DESIGN DECISION / DESIGN ANALYSIS

Document Title: Design Analysis #5 – EB On-Ramp @ Montlake Blvd (DXEI)

Project Title: Montlake to Lake Washington I/C and Bridge Replacement

SR 520 MP 0.84 TO MP 2.34

XL-5097 PIN-852001L

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Region: SR 520

Office: SR 520

Prepared by: P. Merrell / J. Haukap

Project Engineer: D. Edwards

Document Phase: ☐ Preliminary / ☒ Final

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WSDOT

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Section 1: Background

Briefly describe the project:

The "SR 520, Montlake to Lake Washington I/C and Bridge Replacement" project will replace the existing earthquake vulnerable Union Bay Bridge (Br 520/6) and West Approach Bridge (Br 520/7.5) along with other associated major work. See Basis of Design for details.

Provide any background information important to understanding the decision(s):

The eastbound on-ramp from Montlake Blvd will be constructed in an interim configuration as part of the subject project until the future "SR 520, I-5 I/C and Portage Bay Bridge Replacement" project, which is funded and scheduled to start construction in 2020. The interim configuration is necessary to connect the existing on-ramp to the new Montlake community enhancement lid structure (built as part of subject project). Widening and partial reconstruction of this on-ramp is also needed to provide additional width that will be temporarily needed to provide an added HOV bypass lane during construction. The temporary HOV bypass lane will only be needed until the new eastbound direct access ramp is built in conjunction with the new Montlake lid. At that time, HOV traffic will be diverted to the new direct access ramp and the eastbound on-ramp from Montlake Blvd will be re-channelized to the final project configuration (as documented within this Design Analysis) until the future Portage Bay Bridge project builds the ultimate configuration for this on-ramp.

Related documents (such as a Basis of Design):

The Basis of Design (BOD) and Alternatives Comparison Table (ACT) for the "SR 520, Montlake to Lake Washington I/C and Bridge Replacement" project (signed and approved on 7/14/2016) are attached.

Section 2: Issues Description

Describe the decision(s) that will be discussed. Identify the design elements that are involved, including the locations. Identify the proposed dimensions and how they compare to Design Manual Guidance.

ID #	*Design Element*	*Location*	*Guidance*	*Proposed*	*Shown on (Sheet #)*
LW1	Lane Width	DXEI 10+56.52 to DXEI 23+29.80	Range = 23 to 25 Ft	24 Ft – 30 Ft	Appendix B, CH01 & CH10
SW1	Shoulder Width	DXEI 10+56.52 to DXEI 12+43.36 DXEI 12+43.36 to DXEI 23+29.80	Range = 2 to 4 Ft Lt & 4 to 8 Ft Rt	1 Ft Lt & 8 Ft Rt 4 Ft Lt & 8 Ft Rt.	Appendix B, CH01 & CH10
SW2	Shoulder Width	DXEI 10+40 to DXEI 10+60 Rt.	Range = 4 to 8 Ft Rt	0 Ft	Appendix B, CH10 & CH16
BS1	Barrier Shy Distance	DXEI 14+40 to DXEI 23+30 Lt.	Add 2 Ft for Shdr < 8	0 Ft	Appendix B, CH01 & CH10
LT1	Lane Transition Rate	DXEI 12+28.89 to DXEI 13+37.32 Rt.	25:1 Taper	18.1:1 Taper	Appendix B, CH10

Details:

The subject Design Analysis documents dimensions for lane and shoulder widths and related geometric elements for the eastbound SR 520 on-ramp @ Montlake Blvd (DXEI), as discussed below:

Lane and Shoulder Width (LW1 & SW1) – Except as clarified below, lane and shoulder width dimensions for the eastbound on-ramp from Montlake Blvd have been developed in accordance with Design Manual (DM) 1100 [July 2016] and in accordance with Alternative Analysis guidelines as found in DM 1104 [July 2016]. Lane and shoulder width dimensions were also developed and evaluated for interchange on-ramp criteria as found in DM 1360 [Nov 2015] including ramp width ranges as found in DM Exhibit 1360-6 [Nov 2015].

The eastbound on-ramp from Montlake Blvd includes a tight radius loop configuration including a combination of tangent, tight radius horizontal curves, and larger radius horizontal curves. Increased lane widths are provided at the tight radius horizontal curves (or turning roadways), consistent with DM 1240 [Nov 2015] to accommodate off-tracking of larger sized vehicles to optimize the operational and safety performance as discussed in the options evaluation section. For the eastbound on-ramp from Montlake Blvd, truck percentages are low (approximately 4%) and freight is not considered a modal priority. However, traveled way widths have been increased (beyond the lane width ranges listed in the Design Manual) to accommodate larger sized vehicles accessing the interchange. Also see turning template exhibits provided in Appendix C where the SU-30 vehicle has been used as the design vehicle and the WB-67 vehicle is shown to be accommodated.

One shoulder width exception exists from DXEI 10+56.52 to DXEI 12+43.36 at the vicinity of the on-ramp entrance where the planned left shoulder width has been reduced to 1-foot. Per DM Exhibit 1360-6 [Nov 2015], the required left shoulder width ranges from 2 feet to 4 feet. Note this portion of the left shoulder is part of the two-way ramp median providing separation between the eastbound off-ramp and the subject eastbound on-ramp.

Shoulder Width / Crosswalk @ On-Ramp Entrance (SW2) – Shoulder width at vicinity of the on-ramp entrance crosswalk has been narrowed to zero feet for the primary purpose of reducing the pedestrian crossing distance and minimizing potential for vehicle / pedestrian conflicts. Shoulder width at the crosswalk has been evaluated per interchange on-ramp criteria as found in DM 1360 [Nov 2015] including shoulder width ranges as found in DM Exhibit 1360-6 [Nov 2015].

Barrier Shy Distance (BS1) – DM 1610.05(2) [July 2016] requires an extra 2 feet of additional widening for shy distance when barrier is to be installed in areas where the roadway is to be widened and the shoulder width will be less than 8 feet. The additional 2 feet of widening is not proposed for where barrier is planned along the eastbound on-ramp from Montlake Blvd and shoulder width is less than 8 feet.

Lane Transition Rate (LT1) – The eastbound on-ramp from Montlake Blvd includes one location where the lane width transitions from 12 feet to 16 feet for the right lane of the two lane on-ramp. The widening of the traveled way is provided to accommodate turning roadway width needs where tight radius horizontal curves of the loop ramp require additional width to accommodate off-tracking of larger vehicles. Per DM 1210.05(1)(a) [Nov 2015] and 1240.02(5) [Nov 2015], a 25:1 taper is considered sufficient for changing the lane width. The planned design uses an 18.1:1 taper rate to widen from 12 feet to 16 feet.

If guidance other than the Design Manual was used describe it here

N/A

Section 3: Options Evaluation

Discuss the evaluation methodology. Describe the metrics/considerations that will be used to choose between options. Describe methodology (quantitative or qualitative) and any performance targets. The performance metrics, methods and targets you choose will be part of your performance trade-offs "story"

Although the project's Basis of Design included three baseline needs and six contextual needs; only one

baseline need and three contextual needs were determined to be pertinent in evaluating between options; baseline need BN3 to reduce the risk of serious injury and fatal crashes, and contextual needs CN1 to avoid or minimize impacts to built land use, CN3 to improve facilities for multi-modal users, and CN6 metric is to improve sustainability. In addition, each option considered safety performance, mobility performance, and location specific metrics for the options evaluated.

The methodology for comparing performance for each geometric element is described in more detail as follows:

- **Lane and Shoulder Width (LW1 – SW1)** – The methodology used to evaluate different lane and shoulder width options consisted of a Safety Performance Evaluation (or quantitative analysis) using the Highway Safety Manual (HSM) Freeway Model through the Interchange Safety Analysis Tool (ISATe) spreadsheet to perform a safety performance prediction for each of the options analyzed.

  A qualitative evaluation was also used to consider location specific needs. As described in Section 1 (above), the eastbound on-ramp from Montlake Blvd will include a temporary traffic control stage where the on-ramp will be re-channelized to provide a third lane dedicated as an HOV bypass lane. Prior to project completion, this HOV bypass lane will be eliminated (relocated to new eastbound direct access on-ramp @ 24th Ave interchange). The qualitative evaluation considered the functional and operational performance associated with this temporary traffic control staging need.

- **Shoulder Width / Crosswalk @ On-Ramp Entrance (SW2)** – A qualitative approach that considers functional and operational performance has been used to evaluate different shoulder width options for the vicinity of the crosswalk at the on-ramp entrance.

- **Barrier Shy Distance (BS1)** – The methodology used to evaluate barrier shy distance options consisted of a Safety Performance Evaluation (or quantitative analysis) using the Highway Safety Manual (HSM) Freeway Model through the Interchange Safety Analysis Tool (ISATe) spreadsheet to prepare a safety performance prediction for the two options analyzed. A qualitative approach that considers functional and operational performance has also been used to evaluate barrier shy distance options where barrier is planned and the shoulder is less than 8 feet in width.

- **Lane Transition Rate (LT1)** – A qualitative approach that considers functional and operational performance has been used to evaluate options for lane transition rate where the traveled way width will be widened for turning roadways.

Options Comparison Table

Issue and Location:
Lane and Shoulder Width (LW1 – SW1)
DXEI 10+56.52 to DXEI 23+29.80

Options Evaluated ↓	Associated Issues (identified in Section 2)	Metrics / Considerations				
		BN3 – Safety Performance - Reduce Risk of Fatal (K) and Serious Injury (A) Crashes (as compared with existing)	*Operational and Mobility Performance*	*CN1 – Impacts to Built Land Use*	*CN6 – Sustainability*	*Traffic Control Staging for Temporary Added HOV Bypass Lane*
		Performance Results:	**Performance Results:**	**Performance Results:**	**Performance Results:**	**Performance Results:**
Option A [2', 11.5', 11.5', 4']	LW1 / SW1	0.05 (K) + 0.14 (A) = **0.19 (K + A) cpy**	Shoulder/Lane Functional & Operational Needs Not Met	Low Impact	Area of Pavement Surface = 36,922 SF	Does not accommodate HOV bypass
Option B [4', 12.5', 12.5', 8']	LW1 / SW1	0.03 (K) + 0.10 (A) = **0.13 (K + A) cpy**	Shoulder Functional & Operational Needs Met	High Impact	Area of Pavement Surface = 47,108 SF	Accommodates HOV bypass
Option C Segment 1 [1', 12', 12', 8'] Segment 2 [4', 14', 16', 8'] Segment 3 [4', 12.5', 12.5', 8']	LW1 / SW1	0.03 (K) + 0.09 (A) = **0.12 (K + A) cpy**	Functional & Operational Needs Met	Low Impact	Area of Pavement Surface = 48,367 SF	Accommodates HOV bypass
Existing (EX) Segment 1 [1', 11', 11', 11', 8'] Segment 2 [2', 14', 16', 6'] Segment 3 [2', 10', 10', 2'] Segment 4 [2', 11', 11', 3']	LW1 / SW1	0.04 (K) + 0.12 (A) = **0.16 (K + A) cpy**	Functional & Operational Needs Not Met	Low Impact	Area of Pavement Surface = 41,053 SF	Does not accommodate HOV bypass
		cpy = Crashes Per Year				

Discuss the performance tradeoffs shown in the table, and compare the performance of the options:

Detailed description of the options evaluated is as follows:

Option A consists of a 2-foot left shoulder, two 11.5-foot lanes, and a 4-foot right shoulder [2', 11.5', 11.5', 4']. Option A represents the narrowest roadway section configurations per ranges listed within DM Exhibit 1360-6 [Nov 2015].

Option B consists of a 4-foot left shoulder, two 12.5-foot lanes, and an 8-foot right shoulder [4', 12.5', 12.5', 8']. Option B represents the widest roadway section configuration per ranges listed within DM

Exhibit 1360-6 [Nov 2015].

Option C consists of three segments as follows:

Segment 1 (DXEI 10+56.52 to DXEI 12+43.36) - 1-foot left shoulder, two 12-foot lanes, and an 8-foot right shoulder [1', 12', 12', 8']. The 1-foot left shoulder width is less than the range listed in DM Exhibit 1360-6 [Nov 2015].

Segment 2 (DXEI 12+43.36 to DXEI 16+44.69) - 4-foot left shoulder, one 14-foot lane and one 16-lane, and an 8-foot right shoulder [4', 14', 16', 8'] within the "loop" portion of the on-ramp.

Segment 3 (DXEI 16+44.69 to DXEI 23+29.80) - 4-foot left shoulder, two 12.5-foot lanes, and one 8-foot outside shoulder [4', 12.5', 12.5', 8'].

Existing (EX) consists of four segments as follows:

Segment 1 (DXEV 10+68 to DXEV 12+52.69) - 1-foot left shoulder, three 11-foot lanes, and an 8-foot right shoulder [1', 11', 11', 11', 8'].

Segment 2 (DXEV 12+52.69 to DXEV 16+37.29) - 2-foot left shoulder, one 14-foot lane and one 16-foot lane, and a 6-foot right shoulder [2', 14', 16', 6'] within the "loop" portion of the existing on-ramp.

Segment 3 (DXEV 16+37.29 to DXEV 22+58.30) - 2-foot left shoulder, two 10-foot lanes, and a 2-foot right shoulder [2', 10', 10', 2'].

Segment 4 (DXEV 22+58.30 to DXEV 23+98.20) - 2-foot left shoulder, two 11-foot lanes, and a 3-foot right shoulder [2', 11', 11', 3']. Note that Section 4 includes a left side on-connection for the existing transit flyer stop merge to the EB on-ramp, which will be eliminated in each of the build options listed above (transit stop to be relocated to surface of new Montlake Lid in all build options).

Performance Comparison and Tradeoffs is as follows:

Metric BN3 – Safety Performance (Reduce Risk of Fatal and Serious Injury Crashes)

This performance metric is evaluated for reduction in risk of fatal and serious injury crashes against existing conditions. Performance results show that crash prediction numbers are similar for each of the options evaluated. As such, lane and shoulder widths (within the ranges evaluated), has limited effect on predicted fatal or serious injury crash rates. For the options evaluated, Option A (the narrowest configuration) results in the highest number of predicted fatal and serious injury crashes at 0.19 crashes per year (cpy). Option C (the planned configuration) predicts the fewest fatal and serious injury crashes at 0.12 cpy. The difference between Option A (0.19 cpy) and Option C (0.12 cpy) is 0.07 cpy, which approximately equates to 1 additional fatal or serious injury crash every 14 years. Results for other options show very small difference between Option B (0.13 cpy) and Option C (0.12 cpy). Performance results for the existing (EX) model show a slight increase in predicted crash rates (0.16 cpy) as compared with Option B and Option C, and slightly less in predicted crash rates as compared with the narrowest configuration (Option A). As described above, the target for Baseline Need BN3 is "to reduce the estimated crash rate for fatal and serious injury crashes as compared with the estimated crash rate for existing conditions". Per the results listed above, this target will be met by both Option B and Option C.

It should be noted that there are limitations inherent within the HSM model. One limitation is that the minimum shoulder width that can be modeled is 2 feet wide. For each of the options evaluated, any shoulder width less than 2 feet wide was modeled as if the shoulder were 2 feet wide. Both Option C and EX (or existing) include small segments with shoulder width less than 2 feet. As a result of the 2-foot shoulder width modeling limitation, crash prediction results for Option C and for the EX model may be slightly underestimated, however still provide a good representation of the difference in safety performance. An additional modeling limitation involves minimum allowable horizontal radius. For each of the build options (A, B & C) and the existing EX option, the horizontal curves used for the loop portion of the on-ramp include small radius horizontal curves. The HSM model cannot model any horizontal radius less than 100 feet. For each of the build options (A, B & C), the horizontal curve at DXEI 17+20.35

includes a horizontal radius of 67 feet (measured at right edge of traveled way) For the existing EX model, the equivalent horizontal curve at DXEV 15+67.35 also includes a horizontal radius of 67 feet (measured at right edge of traveled way). Due to the modeling limitation, each of the build options and the EX model each used 100 feet for the horizontal radii at the curve locations listed above. As a result of this horizontal modeling limitation, each of the options evaluated will tend to slightly underestimate crash prediction rates. However, each of the evaluations used the same modeling adjustment, and therefore the results still provide a good representation of the difference in safety performance.

Metric – Operational and Mobility Performance

This performance metric is evaluated for operational and mobility needs of the shoulder in order to provide the width for breakdown and crashed vehicles and support maintenance functions, while the lane widths will be evaluated for their accommodation of occasional WB-67 vehicles. Of the options considered, Options B and C would both provide an 8-foot outside shoulder. Option A would provide a 4-foot outside shoulder, and the existing outside shoulder (Option EX) ranges from 2 to 8 feet in width. Options B and C would provide the following operational and functional benefits:

- Vehicles involved in crashes will have a wider shoulder available for moving out of the traveled way, thereby reducing the potential for secondary crashes. Similarly, vehicle breakdowns will also have adequate shoulder width available to move out of the traveled way. The opportunity to move vehicle breakdowns or crashes out of the traveled way will assist operational performance by minimizing the potential for traffic backups that might otherwise occur under options with narrower shoulders. It should also be noted that the SR 520 utilizes Incident Response Team (IRT) vehicles to assist disabled vehicles. The wider 8-foot shoulder would provide a location where the IRT can push disabled vehicles out of the traveled way.
- The 8-foot outside shoulder would better allow WSDOT maintenance forces to perform routine maintenance activities without closing the on-ramp, or portions of the on-ramp.
- The 8-foot outside shoulder would better allow the Washington State Patrol (WSP) to perform driver assistance and enforcement activities.
- Additionally, Option C provides wider lane widths for the loop portion of the on-ramp to better accommodate vehicle off-tracking.

In terms of operational and mobility performance, Option C performs the best.

Metric CN1 – Impacts to Built Land Use

This performance metric is evaluated for minimal impacts to existing built land use. The eastbound on-ramp from Montlake Blvd (DXEI) is primarily located within developed upland areas currently being used for highway purposes. The eastbound on-ramp from Montlake Blvd (DXEI) and the eastbound off-ramp to Montlake Blvd (EDXI) are located adjacent to each other as a two-way ramp with a narrow raised median (providing separation between the ramps). Properties to the south of the EDXI off-ramp include a commercial property (Montlake Market & gas station). Land use to the north of the subject on-ramp includes the SR 520 mainline roadway.

Of the options evaluated, only Option B would require right-of-way acquisition from the adjacent property. More specifically, Option B's wider lane and shoulder widths would require the adjacent eastbound off-ramp to be shifted further south. The additional right-of-way acquisition would be needed to accommodate the shift in location for the eastbound off-ramp. Widening to the north of the eastbound on-ramp is not considered practical or feasible as doing so would require relocation of the mainline SR 520 roadway. The loop on-ramp alignment also includes several tight radius horizontal curves such that additional "tightening" of the on-ramp's horizontal alignment is also not practical. Other alternatives that might include fly-over type alignments would be inconsistent with the contextual needs of the project and the project's environmental documentation (FEIS/ROD).

In terms of Performance Metric CN1 (Impacts to Built Land Use), Option A, Option C and the existing configuration could all be contained within existing highway right-of-way, and therefore provide equivalent

levels for achieving Performance Metric CN1, scored as "low impact". Option B would require additional right-of-way acquisition and in terms of Performance Metric CN1, would perform the worst of the options evaluated, and was scored as "high impact".

Metric CN6 - Sustainability

This metric is evaluated for maximum reduction, reuse, and/or recycle of construction materials. Each of the options evaluated will use a different amount of construction materials that is directly related to the pavement surface area for each option.

In terms of CN6, the existing option (EX) would not require any additional construction materials, and therefore would perform the best (of the options evaluated). However, the subject project will include the construction of a new community enhancement lid structure at Montlake Blvd that will require at least partial reconstruction of the eastbound on-ramp. As such, a "no-build" option is not considered practical as it would not meet the purpose and need for the project.

Of the build options evaluated, Option A would require the smallest footprint and therefore the least amount of construction materials. Options B and C would require the largest footprints, each requiring similar amounts of construction materials. In terms of CN6, Option A would perform the best of the build options considered while Option C would perform the worst.

Metric – Traffic Control Staging for Temporary HOV Bypass Lane

This metric is evaluated for each of the options' ability to provide a temporary HOV Bypass Lane during construction of this project. The temporary HOV bypass lane will be needed until the new eastbound direct access ramp is built in conjunction with the new Montlake community enhancement lid structure at the completion of this project. At that time, the eastbound on-ramp will be channelized in the final project configuration (as documented within this Design Analysis) until the future Portage Bay Bridge project builds the ultimate configuration for this on-ramp. Of the options evaluated, only Options B and C will provide the roadway width needed to accommodate the temporary HOV bypass lane. The narrower lane and shoulder widths evaluated under Option A and the existing configuration would not accommodate the roadway width needed for the temporary HOV bypass lane.

Discuss any mitigating measures added to address performance trade-offs:

The subject project will require that all final configuration edge and lane lines be constructed with profiled methyl-methacrylate pavement markings. The methyl-methacrylate marking material will provide a durable and highly visible edge line marking to better assist drivers during hours of darkness and inclement weather. The profiled edge line will also provide a "rumble strip" effect that will better alert the drivers of the edge of travelled way. The profiled edge line also offers mitigation for not providing barrier shy distance. It should also be noted that the eastbound on-ramp from Montlake Blvd (including the intersection with Montlake Blvd) will be illuminated during hours of darkness. Existing and planned signage at vicinity of the "loop" portion of the on-ramp includes 15 mph advisory speed signage, chevrons, and other advisory signage as appropriate.

Summarize the reasoning for selecting the preferred option:

Option C was selected as the preferred option because it performs best in terms of safety performance as compared with the existing configuration in accordance with baseline need BN3; includes an 8-foot right shoulder width that will meet the functional and operational needs for this on-ramp location; avoids impacts to adjacent built properties in accordance with contextual need CN1; minimizes the amount of reconstruction that will be needed in the future Portage Bay Bridge project thereby reducing the amount of construction materials needed in accordance with contextual need CN6; and also provides the total roadway width needed to accommodate a temporary HOV bypass lane during construction thereby meeting one of the projects location specific needs.

Options Comparison Table

Issue and Location:

Shoulder Width – Crosswalk @ On-Ramp Entrance (SW2)

DXEI 10+40 to DXEI 10+60 Rt.

Options Evaluated ↓	Associated Issues (identified in Section 2)	Metrics / Considerations				
		Safety Performance	*Operational and Mobility Performance*	*CN3 – Improved Facilities for Multi-modal Users.*		
		Performance Results:	**Performance Results:**	**Performance Results:**		
Maintain Full Width Shoulder @ Vicinity of Crosswalk	SW2	Higher Vehicle/Pedestrian Conflicts	Longer Signal Phase	Higher Vehicle/Pedestrian Conflicts		
Reduce Shoulder Width to Zero @ Vicinity of Crosswalk	SW2	Lower Vehicle/Pedestrian Conflicts	Shorter Signal Phase	Lower Vehicle/Pedestrian Conflicts		

Discuss the performance tradeoffs shown in the table, and compare the performance of the options:

The subject project intends to reduce the shoulder width to zero feet at the vicinity of crosswalks at each of the projects on-ramp and off-ramp locations. At the entrance to the eastbound on-ramp from Montlake Blvd (DXEI), reducing the right shoulder width to zero feet (at the vicinity of the crosswalk) will reduce the pedestrian crossing distance by 8 feet. This reduction in crossing distance has two primary benefits including minimizing a pedestrians exposure to vehicular conflicts, and also reducing the traffic signal timing needed for pedestrians to complete a crossing. The reduced exposure to vehicular-pedestrian conflicts provides a safety benefit for pedestrians, achieving one of the projects contextual needs (CN3) by providing an improved facility for multi-modal users. The reduction in traffic signal timing benefits all intersections users by reducing the wait time for each of the signal phases thereby improving operational (or mobility) performance.

In terms of functional needs, the area where the shoulder width is reduced to zero feet is relatively short, approximately 20 feet. Once beyond the crosswalk, the right shoulder widens to the planned 8-foot width thereby providing the functional benefits of a wider shoulder (including space for disabled vehicles to move out of the travelled way, space for maintenance operations to occur without lane closures, and space to allow law enforcement to perform driver assistance and enforcement responsibilities). As such, ramp operational and mobility performance generally remains unaffected.

Discuss any mitigating measures added to address performance trade-offs:

The intersection at the vicinity of the on-ramp entrance will be illuminated during hours of darkness. The illumination will benefit the driver's ability to see pedestrians and the roadway. Pavement markings at the on-ramp entrance (including crosswalk markings) shall be constructed with methyl-methacrylate. The methyl-methacrylate marking material will provide a durable and highly visible marking to better assist drivers during hours of darkness and inclement weather. Additionally, the intersection at the on-ramp entrance will be signalized including accessible pedestrian crossing signals.

Summarize the reasoning for selecting the preferred option:

The option to reduce shoulder width to zero at the vicinity of the on-ramp crosswalk was selected as it will benefit pedestrian safety as well as benefit the intersections operational performance. Additionally, the reduced shoulder width at the vicinity of the on-ramp entrance is not expected to have any significant effect on the on-ramps functional needs.

The preferred crosswalk design will meet the pedestrian oriented context as intended for Montlake Blvd, and is consistent with local agency and community engagement commitments as well as WSDOT policy for context sensitive design.

Options Comparison Table

Issue and Location:
Barrier Shy Distance (BS1)
DXEI 14+40 to DXEI 23+30 Lt.

Options Evaluated ↓	Associated Issues (identified in Section 2)	Metrics / Considerations: *BN3 – Safety Performance - Reduce Risk of Fatal (K) and Serious Injury (A) Crashes (as compared with existing)*	Metrics / Considerations: *Operational and Mobility Performance*	Metrics / Considerations
		Performance Results:	**Performance Results:**	
Provide Additional Widening for Barrier Shy Distance – Left Shoulder (sub-option BS1b) Segment 1 [6', 14', 16', 8'] Segment 2 [6', 12.5', 12.5', 8']	BS1	6 Ft Lt. Shoulder with Shy 0.00 (K) + 0.01 (A) = **0.01 (K + A) cpy**	Increases Disabled Vehicle Use and potential operational issues	
No Additional Widening for Barrier Shy Distance – Left Shoulder (sub-option BS1a) Segment 1 [4', 14', 16', 8'] Segment 2 [4', 12.5', 12.5' 8']	BS1	4 Ft Lt. Shoulder without Shy 0.00 (K) + 0.01 (A) = **0.01 (K + A) cpy**	Minimizes Disabled Vehicle Use and potential operational issues	
		cpy = Crashes Per Year		

Discuss the performance tradeoffs shown in the table, and compare the performance of the options:

This performance metric is evaluated for reduction in risk of fatal and serious injury crashes for two sub-options, BS1a with 4-foot left shoulder and BS1b with 6-foot left shoulder (4-foot shoulder + 2 additional feet provided for barrier shy distance). Performance results show that for fatal and serious injury crashes, crash prediction numbers are the same for both options evaluated. In terms of fatal and serious injury crash safety performance, the two sub-options perform equally.

Also note that 6-foot wide shoulders are typically avoided as the 6-foot width can be mistaken as being wide enough to accommodate a disabled vehicle that is trying to move out of the traveled way (due to breakdown or crash). Eight feet is considered the minimum shoulder width needed for disabled vehicles to move out of

the traveled way. As such, shoulder widths between 4 and 8 feet in width are typically avoided.

For the reasons stated, the option to eliminate additional widening for barrier shy distance will provide equivalent safety performance. The "no barrier shy distance" option (BS1a) will benefit mobility and operational performance as the potential for crashes related to providing an undesirable 6-foot wide shoulder width are avoided. The elimination of additional widening for barrier shy distance is the intended design for both the interim and ultimate on-ramp configurations.

Discuss any mitigating measures added to address performance trade-offs:

The eastbound on-ramp will provide an 8-foot wide right shoulder thereby providing a location for disabled vehicles to use when moving out of the traveled way (in the event of a vehicular breakdown or crash). The subject project will also require that all final configuration edge lines be constructed with profiled methyl-methacrylate pavement markings. The methyl-methacrylate marking material will provide a durable and highly visible edge line marking to better assist drivers during hours of darkness and inclement weather. The profiled edge line will also provide a "rumble strip" effect that will better alert the drivers of the edge of travelled way. The profiled edge line offers mitigation for not providing barrier shy distance. It should also be noted that the eastbound on-ramp from Montlake Blvd will be illuminated during hours of darkness.

Summarize the reasoning for selecting the preferred option:

The preferred sub-option (BS1a) will not provide 2 feet of additional widening for barrier shy distance for the reasons stated above.

Options Comparison Table

Issue and Location:

Lane Transition Rate (LT1)

DXEI 12+28.89 to DXEI 13+37.32

Options Evaluated ↓	Associated Issues (identified in Section 2)	Metrics / Considerations				
		Safety Performance	*Operational and Mobility Performance*	*CN1 – Impacts to Built Land Use*		
		Performance Results:	**Performance Results:**	**Performance Results:**		
Provide 25:1 Taper Rate	LT1	Not Impacted with Lane Width Increase	Accomodates WB-67 Vehicles	Higher Impact to Land Use		
Provide 18.1:1 Taper Rate	LT1	Not Impacted with Lane Width Increase	Accomodates WB-67 Vehicles	Lower Impact to Land Use		

Discuss the performance tradeoffs shown in the table, and compare the performance of the options:

The eastbound on-ramp from Montlake Blvd transitions from a short tangent section (approximately 250 feet in length) to a set of three tight-radius horizontal curves that form the "loop" portion of the loop on-ramp. The lane width for the left lane transitions from 12 feet (at DXEI 12+37.05) to 14 feet wide (at DXEI 13+30.37) as

needed to provide additional width for the turning roadway (to accommodate off-tracking by WB-67 vehicles). The lane width transition rate for the left lane is 46.7:1 (which exceeds the recommended taper rate of 25:1 per Design Manual). Concurrently, the right lane transitions from 12 feet wide (at DXEI 12+28.89) to 16 feet wide (at DXEI 13+37.32). Similar to the left lane width transition, the right lane transition is needed to provide additional width for the turning roadway. The additional 2 feet of width needed for the 16-foot right lane (as compared with the 14-foot left lane) is necessary due to the tighter turning radius provided for the right lane. The lane width transition rate for the right lane is 18.1:1, which is less than the recommended taper rate of 25:1. However, it should be noted that 25:1 taper rate recommended per the Design Manual is also for conditions where the lane width is being reduced. Lane width reductions are more likely to affect driver comfort as compared with lane width increases. For the subject location, the lane width is increasing and as such, the additional pavement width provided by the shorter pavement transition rate is not expected to have a negative affect with regards to driver comfort, safety performance or operational (mobility) performance. It should also be noted that the 25:1 taper rate (for lane width transitions) is not adjusted for design speed but is generally for aesthetics. As such, the same 25:1 taper rate is allowed for freeway conditions as well as for lower speed ramp conditions. For this loop on-ramp location, the design speed is 25 mph.

In terms of the project's goal to avoid or minimize impacts to adjacent built land use (contextual need CN1), the quicker 18.1:1 taper rate will avoid the need for widening the traveled way width along the tangent portion of the on-ramp (from vicinity Montlake Blvd to start of loop portion of on-ramp). Any widening of this portion of the on-ramp would essentially require the eastbound off-ramp be shifted southerly into the adjacent commercial property thereby increasing impacts to adjacent built land use.

Discuss any mitigating measures added to address performance trade-offs:

The subject project will require that all final configuration edge and lane lines be constructed with profiled methyl-methacrylate pavement markings. The methyl-methacrylate marking material will provide a durable and highly visible edge line marking to better assist drivers during hours of darkness and inclement weather. The profiled edge line will also provide a "rumble strip" effect that will better alert the drivers of the edge of travelled way. It should also be noted that the eastbound on-ramp from Montlake Blvd will be illuminated during hours of darkness.

Summarize the reasoning for selecting the preferred option:

The preferred option will avoid impacts to adjacent built land use and will not affect safety performance or mobility performance. Additionally, the preferred option is only intended for the interim on-ramp configuration. The future "I-5 I/C and Portage Bay Bridge Replacement" project will reconstruct this on-ramp in its ultimate configuration at which time the on-ramp taper rate may be increased.

Section 4: Attachments

- ☐ **Vicinity Map**
- ☐ **Basis of Design**
- ☐ **Alternatives Comparison Table**
- ☐ **Appendix A – Quantitative Analysis**
- ☐ **Appendix B – Alignment and Channelization Plans (w/HSM segments delineated)**

- ☐ **Appendix C – Auto-Turn Exhibits**
- ☐ **Appendix D – Quantitative Analysis for Barrier Shy Distance Only**

Section 5 Approvals

Design Decisions approved by Project Engineer. See WSDOT Design Manual Chapter 300 and required approvals for Design Analysis

Design Analysis Approvals: ☒ WSDOT Region / ☒ WSDOT HQ / ☒ FHWA

Design Decision / Design Analysis - Recommended for Approval:

Signed _____
Print Phil Merrell
Date 01/12/17
SR 520 Project Engineer Staff

Design Decision Approval / Design Analysis Recommended for Approval:

Signed _____
Print DAVID L. EDWARDS
Date 1/17/17
SR 520 Project Engineer

Design Analysis Approval:

Signed _____
Print Dawn Yankauskas
Date 1/18/17
SR 520 Engineering Manager

Design Analysis Approval:

Signed _____
Print RICKY BHALLA
Date 1/19/2017
WSDOT HQ

Design Analysis Approval:

Signed _____
Print ANTHONY SARHAN
Date 2/23/2017
FHWA

T. 25 N. R. 4 E. W.M.

END CONSTRUCTION
SR 513 MP 0.16
DXRI 22+91.90

BEGIN CONSTRUCTION
DXRI 7+79.11

BEGIN PROJECT
MRI 550+73.80 POB
SR 520 MP 0.84
N 566429.570
E 1605429.125

DXRI 14+60.52 =
SR 513 MP 0.00

END PROJECT
SR 520 MP 3.19
ML a 182+46.00 POE
N 564970.614
E 1617629.672

MLI 556+20.00 POE BK=
ML 56+20.00 POC/POB AHD
EQUATION

MRI 557+30.91 POE/BK=
MR 57+30.91 POE/AHD
EQUATION

ML 130+17.16 POC BK=
ML a 137+12.10 POC AHD
EQUATION

MR 129+80.35 POC/BK=
MR a 137+12.35 POC/AHD
EQUATION

BRIDGE 513/10 INCLUDED IN PROJECT

NEW BRIDGE INCLUDED IN PROJECT 24th AVE E W-S UC

BRIDGE 520/5 INCLUDED IN PROJECT

NEW BRIDGE INCLUDED IN PROJECT WEST APPROACH BRIDGE NORTH

BRIDGE 520/7.5 INCLUDED IN PROJECT

BRIDGE 520/6N-E INCLUDED IN PROJECT

BRIDGE 520/6 INCLUDED IN PROJECT

BRIDGE 520/7.7S INCLUDED IN PROJECT

BRIDGE 520/8 INCLUDED IN PROJECT

BRIDGE 520/8.5 NOT INCLUDED IN PROJECT

UNIVERSITY OF WASHINGTON
LAURELHURST
LAKE UNION
PORTAGE BAY
MONTLAKE CUT
UNION BAY
LAKE WASHINGTON
FAIRWEATHER BAY
MADISON PARK
MONTLAKE
CITY OF SEATTLE
ARBORETUM
TOWN OF HUNTS POINT
CITY OF MEDINA

NE NORTHLAKE PL
NE PACIFIC ST
HARVARD AVE E
BOLYSTON AVE E.
EASTLAKE AVE E.
ROANOKE ST
E. LYNN ST.
BOYER AVE E
DELMAR DR E
10TH AVE E
19TH AVE E
42ND AVE E
E MC GILVRA ST
43RD AVE E
GOV ALBERT D. ROSELLINI EVERGREEN POINT BRIDGE
1 MILE TO MEDINA
E CRESCENT DR
E GALER ST
15TH AVE E
LAKEVIEW BLVD
BELMONT AVE E
E ALOHA ST
E ROY ST
12TH AVE E
23TH AVE E
TURNER WAY E
E MADISON ST

17 16 15 21 22 20 24 28

513 520 5

0 750 1500
SCALE IN FEET

LEGEND

- SECTION LINE
- QUARTER SECTION LINE
- SIXTEENTH SECTION LINE
- 16 SECTION NUMBER
- 5 INTERSTATE
- 520 STATE ROUTE
- 520/6N-E WSDOT STRUCTURE NUMBER
- EXISTING WETLAND
- EXISTING SHORELINE

FILE NAME	PW:_ROTW\DesIgn-WAML\CADProd_PlanForApprvl\XL5097_WAML_MC_VM_01.dgn
TIME	3:56:21 PM
DATE	11/7/2016
PLOTTED BY	priharr
DESIGNED BY	K. PRIHAR
ENTERED BY	M. AUDAR
CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

PRELIMINARY
NOT FOR CONSTRUCTION

REVISION | DATE | BY

REGION NO. 10 | STATE WASH | JOB NUMBER | CONTRACT NO. | FED.AID PROJ.NO. | LOCATION NO.

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

Washington State Department of Transportation

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

VICINITY MAP

PLAN REF. NO. VM01

SHEET OF SHEETS

Basis of Design

Project Title: SR 520, Montlake to Lake Washington – I/C and Bridge Replacement

PIN: 852001L

Date: 06/01/2016

Basis of Design Phase

(Identify the current project phase)

Planning		Scoping		Design	X

Related Planning Documents and Technical Reports

Trans-Lake Washington Study (1998-1999); SR 520 Health Impact Assessment (2008); Draft Environmental Impact Study (DEIS, August 2006); Supplemental Draft Environmental Impact Statement (SDEIS, January 2010); Final Environmental Impact Statement (FEIS, May 2011); Record of Decision (ROD, August 2011); NEPA Re-Evaluations (including "Harbor Line Commission Public Place Designation Authorization" approved October 10, 2011, "Temporary Westside Over-Water Staging Area" approved February 2, 2013, "West Approach Bridge North" approved January 23, 2014, and "Geotechnical Investigation Update" approved January 6, 2015); Seattle Community Design Process Final Report (2012, 2011-2012 Seattle Community Design Process); West Side Final Concept Design Report (2015); and West Side Design Refinements Process (directed via ESSB 6001).

General Project Information

Route Information	**SR**	**NHS (Y/N)**	**Functional Class**	**Current Posted Speed**	**Truck %**	**Current ADT**
	520	Y	U1 (Urban Freeway)	50 mph	4%	61,000 (@ MP 1.43 per 2015 ATR)
Project Information	**Begin MP**	**End MP**	**Sub-Program**	**County**	**Within City?**	**Funding**
	0.84	2.34	I-1 Urban Mobility	King (17)	City of Seattle	Connecting Washington
	Existing Access Control	**WSDOT Planned Access Control**	**Project Proposed Access Control**	**Project Delivery Method – Probable**	**Project Delivery Method - Final**	
	Full Limited	Full Limited	Full Limited	Design-Build	Design-Build	
Brief Project Description	This stage of the "SR 520, I-5 to Medina Bridge Replacement and HOV" project will replace the existing earthquake vulnerable Union Bay Bridge (Br 520/6) and West Approach Bridge (Br 520/7.5) with a new West Approach Bridge South (WABS) structure providing a final connection with the south half of the new floating bridge with the western Lake Washington shoreline at vicinity of 24th Ave E. The new WABS structure will be built to accommodate an added EB HOV lane. The project will also replace the existing Montlake Blvd (SR 513) undercrossing (Br 513/10) with a new community enhancement lid structure. Work included as part of the new lid structure will include modifications to SR 520 Montlake Blvd (SR 513) and 24th Ave E interchanges (including reconstruction of portions of the EB SR 520 off-ramp to Montlake Blvd., the EB SR 520 on-ramp from Montlake Blvd., the WB SR 520 on-ramp from Montlake Blvd, the WB SR 520 off-ramp to Montlake Blvd, and the WB SR 520 off-ramp to 24th Ave E). The project will include the addition of two new direct access ramps at the reconstructed 24th Ave E interchange including an EB on-ramp and a WB off-ramp. Note that the "SR 520, West Approach Bridge North" (WABN) project is currently under construction and when complete will provide the final connection for westbound SR 520 between the north half of the new floating bridge and the western Lake Washington shoreline at vicinity of 24th Ave E. When complete, the WABN and WABS projects will have completed another earthquake and windstorm resistant link across Lake Washington including the addition of an HOV lane in both the westbound and eastbound directions.					

Important Project History or Background Information	The Trans-Lake Study (released 1998-1999) evaluated No Build, 4-Lane, 6-Lane and 8-Lane configurations with multiple cross lake options (including bored tunnels below lake level, sunken tunnels on the lake bottom, floating tunnels below lake surface, floating bridge on lake surface, fixed bridges above lake surface, and other considerations such a surface ferry, traffic demand management, fixed rail options, and others). The Trans-Lake Study screening phase determined that the type of cross lake structure should be a floating bridge and that the 4-lane, 6-Lane w/HOV, and 8-Lane w/HOV configurations should be the alternatives for further evaluation during the EIS Initiation and Alternative Screening phase. Recommendations from the EIS Initiation phase determined to further evaluate the No-Build, 4-Lane, and 6-Lane alternatives as part of the Draft EIS phase. The evaluation of new corridors, lake crossing methods, and the 8-Lane w/HOV alternatives would not be carried forward. In August 2006, the Draft EIS was released. The outcome from the Draft EIS phase included a determination by then Gov. Gregoire that the 6-Lane Alternative was identified as "best serving needs of regional transportation system". In spring 2007, ESSB 6099 passed establishing a mediation process for evaluation of 12 alternatives (Options A thru L), the basis of each being a 6-lane w/HOV configuration. In February 2008, mediation determined that Options A, K and L (with various sub-options for each) would be carried forward and evaluated within a Supplemental Draft EIS. Option A was similar to the existing configuration but with four general purpose lanes and two HOV lanes. Option K included a new single-point urban interchange (SPUI) located under the SR 520 highway including a tunnel crossing beneath the Montlake Cut (for northbound leg of SPUI). Option L also included a SPUI interchange with alignments similar to Option K but with interchange ramps located above SR 520 and crossing the Montlake Cut on a diagonal aligned bascule bridge. In May 2009, ESHB 2211 was approved establishing a legislative workgroup to further develop options, consider project financing recommendations, and other related responsibilities. In November 2009, the work group provided recommendations that Option A (with various modifications) be carried forward to the legislature and the Governor as the preferred 6-lane alternative. In June 2011, the Final EIS was released with Option A (with various modifications) identified as the Preferred Alternative. In 2010, ESSB 6392 passed which required that specific areas and elements of the Preferred Alternative be further refined through a multi-agency process. More specifically, two separate workgroups were formed to develop further design refinements, but only within the conditions established within the SDEIS. One workgroup included City of Seattle, King County, U of W, Sound Transit, WSDOT and others to consider design refinements to transit connections within the PA. The second workgroup included King County Metro, Sound Transit, and WSDOT to consider study options for High Capacity Transit through the SR 520 corridor. On August 4, 2011, the FHWA signed the Record of Decision selecting the Preferred Alternative for construction. Workgroup coordination with affected stake holders is ongoing for remaining stages of the project.
Future and Related Projects	The "SR 520, Montlake to Lake Washington – I/C and Bridge Replacement" project is one of several projects programmed to replace windstorm and earthquake vulnerable structures as well as to improve mobility for people and commerce across Lake Washington and through the SR 520 corridor from Seattle to Redmond. Several projects programmed as part of the SR 520 corridor improvements have been completed including the "Lake Washington Congestion Management" project, the "Medina to SR 202 – Eastside Transit and HOV" project, and the "West Connection Bridge" project. Projects currently under construction include the "Floating Bridge and Landings" (FB&L), which is scheduled for completion in Spring 2017, and the "West Approach Bridge North" (WABN) project, which is scheduled for completion in late 2017. The subject project will follow the FB&L and WABN projects. The last stage of the SR 520 corridor improvements will include the future "Portage Bay Bridge Replacement and I-5 Lid" project. Additionally, there are several wetland mitigation projects either built, under construction, or planned to address the project's environmental commitments.

Section 1) Project Needs

Note for I-2 Safety Projects: *If a Crash Analysis Report already exists, some of the information required in this section may already be covered in the report. See the Bases of Design Instructions for more details.*

List the project's BASELINE NEED(S). Include the performance metrics that will be used to evaluate alternatives and the performance targets for those metrics.	**Baseline Need BN1:** The existing west approach bridge structure (Bridge 520/7.5) was constructed with hollow columns and has been determined to be vulnerable to earthquakes. Metric: Reduce Risk of Catastrophic Failure (Safety of the traveling public). Target: Replace earthquake vulnerable bridge with a replacement structure capable of withstanding a higher level of seismic event, meeting current seismic and structural criteria. **Baseline Need BN2:** Traffic demand exceeds capacity, resulting in extended congestion, impaired mobility and unreliable travel times.

	Evaluation of mobility and reliability performance needs will include improvements to multi-modal, transit options and operations, and freight. Metric: Improve travel times (Congestion relief on SR 520 corridor). Target: Improve travel times to "free flow travel time" for transit and HOV during all travel periods including peak travel times. Increase capacity, reduce congestion, and reduce delay resulting from disabled vehicles for all highway users. **Baseline Need BN3:** Collision history for SR 520 within the project limits includes serious injury and fatal crashes. Metric: Reduce risk of serious injury and fatal crashes. Target: Reduction in estimated collision rate for serious injury or fatal crashes as compared with the estimated collision rate for existing conditions.
List the project's CONTEXTUAL NEED(S). Include the performance metrics that will be used to evaluate alternatives. List performance targets for the metrics, if applicable.	**Contextual Need CN1 - Impacts to Built Land Use:** Built land use contextual needs include minimizing the project footprint to avoid or reduce impacts to adjacent mixed use properties including residential neighborhoods, commercial properties, institutional facilities, parks and recreation areas, and historical and cultural resources. Metric: Impacts to adjacent built land use, historical and cultural resources, and parks and recreation areas. Target: Avoid or minimize impacts to building structures located within project limits; avoid or minimize acquisition needs of adjacent properties; minimize and mitigate impacts to historical resources; minimize and mitigate for impacts to cultural resources; minimize and mitigate for impacts to parks and recreation areas; all in accordance with the "SR 520 West Side Final Concept Design Report" planning agreement between WSDOT and City of Seattle in accordance with Engrossed Substitute Senate Bill (ESSB) 6001 in 2014. **Contextual Need CN2 - Impacts to Natural Areas:** Natural area contextual needs include minimizing the project footprint to avoid or reduce impacts to adjacent natural areas. Natural areas include Lake Washington and associated wetlands and aquatic resources, and "on land" areas including but not limited to Foster Island and the Washington Arboretum. Natural area contextual needs also include avoiding or minimizing impacts to fish and wildlife and their habitats. Metric: Impacts to natural areas. Target: Minimize and mitigate for impacts to aquatic resources; minimize impacts to "on land" natural areas; minimize and mitigate for impacts to fish and wildlife habitat; avoid impacts to fish and wildlife with no loss of life to threatened or endangered species. **Contextual Need CN3 - Regional and Local Multi-modal Facility Needs:** Regional and local multi-modal contextual needs include improved routing and connectivity of shared-use paths and pedestrian access routes. Metric: Improved facilities for multi-modal users. Target: Improve connectivity from the regional trail system to local trails for bicycles and pedestrians that is consistent with ADA criteria and local agency and community needs, all in accordance with the "SR 520 West Side Final Concept Design Report" planning agreement between WSDOT and City of Seattle in accordance with Engrossed Substitute Senate Bill (ESSB) 6001 in 2014. **Contextual Need CN4 - Transit Connectivity:** Transportation contextual needs include improving regional and local transit connectivity and operations with the addition of direct access HOV ramps, providing direct connections between SR 520 HOV lanes and

	existing and planned transit facilities located along Montlake Boulevard (SR 513) and surrounding neighborhoods including the University of Washington light rail station. Transit contextual needs will also include improving transit stops to be fully ADA accessible. Metric: Improve transit connections and operations. Target: Provide an effective network of transit connections for SR 520 and local surface streets to improve travel times for buses traveling on Montlake Boulevard NE and NE Pacific Street through the Montlake interchange area by an average of 5 minutes during peak travel periods and by 7 to 9 minutes during off peak travel periods, as compared with a no-build alternative. Integrate connections between transit facilities and non-motorized multi-modal facilities. **Contextual Need CN5 - Crime Prevention Through Environmental Design (CPTED):** CPTED needs include an urban design that provides a safer facility for users by considering routing of shared use paths and pedestrian access routes, open spaces, lighting, structural designs, landscaping, sight lines, and related elements with a focus on minimizing potential areas for criminal activity. Metric: Improved safety for pedestrians and bicyclists from criminal elements. Target: Provide safer shared use paths, pedestrian access routes, and open spaces; optimize sight lines and avoid blind spots. **Contextual Need CN6 - Sustainability:** Sustainability contextual needs for the project include reducing fuel consumption and resulting greenhouse gases; reducing, reusing and recycling construction materials; and improving access for alternative transportation modes including transit/HOV, bicycles and pedestrian modes. Metric: Improve sustainability. Target: Reduce annual energy consumption on SR 520 between Seattle and Medina by 5 to 10 percent as compared with a No Build alternative; produce 10% less emissions as compared with a No Build alternative; reduce, reuse or recycle construction materials to the extent practical; and improve access for transit/HOV, bicycles and pedestrians.	
Has a Contributing Factors Analysis been completed? If so, list any major findings that are useful in more specifically understanding the project need(s).	The determination of need to replace earthquake vulnerable bridge structures (such as the west approach bridge) has been identified as part of a vulnerability assessment performed by HQ Bridge and Structures as documented within the "Final SR 520 Corridor Structures Seismic Deficiency Report" prepared in May 2007. The Transportation Discipline Report (as prepared for the FEIS), provides an operational performance analysis specifically with regards to the project need.	
Has a crash diagnosis (i.e. Crash Analysis Report) been completed?	Yes	See Transportation Discipline Report (an appendix to the FEIS dated May 2011) and also see Corridor Analysis (dated February 2006) for crash analysis documentation.

Section 2) Context

Land Use Context **(existing and future)**	The existing land use context includes a mix of residential, commercial, institutional, and recreational land uses. The western portion of the project is located within the Montlake neighborhood, which is predominantly residential with some institutional facilities such as the NOAA Northwest Fisheries Science Center, and small commercial developments located near the project area. Institutional facilities located to the north of the Montlake neighborhood include the University of Washington campus, Husky Stadium, and UW Medical Center. The project is also located adjacent to the Washington Park Arboretum and East Montlake Park. Future land use is expected to remain mixed use. See FEIS section "Chapter 4: The Project Area's Environment".

Community Engagement	Community engagement has and continues to be a priority for the SR 520 program. Engagement with communities began as early as the late 1990's with the Trans-Lake Study, continued with a myriad of public forums (design commissions, open houses, public events, hearings, online newsletters, etc.), and remains a priority for the remaining stages to complete the western portion of the SR 520 corridor. A summarized community vision of the facility includes a facility that considers all users, minimizes the project foot-print and associated impacts to the community and environmental resources, and minimizes project costs. See "Planning Document Summary" (above) for documents that have been produced as a result of stakeholder processes. Also, see attached "SR 520 Program Practical Solutions Timeline".
Transportation Context **(existing and future)**	Existing SR 520 is a partially tolled urban multilane divided freeway providing both regional and local access. The existing transportation context supports access for residential, employment, activity centers, and connectivity to transit facilities. Future context will continue to provide regional and local access and will extend and complete the HOV system for transit and other high-occupancy vehicles, as well as providing a regional shared-use path and other pedestrian access route improvements providing new or improved connectivity for foot-powered modal users.
Major Environmental Considerations (See the Environmental Review Summary for details)	The west approach bridge structure is situated above Lake Washington providing an eastbound connection between land at the vicinity of the Montlake interchange and the Evergreen Pt. Floating Bridge. Major environmental considerations include Lake Washington and associated wetlands, fish and wildlife habitat and migration areas, and culturally sensitive areas on Foster Island. The project also traverses through the recently listed Montlake Historic District and abuts two section 4(f) and 6(f) resources, the Arboretum and East Montlake Park. A complete discussion of major environmental considerations is available within the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD).

Section 3) Design Controls

Selected Design Years (and explanation for the selection)	2030 (established 20 years from initial stage of construction for the "SR 520, I-5 to Medina Bridge Replacement and HOV" project's initial stage).
Design Users	Design users will include all modes including automobile, transit, freight, pedestrian (both commuter and recreational), and bicyclist (both commuter and recreational).
Modal Compatibility	Modes most compatible with the identified context environment include transit, automobile, bicyclist, and pedestrians.

Modal Priorities

Mode	To be prioritized in design decisions? (Yes or No)	Rank / Priority (1,2,3, etc.)	Notes
Automobile	Yes	2	Addition of the EB HOV lane and widening of EB mainline shoulders fulfills a project baseline need.
Transit	Yes	1	Completion of HOV lanes and direct access ramps fulfills a project baseline need and contextual need.
Freight	No		
Pedestrian	Yes	4	Connection to and extending the regional shared-use path and development of new and modified pedestrian access routes fulfill a project contextual need.
Bicycle	Yes	3	Connecting to and extending the regional shared-use path fulfills a

				project contextual need.
	Other	N/A		
Intersection Design Vehicle	Varies depending on intersection location and context. WB-67 design vehicle will be accommodated for at general purpose ramp terminals.			
Terrain Classification	SR 520 terrain is classified as "Level" per 2014 State Highway Log.			
Selected Access Control (Given the current access density and intersection spacing, is a different access selection warranted? If designing for a future context vision, what is the appropriate level of access needed?)	Access control is defined as "Full Limited Access" per WSDOT's Access Master Plan. Changes to this designation are not proposed.			
Target Speed	Existing posted speed is 50 mph. Target Speed (Design Speed) will be 50 mph from vicinity MP 0.84 to MP 1.23 and 60 mph from vicinity MP 1.23 to end of project at MP 2.34. MP 1.23 correlates with the existing and planned ATMS sign gantry at the vicinity of the eastern portal of the planned Montlake Lid structure (where a contextual transition occurs in advance of the SR 520 freeway termination at MP 0.00 and SR 520's connections with I-5). Note that for SR 520, variable speed limits are controlled through the ATMS. Future stages (including Portage Bay Bridge replacement) also anticipate a Target Speed (Design Speed) of 50 mph where SR 520 context transitions to connect with I-5 (MP 0.27 to MP 1.23). Note that existing speed limit changes from 40 mph to 50 mph at SR 520 MP 0.27 (per 2014 State Highway Log).			

Section 4) Alternatives Analysis

Note for I-2 Safety Projects: *If a Crash Analysis Report already exists, some of the information required in this section may already be covered in the report. See the Basis of Design Instructions for more details.*

		Alternative Name or Description
Alternatives Considered	**No Build**	Included in Draft EIS. "No Build" alternative not carried forward to Supplemental Draft EIS.
	Retrofit	Retrofit of existing west approach bridge was evaluated as part of the Trans-Lake Study and as part of the Supplemental Draft EIS.
	4-Lane	Included in Draft EIS. The "4-Lane" alternative was not carried forward to the Supplemental Draft EIS.
	6-Lane	Included Options A through L as described in Final EIS.
Preferred Alternative	**6-Lane (Option A w/refinements)**	

Attach copies or provide information (title, date, etc.) regarding alternatives analysis, trade-offs comparison, or similar exercises that have been completed for this project, such as an ALTERNATIVES COMPARISON TABLE.	See "SR 520, I-5 to Medina – Bridge Replacement and HOV Project" Final Environmental Impact Statement (FEIS) and determination of the Preferred Alternative (PA) [approved May 2011].

Section 5) Design Element Selection

For each design element below, identify whether or not the design element is included in the preferred alternative for each alignment or location. You can group alignments into a single location if desired. You may need to add or delete columns.

Design Element	SR 520 – WB & EB Mainline (ML & MR)	SR 513 / Montlake Blvd (DXL & DXR)	SR 520 – EB GP Ramps (EDX & DXE)	SR 520 –WB GP Ramps (DXW, WDX & WPX)	SR 520 – HOV Direct Access Ramps (HWDX & HWDE)	Shared-Use Paths & Ped Access Routes (BDT, SW, VX)
1. Lane	Yes	Yes	Yes	Yes	Yes	N/A
2. Median / Buffer	Yes	Yes	Yes	Yes	Yes	N/A
3. Shoulder	Yes	Yes	Yes	Yes	Yes	N/A
4. Streetside / Roadside Zone	Yes	Yes	Yes	Yes	Yes	N/A
5. Pedestrian Facility	No	Yes	No	No	No	Yes
6. Bicycle Facility	No	Yes	No	No	No	Yes
7. Bridges	Yes	Yes	No	Yes	Yes	Yes
8. Horizontal Alignment	Yes	Yes	Yes	Yes	Yes	Yes
9. Vertical Alignment	Yes	Yes	Yes	Yes	Yes	Yes
10. Cross Slope	Yes	Yes	Yes	Yes	Yes	Yes
11. Side Slope	Yes	Yes	Yes	Yes	Yes	Yes
12. Clear Zone	Yes	Yes	Yes	Yes	Yes	Yes
13. Barrier, Guardrail & Rumble Strips	Yes	Yes	Yes	Yes	Yes	N/A
14. Signals, Illumination, and ITS	Yes	Yes	Yes	Yes	Yes	Yes
15. Signing and Delineation	Yes	Yes	Yes	Yes	Yes	Yes
16. On/Off Connections	Yes	N/A	Yes	Yes	Yes	N/A
17. Intersection / Ramp Terminal	N/A	Yes	Yes	Yes	Yes	Yes
18. Road Approaches	N/A	Yes	N/A	N/A	N/A	N/A
19. Roundabout	N/A	N/A	N/A	N/A	N/A	N/A
20. Access Control	Yes	Yes	Yes	Yes	Yes	N/A

Approval Signatures

REGION — Date: 7/5/16

REGION TRAFFIC ENGINEER — Date: 6/22/16

HEADQUARTERS Assistant State Design Engineer	7/19/16 Date
FHWA	7/14/16 Date

Basis of Design Form Date: 05-11-2016

Alternatives Comparison Table - (SR 520, Montlake To Lake Washington - I/C and Bridge Replacement)

Date: 01/13/16

Performance Category	Baseline Performance Metrics															Contextual Performance Metrics																						Cost
	Safety - Seismic Deficiency					Mobility					Safety					Land Use / Built					Land Use / Natural					Mobility					Mobility	Community & Stakeholder			Sustainability					
Mode	Ped	Bike	Auto	Transit - General	Freight - General	Ped	Bike	Auto	Transit - General	Freight - General	Ped	Bike	Auto	Transit - General	Freight - General	Ped	Bike	Auto	Transit - General	Freight - General	Ped	Bike	Auto	Transit - General	Freight - General	Ped	Bike	Auto	Transit - General	Freight - General	Transit - General	Ped	Bike	Transit - General	Ped	Bike	Auto	Transit - General	Freight - General	
Performance METRIC / ALTERNATIVE	BN1: Reduce Risk of Catastrophic Failure					BN2: Reduces Average Travel Times by up to 25 Minutes in HOV Travel Time during Peak Periods					BN3: Reduce Risk of Serious Injury and Fatal Crashes					CN1: Impacts to Built Land Use					CN2: Impacts to Natural Areas					CN3: Improve Transportation Options for Multi-Modal Users					CN4: Improve Transit Connections and Operations	CN5: Crime Prevention Through Environmental Design (CPTED)			CN6: Reduce Annual Fuel Consumption on SR 520 between Seattle and Medina by 5 to 10 Percent, Reducing Greenhouse Gases; Reduce, Reuse or Recycle Construction Materials; and Improve Access for Alternative Transportation Modes Including Transit/HOV, Bicycles and Pedestrian Modes					
No Build	N/A	N/A	--	--	--	N/A	N/A	-	-	-	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	-	-	-	-	o	o	o	o	o	$0
6-Lane w/HOV - Option A	o	o	++	++	++	++	++	+	++	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	++	++	+	++	+	+	++	++	++	++	++	++	++	+	$3,392 to $3,668 M
6-Lane w/HOV - Option K	o	o	++	++	++	++	++	+	++	+	+	+	+	+	+	--	--	--	--	--	--	--	--	--	--	--	++	++	+	++	+	+	++	++	++	--	--	--	--	--	$5,440 to $5,538 M
6-Lane w/HOV - Option L	o	o	++	++	++	++	++	+	++	+	+	+	+	+	+	--	--	--	--	--	--	--	--	--	--	--	++	++	+	++	+	+	++	++	++	-	-	-	-	-	$3,932 to $4,012 M
PA Option A w/refinements	o	o	++	++	++	++	++	+	++	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	++	++	+	++	+	++	++	++	++	++	++	++	+	$3,419 M

Performance Trade-Offs Discussion and Recommended Preferred Alternative

Alternatives listed above align with the alternatives evaluated in the Final Environmental Impact Statement (FEIS). Options A, K and L are similar for addressing Baseline Needs. Primary differences for scores listed above for Options A, K, L and the Preferred Alternative (PA) are related to Contextual Needs primarily associated with land use (Built and Natural), sustainability, and cost. See below for summary of alternative analysis process used for each of the various environmental documentation phases including Trans-Lake Study phase, EIS Initiation phase, Draft EIS phase, Supplemental Draft EIS phase, and Final EIS phase, including processes followed for developing community and stakeholder support.

Score (relative to other alternatives):

- **++ Optimal Performance**
- **+ Benefit**
- **o Neutral**
- **- Impact**

Alternative Comparison Table
Form Date: 11-17-15

SUMMARY OF ALTERNATIVE ANALYSIS PROCESS

The Trans-Lake Study (released 1998-1999) evaluated No Build, 4-Lane, 6-Lane and 8-Lane configurations with multiple cross lake options (including bored tunnels below lake level, sunken tunnels on the lake bottom, floating tunnels below lake surface, floating bridge on lake surface, fixed bridges above lake surface, and other considerations such a surface ferry, traffic demand management, fixed rail options, and others). The Trans-Lake Study screening phase determined that the type of cross lake structure should be a floating bridge and that the 4-lane, 6-Lane w/HOV, and 8-Lane w/HOV configurations should be the alternatives for further evaluation during the EIS Initiation and Alternative Screening phase. Recommendations from the EIS Initiation phase determined to further evaluate the No-Build, 4-Lane, and 6-Lane alternatives as part of the Draft EIS phase. The evaluation of new corridors, lake crossing methods, and the 8-Lane w/HOV alternatives would not be carried forward. In August 2006, the Draft EIS was released. The outcome from the Draft EIS phase included a determination by then Gov. Gregoire that the 6-Lane Alternative was identified as "best serving needs of regional transportation system". In spring 2007, ESSB 6099 passed establishing a mediation process for evaluation of 12 alternatives (Options A thru L), the basis of each being a 6-lane w/HOV configuration. In February 2008, mediation determined that Options A, K and L (with various sub-options for each) would be carried forward and evaluated within a Supplemental Draft EIS. Option A was similar to the existing configuration but with four general purpose lanes and two HOV lanes. Option K included a new single-point urban interchange (SPUI) located under the SR 520 highway including a tunnel crossing beneath the Montlake Cut (for northbound leg of SPUI). Option L also included a SPUI interchange with alignments similar to Option K but with interchange ramps located above SR 520 and crossing the Montlake Cut on a diagonal aligned bascule bridge. In May 2009, ESHB 2211 was approved establishing a legislative workgroup to further develop options, consider project financing recommendations, and other related responsibilities. In November 2009, the work group provided recommendations that Option A (with various modifications) be carried forward to the legislature and the Govenor as the preferred 6-lane alternative. In June 2011, the Final EIS was released with Option A (with various modifications) identified as the Preferred Alternative. In 2010, ESSB 6392 passed which required that specific areas and elements of the Preferred Alternative be further refined through a multi-agency process. More specifically, two separate workgroups were formed to develop further design refinements, but only within the conditions established within the SDEIS. One workgroup included City of Seattle, King County, U of W, Sound Transit, WSDOT and others to consider design refinements to transit connections within the PA. The second workgroup included King County Metro, Sound Transit, and WSDOT to consider study options for High Capacity Transit through the SR 520 corridor. On August 4, 2011, the FHWA signed the Record of Decision selecting the Preferred Alternative for construction.

APPENDIX A

Quantitative Analysis

(HSM Freeway Model / ISATe)

Washington State Department of Transportation

SR 520, MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT
DESIGN ANALYSIS #5 (EB SR 520 ON-RAMP @ MONTLAKE BLVD - DXEI)

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

Output Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option A				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011				
Last year of analysis:	2030				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	128.7	0.9	2.8	14.5	32.0	78.6
Estimated average crash freq. during Study Period, crashes/yr:	6.4	0.0	0.1	0.7	1.6	3.9

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	3	128.7	0.9	2.8	14.5	32.0	78.6
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2011	6.4	0.0	0.1	0.7	1.6	3.9
	2012	6.4	0.0	0.1	0.7	1.6	3.9
	2013	6.4	0.0	0.1	0.7	1.6	3.9
	2014	6.4	0.0	0.1	0.7	1.6	3.9
	2015	6.4	0.0	0.1	0.7	1.6	3.9
	2016	6.4	0.0	0.1	0.7	1.6	3.9
	2017	6.4	0.0	0.1	0.7	1.6	3.9
	2018	6.4	0.0	0.1	0.7	1.6	3.9
	2019	6.4	0.0	0.1	0.7	1.6	3.9
	2020	6.4	0.0	0.1	0.7	1.6	3.9
	2021	6.4	0.0	0.1	0.7	1.6	3.9
	2022	6.4	0.0	0.1	0.7	1.6	3.9
	2023	6.4	0.0	0.1	0.7	1.6	3.9
	2024	6.4	0.0	0.1	0.7	1.6	3.9
	2025	6.4	0.0	0.1	0.7	1.6	3.9
	2026	6.4	0.0	0.1	0.7	1.6	3.9
	2027	6.4	0.0	0.1	0.7	1.6	3.9
	2028	6.4	0.0	0.1	0.7	1.6	3.9
	2029	6.4	0.0	0.1	0.7	1.6	3.9
	2030	6.4	0.0	0.1	0.7	1.6	3.9
	2031						
	2032						
	2033						
	2034						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.3	0.0	0.0	0.0	0.1	0.2
	Right-angle crashes:	0.2	0.0	0.0	0.0	0.1	0.1
	Rear-end crashes:	18.4	0.1	0.4	2.3	5.1	10.4
	Sideswipe crashes:	7.8	0.0	0.1	0.4	0.9	6.3
	Other multiple-vehicle crashes:	3.5	0.0	0.1	0.4	1.0	1.9
	Total multiple-vehicle crashes:	30.2	0.2	0.6	3.2	7.2	19.0
Single vehicle	Crashes with animal:	0.4	0.0	0.0	0.0	0.1	0.3
	Crashes with fixed object:	77.7	0.5	1.5	8.1	17.8	49.7
	Crashes with other object:	2.0	0.0	0.0	0.2	0.4	1.4
	Crashes with parked vehicle:	1.2	0.0	0.0	0.1	0.3	0.7
	Other single-vehicle crashes	17.3	0.2	0.5	2.9	6.2	7.5
	Total single-vehicle crashes:	98.6	0.7	2.2	11.3	24.7	59.6
	Total crashes:	128.7	0.9	2.8	14.5	32.0	78.6

Predicted cpy (1 year) 0.05 0.14 0.73 1.6 3.93

Fatal (K) + Serious Injury (A) = 0.19 cpy

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option A				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011	Total length of freeway segments for Study Period (mi):	0.000		
Last year of analysis:	2030				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEI 10+56.52 to 12+43.36		21	0
2	DXEI 12+43.36 to 16+44.69		22	0
3	DXEI 16+44.69 to 23+29.80		23	0
4	0		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

Input Worksheet for Ramp Segments						
Clear / Echo Input Values (View results in Column CJ) / Check Input Values (View results in Advisory Messages)		Segment 1 **Study Period**	Segment 2 **Study Period**	Segment 3 **Study Period**	Segment 4 **Study Period**	Segment 5 **Study Period**
Basic Roadway Data						
Number of through lanes (n):		2	2	2		
Ramp segment description:		DXEI 10+56.5	DXEI 12+43.3	DXEI 16+44.69 to 23+29.80		
Segment length (L), mi:		0.04	0.08	0.13		
Average traffic speed on the freeway (V_{frwy}), mi/h:		60	60	60		
Segment type (ramp or collector-distributor road):		Entrance	Entrance	Entrance		
Type of control at crossroad ramp terminal:		Signal	Signal	Signal		
Alignment Data						
Horizontal Curve Data ←See notes→						
1	Horizontal curve?:	No	In Seg.	In Seg.		
	Curve radius (R_1), ft:		119	2929		
	Length of curve (L_{c1}), mi:		0.02	0.13		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.02	0.13		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.04	0.12		
2	Horizontal curve?:		In Seg.	No		
	Curve radius (R_2), ft:		100			
	Length of curve (L_{c2}), mi:		0.05			
	Length of curve in segment ($L_{c2,seg}$), mi:		0.05			
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.06			
3	Horizontal curve?:		In Seg.			
	Curve radius (R_3), ft:		119			
	Length of curve (L_{c3}), mi:		0.01			
	Length of curve in segment ($L_{c3,seg}$), mi:		0.01			
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:		0.11			
4	Horizontal curve?:		No			
	Curve radius (R_4), ft:					
	Length of curve (L_{c4}), mi:					
	Length of curve in segment ($L_{c4,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:					
5	Horizontal curve?:					
	Curve radius (R_5), ft:					
	Length of curve (L_{c5}), mi:					
	Length of curve in segment ($L_{c5,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:					
Cross Section Data						
Lane width (W_l), ft:		11.5	11.5	11.5		
Right shoulder width (W_{rs}), ft:		4	4	4		
Left shoulder width (W_{ls}), ft:		2	2	2		
Presence of lane add or lane drop by taper:		No	No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:					
Roadside Data						
Presence of barrier on <u>right</u> side of roadway:		No	No	Yes		
1	Length of barrier ($L_{rb,1}$), mi:			0.1		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:			4		
2	Length of barrier ($L_{rb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:					
3	Length of barrier ($L_{rb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:					
4	Length of barrier ($L_{rb,4}$), mi:					

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:					
5	Length of barrier ($L_{rb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:					
Presence of barrier on left side of roadway:		No	Yes	Yes		
1	Length of barrier ($L_{lb,1}$), mi:		0.04	0.13		
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:		2	2		
2	Length of barrier ($L_{lb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:					
3	Length of barrier ($L_{lb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:					
4	Length of barrier ($L_{lb,4}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:					
5	Length of barrier ($L_{lb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:					
Ramp Access Data	↖ See note					
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No	No		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:					
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:					
Weaving Section	Weave section in collector-distributor road segment?:					
	Length of weaving section (L_{wev}), mi:					
	Length of weaving section in segment ($L_{wev,seg}$), mi:					

Traffic Data	**Year**					
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2011	14300	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2012					
	2013					
	2014					
	2015					
	2016					
	2017					
	2018					
	2019					
	2020					
	2021					
	2022					
	2023					
	2024					
	2025					
	2026					
	2027					
	2028					
	2029					
	2030	14300	14300	14300		
	2031					
	2032					
	2033					
	2034					

Crash Data	**Year**		Segment Crashes -->				
Count of Fatal-and-Injury (FI) Crashes by Year							
Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2011						
	2012						
	2013						
	2014						
	2015						
Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2011						
	2012						
	2013						
	2014						

		2015						
Count of Property-Damage-Only (PDO) Crashes by Year								
	Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						
	Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						

Advisory Messages

Variable Limits

Number of through lanes (n):	2	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.02	0.13	0	0
Length of curve in segment (Lc2,seg), mi:	0.04	0.05	0.13	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

Length of curve in segment (Lc3,seg), mi:	0.04	0.01	0.13	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.08	0.13	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.08	0.13	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.08	0.13	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.08	0.13	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

Output Worksheet for Ramp Segments						
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period	Segment 4 Study Period
Crash Modification Factors						
Fatal-and-Injury Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		1.000	4.539	1.013	
		SV	1.000	11.931	1.041	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	1.121	1.121	1.121	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.241	1.241	1.241	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	1.114	1.114	1.114	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.000	1.249	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.000	1.162	1.323	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	
		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Property-Damage-Only Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		1.000	3.476	1.009	
		SV	1.000	15.247	1.054	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.109	1.109	1.109	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	1.053	1.053	1.053	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.226	
Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.000	1.147	1.293	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	

		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	

Predicted Average Crash Frequency

Fatal-and-Injury Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,mv,fi}$):					
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,mv,fi}$), crashes/yr:	2011	0.033	0.348	0.180	
	2012	0.033	0.348	0.180	
	2013	0.033	0.348	0.180	
	2014	0.033	0.348	0.180	
	2015	0.033	0.348	0.180	
	2016	0.033	0.348	0.180	
	2017	0.033	0.348	0.180	
	2018	0.033	0.348	0.180	
	2019	0.033	0.348	0.180	
	2020	0.033	0.348	0.180	
	2021	0.033	0.348	0.180	
	2022	0.033	0.348	0.180	
	2023	0.033	0.348	0.180	
	2024	0.033	0.348	0.180	
	2025	0.033	0.348	0.180	
	2026	0.033	0.348	0.180	
	2027	0.033	0.348	0.180	
	2028	0.033	0.348	0.180	
	2029	0.033	0.348	0.180	
	2030	0.033	0.348	0.180	
	2031				
	2032				

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,fi}$):					
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,fi}$), crashes/yr:	2011	0.057	1.572	0.317	
	2012	0.057	1.572	0.317	
	2013	0.057	1.572	0.317	
	2014	0.057	1.572	0.317	
	2015	0.057	1.572	0.317	
	2016	0.057	1.572	0.317	
	2017	0.057	1.572	0.317	
	2018	0.057	1.572	0.317	
	2019	0.057	1.572	0.317	
	2020	0.057	1.572	0.317	
	2021	0.057	1.572	0.317	
	2022	0.057	1.572	0.317	
	2023	0.057	1.572	0.317	
	2024	0.057	1.572	0.317	
	2025	0.057	1.572	0.317	
	2026	0.057	1.572	0.317	
	2027	0.057	1.572	0.317	
	2028	0.057	1.572	0.317	
	2029	0.057	1.572	0.317	
	2030	0.057	1.572	0.317	
	2031				
	2032				
	2033				
	2034				

Property-Damage-Only Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,mv,pdo}$):					
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,mv,pdo}$), crashes/yr:	2011	0.067	0.533	0.348	
	2012	0.067	0.533	0.348	
	2013	0.067	0.533	0.348	
	2014	0.067	0.533	0.348	
	2015	0.067	0.533	0.348	
	2016	0.067	0.533	0.348	
	2017	0.067	0.533	0.348	
	2018	0.067	0.533	0.348	
	2019	0.067	0.533	0.348	
	2020	0.067	0.533	0.348	
	2021	0.067	0.533	0.348	
	2022	0.067	0.533	0.348	
	2023	0.067	0.533	0.348	

	2024	0.067	0.533	0.348	
	2025	0.067	0.533	0.348	
	2026	0.067	0.533	0.348	
	2027	0.067	0.533	0.348	
	2028	0.067	0.533	0.348	
	2029	0.067	0.533	0.348	
	2030	0.067	0.533	0.348	
	2031				
	2032				
	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,pdo}$):					
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,pdo}$), crashes/yr:	2011	0.072	2.519	0.391	
	2012	0.072	2.519	0.391	
	2013	0.072	2.519	0.391	
	2014	0.072	2.519	0.391	
	2015	0.072	2.519	0.391	
	2016	0.072	2.519	0.391	
	2017	0.072	2.519	0.391	
	2018	0.072	2.519	0.391	
	2019	0.072	2.519	0.391	
	2020	0.072	2.519	0.391	
	2021	0.072	2.519	0.391	
	2022	0.072	2.519	0.391	
	2023	0.072	2.519	0.391	
	2024	0.072	2.519	0.391	
	2025	0.072	2.519	0.391	
	2026	0.072	2.519	0.391	
	2027	0.072	2.519	0.391	
	2028	0.072	2.519	0.391	
	2029	0.072	2.519	0.391	
	2030	0.072	2.519	0.391	
	2031				
	2032				
	2033				
	2034				
Crash Severity Distribution (during Study Period)					
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:		0.036	0.720	0.151	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:		0.110	2.184	0.458	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:		0.571	11.447	2.478	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:		1.077	24.047	6.845	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:		1.795	38.399	9.933	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:		2.778	61.043	14.776	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:		4.573	99.442	24.709	
Intermediate Results					
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			38.5	100.7	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option A

Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:		48.7	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:		38.5	87.2	
Proportion of segment length with curve 1 ($P_{c,1}$):		0.250	1.000	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:		36.6		
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:		38.5		
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:		36.6		
Proportion of segment length with curve 2 ($P_{c,2}$):		0.625		
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:		38.5		
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:		36.6		
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:		38.5		
Proportion of segment length with curve 3 ($P_{c,3}$):		0.125		
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:				
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:				
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:				
Proportion of segment length with curve 4 ($P_{c,4}$):				
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:				
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:				
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:				
Proportion of segment length with curve 5 ($P_{c,5}$):				
Distance from edge of right shoulder to barrier face (W_{rcb}), ft:	999.000	999.000	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):	0.000	0.000	0.769	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:	999.000	0.750	0.750	
Proportion of segment length with barrier on the left side (P_{lb}):	0.000	0.500	1.000	
Proportion of segment length within a weaving section (P_{wev}):	0.000	0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):	0.000	0.000	0.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):	0.000	0.000	0.000	

Traffic Data	**Year**				
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:	2011	14300	14300	14300	
	2012	14300	14300	14300	
	2013	14300	14300	14300	
	2014	14300	14300	14300	
	2015	14300	14300	14300	
	2016	14300	14300	14300	
	2017	14300	14300	14300	
	2018	14300	14300	14300	
	2019	14300	14300	14300	
	2020	14300	14300	14300	
	2021	14300	14300	14300	
	2022	14300	14300	14300	
	2023	14300	14300	14300	
	2024	14300	14300	14300	
	2025	14300	14300	14300	
	2026	14300	14300	14300	
	2027	14300	14300	14300	
	2028	14300	14300	14300	
	2029	14300	14300	14300	
	2030	14300	14300	14300	
	2031	14300	14300	14300	
	2032	14300	14300	14300	
	2033	14300	14300	14300	
	2034	14300	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

Output Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option B				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011				
Last year of analysis:	2030				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	102.4	0.6	1.9	10.1	22.2	67.6
Estimated average crash freq. during Study Period, crashes/yr:	5.1	0.0	0.1	0.5	1.1	3.4

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	3	102.4	0.6	1.9	10.1	22.2	67.6
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2011	5.1	0.0	0.1	0.5	1.1	3.4
	2012	5.1	0.0	0.1	0.5	1.1	3.4
	2013	5.1	0.0	0.1	0.5	1.1	3.4
	2014	5.1	0.0	0.1	0.5	1.1	3.4
	2015	5.1	0.0	0.1	0.5	1.1	3.4
	2016	5.1	0.0	0.1	0.5	1.1	3.4
	2017	5.1	0.0	0.1	0.5	1.1	3.4
	2018	5.1	0.0	0.1	0.5	1.1	3.4
	2019	5.1	0.0	0.1	0.5	1.1	3.4
	2020	5.1	0.0	0.1	0.5	1.1	3.4
	2021	5.1	0.0	0.1	0.5	1.1	3.4
	2022	5.1	0.0	0.1	0.5	1.1	3.4
	2023	5.1	0.0	0.1	0.5	1.1	3.4
	2024	5.1	0.0	0.1	0.5	1.1	3.4
	2025	5.1	0.0	0.1	0.5	1.1	3.4
	2026	5.1	0.0	0.1	0.5	1.1	3.4
	2027	5.1	0.0	0.1	0.5	1.1	3.4
	2028	5.1	0.0	0.1	0.5	1.1	3.4
	2029	5.1	0.0	0.1	0.5	1.1	3.4
	2030	5.1	0.0	0.1	0.5	1.1	3.4
	2031						
	2032						
	2033						
	2034						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.3	0.0	0.0	0.0	0.1	0.1
	Right-angle crashes:	0.2	0.0	0.0	0.0	0.1	0.1
	Rear-end crashes:	14.4	0.1	0.3	1.6	3.5	8.9
	Sideswipe crashes:	6.5	0.0	0.1	0.3	0.6	5.4
	Other multiple-vehicle crashes:	2.7	0.0	0.1	0.3	0.7	1.6
	Total multiple-vehicle crashes:	24.0	0.1	0.4	2.2	5.0	16.3
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.1	0.3
	Crashes with fixed object:	62.2	0.4	1.1	5.6	12.3	42.8
	Crashes with other object:	1.6	0.0	0.0	0.1	0.3	1.2
	Crashes with parked vehicle:	0.9	0.0	0.0	0.1	0.2	0.6
	Other single-vehicle crashes	13.3	0.1	0.4	2.0	4.3	6.5
	Total single-vehicle crashes:	78.3	0.5	1.5	7.9	17.2	51.3
	Total crashes:	102.4	0.6	1.9	10.1	22.2	67.6

Predicted cpy (1 year) 0.03 0.10 0.51 1.11 3.38

Fatal (K) + Serious Injury (A) = 0.13 cpy

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option B				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011	Total length of freeway segments for Study Period (mi):	0.000		
Last year of analysis:	2030				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEI 10+56.52 to 12+43.36		21	0
2	DXEI 12+43.36 to 16+44.69		22	0
3	DXEI 16+44.69 to 23+29.80		23	0
4	0		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

Input Worksheet for Ramp Segments						
Clear / Echo Input Values (View results in Column CJ) / Check Input Values (View results in Advisory Messages)		Segment 1 **Study Period**	Segment 2 **Study Period**	Segment 3 **Study Period**	Segment 4 **Study Period**	Segment 5 **Study Period**
Basic Roadway Data						
Number of through lanes (n):		2	2	2		
Ramp segment description:		DXEI 10+56.5	DXEI 12+43.3	DXEI 16+44.69 to 23+29.80		
Segment length (L), mi:		0.04	0.08	0.13		
Average traffic speed on the freeway (V_{frwy}), mi/h:		60	60	60		
Segment type (ramp or collector-distributor road):		Entrance	Entrance	Entrance		
Type of control at crossroad ramp terminal:		Signal	Signal	Signal		
Alignment Data						
Horizontal Curve Data ←See notes→						
1	Horizontal curve?:	No	In Seg.	In Seg.		
	Curve radius (R_1), ft:		117	2927		
	Length of curve (L_{c1}), mi:		0.02	0.13		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.02	0.13		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.04	0.12		
2	Horizontal curve?:		In Seg.	No		
	Curve radius (R_2), ft:		100			
	Length of curve (L_{c2}), mi:		0.05			
	Length of curve in segment ($L_{c2,seg}$), mi:		0.05			
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.06			
3	Horizontal curve?:		In Seg.			
	Curve radius (R_3), ft:		117			
	Length of curve (L_{c3}), mi:		0.01			
	Length of curve in segment ($L_{c3,seg}$), mi:		0.01			
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:		0.11			
4	Horizontal curve?:		No			
	Curve radius (R_4), ft:					
	Length of curve (L_{c4}), mi:					
	Length of curve in segment ($L_{c4,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:					
5	Horizontal curve?:					
	Curve radius (R_5), ft:					
	Length of curve (L_{c5}), mi:					
	Length of curve in segment ($L_{c5,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:					
Cross Section Data						
Lane width (W_l), ft:		12.5	12.5	12.5		
Right shoulder width (W_{rs}), ft:		8	8	8		
Left shoulder width (W_{ls}), ft:		4	4	4		
Presence of lane add or lane drop by taper:		No	No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:					
Roadside Data						
Presence of barrier on <u>right</u> side of roadway:		No	No	Yes		
1	Length of barrier ($L_{rb,1}$), mi:			0.1		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:			4		
2	Length of barrier ($L_{rb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:					
3	Length of barrier ($L_{rb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:					
4	Length of barrier ($L_{rb,4}$), mi:					

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:					
5	Length of barrier ($L_{rb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:					
Presence of barrier on left side of roadway:		No	Yes	Yes		
1	Length of barrier ($L_{lb,1}$), mi:		0.04	0.13		
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:		2	2		
2	Length of barrier ($L_{lb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:					
3	Length of barrier ($L_{lb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:					
4	Length of barrier ($L_{lb,4}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:					
5	Length of barrier ($L_{lb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:					
Ramp Access Data	↖ See note					
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No	No		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:					
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:					
Weaving Section	Weave section in collector-distributor road segment?:					
	Length of weaving section (L_{wev}), mi:					
	Length of weaving section in segment ($L_{wev,seg}$), mi:					

Traffic Data	**Year**					
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2011	14300	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2012					
	2013					
	2014					
	2015					
	2016					
	2017					
	2018					
	2019					
	2020					
	2021					
	2022					
	2023					
	2024					
	2025					
	2026					
	2027					
	2028					
	2029					
	2030	14300	14300	14300		
	2031					
	2032					
	2033					
	2034					

Crash Data	**Year**		Segment Crashes -->				
Count of Fatal-and-Injury (FI) Crashes by Year							
Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2011						
	2012						
	2013						
	2014						
	2015						
Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2011						
	2012						
	2013						
	2014						

		2015						
Count of Property-Damage-Only (PDO) Crashes by Year								
	Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						
	Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						

Advisory Messages

Variable Limits

Number of through lanes (n):	2	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.02	0.13	0	0
Length of curve in segment (Lc2,seg), mi:	0.04	0.05	0.13	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

Length of curve in segment (Lc3,seg), mi:	0.04	0.01	0.13	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.08	0.13	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.08	0.13	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.08	0.13	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.08	0.13	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

Output Worksheet for Ramp Segments						
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period	Segment 4 Study Period
Crash Modification Factors						
Fatal-and-Injury Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		1.000	4.561	1.013	
		SV	1.000	11.999	1.041	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	1.071	1.071	1.071	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.000	1.249	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.000	1.162	1.323	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	
		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Property-Damage-Only Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		1.000	3.491	1.009	
		SV	1.000	15.336	1.054	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.226	
Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.000	1.147	1.293	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	

		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Predicted Average Crash Frequency						
Fatal-and-Injury Crash Frequency						
Multiple-Vehicle Crash Analysis		**Year**				
Overdispersion parameter ($k_{w,x,mv,fi}$):						
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:						
Reference year (r):						
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:						
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:						
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:						
Predicted average crash frequency ($N_{p,w,x,mv,fi}$), crashes/yr:		2011	0.023	0.242	0.124	
		2012	0.023	0.242	0.124	
		2013	0.023	0.242	0.124	
		2014	0.023	0.242	0.124	
		2015	0.023	0.242	0.124	
		2016	0.023	0.242	0.124	
		2017	0.023	0.242	0.124	
		2018	0.023	0.242	0.124	
		2019	0.023	0.242	0.124	
		2020	0.023	0.242	0.124	
		2021	0.023	0.242	0.124	
		2022	0.023	0.242	0.124	
		2023	0.023	0.242	0.124	
		2024	0.023	0.242	0.124	
		2025	0.023	0.242	0.124	
		2026	0.023	0.242	0.124	
		2027	0.023	0.242	0.124	
		2028	0.023	0.242	0.124	
		2029	0.023	0.242	0.124	
		2030	0.023	0.242	0.124	
		2031				
		2032				

	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,fi}$):					
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,fi}$), crashes/yr:	2011	0.039	1.093	0.219	
	2012	0.039	1.093	0.219	
	2013	0.039	1.093	0.219	
	2014	0.039	1.093	0.219	
	2015	0.039	1.093	0.219	
	2016	0.039	1.093	0.219	
	2017	0.039	1.093	0.219	
	2018	0.039	1.093	0.219	
	2019	0.039	1.093	0.219	
	2020	0.039	1.093	0.219	
	2021	0.039	1.093	0.219	
	2022	0.039	1.093	0.219	
	2023	0.039	1.093	0.219	
	2024	0.039	1.093	0.219	
	2025	0.039	1.093	0.219	
	2026	0.039	1.093	0.219	
	2027	0.039	1.093	0.219	
	2028	0.039	1.093	0.219	
	2029	0.039	1.093	0.219	
	2030	0.039	1.093	0.219	
	2031				
	2032				
	2033				
	2034				

Property-Damage-Only Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,mv,pdo}$):					
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,mv,pdo}$), crashes/yr:	2011	0.057	0.458	0.298	
	2012	0.057	0.458	0.298	
	2013	0.057	0.458	0.298	
	2014	0.057	0.458	0.298	
	2015	0.057	0.458	0.298	
	2016	0.057	0.458	0.298	
	2017	0.057	0.458	0.298	
	2018	0.057	0.458	0.298	
	2019	0.057	0.458	0.298	
	2020	0.057	0.458	0.298	
	2021	0.057	0.458	0.298	
	2022	0.057	0.458	0.298	
	2023	0.057	0.458	0.298	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

	2024	0.057	0.458	0.298	
	2025	0.057	0.458	0.298	
	2026	0.057	0.458	0.298	
	2027	0.057	0.458	0.298	
	2028	0.057	0.458	0.298	
	2029	0.057	0.458	0.298	
	2030	0.057	0.458	0.298	
	2031				
	2032				
	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,pdo}$):					
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,pdo}$), crashes/yr:	2011	0.062	2.169	0.335	
	2012	0.062	2.169	0.335	
	2013	0.062	2.169	0.335	
	2014	0.062	2.169	0.335	
	2015	0.062	2.169	0.335	
	2016	0.062	2.169	0.335	
	2017	0.062	2.169	0.335	
	2018	0.062	2.169	0.335	
	2019	0.062	2.169	0.335	
	2020	0.062	2.169	0.335	
	2021	0.062	2.169	0.335	
	2022	0.062	2.169	0.335	
	2023	0.062	2.169	0.335	
	2024	0.062	2.169	0.335	
	2025	0.062	2.169	0.335	
	2026	0.062	2.169	0.335	
	2027	0.062	2.169	0.335	
	2028	0.062	2.169	0.335	
	2029	0.062	2.169	0.335	
	2030	0.062	2.169	0.335	
	2031				
	2032				
	2033				
	2034				
Crash Severity Distribution (during Study Period)					
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:		0.025	0.501	0.104	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:		0.076	1.518	0.317	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:		0.395	7.957	1.713	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:		0.744	16.716	4.732	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:		1.241	26.692	6.867	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:		2.378	52.549	12.650	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:		3.619	79.241	19.517	
Intermediate Results					
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			38.3	100.7	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option B

Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:		48.7	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:		38.3	87.2	
Proportion of segment length with curve 1 ($P_{c,1}$):		0.250	1.000	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:		36.6		
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:		38.3		
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:		36.6		
Proportion of segment length with curve 2 ($P_{c,2}$):		0.625		
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:		38.3		
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:		36.6		
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:		38.3		
Proportion of segment length with curve 3 ($P_{c,3}$):		0.125		
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:				
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:				
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:				
Proportion of segment length with curve 4 ($P_{c,4}$):				
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:				
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:				
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:				
Proportion of segment length with curve 5 ($P_{c,5}$):				
Distance from edge of right shoulder to barrier face (W_{rcb}), ft:	999.000	999.000	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):	0.000	0.000	0.769	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:	999.000	0.750	0.750	
Proportion of segment length with barrier on the left side (P_{lb}):	0.000	0.500	1.000	
Proportion of segment length within a weaving section (P_{wev}):	0.000	0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):	0.000	0.000	0.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):	0.000	0.000	0.000	

Traffic Data	**Year**				
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:	2011	14300	14300	14300	
	2012	14300	14300	14300	
	2013	14300	14300	14300	
	2014	14300	14300	14300	
	2015	14300	14300	14300	
	2016	14300	14300	14300	
	2017	14300	14300	14300	
	2018	14300	14300	14300	
	2019	14300	14300	14300	
	2020	14300	14300	14300	
	2021	14300	14300	14300	
	2022	14300	14300	14300	
	2023	14300	14300	14300	
	2024	14300	14300	14300	
	2025	14300	14300	14300	
	2026	14300	14300	14300	
	2027	14300	14300	14300	
	2028	14300	14300	14300	
	2029	14300	14300	14300	
	2030	14300	14300	14300	
	2031	14300	14300	14300	
	2032	14300	14300	14300	
	2033	14300	14300	14300	
	2034	14300	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

Output Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option C				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011				
Last year of analysis:	2030				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	101.0	0.6	1.8	9.4	20.7	68.6
Estimated average crash freq. during Study Period, crashes/yr:	5.1	0.0	0.1	0.5	1.0	3.4

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	3	101.0	0.6	1.8	9.4	20.7	68.6
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2011	5.1	0.0	0.1	0.5	1.0	3.4
	2012	5.1	0.0	0.1	0.5	1.0	3.4
	2013	5.1	0.0	0.1	0.5	1.0	3.4
	2014	5.1	0.0	0.1	0.5	1.0	3.4
	2015	5.1	0.0	0.1	0.5	1.0	3.4
	2016	5.1	0.0	0.1	0.5	1.0	3.4
	2017	5.1	0.0	0.1	0.5	1.0	3.4
	2018	5.1	0.0	0.1	0.5	1.0	3.4
	2019	5.1	0.0	0.1	0.5	1.0	3.4
	2020	5.1	0.0	0.1	0.5	1.0	3.4
	2021	5.1	0.0	0.1	0.5	1.0	3.4
	2022	5.1	0.0	0.1	0.5	1.0	3.4
	2023	5.1	0.0	0.1	0.5	1.0	3.4
	2024	5.1	0.0	0.1	0.5	1.0	3.4
	2025	5.1	0.0	0.1	0.5	1.0	3.4
	2026	5.1	0.0	0.1	0.5	1.0	3.4
	2027	5.1	0.0	0.1	0.5	1.0	3.4
	2028	5.1	0.0	0.1	0.5	1.0	3.4
	2029	5.1	0.0	0.1	0.5	1.0	3.4
	2030	5.1	0.0	0.1	0.5	1.0	3.4
	2031						
	2032						
	2033						
	2034						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.3	0.0	0.0	0.0	0.1	0.1
	Right-angle crashes:	0.2	0.0	0.0	0.0	0.0	0.1
	Rear-end crashes:	14.3	0.1	0.3	1.5	3.4	9.0
	Sideswipe crashes:	6.5	0.0	0.1	0.3	0.6	5.5
	Other multiple-vehicle crashes:	2.7	0.0	0.1	0.3	0.7	1.7
	Total multiple-vehicle crashes:	23.8	0.1	0.4	2.1	4.8	16.4
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	61.5	0.3	1.0	5.2	11.5	43.5
	Crashes with other object:	1.6	0.0	0.0	0.1	0.2	1.2
	Crashes with parked vehicle:	0.9	0.0	0.0	0.1	0.2	0.6
	Other single-vehicle crashes	12.9	0.1	0.3	1.8	4.0	6.6
	Total single-vehicle crashes:	77.2	0.5	1.4	7.3	16.0	52.1
	Total crashes:	101.0	0.6	1.8	9.4	20.7	68.6

Predicted cpy (1 year) 0.03 0.09 0.47 1.04 3.43

Fatal (K) + Serious Injury (A) = 0.12 cpy

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake To Lk Wash I/C and Br Replacement (DXEI EB OnRmp @ Mntlk) - Option C				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011	Total length of freeway segments for Study Period (mi):	0.000		
Last year of analysis:	2030				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEI 10+56.52 to 12+43.36		21	0
2	DXEI 12+43.36 to 16+44.69		22	0
3	DXEI 16+44.69 to 23+29.80		23	0
4	0		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

Input Worksheet for Ramp Segments						
Clear / Echo Input Values (View results in Column CJ) / Check Input Values (View results in Advisory Messages)		Segment 1 **Study Period**	Segment 2 **Study Period**	Segment 3 **Study Period**	Segment 4 **Study Period**	Segment 5 **Study Period**
Basic Roadway Data						
Number of through lanes (n):		2	2	2		
Ramp segment description:		DXEI 10+56.5	DXEI 12+43.3	DXEI 16+44.69 to 23+29.80		
Segment length (L), mi:		0.04	0.08	0.13		
Average traffic speed on the freeway (V_{frwy}), mi/h:		60	60	60		
Segment type (ramp or collector-distributor road):		Entrance	Entrance	Entrance		
Type of control at crossroad ramp terminal:		Signal	Signal	Signal		
Alignment Data						
Horizontal Curve Data ←See notes→						
1	Horizontal curve?:	No	In Seg.	In Seg.		
	Curve radius (R_1), ft:		112	2927		
	Length of curve (L_{c1}), mi:		0.02	0.13		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.02	0.13		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.04	0.12		
2	Horizontal curve?:		In Seg.	No		
	Curve radius (R_2), ft:		100			
	Length of curve (L_{c2}), mi:		0.05			
	Length of curve in segment ($L_{c2,seg}$), mi:		0.05			
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.06			
3	Horizontal curve?:		In Seg.			
	Curve radius (R_3), ft:		112			
	Length of curve (L_{c3}), mi:		0.01			
	Length of curve in segment ($L_{c3,seg}$), mi:		0.01			
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:		0.11			
4	Horizontal curve?:		No			
	Curve radius (R_4), ft:					
	Length of curve (L_{c4}), mi:					
	Length of curve in segment ($L_{c4,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:					
5	Horizontal curve?:					
	Curve radius (R_5), ft:					
	Length of curve (L_{c5}), mi:					
	Length of curve in segment ($L_{c5,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:					
Cross Section Data						
Lane width (W_l), ft:		12	15	12.5		
Right shoulder width (W_{rs}), ft:		8	8	8		
Left shoulder width (W_{ls}), ft:		2	4	4		
Presence of lane add or lane drop by taper:		No	No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:					
Roadside Data						
Presence of barrier on <u>right</u> side of roadway:		No	No	Yes		
1	Length of barrier ($L_{rb,1}$), mi:			0.1		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:			4		
2	Length of barrier ($L_{rb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:					
3	Length of barrier ($L_{rb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:					
4	Length of barrier ($L_{rb,4}$), mi:					

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:					
5	Length of barrier ($L_{rb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:					
Presence of barrier on left side of roadway:		No	Yes	Yes		
1	Length of barrier ($L_{lb,1}$), mi:		0.04	0.13		
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:		2	2		
2	Length of barrier ($L_{lb,2}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:					
3	Length of barrier ($L_{lb,3}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:					
4	Length of barrier ($L_{lb,4}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:					
5	Length of barrier ($L_{lb,5}$), mi:					
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:					
Ramp Access Data	↖ See note					
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No	No		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:					
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:					
Weaving Section	Weave section in collector-distributor road segment?:					
	Length of weaving section (L_{wev}), mi:					
	Length of weaving section in segment ($L_{wev,seg}$), mi:					

Traffic Data	Year					
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2011	14300	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2012					
	2013					
	2014					
	2015					
	2016					
	2017					
	2018					
	2019					
	2020					
	2021					
	2022					
	2023					
	2024					
	2025					
	2026					
	2027					
	2028					
	2029					
	2030	14300	14300	14300		
	2031					
	2032					
	2033					
	2034					

Crash Data	Year		Segment Crashes -->				
Count of Fatal-and-Injury (FI) Crashes by Year							
Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2011						
	2012						
	2013						
	2014						
	2015						
Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2011						
	2012						
	2013						
	2014						

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

		2015						
Count of Property-Damage-Only (PDO) Crashes by Year								
	Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						
	Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2011						
		2012						
		2013						
		2014						
		2015						

Advisory Messages

Variable Limits					
Number of through lanes (n):	2	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.02	0.13	0	0
Length of curve in segment (Lc2,seg), mi:	0.04	0.05	0.13	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

Length of curve in segment (Lc3,seg), mi:	0.04	0.01	0.13	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.08	0.13	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.08	0.13	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.08	0.13	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.08	0.13	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.08	0.13	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

Output Worksheet for Ramp Segments						
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period	Segment 4 Study Period
Crash Modification Factors						
Fatal-and-Injury Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		1.000	4.626	1.013	
		SV	1.000	12.200	1.041	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	1.096	0.955	1.071	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	1.114	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.000	1.249	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.000	1.162	1.323	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	
		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.000	1.000	
Property-Damage-Only Crash CMFs						
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		1.000	3.537	1.009	
		SV	1.000	15.598	1.054	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	1.053	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.226	
Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.000	1.147	1.293	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV				
	Year:	2011	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	

		2013	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	
		2031				
		2032				
		2033				
		2034				
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	

Predicted Average Crash Frequency

Fatal-and-Injury Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,mv,fi}$):					
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,mv,fi}$), crashes/yr:	2011	0.026	0.219	0.124	
	2012	0.026	0.219	0.124	
	2013	0.026	0.219	0.124	
	2014	0.026	0.219	0.124	
	2015	0.026	0.219	0.124	
	2016	0.026	0.219	0.124	
	2017	0.026	0.219	0.124	
	2018	0.026	0.219	0.124	
	2019	0.026	0.219	0.124	
	2020	0.026	0.219	0.124	
	2021	0.026	0.219	0.124	
	2022	0.026	0.219	0.124	
	2023	0.026	0.219	0.124	
	2024	0.026	0.219	0.124	
	2025	0.026	0.219	0.124	
	2026	0.026	0.219	0.124	
	2027	0.026	0.219	0.124	
	2028	0.026	0.219	0.124	
	2029	0.026	0.219	0.124	
	2030	0.026	0.219	0.124	
	2031				
	2032				

	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,fi}$):					
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,fi}$), crashes/yr:	2011	0.045	0.991	0.219	
	2012	0.045	0.991	0.219	
	2013	0.045	0.991	0.219	
	2014	0.045	0.991	0.219	
	2015	0.045	0.991	0.219	
	2016	0.045	0.991	0.219	
	2017	0.045	0.991	0.219	
	2018	0.045	0.991	0.219	
	2019	0.045	0.991	0.219	
	2020	0.045	0.991	0.219	
	2021	0.045	0.991	0.219	
	2022	0.045	0.991	0.219	
	2023	0.045	0.991	0.219	
	2024	0.045	0.991	0.219	
	2025	0.045	0.991	0.219	
	2026	0.045	0.991	0.219	
	2027	0.045	0.991	0.219	
	2028	0.045	0.991	0.219	
	2029	0.045	0.991	0.219	
	2030	0.045	0.991	0.219	
	2031				
	2032				
	2033				
	2034				

Property-Damage-Only Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,mv,pdo}$):					
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,mv,pdo}$), crashes/yr:	2011	0.060	0.464	0.298	
	2012	0.060	0.464	0.298	
	2013	0.060	0.464	0.298	
	2014	0.060	0.464	0.298	
	2015	0.060	0.464	0.298	
	2016	0.060	0.464	0.298	
	2017	0.060	0.464	0.298	
	2018	0.060	0.464	0.298	
	2019	0.060	0.464	0.298	
	2020	0.060	0.464	0.298	
	2021	0.060	0.464	0.298	
	2022	0.060	0.464	0.298	
	2023	0.060	0.464	0.298	

	2024	0.060	0.464	0.298	
	2025	0.060	0.464	0.298	
	2026	0.060	0.464	0.298	
	2027	0.060	0.464	0.298	
	2028	0.060	0.464	0.298	
	2029	0.060	0.464	0.298	
	2030	0.060	0.464	0.298	
	2031				
	2032				
	2033				
	2034				
Single-Vehicle Crash Analysis	**Year**				
Overdispersion parameter ($k_{w,x,sv,pdo}$):					
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:					
Reference year (r):					
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:					
Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:					
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:					
Predicted average crash frequency ($N_{p,w,x,sv,pdo}$), crashes/yr:	2011	0.065	2.206	0.335	
	2012	0.065	2.206	0.335	
	2013	0.065	2.206	0.335	
	2014	0.065	2.206	0.335	
	2015	0.065	2.206	0.335	
	2016	0.065	2.206	0.335	
	2017	0.065	2.206	0.335	
	2018	0.065	2.206	0.335	
	2019	0.065	2.206	0.335	
	2020	0.065	2.206	0.335	
	2021	0.065	2.206	0.335	
	2022	0.065	2.206	0.335	
	2023	0.065	2.206	0.335	
	2024	0.065	2.206	0.335	
	2025	0.065	2.206	0.335	
	2026	0.065	2.206	0.335	
	2027	0.065	2.206	0.335	
	2028	0.065	2.206	0.335	
	2029	0.065	2.206	0.335	
	2030	0.065	2.206	0.335	
	2031				
	2032				
	2033				
	2034				
Crash Severity Distribution (during Study Period)					
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:		0.029	0.454	0.104	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:		0.087	1.376	0.317	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:		0.450	7.212	1.713	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:		0.848	15.150	4.732	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:		1.414	24.192	6.867	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:		2.505	53.409	12.650	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:		3.918	77.601	19.517	
Intermediate Results					
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			37.8	100.7	

Eastbound On-ramp from Montlake Blvd (DXEI) - Option C

Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:			48.7	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:			37.8	87.2	
Proportion of segment length with curve 1 ($P_{c,1}$):			0.250	1.000	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:			36.6		
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:			37.8		
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:			36.6		
Proportion of segment length with curve 2 ($P_{c,2}$):			0.625		
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:			37.8		
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:			36.6		
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:			37.8		
Proportion of segment length with curve 3 ($P_{c,3}$):			0.125		
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:					
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:					
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:					
Proportion of segment length with curve 4 ($P_{c,4}$):					
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:					
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:					
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:					
Proportion of segment length with curve 5 ($P_{c,5}$):					
Distance from edge of right shoulder to barrier face (W_{rcb}), ft:		999.000	999.000	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):		0.000	0.000	0.769	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:		999.000	0.750	0.750	
Proportion of segment length with barrier on the left side (P_{lb}):		0.000	0.500	1.000	
Proportion of segment length within a weaving section (P_{wev}):		0.000	0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):		0.000	0.000	0.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):		0.000	0.000	0.000	
Traffic Data	**Year**				
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:	2011	14300	14300	14300	
	2012	14300	14300	14300	
	2013	14300	14300	14300	
	2014	14300	14300	14300	
	2015	14300	14300	14300	
	2016	14300	14300	14300	
	2017	14300	14300	14300	
	2018	14300	14300	14300	
	2019	14300	14300	14300	
	2020	14300	14300	14300	
	2021	14300	14300	14300	
	2022	14300	14300	14300	
	2023	14300	14300	14300	
	2024	14300	14300	14300	
	2025	14300	14300	14300	
	2026	14300	14300	14300	
	2027	14300	14300	14300	
	2028	14300	14300	14300	
	2029	14300	14300	14300	
	2030	14300	14300	14300	
	2031	14300	14300	14300	
	2032	14300	14300	14300	
	2033	14300	14300	14300	
	2034	14300	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

Output Summary

General Information

Project description:	SR 520, Montlake to Lake Wash I/C and Br Replacement (DXEI OnRamp @ Montlake) - Exist				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011				
Last year of analysis:	2030				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	127.0	0.8	2.4	12.7	31.8	79.4
Estimated average crash freq. during Study Period, crashes/yr:	6.4	0.0	0.1	0.6	1.6	4.0

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	4	127.0	0.8	2.4	12.7	31.8	79.4
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2011	6.4	0.0	0.1	0.6	1.6	4.0
	2012	6.4	0.0	0.1	0.6	1.6	4.0
	2013	6.4	0.0	0.1	0.6	1.6	4.0
	2014	6.4	0.0	0.1	0.6	1.6	4.0
	2015	6.4	0.0	0.1	0.6	1.6	4.0
	2016	6.4	0.0	0.1	0.6	1.6	4.0
	2017	6.4	0.0	0.1	0.6	1.6	4.0
	2018	6.4	0.0	0.1	0.6	1.6	4.0
	2019	6.4	0.0	0.1	0.6	1.6	4.0
	2020	6.4	0.0	0.1	0.6	1.6	4.0
	2021	6.4	0.0	0.1	0.6	1.6	4.0
	2022	6.4	0.0	0.1	0.6	1.6	4.0
	2023	6.4	0.0	0.1	0.6	1.6	4.0
	2024	6.4	0.0	0.1	0.6	1.6	4.0
	2025	6.4	0.0	0.1	0.6	1.6	4.0
	2026	6.4	0.0	0.1	0.6	1.6	4.0
	2027	6.4	0.0	0.1	0.6	1.6	4.0
	2028	6.4	0.0	0.1	0.6	1.6	4.0
	2029	6.4	0.0	0.1	0.6	1.6	4.0
	2030	6.4	0.0	0.1	0.6	1.6	4.0
	2031						
	2032						
	2033						
	2034						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.3	0.0	0.0	0.0	0.1	0.2
	Right-angle crashes:	0.2	0.0	0.0	0.0	0.1	0.1
	Rear-end crashes:	18.9	0.1	0.4	2.2	5.4	10.8
	Sideswipe crashes:	8.1	0.0	0.1	0.4	1.0	6.6
	Other multiple-vehicle crashes:	3.6	0.0	0.1	0.4	1.1	2.0
	Total multiple-vehicle crashes:	31.2	0.2	0.6	3.0	7.6	19.7
Single vehicle	Crashes with animal:	0.4	0.0	0.0	0.0	0.1	0.3
	Crashes with fixed object:	75.7	0.4	1.3	6.9	17.3	49.7
	Crashes with other object:	1.9	0.0	0.0	0.1	0.4	1.4
	Crashes with parked vehicle:	1.2	0.0	0.0	0.1	0.3	0.7
	Other single-vehicle crashes	16.6	0.2	0.5	2.4	6.1	7.5
	Total single-vehicle crashes:	95.9	0.6	1.8	9.7	24.2	59.6
Total crashes:		127.0	0.8	2.4	12.7	31.8	79.4

Predicted cpy (1 year)	0.04	0.12	0.64	1.59	3.97

Fatal (K) + Serious Injury (A) = 0.16 cpy

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake to Lake Wash I/C and Br Replacement (DXEI OnRamp @ Montlake) - Exist				
Analyst:	jh	Date:	11/14/2016	Area type:	Urban
First year of analysis:	2011	Total length of freeway segments for Study Period (mi):	0.000		
Last year of analysis:	2030				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEV 10+68 to 12+52.60		21	0
2	DXEV 12+52.69 to 16+37.2		22	0
3	DXEV 16+37.29 to 22+58.3		23	0
4	DXEV 22+58.30 to 23+98.2		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

Input Worksheet for Ramp Segments

Clear | Echo Input Values (View results in Column CJ) | Check Input Values (View results in Advisory Messages)

		Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
		Study Period	**Study Period**	**Study Period**	**Study Period**	**Study Period**	**Study Period**
Basic Roadway Data							
Number of through lanes (n):		2	2	2	2		
Ramp segment description:		DXEV 10+68	DXEV 12+52.	DXEV 16+37.	DXEV 22+58.30 to 23+98.20		
Segment length (L), mi:		0.04	0.07	0.12	0.03		
Average traffic speed on the freeway (V_{frwy}), mi/h:		60	60	60	60		
Segment type (ramp or collector-distributor road):		Entrance	Entrance	Entrance	Entrance		
Type of control at crossroad ramp terminal:		Signal	Signal	Signal	Signal		
Alignment Data							
Horizontal Curve Data ←See notes→							
1	Horizontal curve?:	No	In Seg.	In Seg.	In Seg.		
	Curve radius (R_1), ft:		104	2815	2815		
	Length of curve (L_{c1}), mi:		0.02	0.14	0.14		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.02	0.12	0.02		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.05	0.12	0.12		
2	Horizontal curve?:		In Seg.	No	No		
	Curve radius (R_2), ft:		100				
	Length of curve (L_{c2}), mi:		0.03				
	Length of curve in segment ($L_{c2,seg}$), mi:		0.03				
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.07				
3	Horizontal curve?:		In Seg.				
	Curve radius (R_3), ft:		164				
	Length of curve (L_{c3}), mi:		0.01				
	Length of curve in segment ($L_{c3,seg}$), mi:		0.01				
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:		0.11				
4	Horizontal curve?:		No				
	Curve radius (R_4), ft:						
	Length of curve (L_{c4}), mi:						
	Length of curve in segment ($L_{c4,seg}$), mi:						
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:						
5	Horizontal curve?:						
	Curve radius (R_5), ft:						
	Length of curve (L_{c5}), mi:						
	Length of curve in segment ($L_{c5,seg}$), mi:						
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:						
Cross Section Data							
Lane width (W_l), ft:		11	15	10	11		
Right shoulder width (W_{rs}), ft:		8	6	2	3		
Left shoulder width (W_{ls}), ft:		2	2	2	2		
Presence of lane add or lane drop by taper:		No	Lane Drop	No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:		0.02				
Roadside Data							
Presence of barrier on <u>right</u> side of roadway:		No	Yes	Yes	Yes		
1	Length of barrier ($L_{rb,1}$), mi:		0.05	0.12	0.03		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:		6	2	3		
2	Length of barrier ($L_{rb,2}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:						
3	Length of barrier ($L_{rb,3}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:						
4	Length of barrier ($L_{rb,4}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:						
5	Length of barrier ($L_{rb,5}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:						
Presence of barrier on <u>left</u> side of roadway:		No	Yes	Yes	No		

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

1	Length of barrier ($L_{lb,1}$), mi:		0.04	0.08			
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:		2	2			
2	Length of barrier ($L_{lb,2}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:						
3	Length of barrier ($L_{lb,3}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:						
4	Length of barrier ($L_{lb,4}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:						
5	Length of barrier ($L_{lb,5}$), mi:						
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:						

Ramp Access Data	See note						
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No	No	S-C Lane		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:				0.03		
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:						
Weaving Section	Weave section in collector-distributor road segment?:						
	Length of weaving section (L_{wev}), mi:						
	Length of weaving section in segment ($L_{wev,seg}$), mi:						

Traffic Data	**Year**						
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2011	14300	14300	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2012						
	2013						
	2014						
	2015						
	2016						
	2017						
	2018						
	2019						
	2020						
	2021						
	2022						
	2023						
	2024						
	2025						
	2026						
	2027						
	2028						
	2029						
	2030	14300	14300	14300	14300		
	2031						
	2032						
	2033						
	2034						

Crash Data	**Year**		Segment Crashes -->					
Count of Fatal-and-Injury (FI) Crashes by Year								
Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2011							
	2012							
	2013							
	2014							
	2015							
Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2011							
	2012							
	2013							
	2014							
	2015							
Count of Property-Damage-Only (PDO) Crashes by Year								
Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2011							
	2012							
	2013							
	2014							
	2015							
Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2011							
	2012							

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

		2013							
		2014							
		2015							

Advisory Messages

Variable Limits

Number of through lanes (n):	2	2	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.02	0.12	0.03	0	0
Length of curve in segment (Lc2,seg), mi:	0.04	0.03	0.12	0.03	0	0
Length of curve in segment (Lc3,seg), mi:	0.04	0.01	0.12	0.03	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.07	0.12	0.03	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.07	0.12	0.03	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.07	0.12	0.03	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.07	0.12	0.03	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.07	0.12	0.03	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.07	0.12	0.03	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

Output Worksheet for Ramp Segments							
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period	Segment 4 Study Period	Segment 5 Study Period
Crash Modification Factors							
Fatal-and-Injury Crash CMFs							
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		1.000	4.381	1.014	1.010	
		SV	1.000	11.443	1.045	1.030	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	1.147	0.955	1.201	1.147	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.000	1.114	1.382	1.309	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	1.114	1.114	1.114	1.114	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.231	1.323	1.323	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.000	1.185	1.215	1.000	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV					
	Year:	2011	1.000	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	1.000	
		2013	1.000	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	1.000	
		2018	1.000	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	1.000	
		2031					
		2032					
		2033					
		2034					
Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	1.000	1.363	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.074	1.000	1.000	
Property-Damage-Only Crash CMFs							
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		1.000	3.366	1.010	1.007	
		SV	1.000	14.611	1.058	1.039	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.000	1.053	1.168	1.138	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	1.053	1.053	1.053	1.053	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.210	1.293	1.293	
Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.000	1.168	1.196	1.000	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV					
	Year:	2011	1.000	1.000	1.000	1.000	
		2012	1.000	1.000	1.000	1.000	
		2013	1.000	1.000	1.000	1.000	
		2014	1.000	1.000	1.000	1.000	
		2015	1.000	1.000	1.000	1.000	
		2016	1.000	1.000	1.000	1.000	
		2017	1.000	1.000	1.000	1.000	

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

		2018	1.000	1.000	1.000	1.000	
		2019	1.000	1.000	1.000	1.000	
		2020	1.000	1.000	1.000	1.000	
		2021	1.000	1.000	1.000	1.000	
		2022	1.000	1.000	1.000	1.000	
		2023	1.000	1.000	1.000	1.000	
		2024	1.000	1.000	1.000	1.000	
		2025	1.000	1.000	1.000	1.000	
		2026	1.000	1.000	1.000	1.000	
		2027	1.000	1.000	1.000	1.000	
		2028	1.000	1.000	1.000	1.000	
		2029	1.000	1.000	1.000	1.000	
		2030	1.000	1.000	1.000	1.000	
		2031					
		2032					
		2033					
		2034					
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	1.000	1.000	
Predicted Average Crash Frequency							
Fatal-and-Injury Crash Frequency							
Multiple-Vehicle Crash Analysis		**Year**					
Overdispersion parameter ($k_{w,x,mv,fi}$):							
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:							
Reference year (r):							
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:							
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:							
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:							
Predicted average crash frequency ($N_{p,w,x,mv,fi}$), crashes/yr:		2011	0.027	0.303	0.193	0.049	
		2012	0.027	0.303	0.193	0.049	
		2013	0.027	0.303	0.193	0.049	
		2014	0.027	0.303	0.193	0.049	
		2015	0.027	0.303	0.193	0.049	
		2016	0.027	0.303	0.193	0.049	
		2017	0.027	0.303	0.193	0.049	
		2018	0.027	0.303	0.193	0.049	
		2019	0.027	0.303	0.193	0.049	
		2020	0.027	0.303	0.193	0.049	
		2021	0.027	0.303	0.193	0.049	
		2022	0.027	0.303	0.193	0.049	
		2023	0.027	0.303	0.193	0.049	
		2024	0.027	0.303	0.193	0.049	
		2025	0.027	0.303	0.193	0.049	
		2026	0.027	0.303	0.193	0.049	
		2027	0.027	0.303	0.193	0.049	
		2028	0.027	0.303	0.193	0.049	
		2029	0.027	0.303	0.193	0.049	
		2030	0.027	0.303	0.193	0.049	
		2031					
		2032					
		2033					
		2034					
Single-Vehicle Crash Analysis		**Year**					
Overdispersion parameter ($k_{w,x,sv,fi}$):							
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:							
Reference year (r):							
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:							
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:							
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:							
Predicted average crash frequency		2011	0.047	1.360	0.341	0.063	

($N_{p,w,x,sv,fi}$), crashes/yr:	2012	0.047	1.360	0.341	0.063	
	2013	0.047	1.360	0.341	0.063	
	2014	0.047	1.360	0.341	0.063	
	2015	0.047	1.360	0.341	0.063	
	2016	0.047	1.360	0.341	0.063	
	2017	0.047	1.360	0.341	0.063	
	2018	0.047	1.360	0.341	0.063	
	2019	0.047	1.360	0.341	0.063	
	2020	0.047	1.360	0.341	0.063	
	2021	0.047	1.360	0.341	0.063	
	2022	0.047	1.360	0.341	0.063	
	2023	0.047	1.360	0.341	0.063	
	2024	0.047	1.360	0.341	0.063	
	2025	0.047	1.360	0.341	0.063	
	2026	0.047	1.360	0.341	0.063	
	2027	0.047	1.360	0.341	0.063	
	2028	0.047	1.360	0.341	0.063	
	2029	0.047	1.360	0.341	0.063	
	2030	0.047	1.360	0.341	0.063	
	2031					
	2032					
	2033					
	2034					
Property-Damage-Only Crash Frequency						
Multiple-Vehicle Crash Analysis	**Year**					
Overdispersion parameter ($k_{w,x,mv,pdo}$):						
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:						
Reference year (r):						
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:						
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:						
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:						
Predicted average crash frequency	2011	0.060	0.528	0.330	0.067	
($N_{p,w,x,mv,pdo}$), crashes/yr:	2012	0.060	0.528	0.330	0.067	
	2013	0.060	0.528	0.330	0.067	
	2014	0.060	0.528	0.330	0.067	
	2015	0.060	0.528	0.330	0.067	
	2016	0.060	0.528	0.330	0.067	
	2017	0.060	0.528	0.330	0.067	
	2018	0.060	0.528	0.330	0.067	
	2019	0.060	0.528	0.330	0.067	
	2020	0.060	0.528	0.330	0.067	
	2021	0.060	0.528	0.330	0.067	
	2022	0.060	0.528	0.330	0.067	
	2023	0.060	0.528	0.330	0.067	
	2024	0.060	0.528	0.330	0.067	
	2025	0.060	0.528	0.330	0.067	
	2026	0.060	0.528	0.330	0.067	
	2027	0.060	0.528	0.330	0.067	
	2028	0.060	0.528	0.330	0.067	
	2029	0.060	0.528	0.330	0.067	
	2030	0.060	0.528	0.330	0.067	
	2031					
	2032					
	2033					
	2034					
Single-Vehicle Crash Analysis	**Year**					
Overdispersion parameter ($k_{w,x,sv,pdo}$):						
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:						
Reference year (r):						
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:						

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:						
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:						
Predicted average crash frequency ($N_{p,w,x,sv,pdo}$), crashes/yr:	2011	0.065	2.470	0.372	0.074	
	2012	0.065	2.470	0.372	0.074	
	2013	0.065	2.470	0.372	0.074	
	2014	0.065	2.470	0.372	0.074	
	2015	0.065	2.470	0.372	0.074	
	2016	0.065	2.470	0.372	0.074	
	2017	0.065	2.470	0.372	0.074	
	2018	0.065	2.470	0.372	0.074	
	2019	0.065	2.470	0.372	0.074	
	2020	0.065	2.470	0.372	0.074	
	2021	0.065	2.470	0.372	0.074	
	2022	0.065	2.470	0.372	0.074	
	2023	0.065	2.470	0.372	0.074	
	2024	0.065	2.470	0.372	0.074	
	2025	0.065	2.470	0.372	0.074	
	2026	0.065	2.470	0.372	0.074	
	2027	0.065	2.470	0.372	0.074	
	2028	0.065	2.470	0.372	0.074	
	2029	0.065	2.470	0.372	0.074	
	2030	0.065	2.470	0.372	0.074	
	2031					
	2032					
	2033					
	2034					
Crash Severity Distribution (during Study Period)						
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:		0.030	0.549	0.165	0.039	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:		0.091	1.666	0.501	0.117	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:		0.471	8.903	2.704	0.620	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:		0.888	22.155	7.305	1.450	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:		1.480	33.273	10.675	2.226	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:		2.505	59.972	14.048	2.830	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:		3.985	93.245	24.723	5.056	
Intermediate Results						
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			37.0	99.5	99.5	
Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:			52.1	68.7	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:			37.0	88.2	88.2	
Proportion of segment length with curve 1 ($P_{c,1}$):			0.286	1.000	0.667	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:			36.6			
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:			37.0			
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:			36.6			
Proportion of segment length with curve 2 ($P_{c,2}$):			0.429			
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:			42.4			
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:			42.2			
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:			42.4			
Proportion of segment length with curve 3 ($P_{c,3}$):			0.143			
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:						
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:						
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:						
Proportion of segment length with curve 4 ($P_{c,4}$):						
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:						
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:						
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:						
Proportion of segment length with curve 5 ($P_{c,5}$):						

Eastbound On-ramp from Montlake Blvd (DXEV) - Existing

Distance from edge of right shoulder to barrier face (W_{rcb}), ft:		999.000	0.750	0.750	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):		0.000	0.714	1.000	1.000	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:		999.000	0.750	0.750	999.000	
Proportion of segment length with barrier on the left side (P_{lb}):		0.000	0.571	0.667	0.000	
Proportion of segment length within a weaving section (P_{wev}):		0.000	0.000	0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):		0.000	0.000	0.000	1.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):		0.000	0.286	0.000	0.000	
Traffic Data	**Year**					
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:	2011	14300	14300	14300	14300	
	2012	14300	14300	14300	14300	
	2013	14300	14300	14300	14300	
	2014	14300	14300	14300	14300	
	2015	14300	14300	14300	14300	
	2016	14300	14300	14300	14300	
	2017	14300	14300	14300	14300	
	2018	14300	14300	14300	14300	
	2019	14300	14300	14300	14300	
	2020	14300	14300	14300	14300	
	2021	14300	14300	14300	14300	
	2022	14300	14300	14300	14300	
	2023	14300	14300	14300	14300	
	2024	14300	14300	14300	14300	
	2025	14300	14300	14300	14300	
	2026	14300	14300	14300	14300	
	2027	14300	14300	14300	14300	
	2028	14300	14300	14300	14300	
	2029	14300	14300	14300	14300	
	2030	14300	14300	14300	14300	
	2031	14300	14300	14300	14300	
	2032	14300	14300	14300	14300	
	2033	14300	14300	14300	14300	
	2034	14300	14300	14300	14300	

APPENDIX B

Alignment and Channelization Plans

(w/HSM segments delineated)

Washington State Department of Transportation

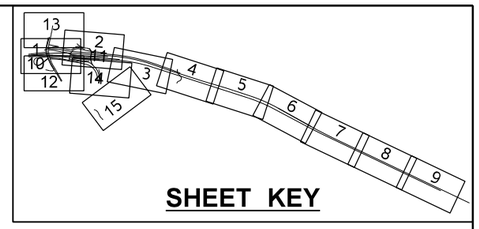
SR 520, MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT
DESIGN ANALYSIS #5 (EB SR 520 ON-RAMP @ MONTLAKE BLVD - DXEI)

SEC.21 T.25N. R.4E W.M.

?	SHOULDER DATA		
	STATION (OFFSET)	SHOULDER WIDTH	TAPER RATE
1	MRI 550+84.89 (25.9' RT)	2.8'	BEGIN 17.8:1
2	MRI 551+77.70 (30' RT)	8'	END 17.8:1
3	MRI 553+49.66 (2' LT)	2'	BEGIN 68.2:1
4	MRI 554+86.13 (4' LT)	4'	END 68.2:1, BEGIN 24.5:1
5	MR 57+30.92 (14' LT)	14'	END 24.5:1
6	MR 59+21.08 (14.0' LT)	14'	BEGIN 32.4:1
7	MR 59+85.97 (16' LT)	16'	END 32.4:1
8	MLI 551+09.71 (13.8' RT)	1.8'	BEGIN 94.7:1
9	MLI 551+53.35 (22.1' LT)	11.1'	BEGIN 104.1:1
10	MLI 552+04.39 (14.8' RT)	2.8'	END 94.7:1, BEGIN 82.1:1
11	MLI 553+61.55 (25.2' LT)	13.1'	END 104.1:1, BEGIN 161:1
12	MLI 554+83.65 (18.2' RT)	6.2'	END 82.1:1, BEGIN 62:1
13	MLI 556+20.00 (16.0' RT)	4'	END 62:1
14	ML 58+60.80 (32.0' LT)	10'	END 161:1
15	DXWI 17+48.27 (16.3' LT)	2.2'	BEGIN 28.8:1
16	DXWI 18+12.32 (3' RT)	3'	BEGIN 104.4:1
17	DXWI 18+54.80 (24.1' LT)	5.9'	END 28.8:1,BEGIN 54.2:1
18	DXWI 19+16.73 (4.0' RT)	4'	END 104.4:1
19	DXWI 19+57.81 (28.0' LT)	4'	END 54.2:1

?	SHOULDER DATA		
	STATION (OFFSET)	SHOULDER WIDTH	TAPER RATE
20	DXEI 18+12.50 (33.0' RT)	8'	-
21	DXEI 18+12.50 (34.0' RT)	9'	BEGIN 81.2:1
22	DXEI 18+93.75 (33.0' RT)	8'	END 81.2:1
23	MR 60+29.72 (16.0' LT)	16'	BEGIN 44.9:1
24	MR 61+19.51 (14.0' LT)	14'	END 44.9:1
25	MR 62+55.56 (14.0' LT)	14'	BEGIN 14.1:1
26	MR 62+68.25 (14.0' LT)	13.1'	END 14.1:1, BEGIN 1.5:1
27	MR 62+85.37 (26.2' LT)	24.2'	END 1.5:1,* BEGIN 7.8:1
28	ML 61+68.62 (16.0' RT)	4'	BEGIN 18.9:1
29	ML 62+68.68 (21.3' RT)	9.3'	END 18.9:1

* CONTINUES ONTO SHEET CH02



SHEET KEY

SEE SHEET CH10 FOR LOCAL STREET AND RAMP DESIGN WITHIN THIS AREA

MONTLAKE BOULEVARD RSUP TUNNEL (BELOW) FOR FUTURE USE

SR 513 (MONTLAKE BLVD)

DXWI 19+57.94
END 21.2:1 LANE TAPER (24' LT)
BEGIN LANE LINE (12' LT)
MLI 553+09.35 (11' LT)
BEGIN 50.1:1 LANE TAPER
MLI 553+61.55
MATCH EXISTING RETAINING WALL

6' SIDEWALK

MATCH LINE SEE SHEET CH10 BD1 23+50

ML 58+65 (16.5' LT)

ML 58+60.80 (11' LT)
BEGIN WIDE DOTTED LANE LINE
ML 58+60.80 (22' LT)
END 50.1:1 LANE TAPER

ML 62+57.53 (11' LT)
BEGIN LANE LINE
END WIDE DOTTED LANE LINE

MONTLAKE LID BRIDGE PORTAL

CONCRETE BARRIER
MAINTENANCE PULL-OUT

ML 61+60 (16.5' LT)

MATCH LINE WDX 15+48 SEE SHEET CH10

MLI 550+85.21
BEGIN 165.9:1 LANE TAPER (11.4' LT)
BEGIN 74:1 LANE TAPER (11.6' RT)
BEGIN LANE LINE
BEGIN WHITE EDGE LINE (11.4' LT)
BEGIN YELLOW EDGE LINE (11.6' RT)
MATCH EXISTING

EOTW

CONCRETE BARRIER

MLI 551+14.82 (12' RT)
END 74:1 LANE TAPER
BEGIN La DXWI 18+12
35 MPH TO 50 MPH
MLI 551+51.58 (11' LT)
END 165.9:1 LANE TAPER

EOP

DXWI 17+47.77
BEGIN 21.2:1 LANE TAPER (14.1' LT)
BEGIN YELLOW EDGE LINE
BEGIN WHITE EDGE LINE (14.1' LT)
MATCH EXISTING

BILL DAWSON TRAIL (BELOW)

PORTAGE BAY BRIDGE

MATCH LINE DXWI 20+00 SEE SHEET CH10

MLI 556+20.00 POE BK=
ML 56+20.00 POB/PC AHD
EQUATION

WB SR 520

DXWI LINE

MLI LINE

ML LINE

MRI LINE

EB SR 520

DXEI LINE

MR LINE

WDX LINE

MATCH LINE ML 63+50 SEE SHEETS CH02 & CH11

MAINTENANCE PULL-ON

BEGIN PROJECT
SR 520 MP 0.84
MRI 550+73.80 POB

MRI 550+84.88
BEGIN 464.1:1 LANE TAPER (11.2' RT)
BEGIN 92.8:1 LANE TAPER (23' RT)
BEGIN LANE LINE (11.2' RT)
BEGIN WHITE EDGE LINE (23' RT)
BEGIN YELLOW EDGE LINE
MATCH EXISTING

BS1

LW1 & SW1

MATCH LINE DXEI 15+30 SEE SHEET CH10

MRI 551+77.70
END 464.1:1 LANE TAPER (11' RT)
END 92.8:1 LANE TAPER (22' RT)

MRI 551+11.74 (2.4' LT)
MATCH EXISTING CONCRETE BARRIER

EXTRUDED CURB

BEGIN La DXEI 16+44.69
RAMP METER OFF
25 MPH TO 60 MPH

DXEI 16+44.69
BEGIN 93.3:1 LANE TAPER (14' RT)
BEGIN 28:1 LANE TAPER (30' RT)

DXEI 17+84.69
END 93.3:1 LANE TAPER (12.5' RT)
END 28:1 LANE TAPER (25' RT)

LW1 & SW1

End Segment 2
Begin Segment 3
DXEI 16+44.69

MRI 557+30.91 POE BK=
MR 57+30.91 POB/PC AHD
EQUATION

MR 60+13.82 (22' RT)
END WHITE EDGE LINE
BEGIN GORE AREA MARKING

DXEI 23+29.80
END LANE LINE (12.5' RT)
STOP LINE (0'-25' RT)
BEGIN GORE AREA MARKING
BEGIN WIDE DOTTED LANE LINE (12.5' RT)

BEGIN La DXEI 23+29.80
RAMP METER ON
0 MPH TO 50 MPH
RAMP METER OFF
45 MPH TO 60 MPH

DXEI 24+35 (18.7' RT)

DXEI 23+50 (18.7' RT)

DXEI 24+29.80
END WIDE DOTTED LANE LINE (12.5' RT)
BEGIN 25:1 LANE TAPER (25' RT)

MR 62+55.56
YELLOW EDGE LINE AP
BEGIN WIDE DOTTED LANE LINE
BEGIN 15:1 LANE TAPER

End Segment 3
DXEI 23+29.80

NOTES:
1. FOR LEGENDS, ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.
2. FOR ALIGNMENT DATA SEE SHEET CH01A.

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PLOTTED BY	priharr
DESIGNED BY	K. PRIHAR
ENTERED BY	M. AUDAR
CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

PRELIMINARY
NOT FOR CONSTRUCTION

REVISION	DATE	BY

REGION NO.	STATE
10	WASH
JOB NUMBER	
CONTRACT NO.	LOCATION NO.

FED.AID PROJ.NO.

HDR

DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING, PLANNING, ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

CHANNELIZATION PLAN

PLAN REF. NO. CH01

SHEET OF SHEETS

SEC.21 T.25N. R.4E W.M.

CURVE DATA					
P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH	S
ML 58+85.44	10°23'53" RT	4112.00'	374.15'	746.25'	2%
MRI 552+90.71	4°23'15" RT	2950.00'	113.01'	225.91'	3%
MR 57+78.30	13°08'37" RT	2988.00'	344.24'	685.45'	3%
DXWI 18+64.52	1°21'36" RT	4400.00'	52.22'	104.44'	EX
DXEI 16+16.64	22°57'01" RT	142.00'	28.83'	56.88'	8%
DXEI 19+88.79	13°17'51" RT	2952.00'	344.10'	685.11'	3%

NOTES:

1. FOR LEGENDS, ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.
2. PORTIONS OF THE ULTIMATE ALIGNMENTS FOR ML & MR LINES ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY.

SEE SHEET CH10A FOR LOCAL STREET AND RAMP ALIGNMENTS WITHIN THIS AREA

BEGIN PROJECT
SR 520 MP 0.84
MRI 550+73.80 POB
N 566429.570
E 1605429.125

DXWI 19+16.73 PT
DXWI 18+64.52 PI
ML 51+51.85 PT=
MLI 551+51.99 (10.94' RT)
DXWI 18+12.30 PC
DXWI 17+47.77 POB=
MRI 550+83.28 (43.79' LT)
DXWI LINE
N70°33'57"E
N71°55'33"E
MLI 550+85.21 POB
N 566450.571
E 1605436.732
N72°44'44"E
MLI LINE
MLI 551+14.96 PI
N73°34'55"E
ML LINE
MR LINE
N72°16'38"E
MR 50+86.75 PT=
MRI 550+85.89 (33.61' RT)
MRI 551+77.70 PC
DXEI 16+16.64 PI
MATCH LINE DXEI 15+30
SEE SHEET CH10A
DXEI 15+87.81 PCC
DXEI 16+44.69 PCC
MR 54+34.06 PC
MRI 554+03.61 PT
MRI 552+90.71 PI
N77°58'11"E
N73°26'27"E
MATCH LINE DXWI 20+00
SEE SHEET CH10A
BDT 21+51.65 POB=
MLI 555+16.01 (99.40' LT)
N56°57'48"E
BDT LINE
MATCH LINE BDT 23+50
SEE SHEET CH10A
BDT 23+09.20 PC
ML 55+89.74 POC=
DX 14+67.83 POT
ML 55+53.78 POC=
DXLI 16+22.50 POC
555
55
ML 55+11.29 PC
MRI LINE
MR 55+98.29 POC=
DX 14+21.50 POT
MR 55+65.64 POC=
DXLI 15+76.98 POC
MLI 556+20.00 POE BK=
ML 56+20.00 POC/POB AHD
EQUATION
ML 56+25.17 POC=
DXRI 15+89.88 POC
MR 56+33.76 POC=
DXRI 15+42.02 POT
ML 58+85.44 PI
60
ML LINE
DXEI 19+88.79 PI
MR 57+78.30 PI
N70°05'49"E
20
DXEI LINE
MRI 557+30.92 POE BK=
MR 57+30.92 POC/POB AHD
EQUATION
DXEI 23+29.80 PT
MR 61+19.51 PT
MR 62+55.56 PC
N85°25'15"E
25
N83°23'40"E
MR LINE
MR 61+80.68 POT=
WPXS 11+06.66 POT
DXEI 24+92.09 POT=
WPXS 10+74.37 POT
WDX 16+13.89 POT=
WPX 9+74.58 POC
ML 62+06.03 POC=
WPX 9+23.74 POC
WDX 15+90.49 PT
WDX LINE
ML 62+57.53 PT
MATCH LINE WDX 15+48
SEE SHEET CH10A
MATCH LINE ML 63+50
SEE SHEETS CH02A & CH11A

End Segment 2
Begin Segment 3
DXEI 16+44.69

End Segment 3
DXEI 23+29.80
@ Metered On-Ramp Stop Bar

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ENTERED BY	M. AUDAR				CONTRACT NO.	LOCATION NO.	
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR

P.E. STAMP BOX DATE

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix

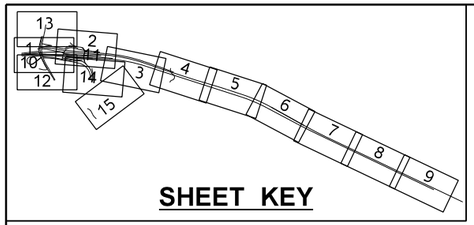
SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

CHANNELIZATION PLAN – ALIGNMENT

PLAN REF. NO. CH01A

SHEET OF SHEETS

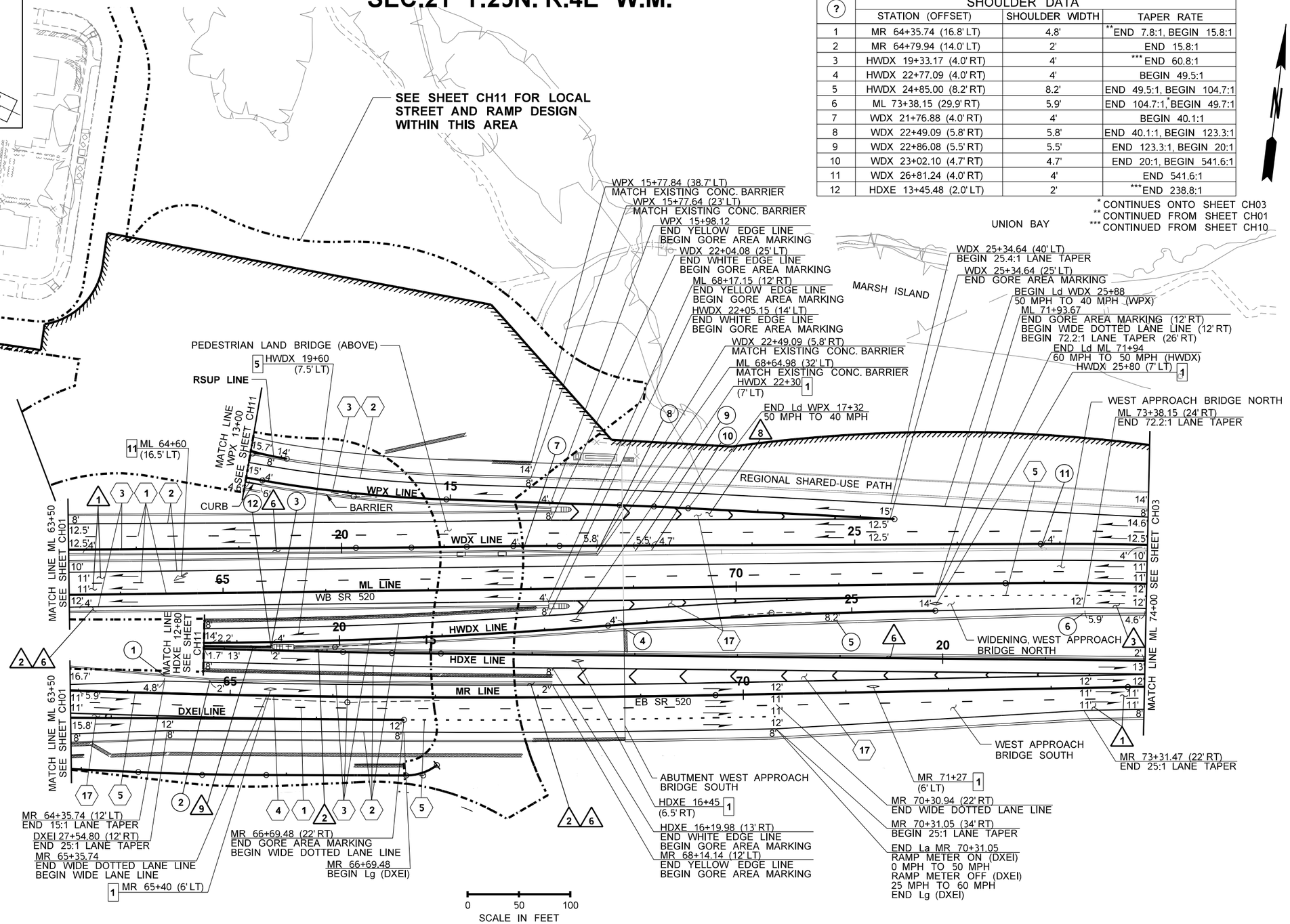
SEC.21 T.25N. R.4E W.M.



SHEET KEY

?	SHOULDER DATA		
	STATION (OFFSET)	SHOULDER WIDTH	TAPER RATE
1	MR 64+35.74 (16.8' LT)	4.8'	**END 7.8:1, BEGIN 15.8:1
2	MR 64+79.94 (14.0' LT)	2'	END 15.8:1
3	HWDX 19+33.17 (4.0' RT)	4'	***END 60.8:1
4	HWDX 22+77.09 (4.0' RT)	4'	BEGIN 49.5:1
5	HWDX 24+85.00 (8.2' RT)	8.2'	END 49.5:1, BEGIN 104.7:1
6	ML 73+38.15 (29.9' RT)	5.9'	END 104.7:1, *BEGIN 49.7:1
7	WDX 21+76.88 (4.0' RT)	4'	BEGIN 40.1:1
8	WDX 22+49.09 (5.8' RT)	5.8'	END 40.1:1, BEGIN 123.3:1
9	WDX 22+86.08 (5.5' RT)	5.5'	END 123.3:1, BEGIN 20:1
10	WDX 23+02.10 (4.7' RT)	4.7'	END 20:1, BEGIN 541.6:1
11	WDX 26+81.24 (4.0' RT)	4'	END 541.6:1
12	HDXE 13+45.48 (2.0' LT)	2'	***END 238.8:1

*CONTINUES ONTO SHEET CH03
**CONTINUED FROM SHEET CH01
***CONTINUED FROM SHEET CH10



NOTES:

1. FOR LEGENDS, ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.
2. FOR ALIGNMENT DATA SEE SHEET CH02A.

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CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

PRELIMINARY
NOT FOR CONSTRUCTION

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

HDR

DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix (ENGINEERING, PLANNING, ENVIRONMENTAL SCIENCES)

SR 520
MONTLAKE TO LAKE WASHINGTON I/C AND BRIDGE REPLACEMENT

CHANNELIZATION PLAN

PLAN REF. NO. CH02

SHEET OF SHEETS

SEC.21 T.25N. R.4E W.M.

CURVE DATA					
P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH	S
MR 66+14.36	3°30'45" LT	11702.00'	358.80'	717.38'	2% *
RSUP 13+72.30	12°17'18" LT	312.00'	33.59'	66.92'	1.5%
WDX 20+68.06	0°30'57" LT	12000.00'	54.02'	108.05'	***
WDX 21+67.25	0°36'58" RT	8400.00'	45.17'	90.33'	2%
WPX 14+06.26	7°58'38" LT	1295.00'	90.30'	180.30'	4%
WPX 16+98.69	1°05'36" RT	3501.00'	33.40'	66.80'	2% EX
HWDX 19+95.52	5°30'25" LT	5550.00'	266.92'	533.44'	2%*
HWDX 24+21.69	3°46'54" RT	4836.00'	159.65'	319.19'	*****
HDXE 14+63.37	0°43'08" LT	7600.00'	47.68'	95.36'	2%*
BERM 2+18.00	2°22'55" LT	3000.00'	62.37'	124.72'	-
BERM 4+33.33	36°46'58" LT	50.00'	16.62'	32.10'	-

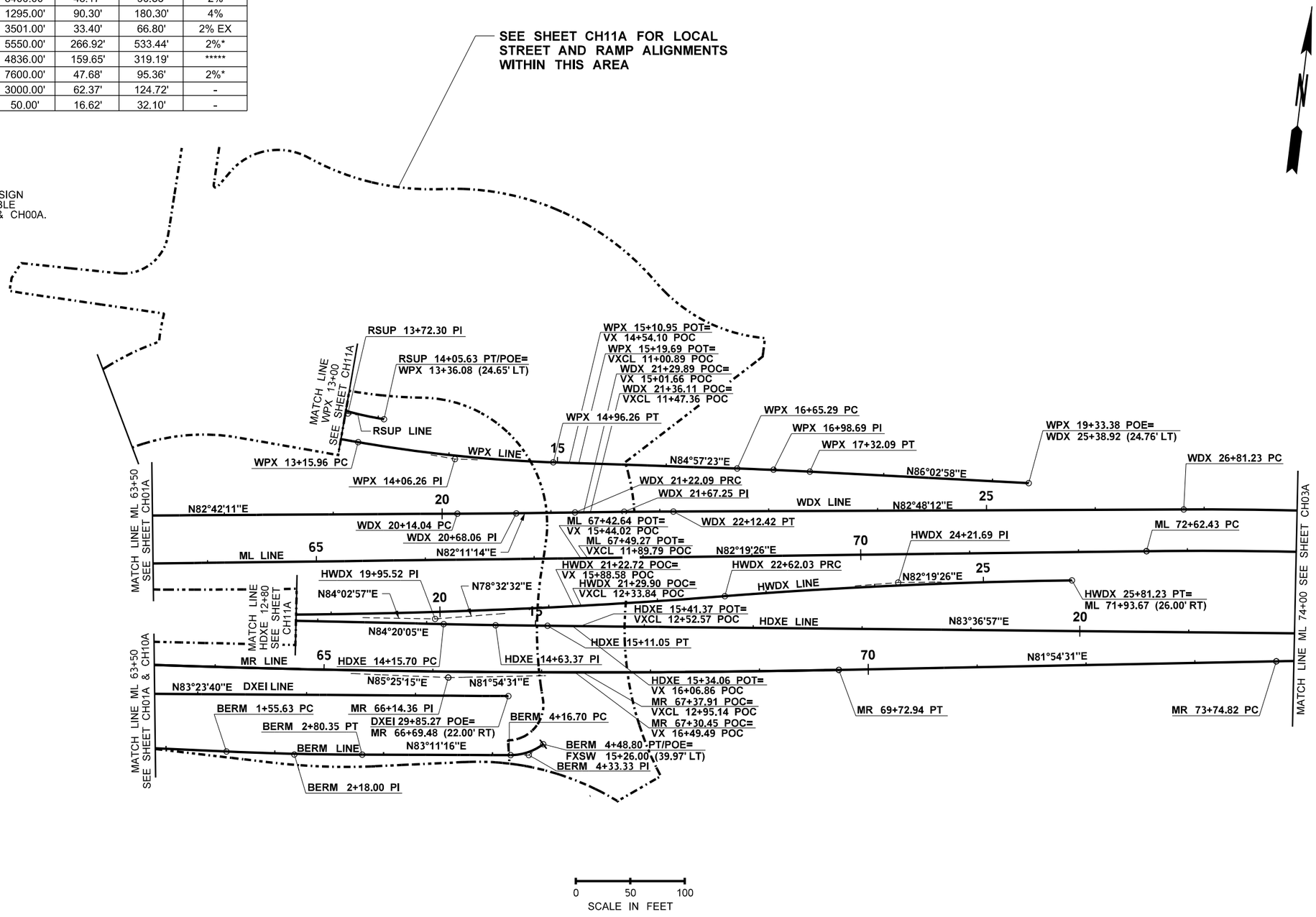
* ADVERSE SUPER

*** TRANSITION FROM 2% TO -2%

***** BRIDGE WIDENING, 2% EX

NOTES:

1. FOR LEGENDS, ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.



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TIME	3:19:32 PM				10	WASH	
DATE	11/7/2016				JOB NUMBER		
PLOTTED BY	priharr	**PRELIMINARY**					
DESIGNED BY	K. PRIHAR	NOT FOR CONSTRUCTION			CONTRACT NO.		LOCATION NO.
ENTERED BY	M. AUDAR						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR

DATE

P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

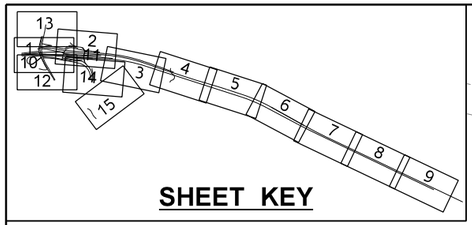
CHANNELIZATION PLAN – ALIGNMENT

PLAN REF. NO. CH02A

SHEET OF SHEETS

SEC.21 T.25N. R.4E W.M.

SHEET KEY



STORAGE MEASUREMENT TABLE				
ALG	LANE TYPE	BEGIN STATION	END STATION	LENGTH
EDXI	LEFT TURN	20+10	21+96	186'
		20+10	21+96	185'
DXLI	LEFT TURN	16+47	15+23	119'
	RIGHT TURN	16+60	15+24	140'
	LEFT TURN	19+78	17+45	234'
DXRI	LEFT TURN	15+06	16+24	125'
		15+13	16+34	127'
FX	LEFT TURN	12+14	10+60	154'
	RIGHT TURN	12+65	10+56	212'
FXE	LEFT TURN	13+47	14+44	97'
WPXS	LEFT TURN	11+11	10+52	59'
	RIGHT TURN	11+11	10+52	59'

NOTES:

1. FOR LEGENDS ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.
2. FOR ALIGNMENT DATA, SEE SHEET SHEET CH10A.
3. SIDEWALK WIDTH IS MEASURED FROM THE FACE OF THE CURB.
4. ? LANE TAPER AND MARKING NOTE SYMBOL, SEE SHEET CH12 FOR NOTES.

FOR TRAFFIC ISLAND #9
DETAIL SEE SHEET CH20
FOR INTERSECTION #2
DETAIL SEE SHEET CH17
DXLI 18+63 (36' LT)
25-FT DRIVEWAY
FOR TRAFFIC ISLAND #4
DETAIL SEE SHEET CH19
FOR TRAFFIC ISLAND #3
DETAIL SEE SHEET CH19
FOR TRAFFIC ISLAND #2
DETAIL SEE SHEET CH19
MONTLAKE BOULEVARD RSUP
TUNNEL BELOW (FOR FUTURE USE)
NOAA FACILITY
DXWI 21+55.11 (25.5' LT)
END 25:1 LANE TAPER
DXWI 21+17.60 (24' LT)
BEGIN 25:1 LANE TAPER
MATCH LINE DXWI 20+00
SEE SHEET CH01
DXWI LINE
MATCH LINE DXRI 18+95
SEE SHEET CH13
DXLI LINE
SR 513 (MONTLAKE BLVD)
DXRI LINE
BIKE RACKS
BILL DAWSON TO MONTLAKE STAIR
6' SIDEWALK
10' PEDESTRIAN ACCESS ROUTE TO MONTLAKE
SHELBY HAMLIN NEIGHBORHOOD STAIR
BDTI 28+73.08 POE=
RSUP 10+00 PC/POB
REGIONAL SHARED-USE PATH, CONNECTION TO MONTLAKE LID
MATCH LINE WDX 15+48
SEE SHEET CH01
24TH AVE E
MATCH LINE WPX 11+00 & CH11
SEE SHEETS CH02 & CH04
SW LINE
BDT LINE
TRANSIT STOP
6' MIN. RSUP LINE
WPX LINE
WDX LINE
8' SIDEWALK
HWDX LINE
PLANTER
SIDEWALK 10'
MONTLAKE LID BRIDGE PORTAL
MONTLAKE LID BRIDGE SOUTH PLAZA
BUS PULL-OUT
MONTLAKE LID BRIDGE LANDSCAPE
FX 12+60.38
(18' LT)
8' TRAIL
WPXS LINE
FX LINE
LAKE WA BLVD
FXE LINE
FXSW LINE
24TH AVE
MATCH LINE ML 63+50
SEE SHEETS CH02 & CH11
HDXE LINE
FOR TRAFFIC ISLAND #8
DETAIL SEE SHEET CH20
FOR INTERSECTION #4
DETAIL SEE SHEET CH18
BEGIN La HWDX 15+43.34
0 MPH TO 60 MPH (HDXE)
MATCH LINE FX 16+70
SEE SHEET CH14
FX 16+59.38 (1.5' RT)
BEGIN 69.4:1 LANE SHIFT TAPER
PARKING LANE
MATCH EXISTING SIDEWALK WIDTH
FOR TRAFFIC ISLAND #7
DETAIL SEE SHEET CH20
FOR TRAFFIC ISLAND #1
DETAIL SEE SHEET CH19
MONTLAKE LID BRIDGE PORTAL
FOR TRAFFIC ISLAND #6
DETAIL SEE SHEET CH20
DXEI 12+28.89 (24' RT)
BEGIN 18.1:1 LANE TAPER
DXEI 12+37.05 (12' RT)
BEGIN 46.7:1 LANE TAPER
EXTRUDED CURB
MATCH LINE DXEI 15+30
SEE SHEET CH01
VIEWING AREA
PLANTER
EDXI LINE
DXEI LINE
W MONTLAKE PL E
DXEI 13+37.32 (12' RT)
END 18.1:1 LANE TAPER
DXEI 13+30.37 (14' RT)
END 46.7:1 LANE TAPER
EDXI 19+04.55
BEGIN 14.1:1 LANE TAPER (14.5' RT)
BEGIN 21.1:1 LANE TAPER (29' RT)
BEGIN YELLOW EDGE LINE
BEGIN WIDE BROKEN LANE LINE (14.5' RT)
BEGIN WHITE EDGE LINE (29' RT)
MATCH EXISTING
EDXI 19+39
(8.5' RT & 23.3' RT)
EDXI 20+14
(5.5' RT, 16.5' RT & 28' RT)
EDXI 20+10.00
END 14.1:1 LANE TAPER (22' RT)
END 21.1:1 LANE TAPER (34' RT)
BEGIN LANE LINE (11' RT)
BEGIN WIDE LANE LINE (22' RT)
END WHITE EDGE LINE (34' RT)
END WIDE BROKEN LANE LINE (22' RT)
EDXI 21+31
(5.5' RT, 16.5' RT & 28' RT)
MATCH LINE DXRI 13+40
SEE SHEET CH12
DXRI 14+60.51=
SR 513 MP 0.00
FOR INTERSECTION #1
DETAIL SEE SHEET CH16
MATCH EXISTING SIDEWALK WIDTH
FOR TRAFFIC ISLAND #5
DETAIL SEE SHEET CH20
FX 13+35.89
END 10.2:1 LANE TAPER
FX 12+13.39
END WIDE LANE LINE
BEGIN 10.2:1 LANE TAPER
7' PARKING LANE
RAISED INTERSECTION
FOR INTERSECTION #3
DETAIL SEE SHEET CH18
SW2
LT1
End Segment 1
Begin Segment 2
DXEI 12+43.36
Begin Segment 1
DXEI 10+56.52
LW1 & SW1

SHOULDER DATA			
?	STATION (OFFSET)	SHOULDER WIDTH	TAPER RATE
1	EDXI 19+04.55 (7.8' LT)	5.7'	BEGIN 31.5:1
2	EDXI 19+04.55 (31.0' RT)	2'	BEGIN 56:1
3	EDXI 19+38.14 (31.9' RT)	1.4'	END 56:1, BEGIN 119.9:1
4	EDXI 20+10.06 (36.8' RT)	2'	END 119.9:1
5	EDXI 20+21.17 (2.0' LT)	2'	END 31.5:1, BEGIN 49.9:1
6	EDXI 20+71.08 (1.0' LT)	1'	END 49.9:1
7	DXEI 11+90.17 (1.0' LT)	1'	BEGIN 16.6:1
8	DXEI 12+40.07 (4.0' LT)	4'	END 16.6:1
9	HDXE 11+06.72 (1.0' LT)	1'	*BEGIN 238.8:1

*CONTINUES ONTO SHEET CH02

0 50 100
SCALE IN FEET

FILE NAME	PW:_ROTW\DesIgn-WAML\CADProd_P...H_10.dgn
TIME	3:22:51 PM
DATE	11/7/2016
PLOTTED BY	priharr
DESIGNED BY	K. PRIHAR
ENTERED BY	M. AUDAR
CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

PRELIMINARY
NOT FOR CONSTRUCTION

REVISION	DATE	BY

REGION | STATE | FED AID PROJ.NO.
JOB NUMBER
CONTRACT NO. | LOCATION NO.

HDR

DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING, PLANNING, ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

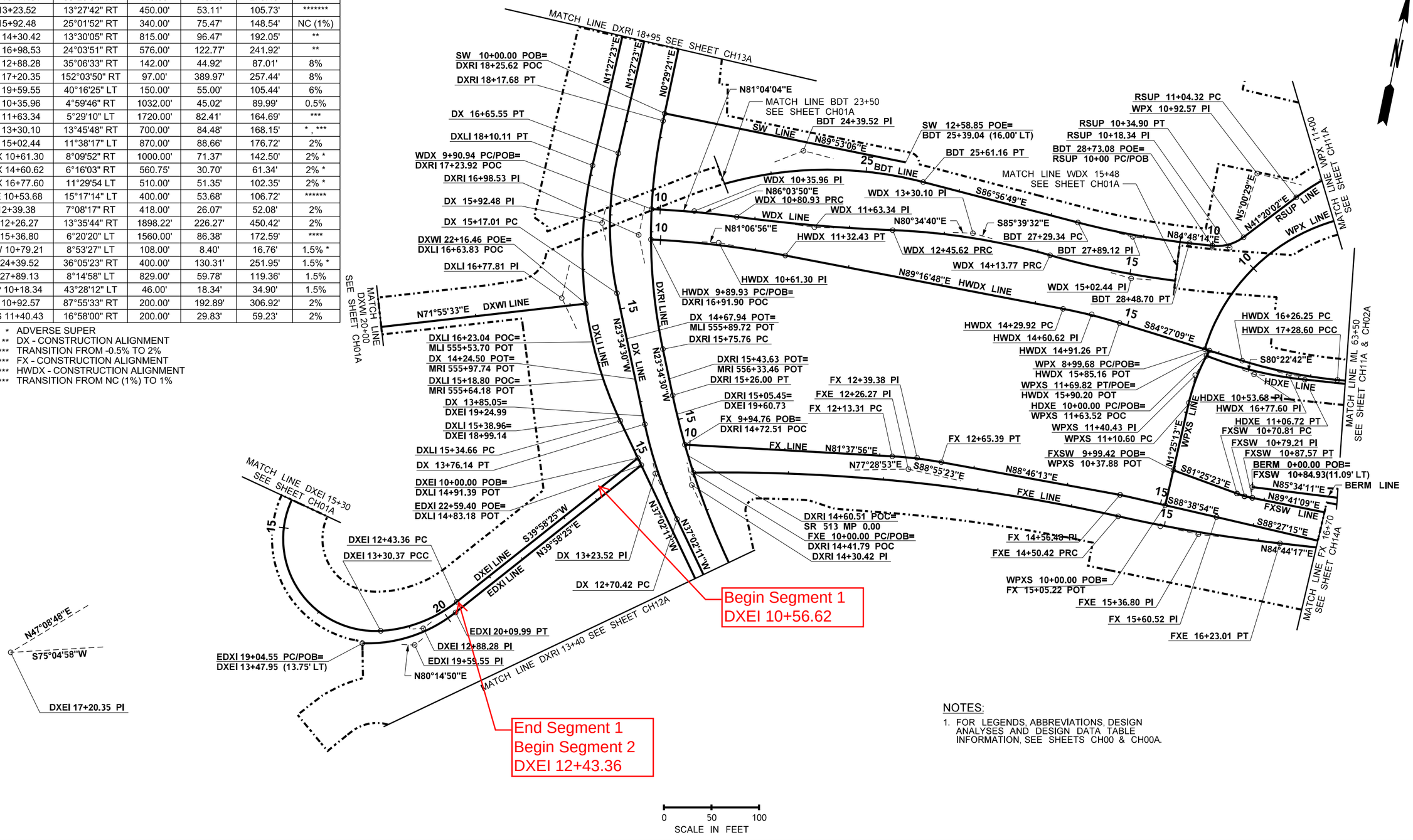
CHANNELIZATION PLAN

PLAN REF. NO. CH10
SHEET
OF
SHEETS

SEC.21 T.25N. R.4E W.M.

CURVE DATA					
P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH	S
DXLI 16+77.81	38°29'34" RT	410.00'	143.15'	275.45'	**
DX 13+23.52	13°27'42" RT	450.00'	53.11'	105.73'	*******
DX 15+92.48	25°01'52" RT	340.00'	75.47'	148.54'	NC (1%)
DXRI 14+30.42	13°30'05" RT	815.00'	96.47'	192.05'	**
DXRI 16+98.53	24°03'51" RT	576.00'	122.77'	241.92'	**
DXEI 12+88.28	35°06'33" RT	142.00'	44.92'	87.01'	8%
DXEI 17+20.35	152°03'50" RT	97.00'	389.97'	257.44'	8%
EDXI 19+59.55	40°16'25" LT	150.00'	55.00'	105.44'	6%
WDX 10+35.96	4°59'46" RT	1032.00'	45.02'	89.99'	0.5%
WDX 11+63.34	5°29'10" LT	1720.00'	82.41'	164.69'	***
WDX 13+30.10	13°45'48" RT	700.00'	84.48'	168.15'	* , ***
WDX 15+02.44	11°38'17" LT	870.00'	88.66'	176.72'	2%
HWDX 10+61.30	8°09'52" RT	1000.00'	71.37'	142.50'	2% *
HWDX 14+60.62	6°16'03" RT	560.75'	30.70'	61.34'	2% *
HWDX 16+77.60	11°29'54 LT	510.00'	51.35'	102.35'	2% *
HDXE 10+53.68	15°17'14" LT	400.00'	53.68'	106.72'	******
FX 12+39.38	7°08'17" RT	418.00'	26.07'	52.08'	2%
FXE 12+26.27	13°35'44" RT	1898.22'	226.27'	450.42'	2%
FXE 15+36.80	6°20'20" LT	1560.00'	86.38'	172.59'	****
FXSW 10+79.21	8°53'27" LT	108.00'	8.40'	16.76'	1.5% *
BDT 24+39.52	36°05'23" RT	400.00'	130.31'	251.95'	1.5% *
BDT 27+89.13	8°14'58" LT	829.00'	59.78'	119.36'	1.5%
RSUP 10+18.34	43°28'12" LT	46.00'	18.34'	34.90'	1.5%
WPX 10+92.57	87°55'33" RT	200.00'	192.89'	306.92'	2%
WPXS 11+40.43	16°58'00" RT	200.00'	29.83'	59.23'	2%

* ADVERSE SUPER
** DX - CONSTRUCTION ALIGNMENT
*** TRANSITION FROM -0.5% TO 2%
**** FX - CONSTRUCTION ALIGNMENT
****** HWDX - CONSTRUCTION ALIGNMENT
******* TRANSITION FROM NC (1%) TO 1%



NOTES:

1. FOR LEGENDS, ABBREVIATIONS, DESIGN ANALYSES AND DESIGN DATA TABLE INFORMATION, SEE SHEETS CH00 & CH00A.

FILE NAME	PW:_ROTW\DesIgn-WAML\CADProd_PlanForApprvl\XL5097_WAML_AP_CH_10A.dgn				REGION NO.	STATE	FED.AID PROJ.NO.	
TIME	3:23:04 PM				10	WASH		
DATE	11/7/2016				JOB NUMBER			
PLOTTED BY	priharr	**PRELIMINARY**						
DESIGNED BY	K. PRIHAR	NOT FOR CONSTRUCTION			CONTRACT NO.		LOCATION NO.	
ENTERED BY	M. AUDAR							
CHECKED BY	P. MERRELL							
PROJ. ENGR.	D. EDWARDS							
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY				

HDR

DATE
P.E. STAMP BOX

Washington State Department of Transportation

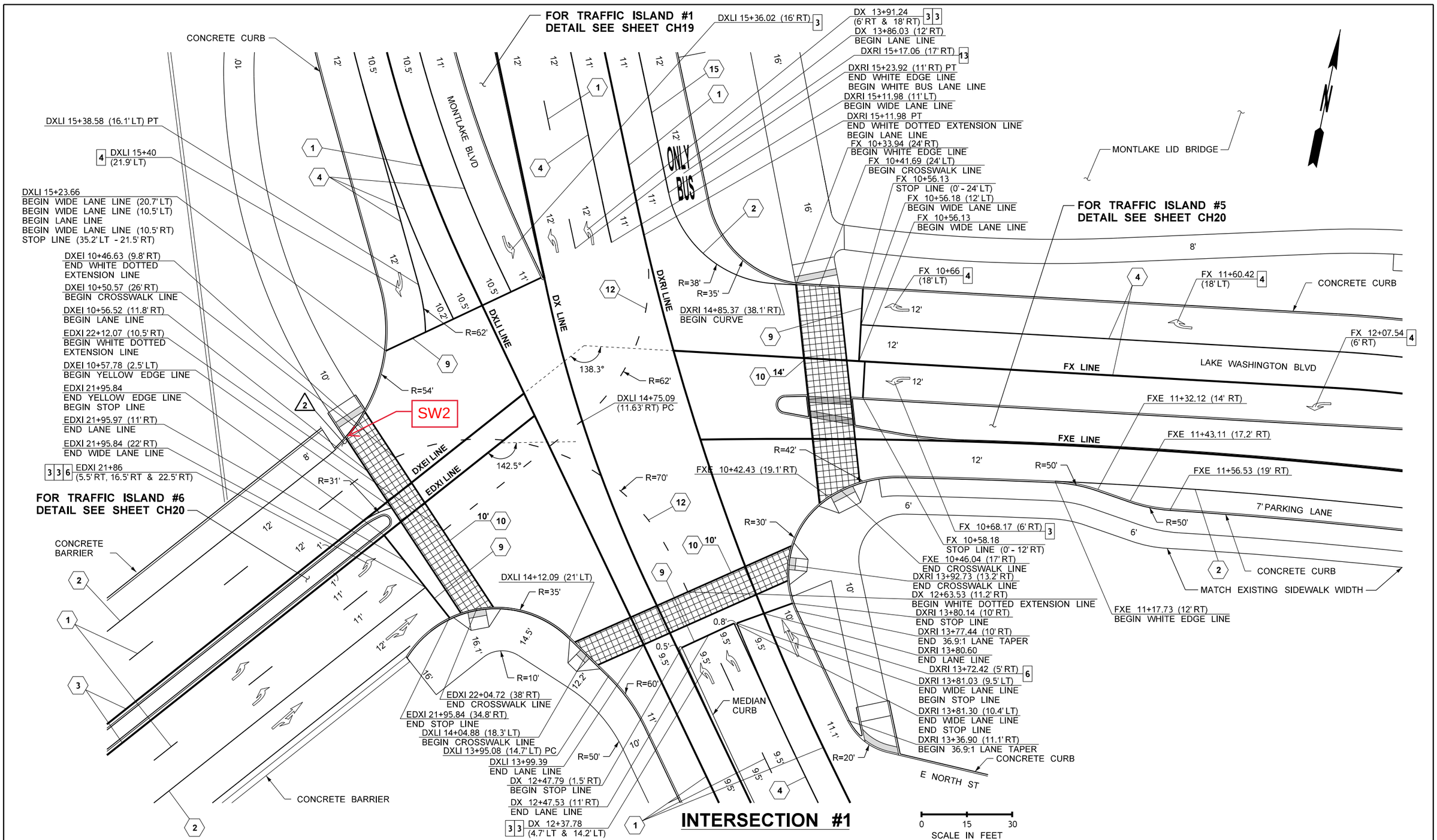
PARSONS BRINCKERHOFF | Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

CHANNELIZATION PLAN – ALIGNMENT

PLAN REF. NO. CH10A

SHEET OF SHEETS



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DATE	11/7/2016				JOB NUMBER		
PLOTTED BY	priharr	**PRELIMINARY**					
DESIGNED BY	K. PRIHAR	NOT FOR CONSTRUCTION					
ENTERED BY	M. AUDAR				CONTRACT NO.		LOCATION NO.
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR

P.E. STAMP BOX DATE

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING. PLANNING. ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT

CHANNELIZATION PLAN – INTERSECTION

PLAN REF. NO. CH16

SHEET OF SHEETS

SEC. 21, T. 25 N. R. 4 E. W.M.

CURVE DATA

P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH	S
MLV 555+96.86	10°58'06" RT	1634.00'	156.88'	312.81'	*
MLV 562+66.76	7°53'45" LT	2230.00'	153.90'	307.32'	5%
MRV 556+72.19	15°52'54" RT	1500.00'	209.23'	415.78'	*
MLHV 10+51.14	26°10'17" LT	220.00'	51.14'	100.49'	2%
MLHV 11+45.28	23°32'11" RT	215.00'	44.79'	88.32'	** 2%
MLHV 13+47.14	6°17'11" RT	220.00'	12.08'	24.14'	** 2%
MRHV 14+59.96	10°48'51" RT	1550.00'	146.71'	292.55'	*
MRHV 18+44.80	1°21'48" LT	2469.00'	29.38'	58.75'	*
DXEV 13+17.85	57°00'13" RT	120.00'	65.16'	119.39'	*
DXEV 15+67.35	133°56'42" RT	83.00'	195.28'	194.04'	*
DXEV 16+02.17	22°39'22" RT	180.00'	36.06'	71.18'	*
DXEV 20+17.29	15°19'20" RT	2825.00'	380.00	755.47	*
DXNV 10+13.71	3°35'42" RT	1200.00'	37.66'	75.29'	*
DXNV 12+77.30	28°57'21" RT	748.00'	193.14'	378.02'	*
DXNV 15+09.76	6°15'38" RT	870.00'	47.58'	95.06'	*
DXSV 11+39.60	14°54'56" RT	900.00'	117.81'	234.29'	*
DXSV 14+54.73	22°40'37" RT	700.00'	140.36'	277.05'	*
DXRV 10+35.81	11°23'30" LT	359.00	35.81'	71.38'	*
DXRV 11+92.03	6°47'34" RT	356.00'	21.13'	42.21'	*
DXRV 13+10.73	52°39'20" RT	70.00'	34.64'	64.33'	*
EDXV 12+80.88	26°42'02" LT	295.00'	70.01'	137.47'	*
EDXV 14+21.64	40°15'12" LT	200.00'	73.30'	140.51'	*
FXV 10+95.04	4°00'10" LT	750.00'	26.21'	52.40'	*
FXV 11+94.65	8°23'57" RT	1000.00'	73.43'	146.59'	*
FXV 13+34.32	4°11'25" RT	1818.00'	66.51'	132.96'	*
FXV 14+23.95	2°57'00" RT	900.00'	23.17'	46.34'	*
WDXV 12+54.80	10°16'47" LT	1015.00'	91.30'	182.11'	3%
WPXV 10+68.70	100°37'59" RT	96.00'	115.70'	168.61'	2%
SWV 11+22.68	22°47'45" LT	106.00'	21.37'	42.17'	**2%
SWV 11+65.09	25°53'30" RT	94.00'	21.61'	42.48'	2%
SWV 13+65.45	16°00'08" LT	376.00'	52.85'	105.01'	**2%
TRV (RP)	184°32'17" LT	10.00'	N/A	32.21'	**2%
TRV 16+66.04	13°19'01" LT	204.00'	23.81'	47.41'	**2%
TRV 17+36.58	13°21'17" RT	196.00'	22.95'	45.69'	2%
PARV 10+43.71	25°02'33" RT	45.00'	9.99'	19.67'	2%
PARV 10+81.35	25°17'36" RT	124.65'	27.97'	55.03'	2%
PARV 11+84.55	38°54'36" RT	50.00'	17.66'	33.96'	-2%-+2%
SPXV 10+29.51	19°49'00" RT	59.00'	10.31'	20.41'	*
SPXV 10+97.08	18°44'46" LT	184.00'	30.37'	60.20'	*

* EXISTING
** ADVERSE SUPERELEVATION

MONUMENTATION TABLE

CONTROL POINT		STATION	OFFSET	NORTHING	EASTING	DESCRIPTION
1	WSDOT GP17520-130	MRV 556+41.65	18.79' RT	566550.018	1605994.130	BRASS DISC IN BRIDGE SIDEWALK

ABBREVIATION

AP	ANGLE POINT	PCC	POINT OF COMPOUND CURVATURE
CP	CONTROL POINT	PRC	POINT OF REVERSE CURVATURE
EX	EXISTING	POB	POINT OF BEGINNING
LT	LEFT	POE	POINT OF END
LU	LOW URBAN	POC	POINT ON CURVE
NC	NORMAL CROWN	POT	POINT ON TANGENT
PI	POINT OF INTERSECTION	RP	RADIUS POINT
PC	POINT OF CURVATURE	RT	RIGHT
PT	POINT OF TANGENCY	RW	RIGHT OF WAY
		S	SUPERELEVATION

MATCH LINE DXNV 17+00 SEE SHEET AL09

MATCH LINE PARV 13+00 SEE SHEET AL02

MATCH LINE MLV 564+00 SEE SHEET AL02

MATCH LINE FXV 17+50 SEE SHEET AL10

BEGIN PROJECT
SR 520 MP 0.88
MRV 553+14.00 POB

BEGIN CONSTRUCTION
DXNV 9+50.14 POB

End Existing Segment 2
Begin Existing Segment 3
DXEV 16+37.29

Begin Existing Segment 1
DXEV 10+68

End Existing Segment 4
DXEV 23+98.20

End Existing Segment 3
Begin Existing Segment 4
DXEV 22+58.30

End Existing Segment 1
Begin Existing Segment 2
DXEV 12+52.69

0 50 100
SCALE IN FEET

CONTROL POINT
CONSTRUCTION ALIGNMENT

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\AL\WABN\PE2344_WABN_PS_AL_01.dgn
TIME	10:32:25 AM
DATE	4/3/2014
PLOTTED BY	leejo
DESIGNED BY	K. PRIHAR
ENTERED BY	S. SHARPE
CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	

HDR ENGINEERING INC.

PHILIP D. MERRELL — STATE OF WASHINGTON — 29200 — REGISTERED PROFESSIONAL ENGINEER — 4/8/14 DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix — ENGINEERING, PLANNING, ENVIRONMENTAL SCIENCES

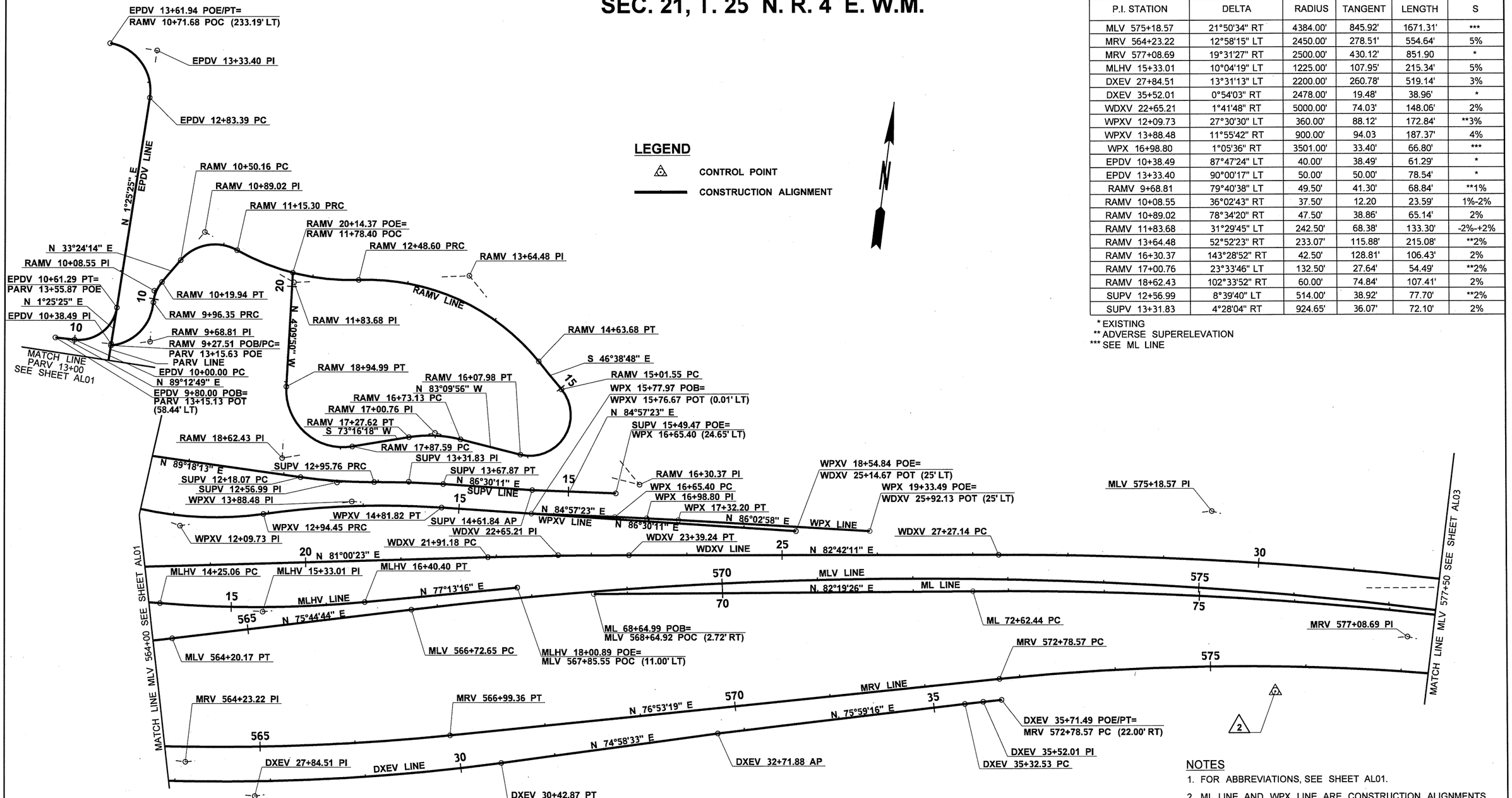
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

ALIGNMENT PLAN

PLAN REF. NO. AL01

SHEET 99 OF 1797 SHEETS

SEC. 21, T. 25 N. R. 4 E. W.M.



LEGEND

CONTROL POINT

CONSTRUCTION ALIGNMENT

CURVE DATA

P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH	S
MLV 575+18.57	21°50'34" RT	4384.00'	845.92'	1671.31'	***
MRV 564+23.22	12°58'15" LT	2450.00'	278.51'	554.64'	5%
MRV 577+08.69	19°31'27" RT	2500.00'	430.12'	851.90	*
MLHV 15+33.01	10°04'19" LT	1225.00'	107.95'	215.34'	5%
DXEV 27+84.51	13°31'13" LT	2200.00'	260.78'	519.14'	3%
DXEV 35+52.01	0°54'03" RT	2478.00'	19.48'	38.96'	*
WDXV 22+65.21	1°41'48" RT	5000.00'	74.03'	148.06'	2%
WPXV 12+09.73	27°30'30" LT	360.00'	88.12'	172.84'	**3%
WPXV 13+88.48	11°55'42" RT	900.00'	94.03	187.37'	4%
WPX 16+98.80	1°05'36" RT	3501.00'	33.40'	66.80'	***
EPDV 10+38.49	87°47'24" LT	40.00'	38.49'	61.29'	*
EPDV 13+33.40	90°00'17" LT	50.00'	50.00'	78.54'	*
RAMV 9+68.81	79°40'38" LT	49.50'	41.30'	68.84'	**1%
RAMV 10+08.55	36°02'43" RT	37.50'	12.20	23.59'	1%-2%
RAMV 10+89.02	78°34'20" RT	47.50'	38.86'	65.14'	2%
RAMV 11+83.68	31°29'45" LT	242.50'	68.38'	133.30'	-2%-+2%
RAMV 13+64.48	52°52'23" RT	233.07'	115.88'	215.08'	**2%
RAMV 16+30.37	143°28'52" RT	42.50'	128.81'	106.43'	2%
RAMV 17+00.76	23°33'46" LT	132.50'	27.64'	54.49'	**2%
RAMV 18+62.43	102°33'52" RT	60.00'	74.84'	107.41'	2%
SUPV 12+56.99	8°39'40" LT	514.00'	38.92'	77.70'	**2%
SUPV 13+31.83	4°28'04" RT	924.65'	36.07'	72.10'	2%

* EXISTING
** ADVERSE SUPERELEVATION
*** SEE ML LINE

MONUMENTATION TABLE

CONTROL POINT		STATION	OFFSET	NORTHING	EASTING	DESCRIPTION
2	WSDOT GP17520-131	MRV 575+68.26	29.52' RT	566807.167	1607895.358	BRASS DISC IN BRIDGE DECK

0 50 100
SCALE IN FEET

NOTES

1. FOR ABBREVIATIONS, SEE SHEET AL01.
2. ML LINE AND WPX LINE ARE CONSTRUCTION ALIGNMENTS FOR WEST APPROACH BRIDGE NORTH STRUCTURE.
3. BR 520/6 WIDENING IS BASED ON SR 520 CONSTRUCTION ALIGNMENT. SEE SHEET AL11 AND BB01 FOR DETAILS.

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\AL\WABN\PE2344_WABN_PS_AL_02.dgn
TIME	9:44:01 AM
DATE	4/4/2014
PLOTTED BY	deguzma
DESIGNED BY	K. PRIHAR
ENTERED BY	S. SHARPE
CHECKED BY	P. MERRELL
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. MEREDITH

REVISION	DATE	BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.
JOB NUMBER 13A012
CONTRACT NO. | LOCATION NO.

HDR ENGINEERING INC.

PHILIP D. MERRELL STATE OF WASHINGTON 22004 REGISTERED PROFESSIONAL ENGINEER
4/4/14
P.E. STAMP BOX DATE

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

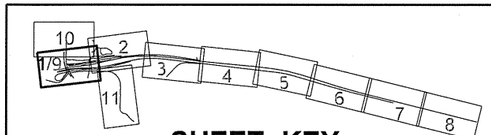
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

ALIGNMENT PLAN

PLAN REF. NO. AL02

SHEET 100 OF 1797 SHEETS

SEC. 21, T. 25 N. R. 4 E. W.M.



SHEET KEY

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE, SEE SHEET MK00.
2. FOR EASTBOUND LOOP RAMP & FLYER STOP CHANNELIZATION INFO, SEE SHEET MK01B

E HAMLIN ST
SR 513 (MONTLAKE BLVD)
E HAMLIN ST
MLHV 11+88.81
END 43:1 YELLOW EDGE LINE TAPER (4' RT)
MLHV 11+80.14 (3.8' RT)
END WIDE LANE LINE
END 22:1 WIDE LANE LINE TAPER
BEGIN YELLOW EDGE LINE
BEGIN 43:1 YELLOW EDGE LINE TAPER
END CROSSHATCH MARKING (CHEVRON)
MLV 561+62.45 (11' LT)
END WIDE LANE LINE
BEGIN WHITE EDGE LINE
MLHV 11+47.80 (16.2' LT)
END 24:1 WHITE EDGE LINE TAPER
END WHITE EDGE LINE
MLHV 13+59.19
END 48:1 YELLOW EDGE LINE TAPER (3.5' RT)
BEGIN 33:1 YELLOW EDGE LINE TAPER (3.5' RT)
BEGIN 22:1 WHITE EDGE LINE TAPER (12' LT)
MLHV 13+35.05
BEGIN 48:1 YELLOW EDGE LINE TAPER (4' RT)
BEGIN WHITE EDGE LINE (12' LT)
TRANSIT STOP PLATFORM
NEW 24th AVE BRIDGE
24th AVE E
MRV 554+62.96
END 124:1 YELLOW EDGE LINE TAPER (11' LT)
END 213:1 WIDE LANE LINE TAPER (11' RT)
MLV 557+52.56
END 26:1 WHITE EDGE LINE TAPER (23' LT)
BEGIN 47:1 WHITE EDGE LINE TAPER (23' LT)
8' WIDE PEDESTRIAN PATH
ACCESS TO MAINLINE
WB TRANSIT STOP
MLHV 11+85 (17.7' LT)
END 16:1 WHITE EDGE LINE TAPER
BEGIN 24:1 WHITE EDGE LINE TAPER
MLV 554+39.98
END 41:1 WHITE EDGE LINE TAPER (11' LT)
END 247:1 YELLOW EDGE LINE TAPER (11' RT)
BEGIN 26:1 WHITE EDGE LINE TAPER (11' LT)
MLHV 11+00.49 (17' LT)
BEGIN 16:1 WHITE EDGE LINE TAPER
EXISTING MEDIAN
EXISTING MONTLAKE BLVD UNDERCROSSING
MLV 553+66.00
BEGIN LANE LINE
BEGIN WHITE EDGE LINE (12.8' LT)
BEGIN 41:1 WHITE EDGE LINE TAPER (12.8' LT)
BEGIN YELLOW EDGE LINE (11.3' RT)
BEGIN 247:1 YELLOW EDGE LINE TAPER (11.3' RT)
MATCH EXISTING
PORTAGE BAY
MLHV 10+94.79
BEGIN 22:1 WIDE LANE LINE TAPER
MLV 559+12 (19.8' LT)
MLV 559+87 (20.5' LT)
MLV 558+37 (18.4' LT)
TRV LINE
MLV LINE
WB SR 520
MRV LINE
EB SR 520
MRHV LINE
DXEV LINE
MLHV LINE
EXISTING 24TH AVE UNDERCROSSING
EOP
MATCH LINE MLV 564+00 SEE SHEET MK02
MLV 559+03.97 (11' LT)
BEGIN WIDE DOTTED LANE LINE (11' LT)
MLHV 10+00.00
BEGIN WIDE LANE LINE
BEGIN CROSSHATCH MARKING (CHEVRON)
MLV 559+87.67
END 47:1 WHITE EDGE LINE TAPER (28' LT)
END WIDE DOTTED LANE LINE (11' LT)
BEGIN WIDE LANE LINE (11' LT)
BEGIN PROJECT
MRV 553+14.00
SR 520 MP 0.88
MRV 553+14.00
BEGIN LANE LINE
BEGIN YELLOW EDGE LINE (12.2' LT)
BEGIN 124:1 YELLOW EDGE LINE TAPER (12.2' LT)
BEGIN WIDE LANE LINE (11.7' RT)
BEGIN 213:1 WIDE LANE LINE TAPER (11.7' RT)
MATCH EXISTING
MRV 555+15.52 (11' RT)
END WIDE LANE LINE
BEGIN WHITE EDGE LINE
MATCH LINE DXEV 14+50 SEE SHEET MK09
E NORTH ST
24th AVE E
E UNIVERSITY ST
E ROANOKE ST
MONTLAKE BLVD
SEE SHEET MK09 FOR LOCAL STREET AND RAMP DESIGN WITHIN THIS AREA
0 50 100
SCALE IN FEET

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\MK\WABN\PE2344_WABN_PS_MK_01A.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	9:55:16 AM				10	WASH	
DATE	4/4/2014				JOB NUMBER		
PLOTTED BY	deguzma				13A012		
DESIGNED BY	K. PRIHAR				CONTRACT NO.		LOCATION NO.
ENTERED BY	S. SHARPE						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR ENGINEERING INC.

PHILIP D. MERRELL — STATE OF WASHINGTON — 29206 — REGISTERED PROFESSIONAL ENGINEER
4/4/14
P.E. STAMP BOX — DATE

Washington State Department of Transportation

PARSONS BRINCKERHOFF — Parametrix — ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

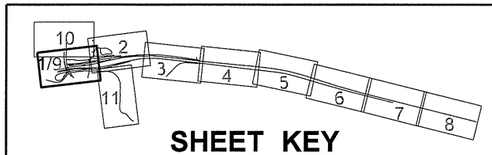
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

PLAN REF. NO. MK01A

SHEET 493 OF 1797 SHEETS

SEC. 21, T. 25 N. R. 4 E. W.M.



SHEET KEY

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE, SEE SHEET MK00.
2. FOR MAINLINE AND WESTBOUND FLYER STOP CHANNELIZATION INFO, SEE SHEET MK01A

E HAMLIN ST
SR 513 (MONTLAKE BLVD)
GRAVEL WALK
PORTAGE BAY
E ROANOKE ST
E NORTH ST
E UNIVERSITY ST
24th AVE E
LAKE BLVD
NEW 24th AVE BRIDGE
MATCH LINE MLV 564+00 SEE SHEET MK02

MRHV 10+00.00
BEGIN WHITE EDGE LINE (11.7' RT)
BEGIN 238:1 WHITE EDGE LINE TAPER (11.7' RT)
BEGIN CROSSHATCH MARKING (CHEVRON)
BEGIN WIDE LANE LINE
MATCH EXISTING
DXEV 16+37.29
BEGIN 300:1 WIDE LANE LINE LANE SHIFT
END 71:1 YELLOW EDGE LINE TAPER (13' LT)
BEGIN 43:1 YELLOW EDGE LINE TAPER (13' LT)
BEGIN 27:1 WHITE EDGE LINE TAPER (16' RT)

8 MRHV 10+13 (5.5' RT)
MRHV 11+66.88 (11' RT)
END 238:1 WHITE EDGE LINE TAPER
BEGIN 73:1 WHITE EDGE LINE TAPER
1 DXEV 16+96 (6.2' LT)
8 MRHV 11+38 (5.6' RT)

MRHV 16+43.70 (12' RT)
END WIDE LANE LINE
MRHV 16+05.80 (12' RT)
END 122:1 LANE TAPER
MRHV 15+79.95 (11.9' RT)
END WHITE EDGE LINE
BEGIN WIDE LANE LINE
MRHV 14+83.67 (13' RT)
BEGIN 122:1 LANE TAPER

SEE SHEET MK09 FOR LOCAL STREET AND RAMP DESIGN WITHIN THIS AREA

DXEV 15+66.11 (14' LT)
BEGIN 71:1 YELLOW EDGE LINE TAPER

End Existing Segment 2
Begin Existing Segment 3
DXEV 16+37.29

EXISTING CURB
1 DXEV 14+68 (7' LT)
MATCH LINE DXEV 14+50 SEE SHEET MK09

DXEV 17+87.29
END 300:1 WIDE LANE LINE LANE SHIFT (0.5' RT)
END 43:1 YELLOW EDGE LINE TAPER (9.5' LT)
END 27:1 WHITE EDGE LINE TAPER (10.5' RT)

MRHV 11+92.18
END WIDE LANE LINE
BEGIN YELLOW EDGE LINE
END CROSSHATCH MARKING (CHEVRON)

EXISTING CURB
MRHV 13+13.25 (13' RT)
END 73:1 WHITE EDGE LINE TAPER

DXEV 20+49.27
BEGIN 418:1 WIDE LANE LINE LANE SHIFT (0.5' RT)
BEGIN 133:1 YELLOW EDGE LINE TAPER (9.5' LT)
BEGIN 418:1 WHITE EDGE LINE TAPER (10.5' RT)

EXISTING TRANSIT STOP

End Existing Segment 3
Begin Existing Segment 4
DXEV 22+58.30

EXISTING MEDIAN
1 DXEV 21+95 (5.3' LT)

DXEV 21+95.27 (10.6' LT)
END YELLOW EDGE LINE
END 133:1 YELLOW EDGE LINE TAPER
BEGIN WIDE LANE LINE
BEGIN 158:1 WIDE LANE LINE TAPER

EXISTING CURB
1 DXEV 23+99 (5.5' LT)
DXEV 23+98.20 (0'-11' RT)
STOP LINE

DXEV 22+58.30
END 418:1 WIDE LANE LINE LANE SHIFT
END 158:1 WIDE LANE LINE TAPER (11' LT)
END 418:1 WHITE EDGE LINE TAPER (11' RT)
END WIDE LANE LINE (11' LT)

EXISTING RETAINING WALL

End Existing Segment 4
DXEV 23+98.20
(@ Metered On-Ramp Stop Line)

DXEV 26+19 (1.4' RT)
DXEV 25+58 (2.7' RT)
DXEV 25+23.73 (10' RT)
END 26:1 WHITE EDGE LINE TAPER
BEGIN 52:1 WHITE EDGE LINE TAPER
DXEV 24+98.20
END WIDE LANE LINE
BEGIN 26:1 WHITE EDGE LINE TAPER (11' RT)
DXEV 24+98 (5.5' RT)

TRV LINE
MLHV LINE
MLV LINE
WB SR 520
MRV LINE
EB SR 520
MRHV LINE
DXEV LINE
EOP

0 100 FEET

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\MK\WABN\PE2344_WABN_PS_MK_01B.dgn				REGION NO. 10	STATE WASH	FED.AID PROJ.NO.
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DATE	4/4/2014				JOB NUMBER 13A012		
PLOTTED BY	deguzma						
DESIGNED BY	K. PRIHAR				CONTRACT NO.	LOCATION NO.	
ENTERED BY	S. SHARPE						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR ENGINEERING INC.

PHILIP D. MERRELL STATE OF WASHINGTON 23206 REGISTERED PROFESSIONAL ENGINEER
4/4/14 DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

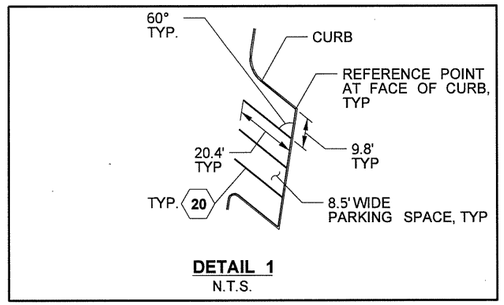
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

PLAN REF. NO. MK01B

SHEET 494 OF 1797 SHEETS

SEC 21, T. 25 N. R. 4 E. W.M.



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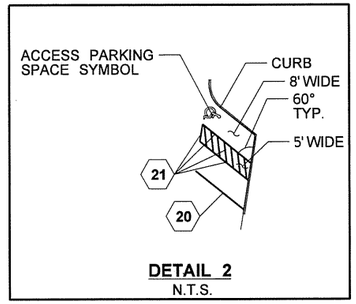

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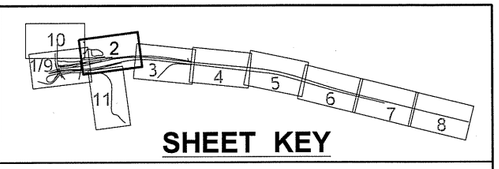


SHEET KEY

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE SEE SHEET MK00.

MATCH LINE SEE SHEET MK10
E SHELBY ST
PARK DRIVE E
EPDV LINE
SEE DETAIL 1
SEE DETAIL 1
SEE DETAIL 1
BACK-IN PARKING
SEE DETAIL 2
SEE DETAIL 1
PARV LINE
E HAMLIN ST
MATCH LINE PARV 13+00 SEE SHEET MK09
MLHV 18+00.89
END CROSSHATCH MARKING (CHEVRON)
END WIDE LANE LINE
END WIDE LANE LINE
BEGIN WHITE EDGE LINE
MLV 567+85.55 (26' LT)
BEGIN 49:1 WHITE EDGE LINE TAPER
WPXV 15+34.41
END YELLOW EDGE LINE
BEGIN CROSSHATCH MARKING (CHEVRON)
BEGIN WIDE LANE LINE
WDXV 21+96.32 (25' LT)
END WHITE EDGE LINE
BEGIN WIDE LANE LINE
EPDV 12+38.16 (22.7' RT)
EPDV 11+98.90 (22.7' RT)
EPDV 11+75.80 (22.7' RT)
EPDV 11+36.54 (22.7' RT)
EPDV 11+13.45 (22.7 RT)
EPDV 10+68.99 (22.7' RT)
15' PEDESTRIAN PATH/MAINTENANCE ACCESS ROAD
CONNECTION TO EXISTING PATH
RAMV LINE
17' WIDE
STORMWATER FACILITY
WPXV 12+94 (15' LT)
END WHITECROSSHATCH MARKING (DIAGNOL), 45° ANGLE 20' SPACING (TYP)
PEDESTRIAN ACCESS ROUTE CONNECTION TO PARK AVE E
UTILITY PADS
MLV 569+33.37 (23' LT)
BEGIN WHITE CROSSHATCH MARKING (DIAGNOL), 45° ANGLE, 30' SPACING (TYP)
END 49:1 WHITE EDGE LINE TAPER
BEGIN 10:1 WHITE EDGE LINE TAPER
MLV 569+60.00 (12' RT)
BEGIN YELLOW CROSSHATCH MARKING (DIAGNOL), 45° ANGLE 100' SPACING (TYP)
MLV 570+53.02 (11' LT)
END WHITE CROSSHATCH MARKING (DIAGNOL), 45° ANGLE, 30' SPACING (TYP)
BEGIN WHITE CROSSHATCH MARKING (DIAGNOL), 45° ANGLE, 100' SPACING (TYP)
END 10:1 WHITE EDGE LINE TAPER
END/BEGIN WHITE EDGE LINE
WDXV 25+14.67
END WIDE LANE LINE(25' LT)
BEGIN 15:1 WHITE EDGE LINE TAPER (40' LT)
WPXV 18+54.84
END WIDE LANE LINE
END CHEVRON CROSSHATCH MARKING
WDXV 27+41.28 (25' LT)
END 15:1 WHITE EDGE LINE TAPER
MLV 576+60.00 (12' RT)
END YELLOW CROSSHATCH MARKING (DIAGNOL) 45° ANGLE 100' SPACING (TYP)
WEST APPROACH BRIDGE NORTH
REGIONAL SHARED-USE PATH
MATCH LINE WPXV 11+65 SEE SHEET MK09
WPXV LINE
MATCH LINE MLV 564+05 SEE SHEETS MK01B & MK09 MLV 564+05 SEE SHEETS MK01A, MK01B & MK09
WDXV LINE
MLHV LINE
WB SR 520
MLV LINE
WB SR 520
MATCH LINE MLV 577+50 SEE SHEET MK03
MLHV 14+25.06 (15' LT)
END 22:1 WHITE EDGE LINE TAPER
MLHV 14+73.19
END 33:1 YELLOW EDGE LINE TAPER
END YELLOW EDGE LINE
BEGIN CROSSHATCH MARKING (CHEVRON)
BEGIN WIDE LANE LINE
MLV 564+20.17 (11' RT)
BEGIN 252:1 YELLOW EDGE LINE TAPER
MLHV 15+30 (7.5' LT)
MLV 564+59.29 (11' LT)
END WHITE EDGE LINE
BEGIN WIDE LANE LINE
MLHV 17+35 (7.5' LT)
MLV 566+72.65 (12' RT)
END 252:1 YELLOW EDGE LINE TAPER
MLV 569+18 (17.5' LT)
WEST APPROACH BRIDGE NORTH ABUTMENT
EB SR 520
MRV LINE
EB SR 520
DXEV LINE
R=2556'
EOP
MRV 566+99.36(11' RT)
END WHITE EDGE LINE
BEGIN WIDE LANE LINE
DXEV 29+92.29 (15' LT)
END YELLOW EDGE LINE
BEGIN WIDE LANE LINE
BEGIN CROSSHATCH MARKING (CHEVRON)
DXEV 30+42.87
END 52:1 WHITE EDGE LINE TAPER
BEGIN 57:1 WIDE LANE LINE TAPER (15' LT)
MRV 567+94.49 (11' LT)
BEGIN WIDE DOTTED LANE LINE
BEGIN 15:1 YELLOW EDGE LINE TAPER
MRV 569+74.49 (23' LT)
END 15:1 YELLOW EDGE LINE TAPER
DXEV 32+71.77 (11' LT)
END 57:1 WIDE LANE LINE TAPER
MATCH LINE SEE SHEET MK11
EXISTING BRIDGE ABUTMENT
MRV 570+80 (17' LT)
MRV 570+74.49 (11' LT) DECK
END WIDE DOTTED LANE LINE
BEGIN WIDE LANE LINE
BRIDGE WIDENING
EDGE OF BRIDGE
EXISTING UNION BAY BRIDGE
DXEV 35+71.48 (11' LT)
END WIDE LANE LINE
END CROSSHATCH MARKING (CHEVRON)
MRV 572+78.57 (11' RT)
END WIDE LANE LINE
BEGIN WIDE DOTTED LANE LINE
MRV 577+20.00 (22' RT)
BEGIN WHITE CROSSHATCH MARKING (DIAGNOL), 45° ANGLE 100' SPACING (TYP)

0 50 100
SCALE IN FEET

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\MK\WABN\PE2344_WABN_PS_MK_02.dgn				REGION NO. 10	STATE WASH	FED.AID PROJ.NO.
TIME	9:56:03 AM				JOB NUMBER 13A012		
DATE	4/4/2014				CONTRACT NO.		LOCATION NO.
PLOTTED BY	deguzma						
DESIGNED BY	K. PRIHAR						
ENTERED BY	S. SHARPE						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR ENGINEERING INC.

PHILIP D. MERRELL STATE OF WASHINGTON 23206 REGISTERED PROFESSIONAL ENGINEER
4/4/14
DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

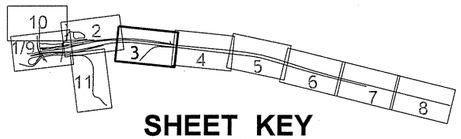
PLAN REF. NO. MK02

SHEET 495 OF 1797 SHEETS

SEC. 21, T. 25 N. R. 4 E. W.M.

SEC. 22, T. 25 N. R. 4 E. W.M.

SHEET KEY



DETAIL 1
N.T.S.

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE SEE SHEET MK00.

FILE NAME	PW:\CADDProj\WestsideCADD\PS&ESheets\MK\WABN\PE2344_WABN_PS_MK_03.dgn				REGION NO. 10	STATE WASH	FED.AID PROJ.NO.
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DESIGNED BY	K. PRIHAR				CONTRACT NO.		LOCATION NO.
ENTERED BY	S. SHARPE						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR ENGINEERING INC.

PHILIP D. MERRELL — STATE OF WASHINGTON — 22010 — REGISTERED PROFESSIONAL ENGINEER — 4/9/14 DATE

P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix — ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

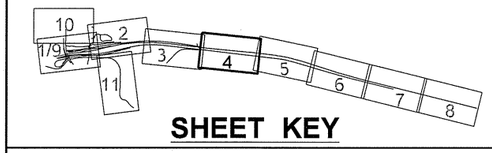
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

PLAN REF. NO. MK03

SHEET 496 OF 1797 SHEETS

SEC. 22, T. 25 N. R. 4 E. W.M.



SHEET KEY

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE SEE SHEET MK00.

LAKE WASHINGTON

ML 94+73.26 (22' LT)
END 21:1 WHITE EDGE LINE TAPER

WEST APPROACH BRIDGE NORTH

EQUIPMENT PLATFORM

BELVEDERE

BELVEDERE

REGIONAL SHARED-USE PATH

MATCH LINE ML 92+00 SEE SHEET MK03

MATCH LINE ML 107+00 SEE SHEET MK05

ML LINE

WB SR 520

MRV LINE

EB SR 520

EXISTING EOP

MRV 597+32 (16.5' RT)

MRV 598+32 (16.5' RT)

MRV 599+32 (16.5' RT)

MRV 598+39.66 (11' RT)
END WIDE DOTTED LANE LINE

MRV 600+75 (17' LT)

MRV 602+39.61 (11' RT)
END 27:1 WHITE EDGE LINE TAPER

MRV 599+90 (20.2' RT)
BEGIN WHITE CROSSHATCH MARKING (DIAGNOL), 45° ANGLE, 100' SPACING, TYP

MRV 593+26.43
END WIDE LANE LINE (11' RT)
BEGIN WIDE DOTTED LANE LINE (11' RT)
END 40:1 WHITE EDGE LINE TAPER (22' RT)

EXISTING WEST APPROACH BRIDGE

MRV 599+39.66 (22' RT)
BEGIN 27:1 WHITE EDGE LINE TAPER

EXISTING WEST APPROACH BRIDGE ABUTMENT

LAKE WASHINGTON

0 50 100
SCALE IN FEET

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DATE	4/4/2014						
PLOTTED BY	deguzma				JOB NUMBER 13A012		
DESIGNED BY	K. PRIHAR						
ENTERED BY	S. SHARPE				CONTRACT NO.		LOCATION NO.
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

HDR ENGINEERING INC.

PHILIP D. MERRELL — STATE OF WASHINGTON — 22306 — REGISTERED PROFESSIONAL ENGINEER
4/9/14
DATE
P.E. STAMP BOX

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix

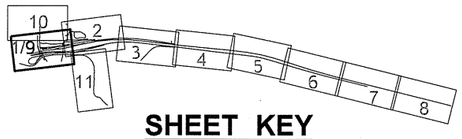
SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

PLAN REF. NO. MK04

SHEET 497 OF 1797 SHEETS

SEC. 21, T. 25 N. R.4 E. W.M.



SHEET KEY

NOTES

1. FOR LEGENDS, ABBREVIATIONS, FLEXIBLE GUIDE POST & BARRIER DELINEATION SCHEDULE SEE SHEET MK00.
2. STRIPING PATTERNS FOR DXNV, DXSV AND FXV ALIGNMENTS, SEE GENERAL NOTE 16, MKQ SHEETS.
3. MEDIAN CURB IS PAINTED ON TOP & FACE OF CURB WITH YELLOW PAINT:

   DXSV 11+87 (20.0' RT) TO DXSV 14+13 (21.2' RT) &
   DXNV 11+97 (11.1' LT) TO DXNV 14+13 (12.9' LT)

E HAMLIN ST

MATCH LINE DXNV 17+00
SEE SHEET MK10

TRANSIT STOP

BICYCLE LOCKER PADS

MATCH LINE PARV 13+00
SEE SHEET MK02

SEE INTERSECTION #2 DETAIL, SHEET MK13 FOR STRIPING

SR 513 (MONTLAKE BLVD)

CONCRETE CURB

PARV LINE

WDXV 10+83.18 (26.2' LT)
BEGIN WHITE EDGE LINE
WDXV 10+82.33 (12.5' LT)
BEGIN LANE LINE

11 WPXV 9+41

16' PEDESTRIAN ACCESS ROUTE

SWV LINE

SUPV LINE

MATCH LINE WPXV 11+65
SEE SHEET MK02

SEE NOTE 3

EXISTING SIDEWALK

WDXV 11+28 (6.2' RT & 18.7' LT) 4

PEDESTRIAN ACCESS ROUTE

GRAVEL WALK

DXRV 13+64.95 (12.5' RT)
BEGIN 25:1 WHITE EDGE LINE TAPER

DXEV 11+35.67
END WIDE DOTTED LANE LINE
END 7:1 WIDE DOTTED LANE LINE TAPER
BEGIN WIDE LANE LINE

DXRV 13+40.42
BEGIN WIDE LANE LINE

WDXV LINE

WPXV 9+53.00
END 5:1 WHITE EDGE LINE TAPER (15' LT)
END 8:1 YELLOW EDGE LINE TAPER

WPXV 9+28.00
BEGIN YELLOW EDGE LINE (3.1' RT)
BEGIN WHITE EDGE LINE (19.9' LT)
BEGIN 8:1 YELLOW EDGE LINE TAPER (3.1' RT)
BEGIN 5:1 WHITE EDGE LINE TAPER (19.9' LT)

WDXV 10+81.55
BEGIN YELLOW EDGE LINE
EXISTING SIDEWALK

SEE SHEET MK01 FOR MAINLINE AREA DESIGN WITHIN THIS AREA

WPXV 9+54 (15' LT)
BEGIN WHITE CROSSHATCH MARKING (DIAGNOL) LINE, 45° ANGLE, 20' SPACING

Begin Existing Segment 1
DXEV 10+68
(see Note 1)

DXRV LINE

DXNV LINE

WDXV 12+28 (6.2' RT & 18.7' LT) 4

FOR INTERSECTION #1 DETAIL AND ADDITIONAL MARKING, SEE SHEET MK12

FOR INTERSECTION #3 DETAIL SEE SHEET MK13

FXV 11+91.69 (11' LT)
BEGIN 44:1 WHITE DOTTED EXTENTION LINE TAPER

11' LANE

WPXV 7+38.49 (7.9' LT)
BEGIN WIDE LINE

FXV 16+05.00
END 68:1 DOUBLE YELLOW CENTER LINE TAPER

MATCH LINE MLV 564+00 SEE SHEET MK02

End Existing Segment 1
Begin Existing Segment 2
DXEV 12+52.69 (PC)

EXTRUDED CURB

1 DXEV 12+51 (5.5' LT)

DXEV 11+43.25 (11' RT)
END 25:1 WIDE LANE LINE TAPER
END WIDE LANE LINE
BEGIN WIDE BROKEN LANE LINE

DXRV 14+02.37 (11' RT)
END 25:1 WHITE EDGE LINE TAPER
BEGIN WIDE DOTTED LANE LINE

DXEV 11+93.25 (11' RT)
END WIDE DOTTED LANE LINE

DXEV EDGE LINE TAPER (22' RT)
END 20:1 WHITE EDGE LINE TAPER (16' RT)
END 40:1 YELLOW EDGE LINE TAPER (14' LT)
EDGE LINE TAPER (11' LT)

12 DXEV 12+49 (17.2' RT)

2 3 EDXV 13+85 (8.3' LT) & (7.2' RT) 4

EDXV 12+10.87 (14.5' LT)
END 98:1 YELLOW EDGE LINE TAPER

MATCH LINE DXEV 14+50 SEE SHEET MK01A/MK01B

EDXV LINE

EDXV 10+00.00
BEGIN WHITE EDGE LINE
BEGIN YELLOW EDGE LINE (14' LT)

EDXV 11+62.10
BEGIN 6:1 WHITE EDGE LINE TAPER
BEGIN 98:1 YELLOW EDGE LINE TAPER (14' LT)

EDXV 12+46.32 (14.5' RT)
END 6:1 WHITE EDGE LINE TAPER

EDXV 12+96.32
BEGIN WIDE BROKEN LANE LINE

2 3 EDXV 13+00 (7.2' LT & RT)

EDXV 13+48.35 (14.5' LT)
BEGIN 19:1 YELLOW EDGE LINE TAPER

EDXV 14+35.49 (14.5' RT)
BEGIN 25:1 WHITE EDGE LINE TAPER

EDXV 14+88.86
BEGIN LANE LINE (11' LT)
END 19:1 YELLOW EDGE LINE TAPER (22' LT)
END WIDE BROKEN LANE LINE
BEGIN WIDE LANE LINE

E ROANOKE ST

EDXV 14+92 (5.5' & 16.5' LT, 6' RT) 3 3 2

EDXV 15+85 (5.5' & 16.5' LT) 3 3

6 EDXV 15+88 (5.5' RT)

EDXV 15+22.99 (11' RT)
END 25:1 WHITE EDGE LINE TAPER

EDXV 16+72.87 (11' LT)
END LANE LINE
FOR TRAFFIC ISLAND #5
SEE SHEET MK15

DXEV 10+68.23 (9' LT)
BEGIN WIDE DOTTED LANE LINE
BEGIN 7:1 WIDE DOTTED LANE LINE TAPER

DXSV LINE

DXNV 11+38.96=
SR 513 MP 0.00

BEGIN CONSTRUCTION
DXNV 9+50.14

E NORTH ST

7' PARKING LANE
FXV 14+68.48
END DOUBLE YELLOW CENTER LINE
FXV 13+01.31 (10' LT)
END WHITE DOTTED EXTENSION LINE
BEGIN LANE LINE
FXV 12+67.82 (10' RT)
END 128:1 WHITE EDGE LINE TAPER
FXV 12+36.17 (10' LT)
END 44:1 WHITE DOTTED EXTENSION LINE TAPER

FXV LINE

LAKE WASHINGTON BLVD

FXV 15+43.57 (0.9' LT)
BEGIN DOUBLE YELLOW CENTER LINE
BEGIN :1 DOUBLE YELLOW CENTER LINE TAPER

FXV 17+12.97
END DOUBLE YELLOW CENTER LINE
BEGIN YELLOW CENTER LINE
BEGIN 67:1 WHITE EDGE LINE TAPER (10' RT)
FXV 17+32.97
END YELLOW CENTER LINE
END WHITE EDGE LINE (9.7' RT)
END 67:1 WHITE EDGE LINE TAPER (9.7' RT)
MATCH EXISTING

SPXV LINE

MATCH LINE FXV 17+50 SEE SHEET MK11

E UNIVERSITY ST

0 50 100
SCALE IN FEET

Note 1: Segment 1 transitions from a 3 lane section down to two lane section. Per HSM ISATe, max lanes that can be modeled for urban locations is 2 lanes. For modeling purposes, segment 1 has been modeled with 2 lanes.

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TIME	9:58:39 AM				10	WASH	
DATE	4/4/2014				JOB NUMBER		
PLOTTED BY	deguzma				13A012		
DESIGNED BY	K. PRIHAR				CONTRACT NO.		LOCATION
ENTERED BY	S. SHARPE						
CHECKED BY	P. MERRELL						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. MEREDITH	REVISION	DATE	BY			

Washington State Department of Transportation

PARSONS BRINCKERHOFF | Parametrix

SR 520
MONTLAKE TO EVERGREEN PT. BRIDGE
WEST APPROACH BRIDGE NORTH

PAVEMENT MARKING PLAN

PLAN REF. NO. MK09

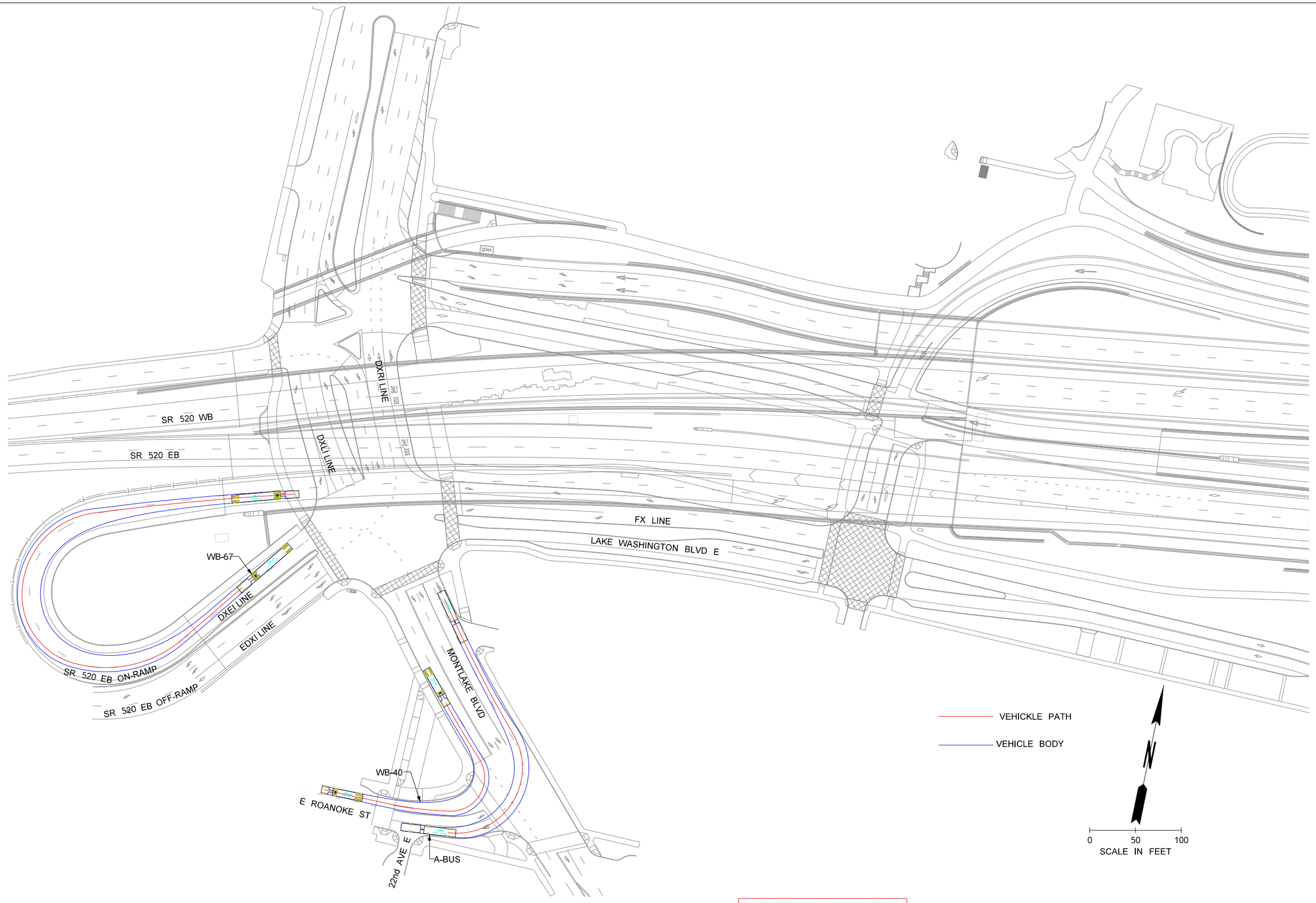
SHEET 502 OF 1797 SHEETS

APPENDIX C

Auto-Turn Exhibits

Washington State Department of Transportation

SR 520, MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT
DESIGN ANALYSIS #5 - EB ON-RAMP @ MONTLAKE BLVD (DXEI)



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Washington State Department of Transportation

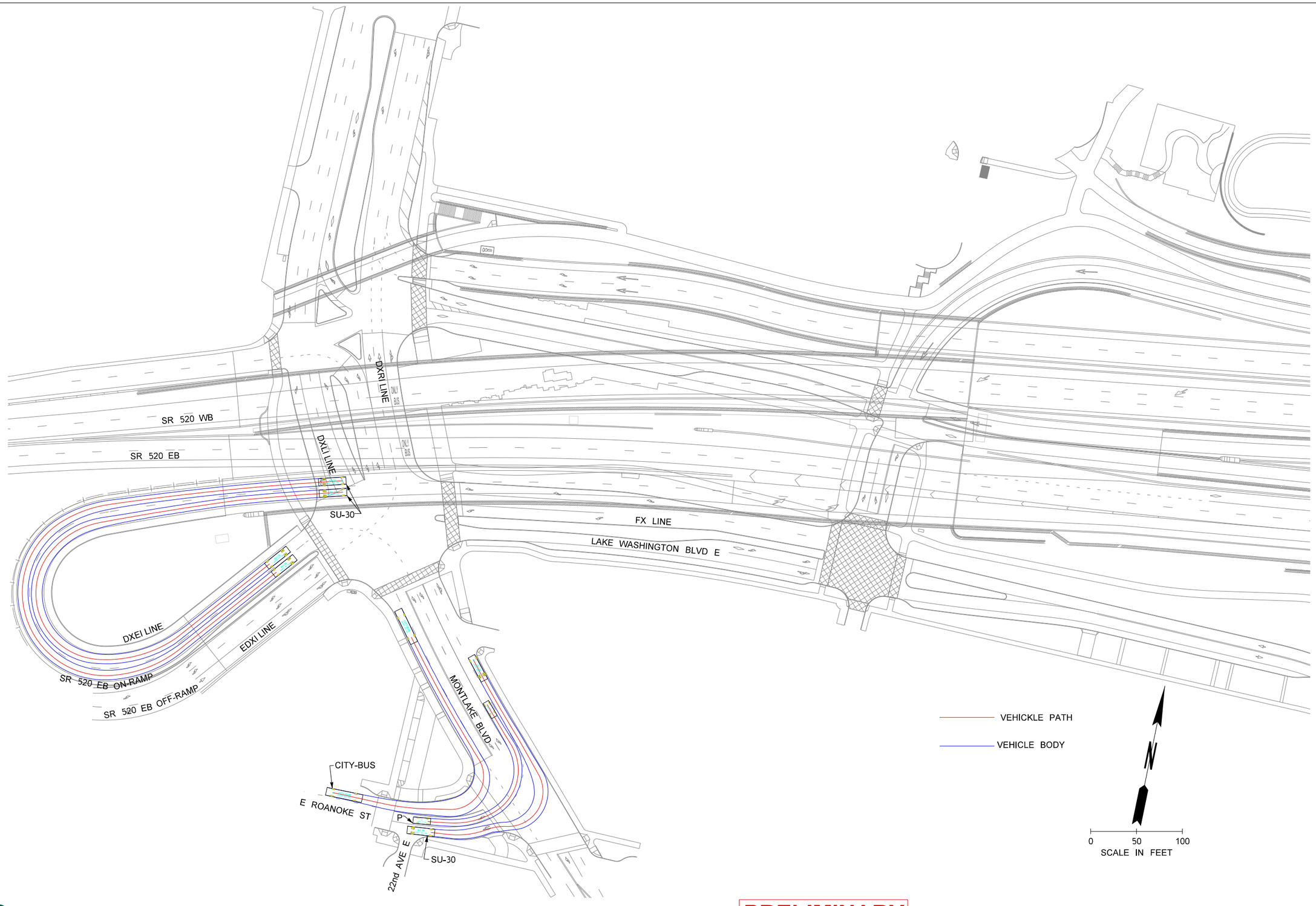
SR 520 Bridge Replacement and HOV Program

U.S. Department of Transportation
Federal Highway Administration

PRELIMINARY
NOT FOR CONSTRUCTION
SUBJECT TO CHANGE WITHOUT NOTIFICATION

AUTO-TURN EASTBOUND LOOP RAMPS AND E. ROANOKE ST @ MONTLAKE BLVD

EXHIBIT 03A



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Washington State Department of Transportation
SR 520 Bridge Replacement and HOV Program

U.S. Department of Transportation
Federal Highway Administration

PRELIMINARY
NOT FOR CONSTRUCTION
SUBJECT TO CHANGE WITHOUT NOTIFICATION

AUTO-TURN EASTBOUND LOOP RAMPS AND E. ROANOKE ST @ MONTLAKE BLVD

EXHIBIT 03B

APPENDIX D

Quantitative Analysis

For Barrier Shy Distance Only

(HSM Freeway Model / ISATe)

Washington State Department of Transportation

SR 520, MONTLAKE TO LAKE WASHINGTON
I/C AND BRIDGE REPLACEMENT
DESIGN ANALYSIS #5 - EB ON-RAMP @ MONTLAKE (DXEI)

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

Output Summary

General Information

Project description:	SR 520, Montlake to Lk Wash I/C and Br Replacement (DXEI OnRmp @ Mntlk) - BS1a				
Analyst:	jh	Date:	12/3/2017	Area type:	Urban
First year of analysis:	2017				
Last year of analysis:	2017				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	4.6	0.0	0.1	0.4	1.0	3.1
Estimated average crash freq. during Study Period, crashes/yr:	4.6	0.0	0.1	0.4	1.0	3.1

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	2	4.6	0.0	0.1	0.4	1.0	3.1
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2017	4.6	0.0	0.1	0.4	1.0	3.1
	2018						
	2019						
	2020						
	2021						
	2022						
	2023						
	2024						
	2025						
	2026						
	2027						
	2028						
	2029						
	2030						
	2031						
	2032						
	2033						
	2034						
	2035						
	2036						
	2037						
	2038						
	2039						
	2040						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Rear-end crashes:	0.6	0.0	0.0	0.1	0.2	0.4
	Sideswipe crashes:	0.3	0.0	0.0	0.0	0.0	0.2
	Other multiple-vehicle crashes:	0.1	0.0	0.0	0.0	0.0	0.1
	Total multiple-vehicle crashes:	1.0	0.0	0.0	0.1	0.2	0.7
Single vehicle	Crashes with animal:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with fixed object:	2.8	0.0	0.0	0.2	0.5	2.0
	Crashes with other object:	0.1	0.0	0.0	0.0	0.0	0.1
	Crashes with parked vehicle:	0.0	0.0	0.0	0.0	0.0	0.0
	Other single-vehicle crashes	0.6	0.0	0.0	0.1	0.2	0.3
	Total single-vehicle crashes:	3.5	0.0	0.1	0.3	0.8	2.4
	Total crashes:	4.6	0.0	0.1	0.4	1.0	3.1

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake to Lk Wash I/C and Br Replacement (DXEI OnRmp @ Mntlk) - BS1a				
Analyst:	jh	Date:	12/3/2017	Area type:	Urban
First year of analysis:	2017	Total length of freeway segments for Study Period (mi):	0.000		
Last year of analysis:	2017				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEI 14+40 to 16+44.59		21	0
2	DXEI 16+44.69 to 23+29.80		22	0
3	0		23	0
4	0		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

Input Worksheet for Ramp Segments						
Clear	Echo Input Values (View results in Column CJ)	Check Input Values (View results in Advisory Messages)	Segment 1 **Study Period**	Segment 2 **Study Period**	Segment 3 **Study Period**	Segment 4 **Study Period**
Basic Roadway Data						
Number of through lanes (n):			2	2		
Ramp segment description:			DXEI 14+40 t	DXEI 16+44.69 to 23+29.80		
Segment length (L), mi:			0.04	0.13		
Average traffic speed on the freeway (V_{frwy}), mi/h:			60	60		
Segment type (ramp or collector-distributor road):			Entrance	Entrance		
Type of control at crossroad ramp terminal:			Signal	Signal		
Alignment Data						
Horizontal Curve Data		← See notes →				
1	Horizontal curve?:		In Seg.	In Seg.		
	Curve radius (R_1), ft:		100	2927		
	Length of curve (L_{c1}), mi:		0.05	0.13		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.03	0.13		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.06	0.12		
2	Horizontal curve?:		In Seg.	No		
	Curve radius (R_2), ft:		112			
	Length of curve (L_{c2}), mi:		0.01			
	Length of curve in segment ($L_{c2,seg}$), mi:		0.01			
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.11			
3	Horizontal curve?:		No			
	Curve radius (R_3), ft:					
	Length of curve (L_{c3}), mi:					
	Length of curve in segment ($L_{c3,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:					
4	Horizontal curve?:					
	Curve radius (R_4), ft:					
	Length of curve (L_{c4}), mi:					
	Length of curve in segment ($L_{c4,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:					
5	Horizontal curve?:					
	Curve radius (R_5), ft:					
	Length of curve (L_{c5}), mi:					
	Length of curve in segment ($L_{c5,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:					
Cross Section Data						
Lane width (W_l), ft:			15	12.5		
Right shoulder width (W_{rs}), ft:			8	8		
Left shoulder width (W_{ls}), ft:			4	4		
Presence of lane add or lane drop by taper:			No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:					
Roadside Data						
Presence of barrier on right side of roadway:			No	Yes		
1	Length of barrier ($L_{rb,1}$), mi:			0.11		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:			8		

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

2	Length of barrier ($L_{rb,2}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:				
3	Length of barrier ($L_{rb,3}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:				
4	Length of barrier ($L_{rb,4}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:				
5	Length of barrier ($L_{rb,5}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:				
Presence of barrier on left side of roadway:		Yes	Yes		
1	Length of barrier ($L_{lb,1}$), mi:	0.04	0.13		
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:	4	4		
2	Length of barrier ($L_{lb,2}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:				
3	Length of barrier ($L_{lb,3}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:				
4	Length of barrier ($L_{lb,4}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:				
5	Length of barrier ($L_{lb,5}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:				
Ramp Access Data	↖ See note				
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:				
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:				
Weaving Section	Weave section in collector-distributor road segment?:				
	Length of weaving section (L_{wev}), mi:				
	Length of weaving section in segment ($L_{wev,seg}$), mi:				

Traffic Data	**Year**				
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2017	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2018				
	2019				
	2020				
	2021				
	2022				
	2023				
	2024				
	2025				
	2026				
	2027				
	2028				
	2029				
	2030				
	2031				
	2032				
	2033				
	2034				
	2035				
	2036				
	2037				
	2038				
	2039				
	2040				

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

Crash Data		**Year**		Segment Crashes -->			
Count of Fatal-and-Injury (FI) Crashes by Year							
	Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2017					
		2018					
		2019					
		2020					
		2021					
	Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2017					
		2018					
		2019					
		2020					
		2021					
Count of Property-Damage-Only (PDO) Crashes by Year							
	Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2017					
		2018					
		2019					
		2020					
		2021					
	Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2017					
		2018					
		2019					
		2020					
		2021					

Advisory Messages

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

Variable Limits				
Number of through lanes (n):	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc2,seg), mi:	0.01	0.13	0	0
Length of curve in segment (Lc3,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.13	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.13	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.13	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.13	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.13	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a

Output Worksheet for Ramp Segments					
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period
Crash Modification Factors					
Fatal-and-Injury Crash CMFs					
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		7.158	1.013	
		SV	20.021	1.041	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	0.955	1.071	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.273	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.323	1.323	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV			
	Year:	2017	1.000	1.000	
		2018			
		2019			
		2020			
		2021			
		2022			
		2023			
		2024			
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		2038			
		2039			
		2040			
Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.000	
Property-Damage-Only Crash CMFs					
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		5.308	1.009	
		SV	25.792	1.054	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	1.000	1.000	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.248	

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.293	1.293	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV			
	Year:	2017	1.000	1.000	
		2018			
		2019			
		2020			
		2021			
		2022			
		2023			
		2024			
		2025			
		2026			
		2027			
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		2036			
		2037			
		2038			
		2039			
		2040			
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	

Predicted Average Crash Frequency

Fatal-and-Injury Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,mv,fi}$):				
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:				
Predicted average crash frequency	2017	0.193	0.127	
($N_{p,w,x,mv,fi}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
	2025			
	2026			
	2027			
	2028			
	2029			
	2030			

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

	2031			
	2032			
	2033			
	2034			
	2035			
	2036			
	2037			
	2038			
	2039			
	2040			
Single-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,sv,fi}$):				
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:				
Predicted average crash frequency ($N_{p,w,x,sv,fi}$), crashes/yr:	2017	0.926	0.223	
	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
	2025			
	2026			
	2027			
	2028			
	2029			
	2030			
	2031			
	2032			
	2033			
	2034			
	2035			
	2036			
	2037			
	2038			
	2039			
	2040			
Property-Damage-Only Crash Frequency				
Multiple-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,mv,pdo}$):				
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:				
Predicted average crash frequency	2017	0.393	0.303	

($N_{p,w,x,mv,pdo}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
	2025			
	2026			
	2027			
	2028			
	2029			
	2030			
	2031			
	2032			
	2033			
	2034			
	2035			
	2036			
	2037			
	2038			
	2039			
	2040			
Single-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,sv,pdo}$):				
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:				
Predicted average crash frequency	2017	2.057	0.341	
($N_{p,w,x,sv,pdo}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
	2025			
	2026			
	2027			
	2028			
	2029			
	2030			
	2031			
	2032			
	2033			
	2034			
	2035			
	2036			
	2037			

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

		2038			
		2039			
		2040			
Crash Severity Distribution (during Study Period)					
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:			0.019	0.005	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:			0.059	0.016	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:			0.312	0.086	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:			0.729	0.243	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:			1.119	0.350	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:			2.450	0.644	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:			3.569	0.994	
Intermediate Results					
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			36.6	100.7	
Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:			55.1	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:			36.6	87.2	
Proportion of segment length with curve 1 ($P_{c,1}$):			0.750	1.000	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:			37.8		
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:			36.6		
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:			37.8		
Proportion of segment length with curve 2 ($P_{c,2}$):			0.250		
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:					
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:					
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:					
Proportion of segment length with curve 3 ($P_{c,3}$):					
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:					
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:					
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:					
Proportion of segment length with curve 4 ($P_{c,4}$):					
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:					
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:					
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:					
Proportion of segment length with curve 5 ($P_{c,5}$):					
Distance from edge of right shoulder to barrier face (W_{rcb}), ft:			999.000	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):			0.000	0.846	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:			0.750	0.750	
Proportion of segment length with barrier on the left side (P_{lb}):			1.000	1.000	
Proportion of segment length within a weaving section (P_{wev}):			0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):			0.000	0.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):			0.000	0.000	
Traffic Data		**Year**			
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:		2017	14300	14300	
		2018	14300	14300	
		2019	14300	14300	
		2020	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1a)

2021	14300	14300	
2022	14300	14300	
2023	14300	14300	
2024	14300	14300	
2025	14300	14300	
2026	14300	14300	
2027	14300	14300	
2028	14300	14300	
2029	14300	14300	
2030	14300	14300	
2031	14300	14300	
2032	14300	14300	
2033	14300	14300	
2034	14300	14300	
2035	14300	14300	
2036	14300	14300	
2037	14300	14300	
2038	14300	14300	
2039	14300	14300	
2040	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Output Summary

General Information

Project description:	SR 520, Montlake to Lk Wash I/C and Br Replacement (DXEI OnRmp @ Mntlk) - BS1b				
Analyst:	jh	Date:	12/3/2017	Area type:	Urban
First year of analysis:	2017				
Last year of analysis:	2017				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	4.3	0.0	0.1	0.4	0.9	2.9
Estimated average crash freq. during Study Period, crashes/yr:	4.3	0.0	0.1	0.4	0.9	2.9

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	2	4.3	0.0	0.1	0.4	0.9	2.9
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2017	4.3	0.0	0.1	0.4	0.9	2.9
	2018						
	2019						
	2020						
	2021						
	2022						
	2023						
	2024						
	2025						
	2026						
	2027						
	2028						
	2029						
	2030						
	2031						
	2032						
	2033						
	2034						
	2035						
	2036						
	2037						
	2038						
	2039						
	2040						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Rear-end crashes:	0.6	0.0	0.0	0.1	0.1	0.4
	Sideswipe crashes:	0.3	0.0	0.0	0.0	0.0	0.2
	Other multiple-vehicle crashes:	0.1	0.0	0.0	0.0	0.0	0.1
	Total multiple-vehicle crashes:	0.9	0.0	0.0	0.1	0.2	0.7
Single vehicle	Crashes with animal:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with fixed object:	2.6	0.0	0.0	0.2	0.5	1.9
	Crashes with other object:	0.1	0.0	0.0	0.0	0.0	0.1
	Crashes with parked vehicle:	0.0	0.0	0.0	0.0	0.0	0.0
	Other single-vehicle crashes	0.5	0.0	0.0	0.1	0.2	0.3
	Total single-vehicle crashes:	3.3	0.0	0.1	0.3	0.7	2.3
Total crashes:		4.3	0.0	0.1	0.4	0.9	2.9

Evaluation Site Summary

General Information

Project description:	SR 520, Montlake to Lk Wash I/C and Br Replacement (DXEI OnRmp @ Mntlk) - BS1b				
Analyst:	jh	Date:	12/3/2017	Area type:	Urban
First year of analysis:	2017	Total length of freeway segments for Study Period (mi):		0.000	
Last year of analysis:	2017				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description		Number	Study Period Description
1	DXEI 14+40 to 16+44.59		21	0
2	DXEI 16+44.69 to 23+29.80		22	0
3	0		23	0
4	0		24	0
5	0		25	0
6	0		26	0
7	0		27	0
8	0		28	0
9	0		29	0
10	0		30	0
11	0		31	0
12	0		32	0
13	0		33	0
14	0		34	0
15	0		35	0
16	0		36	0
17	0		37	0
18	0		38	0
19	0		39	0
20	0		40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Input Worksheet for Ramp Segments						
Clear	Echo Input Values (View results in Column CJ)	Check Input Values (View results in Advisory Messages)	Segment 1 **Study Period**	Segment 2 **Study Period**	Segment 3 **Study Period**	Segment 4 **Study Period**
Basic Roadway Data						
Number of through lanes (n):			2	2		
Ramp segment description:			DXEI 14+40 t	DXEI 16+44.69 to 23+29.80		
Segment length (L), mi:			0.04	0.13		
Average traffic speed on the freeway (V_{frwy}), mi/h:			60	60		
Segment type (ramp or collector-distributor road):			Entrance	Entrance		
Type of control at crossroad ramp terminal:			Signal	Signal		
Alignment Data						
Horizontal Curve Data		← See notes →				
1	Horizontal curve?:		In Seg.	In Seg.		
	Curve radius (R_1), ft:		100	2927		
	Length of curve (L_{c1}), mi:		0.05	0.13		
	Length of curve in segment ($L_{c1,seg}$), mi:		0.03	0.13		
	Ramp-mile of beginning of curve in direction of travel (X_1), mi:		0.06	0.12		
2	Horizontal curve?:		In Seg.	No		
	Curve radius (R_2), ft:		112			
	Length of curve (L_{c2}), mi:		0.01			
	Length of curve in segment ($L_{c2,seg}$), mi:		0.01			
	Ramp-mile of beginning of curve in direction of travel (X_2), mi:		0.11			
3	Horizontal curve?:		No			
	Curve radius (R_3), ft:					
	Length of curve (L_{c3}), mi:					
	Length of curve in segment ($L_{c3,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_3), mi:					
4	Horizontal curve?:					
	Curve radius (R_4), ft:					
	Length of curve (L_{c4}), mi:					
	Length of curve in segment ($L_{c4,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_4), mi:					
5	Horizontal curve?:					
	Curve radius (R_5), ft:					
	Length of curve (L_{c5}), mi:					
	Length of curve in segment ($L_{c5,seg}$), mi:					
	Ramp-mile of beginning of curve in direction of travel (X_5), mi:					
Cross Section Data						
Lane width (W_l), ft:			15	12.5		
Right shoulder width (W_{rs}), ft:			8	8		
Left shoulder width (W_{ls}), ft:			6	6		
Presence of lane add or lane drop by taper:			No	No		
	Length of taper in segment ($L_{add,seg}$ or $L_{drop,seg}$), mi:					
Roadside Data						
Presence of barrier on right side of roadway:			No	Yes		
1	Length of barrier ($L_{rb,1}$), mi:			0.11		
	Distance from edge of traveled way to barrier face ($W_{off,r,1}$), ft:			8		

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

2	Length of barrier ($L_{rb,2}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,2}$), ft:				
3	Length of barrier ($L_{rb,3}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,3}$), ft:				
4	Length of barrier ($L_{rb,4}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,4}$), ft:				
5	Length of barrier ($L_{rb,5}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,r,5}$), ft:				
Presence of barrier on left side of roadway:		Yes	Yes		
1	Length of barrier ($L_{lb,1}$), mi:	0.04	0.13		
	Distance from edge of traveled way to barrier face ($W_{off,l,1}$), ft:	6	6		
2	Length of barrier ($L_{lb,2}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,2}$), ft:				
3	Length of barrier ($L_{lb,3}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,3}$), ft:				
4	Length of barrier ($L_{lb,4}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,4}$), ft:				
5	Length of barrier ($L_{lb,5}$), mi:				
	Distance from edge of traveled way to barrier face ($W_{off,l,5}$), ft:				
Ramp Access Data	← See note				
Ramp Entrance	Ramp entrance in segment? (If yes, indicate type.):	No	No		
	Length of entrance s-c lane in segment ($L_{en,seg}$), mi:				
Ramp Exit	Ramp exit in segment? (If yes, indicate type.):	No	No		
	Length of exit s-c lane in segment ($L_{ex,seg}$), mi:				
Weaving Section	Weave section in collector-distributor road segment?:				
	Length of weaving section (L_{wev}), mi:				
	Length of weaving section in segment ($L_{wev,seg}$), mi:				

Traffic Data	**Year**				
Average daily traffic ($AADT_r$ or $AADT_c$) by year, veh/d:	2017	14300	14300		
(enter data only for those years for which it is available, leave other years blank)	2018				
	2019				
	2020				
	2021				
	2022				
	2023				
	2024				
	2025				
	2026				
	2027				
	2028				
	2029				
	2030				
	2031				
	2032				
	2033				
	2034				
	2035				
	2036				
	2037				
	2038				
	2039				
	2040				

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Crash Data		**Year**		Segment Crashes -->			
Count of Fatal-and-Injury (FI) Crashes by Year							
	Multiple-vehicle crashes ($N_{o,w,n,mv,fi}$)	2017					
		2018					
		2019					
		2020					
		2021					
	Single-vehicle crashes ($N_{o,w,n,sv,fi}$)	2017					
		2018					
		2019					
		2020					
		2021					
Count of Property-Damage-Only (PDO) Crashes by Year							
	Multiple-vehicle crashes ($N_{o,w,n,mv,pdo}$)	2017					
		2018					
		2019					
		2020					
		2021					
	Single-vehicle crashes ($N_{o,w,n,sv,pdo}$)	2017					
		2018					
		2019					
		2020					
		2021					

Advisory Messages

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Variable Limits				
Number of through lanes (n):	2	2	2	2
Length of curve in segment (Lc1,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc2,seg), mi:	0.01	0.13	0	0
Length of curve in segment (Lc3,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc4,seg), mi:	0.04	0.13	0	0
Length of curve in segment (Lc5,seg), mi:	0.04	0.13	0	0
Length of taper in segment (Ladd,seg or Ldrop,seg), mi:	0.04	0.13	0.3	0.3
Length of entrance s-c lane in segment (Len,seg), mi:	0.04	0.13	0.19	0.19
Length of exit s-c lane in segment (Lex,seg), mi:	0.04	0.13	0.19	0.19
Length of weaving section in segment (Lwev,seg), mi:	0.04	0.13	0.3	0.3

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Output Worksheet for Ramp Segments					
MV = multiple-vehicle model SV = single-vehicle model	Applicable Models		Segment 1 Study Period	Segment 2 Study Period	Segment 3 Study Period
Crash Modification Factors					
Fatal-and-Injury Crash CMFs					
Horizontal curve ($CMF_{1,w,x,y,fi}$):	MV		7.158	1.013	
		SV	20.021	1.041	
Lane width ($CMF_{2,w,x,y,fi}$):	MV	SV	0.955	1.071	
Right shoulder width ($CMF_{3,w,x,y,fi}$):	MV	SV	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,fi}$):	MV	SV	0.898	0.898	
Right side barrier ($CMF_{5,w,x,y,fi}$):	MV	SV	1.000	1.273	
Left side barrier ($CMF_{6,w,x,y,fi}$):	MV	SV	1.323	1.323	
Weaving section ($CMF_{9,cds,ac,at,fi}$):	MV	SV			
	Year:	2017	1.000	1.000	
		2018			
		2019			
		2020			
		2021			
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Ramp speed-change lane ($CMF_{8,w,x,mv,fi}$):	MV		1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,fi}$):	MV	SV	1.000	1.000	
Property-Damage-Only Crash CMFs					
Horizontal curve ($CMF_{1,w,x,y,pdo}$):	MV		5.308	1.009	
		SV	25.792	1.054	
Lane width ($CMF_{2,w,x,y,pdo}$):	MV	SV	1.000	1.000	
Right shoulder width ($CMF_{3,w,x,y,pdo}$):	MV	SV	1.000	1.000	
Left shoulder width ($CMF_{4,w,x,y,pdo}$):	MV	SV	0.950	0.950	
Right side barrier ($CMF_{5,w,x,y,pdo}$):	MV	SV	1.000	1.248	

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

Left side barrier ($CMF_{6,w,x,y,pdo}$):	MV	SV	1.293	1.293	
Weaving section ($CMF_{9,cds,ac,at,pdo}$):	MV	SV			
	Year:	2017	1.000	1.000	
		2018			
		2019			
		2020			
		2021			
		2022			
		2023			
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		2040			
Ramp speed-change lane ($CMF_{8,w,x,mv,pdo}$):	MV		1.000	1.000	
Lane add or drop ($CMF_{7,w,x,y,pdo}$):	MV	SV	1.000	1.000	

Predicted Average Crash Frequency

Fatal-and-Injury Crash Frequency

Multiple-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,mv,fi}$):				
Observed crash count ($N^*_{o,w,x,mv,fi}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,mv,fi,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,mv,fi,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,fi,r}$), crashes/yr:				
Predicted average crash frequency	2017	0.173	0.114	
($N_{p,w,x,mv,fi}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
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	2040			
Single-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,sv,fi}$):				
Observed crash count ($N^*_{o,w,x,sv,fi}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,sv,fi,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,sv,fi,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,fi,r}$), crashes/yr:				
Predicted average crash frequency ($N_{p,w,x,sv,fi}$), crashes/yr:	2017	0.831	0.201	
	2018			
	2019			
	2020			
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Property-Damage-Only Crash Frequency				
Multiple-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,mv,pdo}$):				
Observed crash count ($N^*_{o,w,x,mv,pdo}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,mv,pdo,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,mv,pdo,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,mv,pdo,r}$), crashes/yr:				
Predicted average crash frequency	2017	0.373	0.288	

($N_{p,w,x,mv,pdo}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
	2024			
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	2040			
Single-Vehicle Crash Analysis	**Year**			
Overdispersion parameter ($k_{w,x,sv,pdo}$):				
Observed crash count ($N^*_{o,w,x,sv,pdo}$), crashes:				
Reference year (r):				
Predicted average crash freq. for reference year ($N_{p,w,x,sv,pdo,r}$), crashes/yr:				
Equivalent years associated with crash count ($C_{b,w,x,sv,pdo,r}$), yr:				
Expected average crash freq. for reference year given N^*_o ($N_{a,w,x,sv,pdo,r}$), crashes/yr:				
Predicted average crash frequency	2017	1.954	0.324	
($N_{p,w,x,sv,pdo}$), crashes/yr:	2018			
	2019			
	2020			
	2021			
	2022			
	2023			
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	2037			

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

		2038			
		2039			
		2040			
Crash Severity Distribution (during Study Period)					
Fatal crash frequency ($N^*_{e,w,x,at,K}$), crashes:			0.017	0.005	
Incapacitating injury crash freq. ($N^*_{e,w,x,at,A}$), crashes:			0.053	0.014	
Non-incapacitating inj. crash freq. ($N^*_{e,w,x,at,B}$), crashes:			0.280	0.078	
Possible injury crash freq. ($N^*_{e,w,x,at,C}$), crashes:			0.655	0.218	
Total fatal-and-injury crash freq. ($N^*_{e,w,x,at,fi}$), crashes:			1.005	0.314	
Property-damage-only crash freq. ($N^*_{e,w,x,at,pdo}$), crashes:			2.327	0.612	
Total crash frequency ($N^*_{e,w,x,at,as}$), crashes:			3.331	0.926	
Intermediate Results					
Friction-limited curve speed for curve 1 ($v_{max,1}$), ft/s:			36.6	100.7	
Curve entry speed for curve 1 ($v_{ent,1}$), ft/s:			55.1	68.7	
Curve exit speed for curve 1 ($v_{ext,1}$), ft/s:			36.6	87.2	
Proportion of segment length with curve 1 ($P_{c,1}$):			0.750	1.000	
Friction-limited curve speed for curve 2 ($v_{max,2}$), ft/s:			37.8		
Curve entry speed for curve 2 ($v_{ent,2}$), ft/s:			36.6		
Curve exit speed for curve 2 ($v_{ext,2}$), ft/s:			37.8		
Proportion of segment length with curve 2 ($P_{c,2}$):			0.250		
Friction-limited curve speed for curve 3 ($v_{max,3}$), ft/s:					
Curve entry speed for curve 3 ($v_{ent,3}$), ft/s:					
Curve exit speed for curve 3 ($v_{ext,3}$), ft/s:					
Proportion of segment length with curve 3 ($P_{c,3}$):					
Friction-limited curve speed for curve 4 ($v_{max,4}$), ft/s:					
Curve entry speed for curve 4 ($v_{ent,4}$), ft/s:					
Curve exit speed for curve 4 ($v_{ext,4}$), ft/s:					
Proportion of segment length with curve 4 ($P_{c,4}$):					
Friction-limited curve speed for curve 5 ($v_{max,5}$), ft/s:					
Curve entry speed for curve 5 ($v_{ent,5}$), ft/s:					
Curve exit speed for curve 5 ($v_{ext,5}$), ft/s:					
Proportion of segment length with curve 5 ($P_{c,5}$):					
Distance from edge of right shoulder to barrier face (W_{rcb}), ft:			999.000	0.750	
Proportion of segment length with barrier on the right side (P_{rb}):			0.000	0.846	
Distance from edge of left shoulder to barrier face (W_{lcb}), ft:			0.750	0.750	
Proportion of segment length with barrier on the left side (P_{lb}):			1.000	1.000	
Proportion of segment length within a weaving section (P_{wev}):			0.000	0.000	
Proportion of segment length adjacent to speed-change lane of another ramp ($P_{en\text{-}ex}$):			0.000	0.000	
Proportion of segment length adjacent to taper of lane add or drop. (P_{tpr}):			0.000	0.000	
Traffic Data		**Year**			
Average daily traffic ($AADT_r$ or AADTc) by year, veh/d:		2017	14300	14300	
		2018	14300	14300	
		2019	14300	14300	
		2020	14300	14300	

Eastbound On-ramp from Montlake Blvd (DXEI) - Barrier Shy Distance Only (sub-option BS1b)

2021	14300	14300	
2022	14300	14300	
2023	14300	14300	
2024	14300	14300	
2025	14300	14300	
2026	14300	14300	
2027	14300	14300	
2028	14300	14300	
2029	14300	14300	
2030	14300	14300	
2031	14300	14300	
2032	14300	14300	
2033	14300	14300	
2034	14300	14300	
2035	14300	14300	
2036	14300	14300	
2037	14300	14300	
2038	14300	14300	
2039	14300	14300	
2040	14300	14300	