%	0.00115	$1.46	per sq ft
	720	Medical Office / Clinic	0.00346	0%	0.00346	$4.40	per sq ft
	750	Office Park	0.00107	0%	0.00107	$1.36	per sq ft

[1] ITE Trip Generation Manual (10th Edition): 4-6 PM Peak Hour Vehicle Trip Generation Rates for the Adjacent Street Traffic (weekday 4-6PM); This worksheet represents only the most common uses in southeast Spokane Valley and is NOT all-inclusive; Projects with land uses not in Table 5 or 6 shall prepare a trip generation and distribution letter and will be responsible for a fee based on $1,272 per PM peak hour trip.

[2] New trips will exclude "pass-by" trips: see "ITE Trip Generation Handbook 3rd Edition" (2017).

[3] PM peak trip rate excluding passby trips

[4] sq ft = square feet, pump = vehicle servicing position/gas pump, room = available hotel room

Appendix B – South Barker Corridor Study

[Add S Barker Corridor Study]

SOUTH BARKER CORRIDOR STUDY

FEHR & PEERS

FINAL REPORT | UPDATED FEBRUARY 2020

City of Spokane Valley

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INTRODUCTION

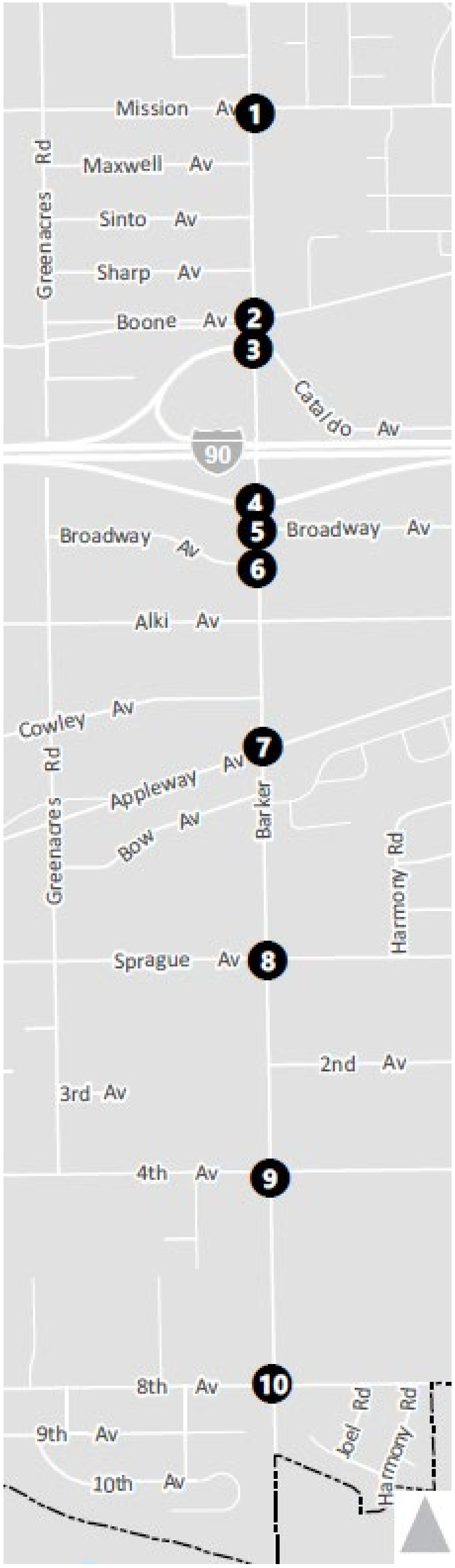
This report presents the findings and recommended improvements of the South Barker Corridor Study. The purpose of the South Barker Corridor Study is to analyze traffic demands through year 2040 and identify potential traffic improvement projects on the segment of Barker Road between Mission Avenue and the South City Limits in Spokane Valley, Washington. The study includes planning-level cost estimates of improvements and an estimate of the proportion of traffic along segments of the corridor from adjacent jurisdictions (Liberty Lake and Spokane County) to assist in developing potential mitigation fee payments for the new development that is occurring in this part of the Spokane region. In addition, this study analyzed traffic operations at the Barker Road/I-90 interchange under the WSDOT interim concept (year 2020) and long-term concept (by year 2040) to verify that the proposed interchange improvements will operate adequately and serve the planned growth in Spokane Valley and the surrounding area. Based on the analysis, guidance is provided to WSDOT on the City of Spokane Valley's preferred interim and long-term improvements for the I-90 interchange.

Study Area

The study area includes the Barker Road corridor between Mission Avenue and the South City Limits on the east side of Spokane Valley. The following 10 intersections along Barker Road were included in the study and mapped in **Figure 1**.

1. Barker Road/Mission Avenue
2. Barker Road/Boone Avenue
3. Barker Road/I-90 westbound ramp/Cataldo Avenue
4. Barker Road/I-90 eastbound ramp
5. Barker Road/Broadway (east)
6. Barker Road/Broadway (west)
7. Barker Road/Appleway Avenue
8. Barker Road/Sprague Avenue
9. Barker Road/4th Avenue
10. Barker Road/8th Avenue

Figure 1. Study Area Intersections



METHODS & ASSUMPTIONS

The following methods and assumptions were applied to forecast traffic and analyze traffic operations as part of this Study.

Land Use Assumptions

Traffic volumes at each of the study intersections were estimated using the current version of the SRTC 2015 and 2040 regional travel demand models, which was last updated in December 2017. Fehr & Peers received a copy of the SRTC travel demand model on January 9, 2018. Land use assumptions were reviewed by the project technical advisory committee (TAC) on May 17, 2018 which is comprised of staff representing Spokane Valley, Liberty Lake, Spokane County, WSDOT and SRTC. The TAC approved the land use assumptions on June 1, 2018 with three comments, including providing a comparison to what is assumed in the Spokane Valley Comprehensive Plan, incorporating impacts of new grade schools, and future land use forecasts in Liberty Lake - all of which are addressed below.

Detailed land use data assumed in the model is provided in the following appendices:

- Appendix A – Includes a summary of the forecast 2015-2040 change in dwelling units and employees by transportation analysis zone (TAZ) near the Study Area.
- Appendix B – Includes a summary of the difference in assumed land use for the TAZs around Barker Road and I-90 between the 2015 travel demand model used for the Spokane Valley Comprehensive Plan Update (prepared in 2016) and the current 2015 SRTC travel demand model used for this study.

New Grade Schools

In addition to the regional travel demand model, traffic forecasts also accounted for several new grade schools planned in the vicinity by 2021. These schools are not specifically accounted for in the model and include:

- A new elementary school at Long Road and Mission Avenue in Spokane Valley (opens 2018)
- A new middle school at Harvest Parkway and Mission Avenue in Liberty Lake (opens 2019)
- A new high school near Sprague Avenue and Henry Road in Spokane County (opens 2021)

It was determined through analysis of existing and future school location and enrollment zone boundaries as well as traffic studies completed for each school that the impact to traffic volume on Barker Road in the study area from the new elementary and middle school would result in a net neutral change. It was also determined that the primary impact from the new high school will be a shift in some traffic currently making a southbound right at the Barker Road/Appleway intersection to instead make a southbound through at that intersection and a southbound left at the Barker Road/Sprague Avenue intersection. The inverse movements at the two intersections[1] were also adjusted. In the southbound direction, 80 vehicles in the AM peak hour and 17 vehicles in the PM peak hour were assumed to shift from making a southbound right at Barker Road/Appleway to making a southbound left at Barker Road/Sprague Avenue. In the northbound direction 37 vehicles in the AM peak hour and 19 vehicles in the PM peak hour were assumed to shift from making an eastbound left at Barker Road/Appleway to making a westbound right at Barker Road/Sprague Avenue and northbound through at Barker Road/Appleway.

[1] For example, at Barker Road and Appleway Avenue southbound right turns were reduced and southbound through movements were increased by the same margin. Similarly, eastbound left turns were also reduced with northbound through movements increased by the same margin.

Liberty Lake Land Use Forecasts
During the analysis stage, the City of Liberty Lake was in the process of updating their land use forecasts for 2040 as part of their Land Quantity Analysis. Land uses are expected to be different from the forecasts assumed in the current SRTC travel demand model, particularly in the Riverside District. Given this information was not yet available at the time of analysis, the 2015 and 2040 land use assumed for Liberty Lake in the current SRTC travel demand model was used. Assumptions regarding the future roadway network in Liberty Lake are explained below.

Roadway Network Assumptions

The SRTC travel demand model was also updated to account for several recent changes to the assumed 2040 roadway network as well as minor changes to the 2015 model to ensure recent projects were reflected. These changes are based on feedback provided by the project's Technical Advisory Committee (TAC), which included the City of Spokane Valley, WSDOT, Spokane County, and Liberty Lake. The changes to the network include the following.

2015 Model Changes:

- Chapman Road was connected from 32nd Avenue to Barker Road just south of 12th Avenue to reflect existing conditions
- The centroid connector at transportation analysis zone (TAZ) 369 was moved to load to 4th Ave and 8th Ave instead of Barker Road, which better reflects where the driveways in the area load onto the roadway network
- The centroid connector at TAZ 392 was moved to load to 4th Ave instead of Barker Road
- The centroid connector at TAZ 327 was moved to load onto Indiana Avenue (instead of the intersection of Barker Road/ Indiana Avenue)
- A second centroid connector at TAZ 327 connecting to Mission Avenue was deleted to match the 2040 model

2040 Model Changes:

- Same changes made to the 2015 model
- Indiana Avenue was connected through from Barker Road to Harvard Road
- Instead of a new I-90 interchange at Henry Road (as is currently in the 2040 model), Henry Road was connected from Appleway Avenue to Mission Avenue via an overpass of I-90, but with no I-90 interchange; the current partial interchange at Appleway Avenue was retained
- The preferred alternative for the Barker Road/BNSF Grade Separation project was assumed for the intersection of Barker Road/Trent Avenue
- The south leg of the Flora Road/Trent Avenue intersection across the BNSF railroad track is assumed to close (consistent with the preferred alternative for the Barker Road/BNSF Grade Separation project)
- A new link was added between Flora Road and Barker Road north of Euclid Avenue and south of Trent Avenue (to reflect the Garland Avenue connection assumed in the Northeast Industrial Area PAO)
- The centroid connector from TAZ 600 is assumed to be more heavily weighted toward Barker Road (reflecting the development potential in the Northeast Industrial Area assumed as part of the Northeast Industrial Area PAO)
- Barker Road was assumed to be 5 lanes from Mission Avenue to I-90 (to reflect planned mitigations in the SEIS to the Comprehensive Plan for the Northeast Industrial Area PAO)

It should be noted that the following planned improvements are already assumed in the current SRTC travel demand model:

- The Barker Road/I-90 interchange would be reconfigured to a standard diamond interchange with two-lane roundabouts plus slip ramps for right-turn movements at both ramps (as reflected in I-90/Barker Rd Interchange Justification Report)
- Barker Road between I-90 and Appleway Avenue would be widened to five lanes as identified in the Spokane Valley Comprehensive Plan and Transportation Improvement Plan (TIP)
- A new northbound lane would be added on Harvard Road across I-90

Traffic Forecast Methodology

Near-Term Traffic Forecasts

An annual growth rate of 3.0% along Barker Road was used for near-term traffic forecasts through year 2020 (based on historic growth) and an annual growth rate of both 2.0% and 3.0% were used for traffic growth on Barker Road between year 2020 and 2028 to capture an upper and lower range of potential growth.

2040 Traffic Forecasts

Instead of using the traffic forecasts directly from the 2040 travel demand model, 2040 volumes were estimated using an industry standard approach known as the difference method. The difference in traffic volumes between the 2015 and 2040 models are added to observed counts at each of the study area intersections to arrive at a 2040 forecast traffic. This method reduces model error by relying as much as possible on observed data rather than model output data. Note: the difference in traffic volumes between the 2015 and 2040 model will be multiplied by 0.88 to account for growth in traffic that occurred between 2015 and 2018 (22 years/ 25 years = 0.88).

Existing traffic data was collected during the AM and PM peak hour on Thursday, May 24th 2018 at all study intersections (see Figure 1) except Barker Road/Boone Avenue and Barker Road/8th Avenue. Existing traffic volumes at Barker Road/Boone Avenue are based on counts collected on Tuesday, February 14th, 2007 and existing volumes at Barker Road/8th Avenue are based on counts collected on Wednesday, February 14, 2018.

Estimating AM Peak Volumes

The regional travel demand model forecasts PM peak hour turn movements, but only forecasts 3-hour AM peak turn movements at each intersection. Therefore, the inverse of PM peak hour traffic growth multiplied by 80% was used to estimate AM peak hour traffic growth. This is consistent with research published in National Cooperative Highway Research Program Report 365[2] and in observed peak hour traffic count data collected in Spokane Valley. For example, 80% of growth in PM peak volumes for southbound right turn movements at each intersection were applied to eastbound left movements to get the AM peak traffic forecast.

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[2] Martin, W., N. McGuckin. *Travel Estimating Techniques for Urban Planning.* NCHRP Report 365. National Academy Press, Washington, D.C., 1998.

Level of Service Standards

Spokane Valley LOS Standards

The City of Spokane Valley uses level of service (LOS) to describe and evaluate traffic operations along major arterial corridors and intersections within the City. Levels range from LOS A to LOS F, which encompass a range of congestion types from uninterrupted traffic (LOS A) to highly-congested conditions (LOS F). The description and intersection delay thresholds of each LOS category are described in **Figure 2.** These are based on the Highway Capacity Manual, which is the methodology used by Spokane Valley. The LOS for signalized intersections and roundabouts is measured by the average delay per vehicle entering the intersection from all approaches, while the LOS for unsignalized intersections is measured by the average delay per vehicle on the approach with the highest average delay.

Figure 2: Level of service description and delay thresholds at intersections

Level of Service	Description	Signalized Intersection Delay (seconds)	Unsignalized Intersection Delay (seconds)
A	Free-flowing conditions.	0-10	0-10
B	Stable operating conditions.	10-20	10-15
C	Stable operating conditions, but individual motorists are affected by the interaction with other motorists.	20-35	15-25
D	High density of motorists, but stable flow.	35-55	25-35
E	Near-capacity operations, with speeds reduced to a low but uniform speed.	55-80	35-50
F	Over-capacity conditions with long delays.	> 80	>50

Source: Highway Capacity Manual 2016, Transportation Research Board

The LOS standards used by Spokane Valley are defined in the Comprehensive Plan as follows:

- LOS D for major arterial corridors:
  - Argonne/Mullan between the town of Millwood and Appleway Boulevard
  - Pines Road between Trent Avenue and 8th Avenue
  - Evergreen Road between Indiana Avenue and 8th Avenue
  - Sullivan Road between Wellesley Avenue and 8th Avenue
  - Sprague Avenue/Appleway Boulevard between Fancher Road and Sullivan Road
- LOS D for signalized intersections not on major arterial corridors
- LOS E for unsignalized intersections (LOS F acceptable if peak hour traffic signal warrant is unmet)

WSDOT LOS Standards

WSDOT also uses LOS thresholds for State Highways. The LOS standard for State Highways in Urban Areas is LOS D. Within the Study Area this would apply to the Barker Road/I-90 interchange. This LOS standard applies to roadway segments and signalized and stop controlled intersections.

Per WSDOT's recommended guidance, the primary measure of effectiveness (MOE) for roundabout analysis is not LOS, but the overall intersection and approach volume to capacity (v/c) ratios. WSDOT recommends that v/c ratios not exceed 0.85-0.9 for any approach or the entire intersection, which typically corresponds to LOS D.

Traffic Analysis Methodology

In order to analyze traffic operations, including LOS, v/c ratios and/or impacts of queuing, the following traffic engineering software was used in accordance with WSDOT Traffic Analysis policies and protocol[3]:

- **Synchro** - Synchro software (version 9.2) was be used to evaluate AM and PM peak hour LOS at most signalized and stop controlled intersections. LOS was measured using the Highway Capacity Manual (HCM) 2010 methodology within Synchro. All settings were set to be consistent with WSDOT Synchro Protocol. The observed intersection peak hour factor averaged for all approaches was used for the existing conditions analysis and near-term traffic analysis. A PHF of 1.0 was used for the 2040 analysis. A saturation flow rate of 1,775 vehicles per lane per hour was assumed in order to be consistent with City of Spokane Valley practice along the Barker Road corridor.

- **Sidra** - Sidra software (version 7.0) was used to analyze the AM and PM peak hour v/c ratios for intersections with a roundabout configuration. All settings were set to be consistent with WSDOT's Sidra Policy Settings (WSDOT, April 2018).

- **SimTraffic** – SimTraffic software was used to analyze the AM and PM peak hour traffic operational performance for closely spaced intersections in order to capture the impacts to traffic delay of queuing. This includes the intersections with Barker Road/Cataldo Avenue and Barker Road/I-90 under the single-lane roundabout configuration proposed by WSDOT as an interim solution. All settings were set to be consistent with WSDOT SimTraffic Protocol with the same PHF and saturation flow rate used in the Synchro analysis. SimTraffic was not used to analyze operations with two-lane roundabouts. Sidra software was used in those instances.

EXISTING CONDITIONS

Within the 1.6 mile segment of Barker Road between Mission Avenue and the south Spokane Valley City limits there are four signalized intersections. These are located where Barker Road crosses Mission Avenue, Cataldo Avenue/I-90 westbound ramp, I-90 eastbound ramp and Appleway Avenue. There is a four-way stop at Barker Road/Sprague Avenue. All other intersection are controlled by side-street stop signs. The segment of Barker Road north of Boone Avenue is a three lane street with bike lanes, curb and gutter and 5-foot sidewalks on both sides. South of Boone Avenue Barker Road is a two-lane street without curb, gutter, storm drain or sidewalks. South of Appleway there is an asphalt paved multiuse trail on the west side of the street that extends to Chapman Road in unincorporated Spokane County. Existing peak hour traffic volumes and lane configurations at the ten study intersections are shown in **Figure 3**.

[3] www.wsdot.wa.gov/Design/Traffic/Analysis/

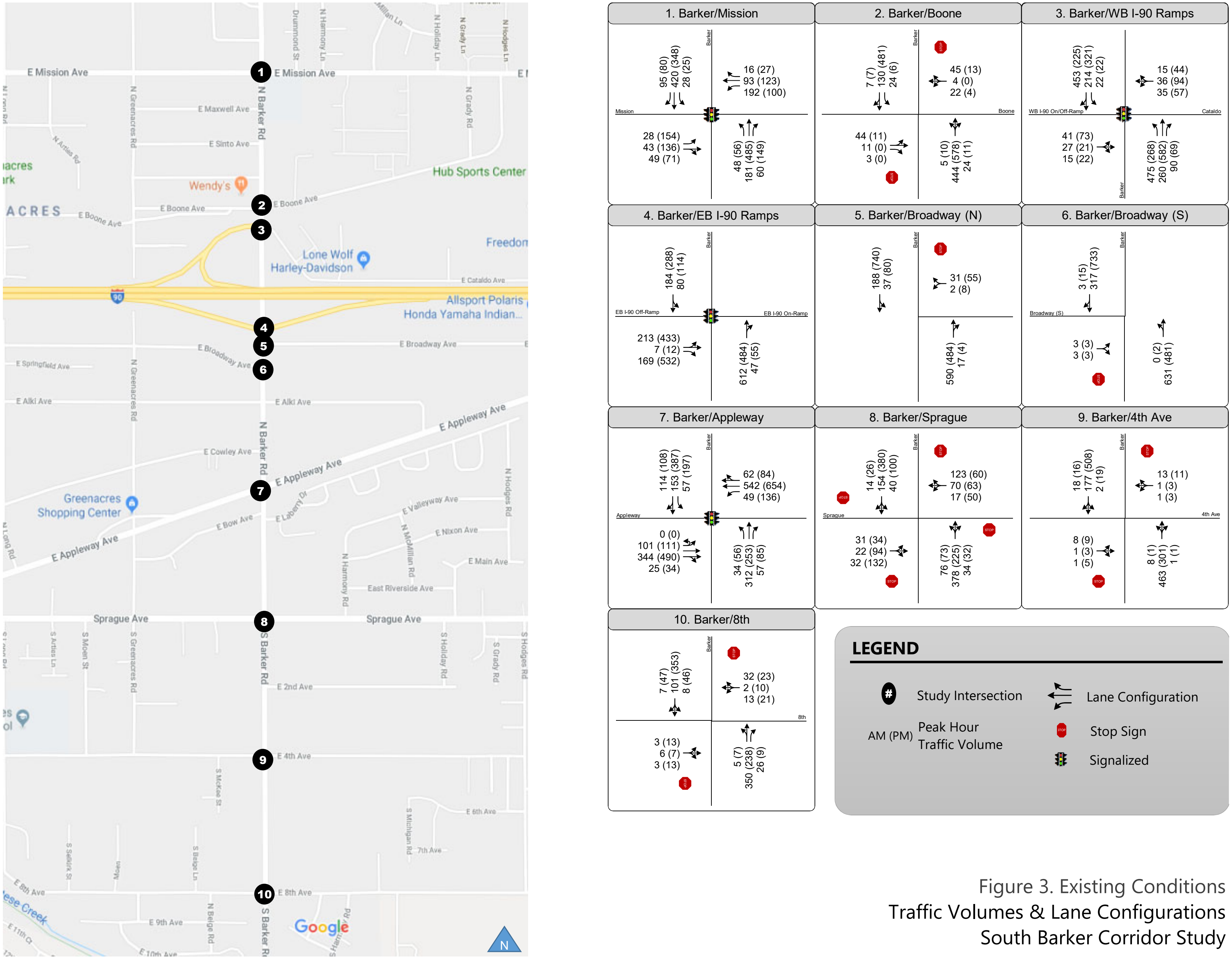


Figure 3. Existing Conditions
Traffic Volumes & Lane Configurations
South Barker Corridor Study

Intersection Level of Service

The AM and PM peak hour level of service (LOS) at the 10 study area intersections are summarized in **Figure 4**. The intersections between Boone Avenue and Broadway were analyzed using SimTraffic to account for the impact of queuing given the close spacing of intersections as well as the split signal phasing currently used at the Barker Road/I-90 eastbound ramp. All other intersections were analyzed using Synchro.

Figure 4. Existing conditions level of service and delay.

Intersection	Control	AM Peak		PM Peak		Side Street Stop Approach	Software (all HCM 2010)
		Delay	LOS	Delay	LOS		
Barker/Mission	Signal	12	B	13	B		Synchro
Barker/Boone	Side-Street Stop	>100	F	64	F	EB	SimTraffic
Barker/I-90 Westbound Ramp/Cataldo	Signal	**57**	**E**	29	C		SimTraffic
Barker/I-90 Eastbound Ramp	Signal	**57**	**E**	**103**	**F**		SimTraffic
Barker/Broadway (N)	Side-Street Stop	>100	F	>100	F	WB	SimTraffic
Barker/Broadway (S)	Side-Street Stop	60	F	43	E	EB	SimTraffic
Barker/Appleway	Signal	21	C	30	C		Synchro
Barker/Sprague	All-Way Stop	26	D	49	E		Synchro
Barker/4th	Side-Street Stop	16	C	17	C	EB	Synchro
Barker/8th	Side-Street Stop	23	C	23	C	EB	Synchro

Source: Fehr & Peers, 2018

Results show that under existing conditions, the Barker Road/I-90 westbound ramp/Cataldo Avenue intersection operates at LOS E in the AM peak hour and the Barker Road/I-90 eastbound ramp intersection operates at LOS E during the AM peak hour and LOS F during the PM peak hour. Thus, both intersections of Barker Road/I-90 do not currently meet WSDOT LOS standards. Additionally, the queue along Barker Road from the two I-90 intersections impacts the LOS at both Barker Road/Boone Avenue and the two Barker Road/Broadway intersections, causing all three intersections to operate at LOS F during either the AM or PM peak hours or both. Additionally the Barker Road/Sprague Avenue intersection is operating at LOS E during the PM peak hour. This intersection has been identified by COSV as a location in need of improvement to address existing congestion and multimodal operations. Results of the existing conditions traffic analysis show this intersection is just two additional seconds of delay from operating at LOS F. A small increase in traffic is likely cause this intersection to operate at LOS F without improvements.

The existing average and maximum queue lengths at the Barker Road/I-90 interchange during the AM peak hour are shown in **Figure 5** and in the PM peak hour are shown in **Figure 6**. In the AM peak hour a long queue forms in the southbound direction at the Barker Road/I-90 westbound ramp intersection. In the PM peak hour a long queue forms in the eastbound direction at the Barker Road/I-90 eastbound ramp intersection. It should be noted the distance between the gore point in the eastbound direction of I-90 and the Barker Road intersection is about 1,700 feet and the average queue on this segment during the PM peak hour is 1,200 feet and the maximum queue is 1,500 feet.

Figure 5. Existing AM peak hour queue lengths at the Barker Road/I-90 interchange

Intersection	Direction	Average Queue (feet)	Maximum Queue (feet)
Barker/ I-90 westbound/Cataldo	EB	60	120
	NB	300	510
	SB	**730**	**1,200**
	WB	100	170
Barker/I-90 eastbound	EB	150	260
	NB	160	170
	SB	170	260

Source: Fehr & Peers, 2018

Figure 6. Existing PM peak hour queue lengths at the Barker Road/I-90 interchange

Intersection	Direction	Average Queue (feet)	Maximum Queue (feet)
Barker/ I-90 westbound/Cataldo	EB	70	120
	NB	190	340
	SB	420	630
	WB	100	160
Barker/I-90 eastbound	**EB**	**1,200**	**1,500**
	NB	160	180
	SB	440	630

Source: Fehr & Peers, 2018

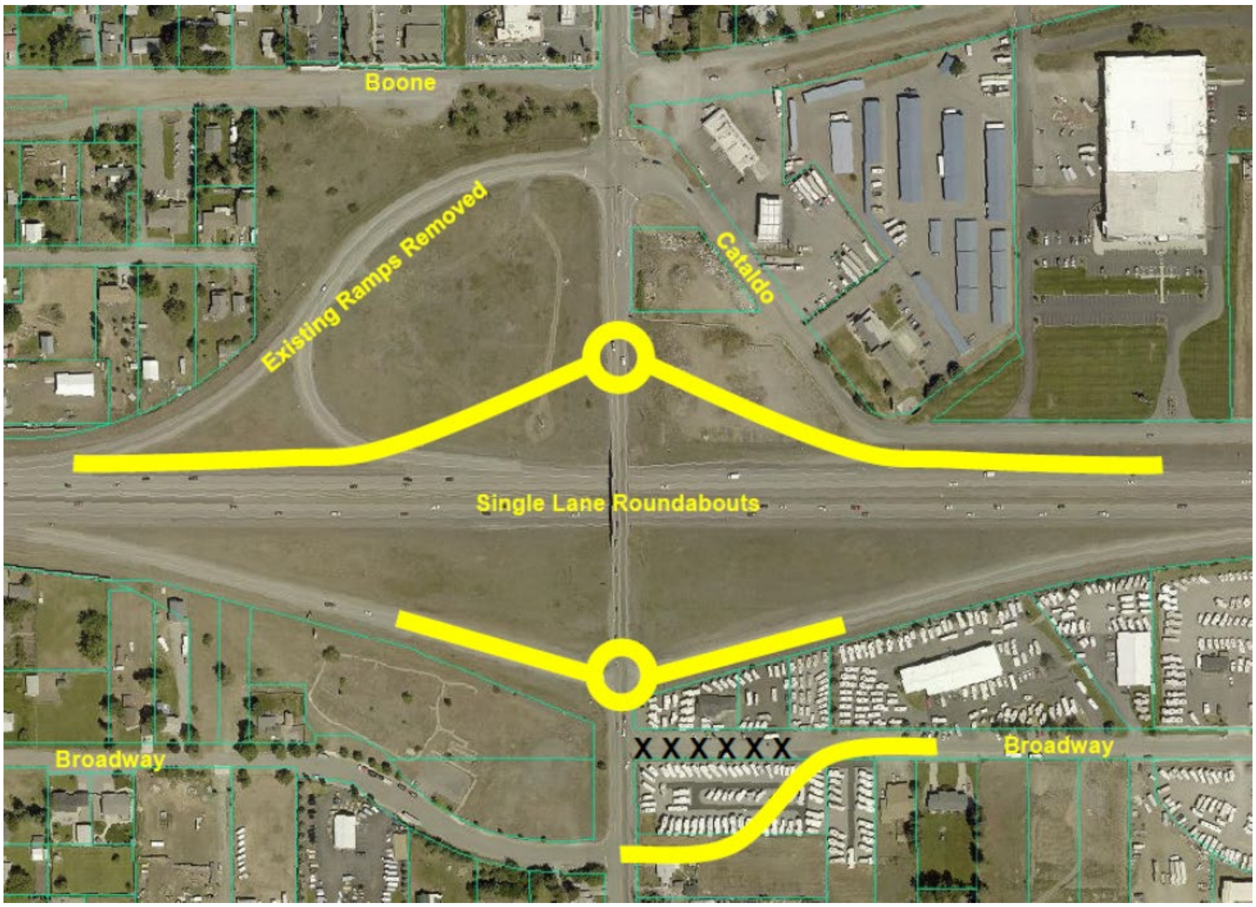
Corridor Level of Service

The existing corridor level of service within the study area is LOS D derived from average daily traffic (ADT) on each roadway segment and weighted by the segment's length. Based on the posted speed and number of lanes, the LOS D threshold for the corridor is 13,800 ADT (as defined in the 2010 Highway Capacity Manual), and the length-average ADT-to-LOS D volume threshold ratio is 0.83. As long as the ratio is less than or equal to 1.00, the corridor is defined as operating at LOS D or better even though some intersections may experience greater congestion than LOS D.

I-90 INTERCHANGE INTERIM IMPROVEMENTS SUMMARY & FINDINGS

The Barker Road/I-90 interchange is currently operating at LOS E or worse at one or both interchange intersections in both the AM and PM peak hour, thus failing WSDOT LOS standards. WSDOT has proposed an interim solution that includes single-lane roundabouts at each ramp intersection until the long-term concept proposed in the 2014 IJR can be implemented. Traffic analysis was performed for the intersections between Barker Road/Boone Avenue and Barker Road/Broadway, including both ramps of the Barker Road/I-90 interchange in years 2020, 2023, and 2028. The analysis was performed to determine how well and for how long a single-lane roundabouts as depicted in **Figure 7** would operate acceptably at the two intersections.

Figure 7. Barker Road/I-90 Interchange Interim Concept proposed by WSDOT



Source: WSDOT

A subsequent revision to this interim concept, shown in **Figure 8,** shifted the northern single-lane roundabout to the existing Cataldo Avenue/Barker Road/I-90 Westbound intersection, maintaining the existing "hook ramp" configuration. According to the best available information at this time regarding long-term plans for the interchange and replacement of the Barker Road Bridge, the advantage of this configuration, as compared to the tight diamond configuration (shown in Figure 7 and originally proposed as the interim solution) is that the proposed location of the Barker Road/westbound ramp intersection is farther from I-90 than what is proposed with a tight diamond configuration. This would allow WSDOT to convert a single-lane roundabout at this location to a two-lane roundabout in the future when the Barker Road Bridge over I-90 is replaced without necessitating lowering the elevation of the I-90 travel lanes in order to achieve the required clearance under the bridge.

Figure 8. Barker Road/I-90 westbound ramp intersection – revised Interim Concept

Source: WSDOT

A summary of the key findings of this traffic analysis are presented below:

- A single lane roundabout will operate acceptably at Barker/I-90 Interchange in 2020 with:
  - A 2nd southbound approach lane at the westbound ramp – This can be implemented through restriping and curb modification within the existing ROW.
  - A 2nd eastbound approach lane at the eastbound ramp
- The eastbound ramp intersection will drop below LOS D sometime between 2023 and 2028
  - Main constraint: sometime between 2023 and 2028 the northbound traffic demand across the bridge will exceed the physical capacity of the bridge (1,000-1,100 vph)
- Regardless of the configuration (either what is shown in Figure 7 or Figure 8) westbound ramp will operate at an acceptable LOS by 2028 because the eastbound roundabout will effectively "meter" northbound traffic so that there will be gaps for the heavy southbound traffic to enter

Figure 9 summarizes the LOS results based on SimTraffic. It should also be noted that Sidra analysis was also performed for both intersections in years 2020, 2023 and 2028 with results showing that the v/c ratio would exceed the 0.85-0.9 threshold for both intersections sometime between 2023 and 2028, with the eastbound ramp failing sooner. However, unlike the Sidra results, SimTraffic showed that the eastbound ramp intersection would effectively "meter" traffic entering the westbound ramp intersection resulting in acceptable LOS at that intersection through 2028.

Figure 9. Year 2028 SimTraffic LOS results under the "hook ramp" concept at the Barker Road/I-90 westbound ramp

Intersection	Control	AM Peak		PM Peak	
		Delay	LOS	Delay	LOS
Barker/Boone	Side-Street Stop	66	E	30	D
Barker/Cataldo/I-90 westbound ramp	Roundabout	40	D	17	B
Barker/I-90 eastbound ramp	Roundabout	**84**	**F**	**88**	**F**
Barker/Broadway	Side-Street Stop	107	F	218	F

Source: Fehr & Peers, 2018

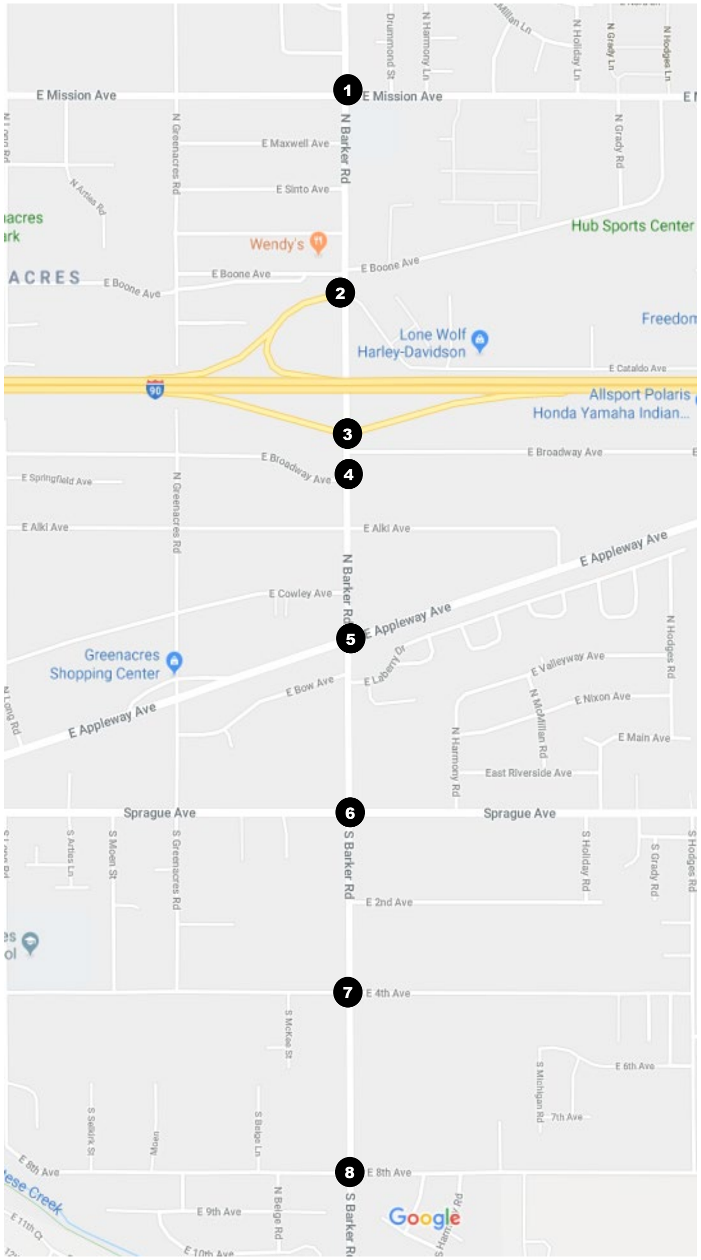
The results of this analysis demonstrate that the interim solution (modified with a second approach lane at one leg of each intersection and revised to maintain the existing location "hook ramp" configuration at Barker Road/Cataldo Avenue/I-90 westbound ramp intersection) for the Barker Road/I-90 interchange would last about 5-10 years before falling below WSDOT LOS standards. Given this, it is recommended that the City of Spokane Valley work with WSDOT to secure funding within 5-10 years to replace the Barker Road Bridge over I-90 with a four-lane bridge.

2040 ANALYSIS & FINDINGS

Traffic analysis of the Barker Corridor intersections was performed with the assumption that several already planned transportation projects would be implemented. This includes:

- Barker Road from Mission Avenue to Appleway would be widened to five lanes (through a combination of several projects).
- The Barker Road/I-90 interchange would be reconfigured into two-lane roundabouts at each ramp intersection similar to the Barker Road IJR preferred alternative, with some modifications (as described below), including adding Boone Avenue into the westbound ramp roundabout and preserving the existing hook ramp configuration for the westbound ramp.
- The east leg of Broadway would be realigned with the west leg of Broadway at Barker Road.

These changes would effectively consolidate the Barker Road/Boone Avenue intersection with the Barker Road/I-90 westbound ramp/Cataldo Avenue intersection and consolidate the two Broadway intersections into one. Consolidation of these intersection means under 2040 conditions there would be eight study intersections instead of ten. Traffic volumes and lane configurations assumed in 2040 at each of the study intersections are shown in **Figure 10**.



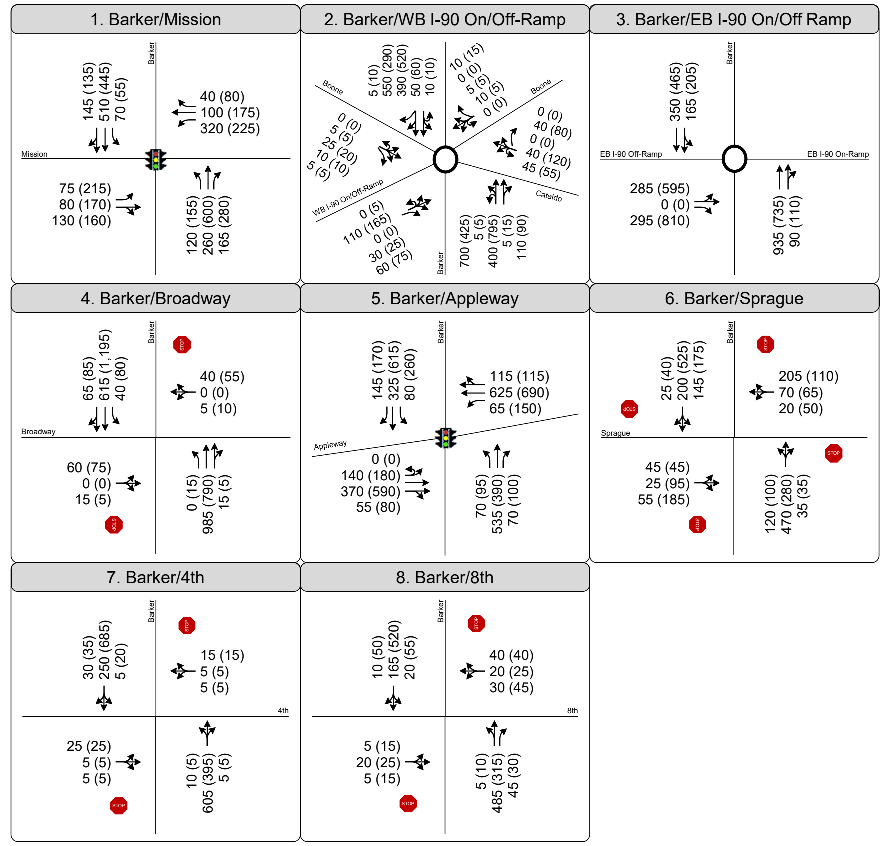


Figure 10. 2040 Conditions
Traffic Volumes & Lane Configurations
South Barker Corridor Study

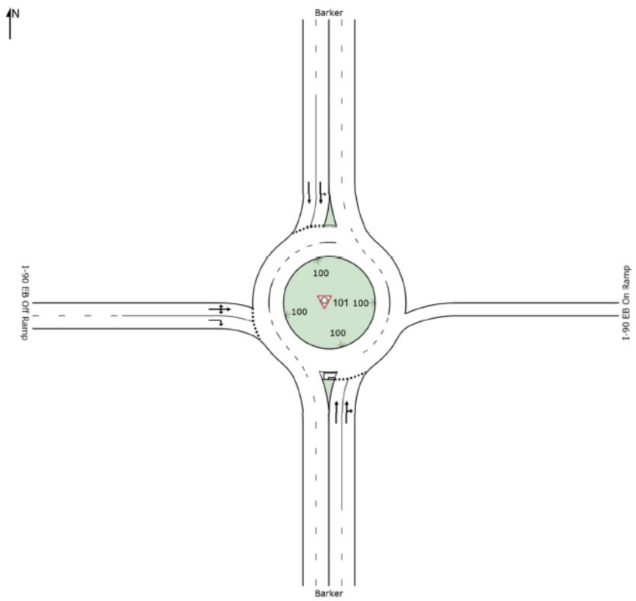
Barker Road/I-90 Interchange Configuration

A conceptual layout in 2040 of the Barker Road/I-90 eastbound ramp intersection is shown in **Figure 11** and a conceptual layout of the Barker Road/I-90 westbound ramp intersection is shown in **Figure 12**. The configuration of the Barker Road/I-90 eastbound ramp intersection would be largely the same as the Barker Road IJR preferred alternative, including a roundabout with two circulating lanes and two eastbound approach lanes on the I-90 off-ramp.

However, the Barker Road/I-90 westbound ramp intersection was modified from the Barker Road IJR preferred alternative in order to preserve the "hook ramp" configuration at the same location as today, with Cataldo Avenue on the east leg. Reasons for this change were to satisfy City of Spokane Valley and WSDOT's desire to shift the interim solution to a location that better accommodates long-term reconstruction of the interchange, as well as City of Spokane Valley's desire to find a solution with the least impact to private property. Converting the I-90 westbound ramp to a diamond interchange would have either required Cataldo Avenue to be rerouted through private property to Boone Avenue or the Barker Road/I-90 westbound ramp intersection to be moved closer to I-90. The original IJR preferred alternative would also have necessitated lowering I-90 in order to achieve adequate clearance under the Barker Road Bridge. Preserving the hook ramp negates both of these potential issues. While the bridge will still need to be replaced to achieve adequate clearance, the proposed configuration would allow sufficient approach length to achieve adequate clearance without the need of lowering I-90.

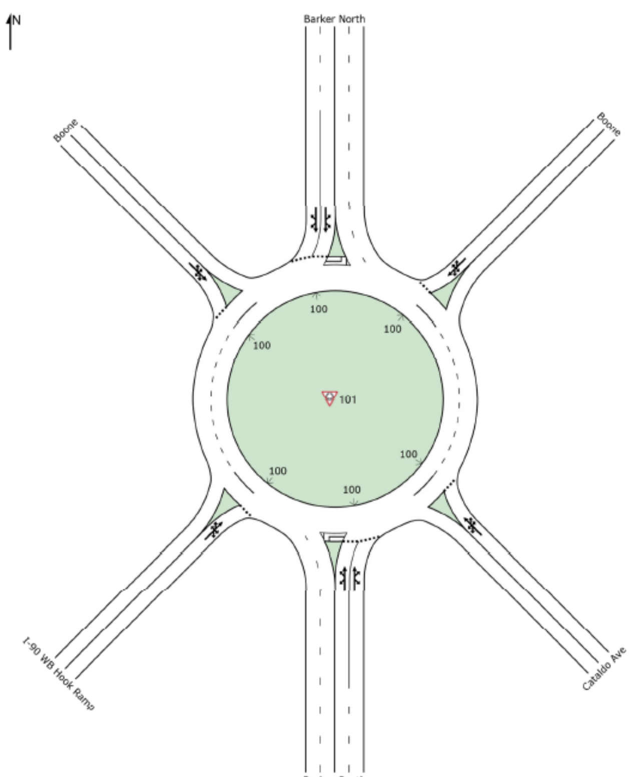
In addition, the east and west leg of Boone Avenue was added to the westbound ramp roundabout in order to preserve full movement on Boone Avenue and reduce the potential impacts of loss of access or additional ROW needed to provide access near the existing Boone Avenue intersection. These modifications result in a roundabout with six legs. Without this configuration Boone Avenue would be too close to the Barker Road/I-90 westbound ramp roundabout to safely operate with full movements. It should be noted that the concepts shown in Figure 11 and Figure 12 are schematic in nature and the exact diameter of a future roundabout would need to be determined through a more detailed engineering study. The assumed length of the roundabout diameter does not affect the Sidra outputs.

Figure 11. 2040 Barker Rd/I-90 <u>eastbound</u> ramp intersection concept (same as Barker Road IJR preferred alternative)



Source: Fehr & Peers, 2018

Figure 12. 2040 Barker Rd/I-90 <u>westbound</u> ramp intersection concept (modified from Barker Road IJR preferred alternative)



Source: Fehr & Peers, 2018

Intersection Level of Service Findings

The AM and PM peak hour level of service (LOS) findings at the eight study area intersections are summarized in **Figure 13**. The I-90 intersections were analyzed using Sidra. The more relevant measure of effectiveness for these intersections per WSDOT policy is v/c ratio, which is shown in **Figure 14**. All other intersections were analyzed using Synchro.

Figure 13. 2040 conditions level of service and delay.

Intersection	Control	AM Peak		PM Peak		Software (all HCM 2010)
		Delay	LOS	Delay	LOS	
Barker/Mission	Signal	20	B	25	C	Synchro
Barker/I-90 WB Ramp/Cataldo/Boone	Roundabout	17	B	13	B	Sidra
Barker/I-90 EB Ramp	Roundabout	9	A	12	B	Sidra
Barker/Broadway	Side-Street Stop	71 (EB)	F	**>300 (EB)**	F	Synchro
Barker/Appleway	Signal	30	C	46	D	Synchro
Barker/Sprague	All-Way Stop	**132 (NB)**	**F**	**>300 (SB)**	F	Synchro
Barker/4th	Side-Street Stop	22	C	33	D	Synchro
Barker/8th	Side-Street Stop	17	C	33	D	Synchro

Source: Fehr & Peers, 2018

Figure 14. Volume-to-capacity ratio in 2040 for Barker Road/I-90 interchange roundabouts.

Intersection	Control	AM Peak		PM Peak		Software (all HCM 2010)
		v/c	95% Queue	v/c	95% Queue	
Barker/I-90 WB Ramp/Cataldo/Boone	Roundabout	0.69	240 ft. (SB)	0.54	110 ft. (NB)	Sidra
Barker/I-90 EB Ramp	Roundabout	0.47	90 ft. (NB)	0.70	150 ft. (NB)	Sidra

Source: Fehr & Peers, 2018

Results presented in Figure 14 show that under existing 2040 conditions, the Barker Road/I-90 eastbound ramp intersection and the Barker Road/I-90 westbound ramp/Cataldo Avenue/Boone Avenue intersection as laid out in Figure 11and Figure 12, respectively, would operate acceptably. The v/c ratio would be meet the WSDOT threshold of 0.85-0.90 for both intersection in both the AM and PM peak hour.

Results presented in Figure 13 show that the Barker Road/Sprague intersection (which had poor LOS under existing conditions) would operate at LOS F in both the AM and PM peak hour without improvements.

Additionally, the Barker Road/Broadway intersection would operate at LOS F during the AM and PM peak hour and would meet the peak hour signal warrant in the PM peak hour, thus failing the City of Spokane LOS threshold in 2040. Analysis shows that the Barker Road/4th Avenue and Barker Road/8th Avenue intersection will with acceptable LOS through 2040 under the existing configurations with side street stop control. These intersections would also operate acceptably with a signal or roundabout although the forecasts do not indicate that either intersection would meet the peak hour signal warrant in 2040.

Mitigation Measures

- **Barker Road/Sprague Avenue** - Traffic operations at the Barker Road/Sprague Avenue intersection were analyzed in Sidra assuming a single-lane roundabout concept and in Synchro assuming a traffic signal with left turn lanes and protected left-turn signal timing for all approaches. Results, shown in **Figure 15**, demonstrate that a single-lane roundabout or a traffic signal with protected left-turn lanes would result in acceptable traffic operations at this intersection in 2040. **Figure 16** summarizes the pros and cons of implementing a traffic signal as compared to a roundabout at this intersection. The primary differences in a traffic signal versus a roundabout relate to traffic safety, cost, right-of-way impact, impervious surface and landscaping opportunities. While this study recommends a roundabout at this intersection primarily due to the safety benefits, the City will undertake a separate and more detailed design study as part of implementation to determine the ultimate future intersection configuration.

Figure 15. Volume-to-capacity ratio, LOS and/or delay in 2040 with mitigations.

Intersection	Control	AM Peak			PM Peak			Software
		v/c	LOS	Delay	v/c	LOS	Delay	
Barker/Sprague	Roundabout	0.52	A	-	0.59	A	-	Sidra
Barker/Sprague	Signal	-	C	34	-	D	36	Synchro

Source: Fehr & Peers, 2018

Figure 16. Pros and cons of a roundabout versus a traffic signal at Barker Road/Sprague Avenue intersection.

Factors	Roundabout versus Traffic Signal
Traffic Safety	The primary benefit of a roundabout over a traffic signal is related to traffic safety. Research provided by WSDOT shows that on average single-lane roundabouts result in 75% fewer injury crashes and 90% fewer fatalities than signalized intersections. Roundabouts mitigate the risk of moderate-to-high-speed broadside crashes commonly caused by a driver running the red light at a traffic signal.
Capital Cost	On average the capital cost of constructing a roundabout is higher than the capital cost of constructing a signalized intersection, but this can vary from location to location.
Operations & Maintenance Cost	Long-term operations and maintenance costs associated with a roundabout are typically lower than those associated with a traffic signal (about $5,000 to $10,000 per year based on COSV research), often enough to offset the higher capital cost of a roundabout over the life of the project.
Right-Of-Way Impact	On average, the right-of-way (ROW) impact of a roundabout can be greater than a traffic signal, but varies depending on the location and number of turn lanes. At the Barker/Sprague location the area of ROW impact would be similar with a roundabout or a signal and neither would impact existing structures.
Impervious Surface	A roundabout could result in more impervious surface than a traffic signal depending on whether the center island is landscaped or hardscaped.
Art & Landscape Opportunities	Roundabouts typically have more opportunity for landscaping or art (primarily because of the center island) than traffic signals.
Noise & Air Pollution	Roundabouts typically result in less air pollution and noise than a traffic signal due to less idling and fewer hard accelerations.

- **Barker Road/Broadway** – Additionally, a two-lane roundabout at the Barker Road/Broadway intersection would result in acceptable operations in year 2040. A traffic signal is not advised at this location due to the proximity of this intersection to the planned roundabout at the Barker Road/I-90 eastbound ramp and the potential for queue spillback onto the I-90 roundabout. An acceptable alternative to a roundabout would be to convert this intersection to right-in/right-out/left-in only configuration. However, this type of intersection configuration would result in some degree of inconvenience for drivers trying to make a left-turn from either leg of Broadway to Barker Road as they would have go out of direction to make that movement. If there is substantial commercial development along the Broadway corridor in the future, the lack of left-out movement could be a major impact to the viability of retail businesses. However, if the Broadway corridor has similar land uses as today (or other lower trip generating uses like offices or apartments), the lack of outbound left-turns would be less of an impact.

Diverging Roundabout Concept

Given the high volume of northbound left turns from Barker Road onto I-90 westbound (700 in the AM peak), WSDOT suggested that a "diverging roundabout" concept be tested to see if the interchange could operate effectively with single-lane roundabouts. A diverging roundabout is a diverging diamond interchange with roundabouts instead of signalized "crossover" intersections—see an example in **Figure 17**. The advantage of this concept is it eliminates all turning vehicle conflicts. The only point of conflict is where through traffic must cross over to the other side of the road. A diverging diamond interchange works best in situations where there are high volumes of vehicles turning off or onto the highway and not a lot of through movement on the road crossing the highway.

Figure 17. Diverging roundabout concept.

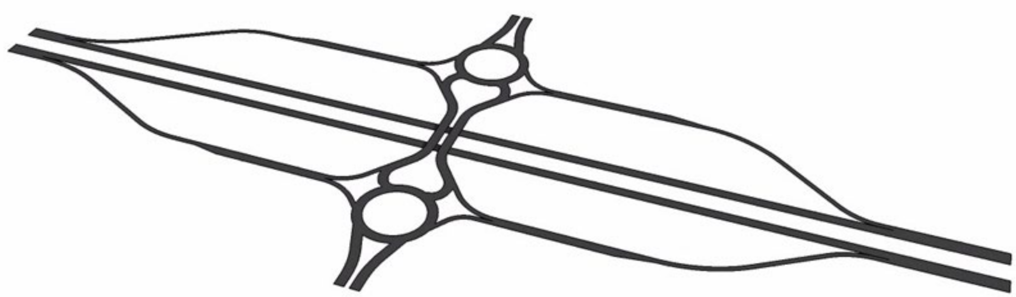


Image source: https://www.youtube.com/watch?v=msSTv2_JPME

Sidra software was used to test the diverging roundabout concept in 2040 with one circulating lane at both the eastbound and westbound I-90 ramp intersections with Barker Road. Results are shown in **Figure 15** and illustrate this configuration would meet WSDOT standards during three of the four conditions tested. This configuration would result in unacceptable operations at the Barker Road/I-90 westbound ramp in the PM peak hour due to the high volume of northbound and southbound through movements. The primary other disadvantage of this configuration is it would require a diamond interchange, which means the hook ramp would have to be removed and Cataldo Avenue would have to be rerouted to Boone Avenue. It should be noted, however, that a diverging roundabout interchange would likely meet WSDOT LOS standards if the roundabouts were dual-lane and there was a four-lane bridge over I-90 (although this configuration was not specifically analyzed).

Figure 18. 2040 volume-to-capacity ratio and 95% queue with a single-lane diverging roundabout.

Intersection	Control	AM Peak		PM Peak		Software
		v/c	95% Q	v/c	95% Q	
Barker/I-90 WB	Roundabout	0.49	80 feet	**0.93**	**590 feet**	Sidra
Barker/I-90 EB	Roundabout	0.65	120 feet	0.52	110 feet	Sidra

Source: Fehr & Peers, 2018

2040 RECOMMENDATIONS

Recommended transportation improvements for the Barker Road corridor are organized by two distinct segments of the corridor, the section between Mission Avenue and Appleway Avenue and the section between Appleway Avenue and the south City limits.

Mission Avenue to Appleway Avenue

The Spokane Valley Comprehensive Plan identifies a five-lane urban section for Barker Road between Mission Avenue and Appleway Avenue. The segment between I-90 and Appleway Avenue is also identified in the Spokane Valley six-year Transportation Improvement Plan (TIP) as a five-lane arterial. Furthermore the segment between Mission Avenue and I-90 is identified in the in the Northeast Industrial Area Planned Action Ordinance (PAO), which is in the process of being adopted as a supplement to the Spokane Comprehensive Plan EIS. WSDOT has allocated funding in 2019 and 2020 for implementing an interim improvement to the Barker Road/I-90 interchange until a longer-term solution can be implemented as identified in the SRTC Horizon 2040 Plan and I-90/Barker Road IJR. Based on these previously planned projects and findings of the traffic operations analysis presented in the previous section of this report, the following projects are recommended for Barker Road north of Appleway Avenue.

- **Barker Road/I-90 Interchange Interim Improvements** – It is recommended that WSDOT convert the I-90 eastbound and westbound ramp intersections with Barker Road to single-lane roundabouts as an interim measure to improve traffic operations and safety until funding for a longer-term solution can be secured. Roundabouts would be implemented at the same locations as the ramp terminal intersections are located today. As part of this project, a second southbound approach lane should be added on Barker Road at the westbound ramp. This can be implemented through restriping and curb modification within the existing ROW. Additionally, a second eastbound approach lane should be added to the eastbound I-90 off-ramp. WSDOT will also realign the east leg of Broadway to match the location of the existing west leg. Traffic analysis shows that this solution will operate effectively for about 5-10 years. Thus, it is recommended that WSDOT and City of Spokane Valley work to secure funding for a longer-term solution within the next 5 to 10 years.
- **Barker Road/I-90 Interchange Long-Term Improvements** – It is recommended that WSDOT convert the I-90 eastbound and westbound ramp intersections with Barker Road to two-lane roundabouts as a longer-term solution to improve traffic operations through 2040. Consistent with recommendations from the 2014 IJR, this would include two eastbound approach lanes at the Barker Road/I-90 eastbound ramp intersection and an expansion of the roundabout to include two circulating lanes. However, unlike the 2014 IJR, it is recommended that westbound hook ramp be preserved and the roundabout at the westbound ramp be implemented as a six-leg intersection with Cataldo and Boone Avenue (this would also require that the interim roundabout be widened to include two circulating lanes). This project would include replacement of the Barker Road Bridge over I-90 with a four-lane bridge including a multiuse trail or sidewalk on both sides to wide enough to allow for safe circulation of bicyclists and pedestrians.
- **Barker Road – Mission Avenue to Boone Avenue Widening** – It is recommended that Spokane Valley widen this segment of Barker Road to a five-lane urban section. This project has been identified in the Spokane Valley Comprehensive Plan and the Northeast Industrial Area PAO. It is recommended that this project be implemented at the same time as (or shortly after) the long term improvements are made to the Barker Road/I-90 Interchange.

- **Barker Road – I-90 to Appleway Avenue Widening** - It is recommended that Spokane Valley widen this segment of Barker Road to a five-lane urban section. This project is identified in the 2019-2024 TIP. It is recommended that this project be implemented at the same time as the long term improvements are made to the Barker Road/I-90 Interchange. Given that traffic analysis also shows the Barker Road/Broadway intersection will need improvement by 2040, it is also recommended that either a two-lane roundabout at Barker Road/Broadway be implemented as part of this project or the intersection be converted to prevent left-out movements. A roundabout at Broadway was included in the TIP.

Appleway Avenue to South City Limits

As identified in the traffic operations analysis, the South Barker corridor will operate acceptably in 2040 with either single-lane roundabouts or traffic signals at the major intersections (Sprague Ave, 4th Ave, 8th Ave).[4] The Spokane Valley Comprehensive Plan and TIP identify a three-lane urban roadway section between Appleway and the southern city limit. This roadway would consist of one travel lane in each direction, a two-way left-turn lane, a sidewalk, and the existing multi-use trail.

Traffic signal control at the major intersections is entirely consistent with the three-lane cross section, since left-turn lanes approaching the intersections would be required. This configuration is very common in Spokane Valley. However, single-lane roundabouts do not require a turn-lane at the major intersections and this configuration could be pursued with a narrower cross-section with just two travel lanes in each direction. While it is true that traffic signals (with widening at the major intersections) could also be accommodated with a two-lane segment, this configuration is less common in the Valley (existing two-lane roads with traffic signals often do not have turn lanes at major intersections, which reduces the capacity of the street).

Based on this finding, Spokane Valley may wish to consider a two-lane cross section for all or a portion of the South Barker Road corridor. **Figure 19** illustrates a few pros and cons of the three-lane versus two-lane configuration. For purposes of this study, the cost estimates assume the full three-lane buildout to capture the higher potential cost, which would lead to a cost savings if the two-lane design is ultimately selected.

[4] Note that in the near-term (next 5-6 years), only the intersection at Barker Rd/Sprague Ave will likely warrant a traffic signal or roundabout to address poor traffic LOS. However, as development increases in the future it is not unlikely that the intersections at 4th Ave and 8th Ave will eventually need to be upgraded from their current side-street stop control. As of now, it does not appear that these intersections will require upgrades prior to 2040, but that could change if a larger use (e.g., apartment, church) is permitted along one of these streets.

Figure 19. Pros and cons of a two-lane versus three-lane configuration south of Appleway.

Option	Pros	Cons
Two-lane configuration	• 33 percent less paved area; results in lower up-front costs and lower long-term maintenance costs • Less impervious surface reduces stormwater conveyance and treatment costs • More space within the right-of-way for wider sidewalks or landscaped area	• No mid-block left-turn lane; may require a median to prohibit left-turns at larger developments or a short widened section to accommodate a turn lane • Retrofitting a turn lane could be costly if a parcel is rezoned at a later date for a more intensive use
Three-lane configuration	• Once this configuration is in place, there is no need to retrofit the road to accommodate left-turns at larger developments • Better accommodates more trip-intensive land uses like multifamily residential	• Higher cost to build and maintain • More impervious surface and water runoff • Less opportunity for landscaping

Source: Fehr & Peers, 2018

Given these pros and cons, along with the potential for rezoning of the land north of Sprague Avenue to more dense residential, the following projects are recommended:

- **Barker Road/Sprague Avenue Intersection Improvements** – Implement a single-lane roundabout at Barker Road/Sprague Avenue intersection to improve traffic operations and safety. This project should be prioritized for this segment and can be implemented prior to making corridor-wide improvements. A roundabout is recommended over a traffic signal at this intersection because roundabouts tend to have lower numbers of serious traffic collisions and they cost less to maintain in the long-run compared to traffic signals. In addition, with all the other roundabouts being built by WSDOT farther north on the corridor, roundabouts will be a common and consistent traffic control device on Barker Road.
- **Barker Road –Appleway Avenue to Sprague Avenue Widening –** Implement a three-lane cross section between Appleway and Sprague Avenue; consider extending the existing northbound right-turn lane at Appleway approximately 200 feet south to Laberry Drive and converting this to a northbound through-right lane when Barker Road is widened north of Appleway.
- **Barker Road –Sprague Avenue to South City Limits Improvements –** Implement a two-lane cross section south of Sprague Avenue. In the design, set the multi-use trail and sidewalk in a position that could ultimately accommodate a three-lane cross section. Build two lanes of a potential three-lane configuration where one side of the street will have a final curb and gutter and the other side of the street will have a shoulder and swale for drainage. In this way, the street can more-easily be widened if it is ever necessary to accommodate a mid-block turn lane, but most of the corridor will benefit from the narrower cross-section. Given the current single-family zoning and the generally smaller parcels south of Sprague, it seems that this area is less likely to see pressure for rezoning and the two-lane cross section will operate well in the future.
- **4th Avenue and 8th Avenue Intersection Improvements** - Phase the construction of Barker Road to include single-lane roundabouts at 4th Avenue and 8th Avenue along with the two-lane configuration.

IMPLEMENTATION

The recommended transportation improvements can be summarized into a total of eight projects along the South Barker Road Corridor. A list of these projects, along with a brief description, timeframe for implementation, and estimated cost in 2018 dollars for the portion Spokane Valley would be responsible for are shown in **Figure 20**. Reference to the program and project number from previous plans, documents or the City's TIP is also identified.

Figure 20. South Barker Road projects and cost estimates to be implemented through year 2040.

Project	Description	Program (Project #)	Agency Responsible	COSV Cost Estimate[1] (2018 $$)
IMMEDIATE (2019-2020)				
I-90 Eastbound Ramp/ Barker Road Interchange Interim Improvements	Reconstruct intersection with single-lane roundabout and two eastbound approach lanes; realign east leg of Broadway	*Horizon 2040 Plan* (#12)	WSDOT	N/A
I-90 Westbound Ramp/ Barker Road Interchange Interim Improvements	Reconstruct intersection with single-lane roundabout and two southbound approach lanes; convert Barker/Boone to right-in/right-out	*Horizon 2040 Plan* (#12)	WSDOT	N/A
NEAR TERM (2021-2024)				
Sprague/Barker Intersection Improvements	Reconstruct intersection with single-lane roundabout	2019-2024 TIP (#15)	COSV	$1,517,000
MID TERM (2025-2030)				
I-90/Barker Road Interchange Long-Term Improvements	Replace Barker Road Bridge and widen to 4-lanes from Boone Avenue to Broadway; reconstruct both intersections to 2-lane roundabout; reconstruct Barker/I-90 westbound ramp intersection to six-leg roundabout with Boone Avenue	*Horizon 2040 Plan* (#12)	WSDOT	Not anticipated at this time
Barker Road Improvement Project – Appleway to I-90	Widen and improve to 5-lane urban section; roundabout @ Broadway	2019-2024 TIP (#22)	COSV	$6,477,000
Barker Road Improvement Project – Mission to I-90	Widen and improve to 5-lane urban section	NE Industrial Area PAO (Phase 2)	COSV	$2,950,000
LONG TERM (2031-2040)				
Barker Road Improvement Project – Appleway to South City Limits	Reconstruct and widen north of Sprague to 3-lane urban section, and south of Sprague to 2-lane urban section.	2019-2024 TIP (#20)	COSV	$2,854,000
4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements	Reconstruct 4th Avenue and 8th Avenue intersections with single-lane roundabouts	2019-2024 TIP (#21)	COSV	$3,000,000

1. Costs do not include WSDOT's portion

Source: Fehr & Peers; City of Spokane Valley. Cost estimates are primarily derived from the City of Spokane Valley 2019-2024 Six-Year Transportation Improvement Program (TIP). Exceptions include the cost of the Barker Road Improvement Project – Mission to I-90, which is derived from the estimate provided in the Northeast Industrial Area PAO and adjusted for 2018 dollars and the 4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements, which assume a cost of $1.5 million per intersection comparable to the cost estimate for the Sprague/Barker Intersection Improvements.

Projects are divided into four distinct timeframes: immediate (by 2020), near-term (3-6 years), mid-term (by 2030) and long-term (2040). The timing of implementation is based on a combination of traffic analysis findings of when the project is needed to meet LOS criteria, time for project development and anticipated availability of funding.

Fair Share Analysis and Potential Funding

In order to offset the costs of the future infrastructure projects that will be needed to achieve acceptable multimodal operations in the Barker Road Corridor, one option would be for Spokane Valley to collect traffic impact mitigation fees based on a fair-share analysis. Fees could be collected from developments in Spokane Valley around the Barker Road corridor, as well as from neighboring jurisdictions, including Liberty Lake and Spokane County where development is expected to generate traffic that will utilize the corridor, generate/exacerbate traffic impacts, and benefit from the future roadway widening projects. The fair-share financial contribution is determined by how much traffic each jurisdiction is expected to contribute in 2040 to locations in the Barker Road corridor where future transportation improvement projects were identified.

The same regional travel demand model used to forecast 2040 traffic was used to estimate the percent of traffic through various segments of Barker Road generated by a portion of each jurisdiction. This was done by using a tool in the model called a “select zone analysis.” The select zone analysis was set to identify the traffic generated by the area in each jurisdiction where development is expected to have the greatest traffic impact on the South Barker Road corridor and thus where a development fee could be reasonably assessed. This includes the portion of Spokane Valley south of the Spokane River and east of Flora Road, the area of unincorporated Spokane County immediately south and east of the Spokane Valley City limits and the City of Liberty Lake west of Harvard Road as shown in **Figure 21**. Please note that the Northeast Industrial Area (north of the Spokane River) was excluded from this analysis as the City is already utilizing a Planned Action Ordinance to assess fair-share fees for projects on Barker Road north of I-90.

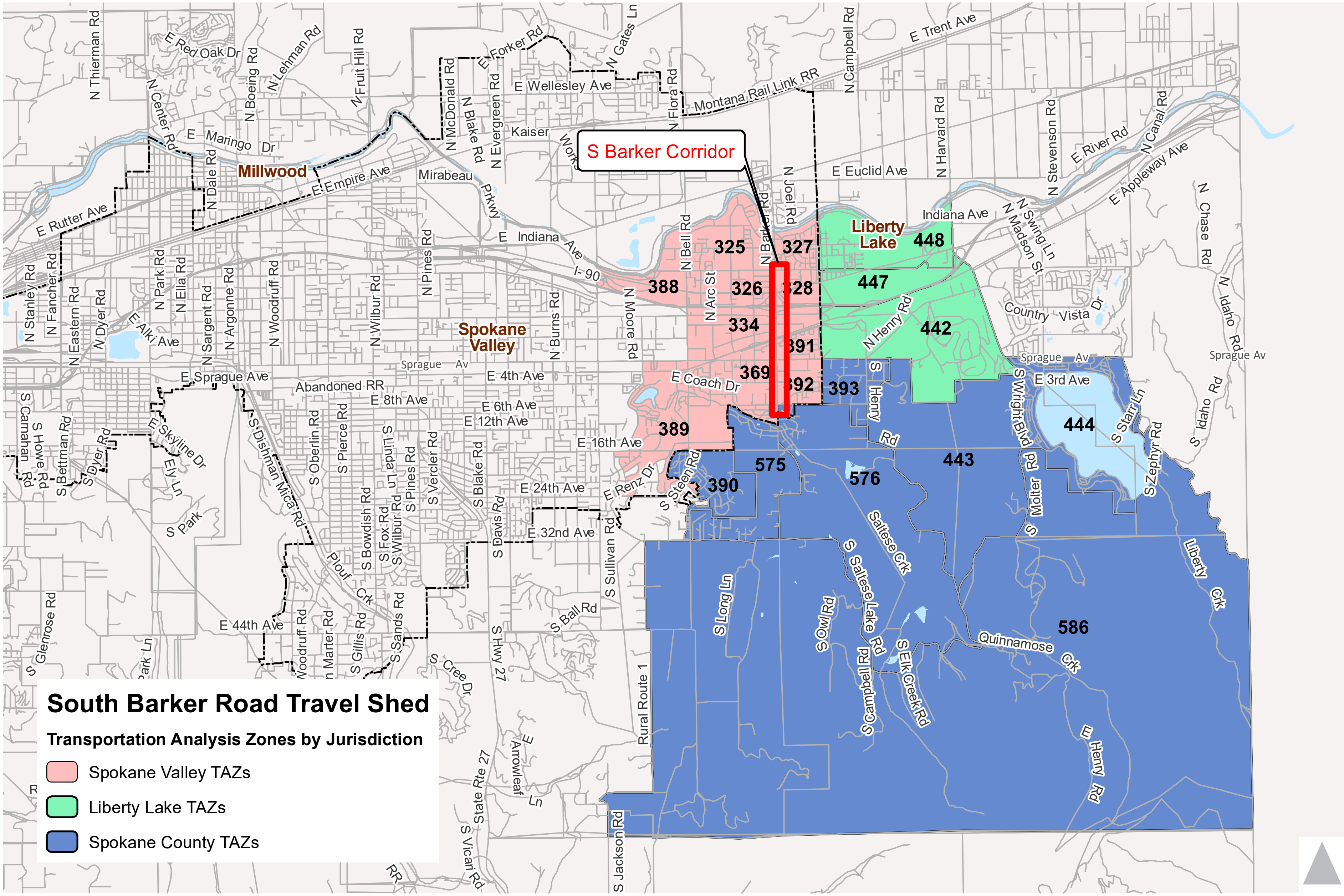


Figure 21

Transportation analysis zones by juristiction included in the fair-share cost analysis.

To complete this analysis, the corridor was divided into three segments: north of I-90, between I-90 and Appleway Avenue, and south of Appleway Avenue. The results of the fair share analysis are shown **Figure 22**. As an example, **Figure 22** shows that by 2040 about 18% of traffic on Barker Road north of I-90 will be generated by Liberty Lake and 4% will be generated by unincorporated Spokane County immediately south and east of Spokane Valley. South of Appleway Avenue, only about 2% of traffic on Barker Road will be generated by Liberty Lake and 35% will be generated by development in unincorporated Spokane County immediately south and east of the Spokane Valley city limits.

It should be noted that the percentages represent the percent of trip ends, since all trips have two ends. The select link analysis provides the origins and destinations by TAZ of all the PM peak hour trips traveling in each direction of Barker Road. Since each trip has both an origin and destination, half of the trip was assigned to the origin and half of the trip was assigned to the destination. For example, in the case of a trip that begins in Spokane Valley and ends in Liberty Lake half of that trip would be assigned to Spokane Valley and half to Liberty Lake, since both locations generated one end of the trip. Trips in the "other" category include traffic that has at least one trip end outside the TAZs included in the travel shed (see Figure 21). These include trips passing through the area or trips that have one end in the travel shed and one end outside of the travel shed (e.g., a trip between southeast Spokane Valley and downtown Spokane). Spokane Valley will need to use non-mitigation fee funding (grants, general funds) to cover the cost of the "other" trips since they cannot be levied on developers in the study area.

Figure 22. Percent of 2040 Barker Road traffic generated by jurisdiction.

Segment of Barker Road	Southeast Spokane Valley	Liberty Lake	Spokane County	Other	Total
North of I-90	26%	18%	4%	52%	100%
I-90 to Appleway Avenue	19%	16%	17%	48%	100%
South of Appleway Avenue	18%	2%	35%	45%	100%

Source: Fehr & Peers, 2018

To estimate the fair share transportation impact mitigation fee for new development in each of the jurisdictions, the cost of each project is multiplied by the percent of traffic from that jurisdiction that is forecast to use the infrastructure. Given the relatively low volume of traffic generated by unincorporated Spokane County north of I-90 and the relatively low volume of traffic generated by Liberty Lake south of Appleway Avenue it is recommended to exclude those jurisdictions from contributing to the cost of projects in those respective segments. It is recommended that new development in Liberty Lake be assessed a fair-share fee of 18% of the capital cost of infrastructure projects needed between Mission Avenue and Boone Avenue and 16% of the capital cost of infrastructure projects needed between I-90 and Appleway Avenue. Similarly, it is recommended that new development in Spokane County within the south Barker Corridor travel shed (see Figure 21) be assessed a fair-share fee of 17% of the capital cost of infrastructure projects needed between I-90 and Appleway Avenue and a fair share fee of 35% of the capital cost of infrastructure projects needed between Appleway Avenue and the south city limits.

In addition to determining which jurisdictions use the new infrastructure, a fair share transportation impact mitigation fee must consider "existing deficiencies." Impact fee case law clearly states that new developments cannot be charged to fix existing deficiencies to the transportation system. Based on the LOS analysis above, there are existing deficiencies at the I-90 ramp intersections. Since WSDOT is funding the bulk of the interim improvements at the Barker Road interchange, there is no need to take a credit at that location.

When the percentages in Figure 22 are applied to the cost of the projects listed in Figure 20, the fair share cost that can be applied to new development in each jurisdiction is listed in **Figure 23**. The total fair share cost is estimated at about $1.57 million to Liberty Lake and $3.57 million to Spokane County. It should be noted that Spokane Valley already has an agreement with Spokane County for a number of vested developments to pay a mitigation fee for improvements on Barker Road. The agreement totals $116,411, which was subtracted from the fair-share cost (specifically the Barker Road Improvement Project – Appleway to South City Limits).

Figure 23. Fair-share cost by jurisdiction and project.

Segment of Barker Road	Total Project Cost	Spokane Valley	Liberty Lake	Spokane County
I-90 Eastbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	N/A
I-90 Westbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	N/A
Sprague/Barker Intersection Improvements	$1,517,000	$273,000	$0	$531,000
I-90/Barker Road Interchange Long-Term Improvements	Not anticipated at this time	N/A	N/A	N/A
Barker Road Improvement Project – Appleway to I-90	$6,477,000	$1,230,000	$1,036,000	$1,101,000
Barker Road Improvement Project – Mission to I-90	$2,950,000	$767,000	$531,000	$0
Barker Road Improvement Project – Appleway to South City Limits	$2,854,000	$514,000	$0	$999,000 minus $116,411
4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements	$3,000,000	$540,000	$0	$1,050,000
Total	**$16,798,000**	**$3,324,000**	**$1,567,000**	**$3,565,000***

Source: Fehr & Peers, 2018

**Total was reduced by $116,411 to account for the existing mitigation fee agreement between Spokane Valley and Spokane County for several vested developments in Spokane County.*

Typically, costs to mitigate transportation infrastructure impacts are allocated based on PM peak hour traffic generation. Using PM peak hour trips is typical, since it is the PM peak hour that typically has the most-congested traffic and trips are a way to distribute costs in a way that is proportionate to the total impact generated. In other words, larger developments that generate more trips pay proportionately more than smaller developments that generate fewer trips.

To develop a per-trip fee, it necessary to estimate PM peak hour traffic that will be generated by new development in the area that will use the South Barker Road Corridor. This includes portions of Spokane Valley and unincorporated Spokane County with the Barker Road Corridor travel shed and Liberty Lake east of Harvard Road (see Figure 21). Based on the 2015 and 2040 regional travel demand model, it was found that about 5,033 new PM peak hour trips will be generated by new development in this area between 2015 and 2040. This includes 2,212 new PM peak hour trips generated by Spokane Valley, 1,888 new PM peak hour trips generated by Liberty Lake and 933 new PM peak hour trips generated by unincorporated Spokane County. To estimate a cost per PM peak hour trip, one would divide the total eligible costs of Barker Road projects (project costs minus existing deficiencies) by the new PM peak hour trips forecast to be generated in the study area.

As an example, **Figure 24** illustrates the cost of each capital improvement project recommended on the South Barker Road Corridor through 2040, along with the portion of the cost attributed to Spokane Valley traffic and the corresponding cost per new PM peak hour trip generated by development east of Flora Road and south of the Spokane River. The total cost of all projects (excluding WSDOT's portion) is about $16.8 million. Using the fair-share estimate, about $3.3 million would be attributed to traffic generated by Southeast Spokane Valley. When the fair share cost is divided by the number of new PM peak hour trips expected from development in Southeast Spokane Valley between 2015 and 2040, the total cost per PM peak hour trip would be $1,503.

Figure 24. Cost per PM peak hour trip from new development (2015-2040) in Spokane Valley.

Project	COSV Cost Estimate[1] (2018 $$)	Percent Attributed to COSV	Portion Attributed to COSV	New PM Peak Hour Trips from Nearby COSV Development	Cost per PM Peak Hour Trip
I-90 Eastbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	2,212	N/A
I-90 Westbound Ramp/ Barker Road Interchange Interim Improvements	N/A	N/A	N/A	2,212	N/A
Sprague/Barker Intersection Improvements	$1,517,000	18%	$273,000	2,212	$123
I-90/Barker Road Interchange Long-Term Improvements	Not anticipated at this time	N/A	N/A	2,212	N/A
Barker Road Improvement Project – Appleway to I-90	$6,477,000	19%	$1,230,000	2,212	$556
Barker Road Improvement Project – Mission to I-90	$2,950,000	26%	$767,000	2,212	$347
Barker Road Improvement Project – Appleway to South City Limits	$2,854,000	18%	$514,000	2,212	$232
4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements	$3,000,000	18%	$540,000	2,212	$244
Total	**$16,798,000**	**-**	**$3,324,000**	**2,212**	**$1,503**

Source: Fehr & Peers, 2018

Applying this same methodology to the other jurisdictions results in a total cost per new PM peak hour trip of $830 for Liberty Lake and $3,821 for the area of unincorporated Spokane County within the South Barker Road travel shed as shown in **Figure 25**. These fees represent potential fair-share costs that could be levied on new development to help finance projects on the South Barker Corridor.

Figure 25. Cost per PM peak hour trip from new development (2015-2040) by jurisdiction.

Segment of Barker Road	Southeast Spokane Valley	Liberty Lake	Spokane County
North of I-90	$347	$281	$0
I-90 to Appleway Avenue	$556	$549	$1,180
South of Appleway Avenue	$600	$0	$2,640
Total	**$1,503**	**$830**	**$3,821**

Vested Trips

According to data provided by Liberty Lake and Spokane County, a significant number of dwelling units forecast to be added between 2015 and 2040 have already been vested. In the three TAZs in Liberty Lake west of Harvard Road, about 1,490 of the 1,929 total new dwelling units forecast to be added between 2015 and 2040 have already been vested. In addition, a number of properties in Liberty Lake have already been vested for commercial development (about 397,853 sq. ft. across the City). While there is no mechanism to charge a mitigation fee to existing or vested trips, the number of vested trips does not detract from the fact that Barker Road is not expected to meet the City of Spokane Valley LOS standard by 2040, nor does it detract that development and growth in Liberty Lake and Spokane County contributes substantially to the traffic and congestion on Barker Road. One could recalculate a new impact fee that specifically accounts for the vested trips. However, the resulting impact fee for the unvested trips would be higher than what was calculated in this Study. This is because the total costs for the capacity expansion would be the same, but there would be fewer growth trips to spread the cost of necessary transportation improvements across. Based on a rough calculation, it's estimated the cost per PM peak hour trip for unvested growth in Liberty Lake to be approximately $1,200 to $1,300 or about 50% higher than the PM peak hour fee of $830 when vested trips are included. Therefore, Spokane Valley is suggesting that any unvested trips be assessed the fee calculated in this study as its proportionate fair-share fee. This keeps these trips from being additionally cost-burdened because of the inability to capture the costs of the vested trips.

It should be noted that Spokane Valley already has an agreement with Spokane County for a number of vested developments to pay a mitigation fee for improvements on Barker Road. The agreement totals $116,411, which was subtracted from the fair-share cost for Spokane County.

CONCLUSIONS

This report provides a summary of recommended capital improvement projects and estimated costs on the South Barker Corridor between Mission Avenue and the south City limits to be implemented by 2040. Projects are recommended to meet City and WSDOT LOS standards as well as to improve multimodal mobility in preparation for future development. This report also provides analysis of a fair-share cost estimation associated with traffic generated by adjacent jurisdictions and potential development traffic impact mitigation fees as one tool to finance projects. Lastly, guidance is provided to WSDOT on the City of Spokane Valley's preferred interim and long-term alternative for the I-90 interchange.

Analysis of existing conditions shows that both intersections of the Barker Road/I-90 Interchange are not currently operating at acceptable standards and the Barker Road/Sprague Avenue intersection is close to failing COSV standards in the PM peak hour. Additionally, by 2040 the Barker Road/Broadway intersection will fail City of Spokane Valley LOS standards. Traffic on Barker Road is expected to grow at a rate of about 1.4% per year through 2040, which will necessitate widening the corridor to five lanes between Mission Avenue and Appleway Avenue.

In order to address traffic operations, traffic safety and multimodal mobility on the corridor a total of eight capital improvement projects are recommended to be implemented between now and 2040. These are listed below, organized into four different time frames for implementation based on when the project is needed as well as other factors (including funding availability):

- Immediate (2019-2020)
  - I-90 Eastbound Ramp/Barker Road Interim Improvements (single-lane roundabout)
  - I-90 Westbound Ramp/Barker Road Interim Improvements (single-lane roundabout)
- Near-Term (2021-2024)
  - Barker Road/Sprague Avenue Intersection Improvements
- Mid-Term (2025-2030)
  - I-90/Barker Road Interchange Long-Term Improvements
  - Barker Road Improvement Project – I-90 to Appleway Avenue (5-lane urban section)
  - Barker Road Improvement Project – Mission Avenue to I-90 (5-lane urban section)
- Long-Term (2031-2040)
  - Barker Road Improvement Project – Appleway Avenue to south City Limits
  - 4th Avenue/Barker & 8th Avenue/Barker Intersection Improvements

In summary, the recommended improvements by 2040 would result in the following future condition. Barker Road would have bike lanes and sidewalks on both sides of the street and curb and gutter along the length of the corridor. The road would be widened to five lanes from Mission Avenue to Appleway Avenue, three lanes from Appleway Avenue to Sprague Avenue and two-lanes from Sprague Avenue to the south City limits. South of Sprague, the area between the sidewalks on either side of the street would be wide enough to accommodate a third center turn lane in the future if warranted by development. Two-lane roundabouts would be implemented at both intersection of the I-90 interchange. The Boone Avenue intersection would be consolidated into a new six-leg roundabout with the I-90 westbound ramp and Cataldo Avenue. The bridge over I-90 would be widened to four lanes with wide sidewalks on both sides to accommodate both bicyclists and pedestrians. The east-leg of Broadway would be realigned to meet the west-leg and the Broadway intersection would be converted to a roundabout or reconfigured to prevent left-out movements. New single-lane roundabouts or traffic signals would be implemented at the Sprague Avenue, 4th Avenue and 8th Avenue intersections.

The combined costs of the projects, excluding the portion that would be funded by WSDOT, is estimated to be about $16.8 million in 2018 dollars. A fair-share analysis of the corridor was also conducted to highlight how development in Spokane Valley, Liberty Lake, and Spokane County could help to finance these projects. By multiplying the eligible project cost with the fair-share percentage and charging that fee, it would ensure that new development in each jurisdiction is contributing funding to the project reflective of their use of/benefit from the improvement. The fair-share analysis demonstrated that traffic from Southeast Spokane Valley developments will generate fairly equal demand on the length of the corridor. Traffic from Liberty Lake is generally expected to use the section of Barker Road north of Appleway Avenue and traffic from unincorporated Spokane County will generally use the section of the corridor south of I-90. Therefore, it is recommended that a fee program be implemented to collect fees for projects on three distinct segments of the corridor based on the fair-share percentage:

- Mission Avenue to I-90
- I-90 to Appleway Avenue
- Appleway Avenue to south City limits

It should be noted that while developer impact fees can provide an important source of funding, after negotiating with developers, elected officials, and neighboring jurisdictions, the impact fees are typically set so that they only cover a portion of project costs (typically less than 50%). Thus, Spokane Valley will need to use other financing strategies to pay for the remaining costs of the projects identified above. Other financing strategies Spokane Valley might consider include implementing a local improvement district or transportation benefit district, and applying for grants. Historically, Spokane Valley has had strong success in seeking and winning external funding, which has kept the costs of expanding transportation infrastructure relatively low for both developers and existing taxpayers compared to other cities in the region and state.