Appendix G

Existing and Future No Build Safety Analysis

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Appendix G-1

Existing Safety Analysis Memo

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TECHNICAL MEMORANDUM

DATE: July 10, 2019

TO: City of Bremerton

FROM: Alex Atchison, PE, PTOE
Emily Welter, PE

SUBJECT: Saftey Analysis Summary

CC: Michael Horntvedt, Parametrix

PROJECT NUMBER: 554-1896-156

PROJECT NAME: SR 303 Corridor Study

SAFETY ANALYSIS

Under 23 United States Code §148 and 23 United States Code §409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

A basic safety level analysis of intersections and roadway segments on the SR 303 corridor was performed to assess current safety performance, summarize recent crash history, and report on any major contributing factors to fatal and serious injury crashes. Crash data was collected for the most recent 5-year period (January 1, 2014 through December 31, 2018) on the SR 303 corridor between Burwell Street (SR 304) and NE McWilliams Road. During this time 1,203 crashes were reported for the overall corridor, with 528 at the study intersections and 675 on the roadway segments between intersections.

Table 1 summarizes crashes by severity and crash type at the study intersections and along four segments of the SR 303 corridor.

Study Intersections

The number of crashes at the study intersections were highest north of the Warren Avenue Bridge, with the most crashes occurring at the Wheaton Way (SR 303)/Sheridan Road and Wheaton Way (SR 303)/NE Riddell Road intersections.

The type and severity of crashes on SR 303 are consistent with urban congested traffic, with rear-end and property damage only (PDO) or non-injury crashes accounting for the majority. As noted in Section 1.5.3 of the FHWA Freeway Management and Operations Handbook, though the relationship between congestion and safety is not well defined, it is generally accepted that crash potential tends to increase as congestion increases, but the severity of those crashes is lower.

Rear-end crashes were the most common type of crash (51%) at all study intersections. Angle (17%) and sideswipe (12%) crashes were the next most common crash types, together accounting for about a third of all intersection crashes. During the 5-year study period, four crashes at the study intersections resulted in serious injuries. There were no fatalities at the study intersections.

The serious injury crash at Warren Avenue (SR 303)/6th Street was a pedestrian crash that occurred when the lighting conditions were dark with no street lights and the roadway surface was icy. The two serious injury crashes at the Wheaton Way (SR 303)/Sheridan Road intersection were approach turn crashes. Inattention was cited as the contributing factor for one of these crashes and while no contributing factor was cited for the other, the roadway was wet. The serious injury crash at the Wheaton Way (SR 303)/Hollis Street intersection was a rear-end crash with inattention as a contributing factor.

The contributing factors noted for rear-end crashes at the study intersections included inattention or distraction (55%), following too closely (19%), and exceeding reasonably safe speeds (8%).

Segments

The number of crashes along the segments between the study intersections were highest north of the Warren Avenue Bridge, with about two thirds of segment crashes occurring between Sheridan Road and NE McWilliams Road. Rear-end crashes were the most common type of crash (55%) for all four segments. Angle (15%) and sideswipe (14%) crashes were the next most common crash types, together accounting for about a third of all segment crashes. During the 5-year study period, nine crashes along the segments between study intersections resulted in serious injuries, with six of those crashes occurring on or north of the Warren Avenue Bridge. There were two fatalities along the segment between Sheridan Road and NE McWilliams Road.

Of the nine serious injury crashes along the four segments, two of the crashes were read-end crashes and three of the crashes involved a pedestrian or bicyclist. Contributing factors were only identified for six of the serious injury crashes and included inattention (50%), exceeding reasonably safe speeds (38%), and alcohol (12%).

The two crashes that results in a fatality occurred just north of the Wheaton Way (SR 303)/Sylvan Way intersection and just north of the Wheaton Way (SR 303)/NE Riddell Road intersection. Both were classified as pedestrian crashes and involved a vehicle traveling northbound along SR 303. No contributing factors were identified for either fatal crash, but the crash just north of the Wheaton Way (SR 303)/NE Riddell Road intersection occurred when the lighting conditions were dark with no street lights.

The contributing factors noted for rear-end crashes along the segments included inattention or distraction (59%), following too closely (25%), and exceeding reasonably safe speeds (8%). Of the 675 crashes that occurred along the four segments, less than 15% occurred at a driveway along the corridor.

Table 1. Historical Crash Rates and Crashes Summarized by Severity and Type

Intersection/Segment	Crashes per Year	Total Crashes	Crash Severity				Crash Type									
			Fatality	Serious Injury	Minor or Possible Injury	PDO[1]	Head-On	Angle	Sideswipe	Rear-End	Approach Turn	Fixed Object	Pedalcyclist	Pedestrian	Animal Related	Other
Intersection Crashes																
SR 303 / Burwell Street (SR 304)	4.0	20	0	0	4	16	0	2	5	8	3	1	0	0	0	1
SR 303 / 4th Street	2.6	13	0	0	1	12	0	1	1	9	1	0	1	0	0	0
SR 303 / 5th Street	1.4	7	0	0	2	5	0	2	0	3	0	1	0	0	0	1
SR 303 / 6th Street	8.2	41	0	1	4	36	0	7	8	15	6	2	0	1	0	2
SR 303 / 11th Street	8.6	43	0	0	13	30	0	6	8	27	1	1	0	0	0	0
SR 303 / 13th Street	7.8	39	0	0	12	27	0	7	3	25	0	2	1	0	0	1
SR 303 / 16th Street	4.6	23	0	0	6	17	0	3	1	15	1	3	0	0	0	0
SR 303 SB Ramps/ Callahan Drive	0.4	2	0	0	0	2	0	1	0	1	0	0	0	0	0	0
SR 303 NB Ramps/ Callahan Drive	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SR 303 / Sheridan Road	13.6	68	0	2	16	50	1	11	15	24	7	4	1	3	0	2
SR 303 / Sylvan Way	12.0	60	0	0	21	39	0	11	3	28	12	0	2	3	0	1
SR 303 / Hollis Street	4.2	21	0	1	9	11	0	7	2	9	1	1	0	1	0	0
SR 303 / NE Riddell Road	13.6	68	0	0	18	50	0	16	9	24	11	3	1	1	0	3
SR 303 / NE Furneys Lane	6.6	33	0	0	16	17	0	4	3	19	3	0	1	1	0	2
SR 303 / NE Fuson Road	6.4	32	0	0	11	21	0	2	0	24	4	0	1	0	0	1
SR 303 / NE McWilliams Road	11.6	58	0	0	16	42	1	10	3	37	4	2	0	0	0	1
Intersection Total	**105.6**	**528**	**0**	**4**	**149**	**375**	**2**	**90**	**61**	**268**	**54**	**20**	**8**	**10**	**0**	**15**
Segment Crashes[2]																
SR 303: Burwell Street (SR 304) to 16th Street	22.0	110	0	2	33	75	0	23	21	49	6	2	2	2	0	5
SR 303: 16th Street To Sheridan Road	29.2	146	0	2	49	95	1	4	16	99	0	12	1	0	1	12
SR 303: Sheridan Road to NE Riddell Road	50.8	254	1	4	70	179	0	59	40	108	23	8	1	8	0	7
SR 303: NE Riddell Road to NE McWilliams Road	33.0	165	1	1	50	113	0	14	15	117	4	5	0	4	2	4
Segments Total	**135.0**	**675**	**2**	**9**	**202**	**462**	**1**	**100**	**92**	**373**	**33**	**27**	**4**	**14**	**3**	**28**

Source: 2014–2018 data from WSDOT Crash Database

[1]PDO = Property damage only

[2] Segment crashes refer to crashes on SR 303 between MP 0.00 and MP 3.75 that were not related and/or did not occur at a study intersection.

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Appendix G-2

Future No Build HSM
Predicted Analysis Results

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HSM Part C Training Tool: HSM1 Extended Spreadsheet for Part C Chapter 12 (v.9, 2016)

Calculates the predicted safety performance for urban and suburban arterials

HSM Part C Training Tool Instructions

Overview

This series of spreadsheets has been developed to assist in the application of the predictive methods contained in the Highway Safety Manual (HSM), 1st Edition for analyzing: urban and suburban arterials, rural multilane roads, and rural two lane roads.

Data Color Guidelines

Required user input data

Required user input data restricted to dropdown values

Automatically updated information based on previous user input data

User work space (notes, comments, etc.)

Upon Opening the File

1. Ensure that macros are enabled in Excel. (Refer to Microsoft Help for more information about enabling macros.)
2. Read the terms of use and follow the directions on the prompts.
3. If analyzing a new project, follow the prompts to save as a new file.
4. Read all instructions before proceeding.

General Steps for Project Safety Performance Analysis

1. Navigate to the “Project Information” tab.
2. Using the color guidelines above, populate the required information under General Information.
3. Push the “Update Element Table” button to set up the element table. *Note: Elements cannot be added to the analysis once this button has been pushed.
4. Fill in the Route, Location Description, and Jurisdiction for each element. For intersections, also select whether or not the intersection is signalized. And where applicable, select divided or undivided for each segment.
5. Once all of the information has been entered, push the “Proceed to 1st Element” button.
6. On the current tab (either “Segment 1” or “Intersection 1”), enter all of the required information (refer to color guidelines).
7. Ensure that all necessary information has been entered, then push the “Next Element” button.
8. Repeat steps 6 and 7 for all project elements.
9. On the tab for the final project element, push the "Generate Report" button to run the analysis and redirect to the “Report” page, giving a summary of the analysis results.
10. At this time, any of the input information on the element tabs can be altered if desired. The results will update automatically.

General Steps for a Multi-Year Project Safety Performance Analysis

1. Complete all steps for the Project Safety Performance Analysis first.
2. Navigate to the “Multi-Year Analysis Inputs” tab.
3. Enter the required information (Input Data*). Refer to color guidelines as necessary. *Note: the Traffic Growth Rate is a linear growth rate per year (i.e. the volume increases by the same number of vehicles each year) and should be entered as a percent, not as a decimal.
4. Once all of the information is complete, push the “Run Multi-Year Analysis” button to perform the analysis.
5. The “Multi-Year Summary Report” tab provides a summary table of the multi-year analysis, with the expected average crash frequency, the potential for safety improvement, and a discussion of the results for the analysis period.

PROJECT SAFETY PERFORMANCE ANALYSIS INPUT SHEET

General Information

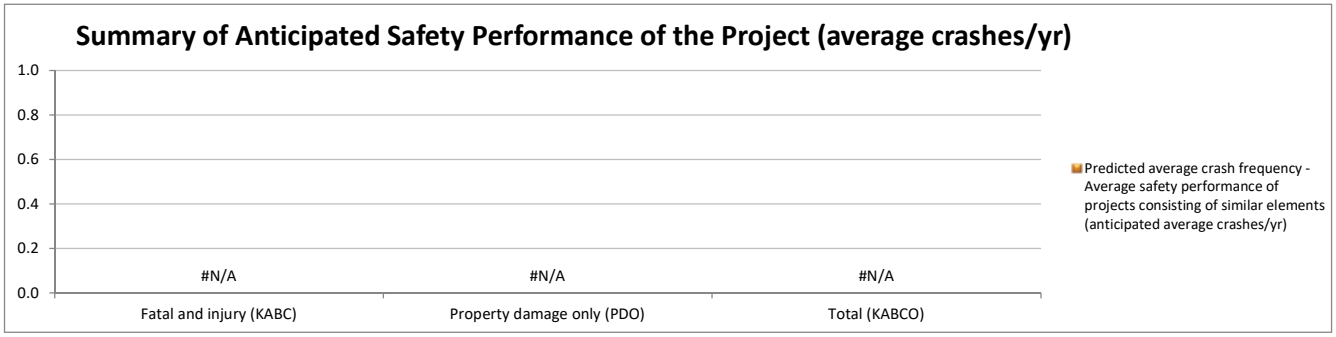
Project Name	SR 303 Corridor Study	Contact Email	ewelter@parametrix.com
Project Description	Burwell to McWilliams	Contact Phone	(206) 838-3975
Reference Number	No Build Alternative	Date Performed	02/07/20
Analyst	Emily Welter	Analysis Year	2040
Agency/Company	Parametrix		
# of Segments in Analysis	13	This spreadsheet calculates the predicted average crash frequency	
# of Intersections in Analysis	14		

INDIVIDUAL PROJECT ELEMENTS	LOCATION INFORMATION		JURISDICTION	INTERSECTIONS ONLY
	Route	Location Description		Signalized or Unsignalized?
SEGMENTS				
Segment 1	SR 303	Burwell to 6th	City of Bremerton	-
Segment 2	SR 303	6th to 11th	City of Bremerton	-
Segment 3	SR 303	11th to 13th	City of Bremerton	-
Segment 4	SR 303	13th to 16th	City of Bremerton	-
Segment 5	SR 303	16th to Callahan	City of Bremerton	-
Segment 6	SR 303	Callahan to Sheridan	City of Bremerton	-
Segment 7	SR 303	Sheridan to Sylvan	City of Bremerton	-
Segment 8	SR 303	Sylvan to E Broad	City of Bremerton	-
Segment 9	SR 303	E Broad to Hollis	City of Bremerton	-
Segment 10	SR 303	Hollis to NE Riddell	City of Bremerton	-
Segment 11	SR 303	NE Riddell to NE Furneys	Kitsap County	-
Segment 12	SR 303	NE Furneys to NE Fuson	Kitsap County	-
Segment 13	SR 303	NE Fuson to NE McWilliams	Kitsap County	-
INTERSECTIONS				
Intersection 1	SR 303	Burwell Street	City of Bremerton	Signalized
Intersection 2	SR 303	6th Street	City of Bremerton	Signalized
Intersection 3	SR 303	11th Street	City of Bremerton	Signalized
Intersection 4	SR 303	13th Street	City of Bremerton	Signalized
Intersection 5	SR 303	16th Street	City of Bremerton	Signalized
Intersection 6	SR 303	Callahan Drive	City of Bremerton	Unsignalized
Intersection 7	SR 303	Sheridan Road	City of Bremerton	Signalized
Intersection 8	SR 303	Sylvan Road	City of Bremerton	Signalized
Intersection 9	SR 303	E Broad Street	City of Bremerton	Signalized
Intersection 10	SR 303	Hollis Street	City of Bremerton	Signalized
Intersection 11	SR 303	NE Riddell Road	City of Bremerton	Signalized
Intersection 12	SR 303	NE Furneys Lane	Kitsap County	Signalized
Intersection 13	SR 303	NE Fuson Road	Kitsap County	Signalized
Intersection 14	SR 303	NE McWilliams Road	Kitsap County	Signalized

PROJECT SAFETY PERFORMANCE SUMMARY REPORT

General Information	
Project Name	SR 303 Corridor Study
Project Description	Burwell to McWilliams
Reference Number	No Build Alternative
Analyst	Emily Welter
Agency/Company	Parametrix
Contact Email	ewelter@parametrix.com
Contact Phone	(206) 838-3975
Date Completed	02/07/20

PROJECT SUMMARY



Project Element	Total Crashes/yr (KABCO) Predicted average crash frequency $N_{predicted\ (KABCO)}$	Fatal and Injury Crashes/yr (KABC) Predicted average crash frequency $N_{predicted\ (KABC)}$	Property Damage Only Crashes/yr (PDO) Predicted average crash frequency $N_{predicted\ (O)}$
INDIVIDUAL SEGMENTS			
Segment 1	1.3	0.4	0.9
Segment 2	5.7	1.9	3.8
Segment 3	2.9	0.9	2.0
Segment 4	6.0	2.0	4.1
Segment 5	10.4	2.8	7.5
Segment 6	3.0	0.9	2.2
Segment 7	21.4	6.7	14.7
Segment 8	20.7	6.5	14.2
Segment 9	5.0	1.6	3.4
Segment 10	13.4	4.2	9.2
Segment 11	9.2	2.9	6.3
Segment 12	8.2	2.3	5.9
Segment 13	14.0	3.9	10.1
INDIVIDUAL INTERSECTIONS			
Intersection 1	5.4	1.9	3.5
Intersection 2	5.9	2.1	3.8
Intersection 3	13.3	4.9	8.4
Intersection 4	15.9	6.0	9.9
Intersection 5	8.4	2.7	5.7
Intersection 6	#N/A	#N/A	#N/A
Intersection 7	8.3	3.1	5.2
Intersection 8	8.1	3.1	5.1
Intersection 9	7.8	2.9	4.8
Intersection 10	4.5	1.6	3.0
Intersection 11	7.3	2.7	4.5
Intersection 12	7.8	2.9	4.9
Intersection 13	7.8	2.9	4.9
Intersection 14	7.5	2.9	4.6
COMBINED (sum of column)	#N/A	#N/A	#N/A

PROJECT SUMMARY -- Site-Specific EB Method Summary Results for Urban and Suburban Arterial Project

Crash severity level	$N_{predicted(PROJECT)}$ Predicted average crash frequency - Average safety performance of projects consisting of similar elements (anticipated average crashes/yr)
Fatal and injury (KABC)	#N/A
Property damage only (PDO)	#N/A
Total (KABCO)	#N/A

HSM1 Extended Spreadsheet for Part C Chapter 12 v.9

Discussion of Results

Given the potential effects of project characteristics on safety performance, results indicate that:

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