Appendix J

Location of Preferred Alternative within I-5 Right-of-Way

Appendix J

Location of Preferred Alternative within I-5 Right-of-Way

J.1 Introduction

The Federal Way Link Extension (FWLE) Preferred Alternative would extend south from the Angle Lake Station, cross over State Route (SR) 99 on an elevated structure, and continue along the south side of the future alignment of the Washington State Department of Transportation (WSDOT) proposed SR 509 Extension Project (SR 509 Extension) until reaching I-5. The alignment would then turn south and generally follow the west side of I-5 to Federal Way. This appendix identifies the advantages and disadvantages of shifting the Preferred Alternative 15 to 20 feet east within the I-5 right-of-way between Kent-Des Moines Road and S 320th Street.

The width of the I-5 right-of-way varies along the project corridor. North of Kent-Des Moines Road, the SR 509 Extension would require most of the available right-of-way, causing the light rail alignment to be mainly outside of the I-5 right-of-way. South of Kent-Des Moines Road, the undeveloped I-5 right-of-way ranges from 40 to 220 feet, so it can accommodate both the SR 509 Extension and a light rail alignment. Therefore, in this area the FWLE would be within the I-5 right-of-way. The analyses in the Final EIS assume that the guideway will generally follow the western edge of the interstate right-of-way while maintaining as straight an alignment as possible, to ensure that potential impacts on neighboring properties and land uses are disclosed as fully as possible given the current level of design. The assumption also reflects the general practice of agencies with jurisdiction over interstate highways (in Washington state, the Federal Highway Administration [FHWA] and WSDOT) to locate non-highway uses as far as possible from an existing highway. There are several reasons for this approach, including the following:

- **Safety:** As the distance diminishes between the proposed non-highway structure and the highway pavement, the risk to highway users increases. The level of hazard at any location depends on factors like the specific highway configuration, location-specific highway volumes, average speeds, topography, and the distance from the edge of pavement to a structure/barrier. The effect could be a very slight increase in the accident rate or a substantial increase, depending on the factors involved. Safety mitigation measures may help, but WSDOT and FHWA believe they would not fully mitigate safety concerns. For example, a guardrail in front of the structure may mitigate the increased hazard of a non-highway use's large concrete pier, but guardrails themselves are potential hazards.
- **Future highway-related needs for the right-of-way:** The highway agencies must also determine that any use of the right-of-way leaves enough room to accommodate reasonably foreseeable highway expansion needs, considering the width of the right-of-way and the anticipated regional growth. Even if introduction of a non-highway use does not preclude highway expansion, such

projects become more difficult and expensive if there is inadequate right-of-way in which to work. In addition to potentially needing right-of-way for new lanes, highway agencies may also need it for other requirements, including new or improved drainage/stormwater facilities, signage, new or existing technologies to improve traffic management, environmental mitigation, and innovative interchange designs. For example, grassy swales within a right-of-way provide an effective stormwater treatment. They can be replaced with concrete vaults, but vaults are more costly and require more maintenance.

- **Operations and maintenance:** The highway agencies must also maintain their roadways. As the amount of right-of-way decreases, the likelihood that maintenance will disrupt traffic increases. If maintenance vehicles have to use the highway shoulders, that also increases risk to motorists. Just as insufficient right-of-way can make new construction more costly, it can increase maintenance costs.

FHWA and WSDOT recognize that site-specific constraints along the undeveloped right-of-way exist and may require flexibility to adjust the light rail guideway location to minimize or avoid impacts as design progresses. For example, moving a guideway closer to the pavement from the edge of the right-of-way in some locations could reduce visual and noise impacts; it may avoid or reduce impacts to streams or wetlands or other natural features at a specific location; it may resolve constructability conflicts or increased cost from working in or around existing infrastructure in the area; or it may mitigate or avoid other impacts that would exist if the guideway were on the edge of the right-of-way. However, moving the guideway may increase impacts on highway safety, limit future highway right-of-way needs, and/or complicate highway operations and maintenance.

To inform the definition of the Preferred Alternative and to provide an initial evaluation of the trade-offs described above, Sound Transit compared two potential configurations of the Preferred Alternative south of Kent-Des Moines Road (Exhibit J-1). The western alignment would generally be along the western limit of the I-5 right-of-way.[1] This configuration is analyzed in the main body of this Final EIS as the Preferred Alternative (and portions of the SR 99 to I-5 Alternative that are in the I-5 right-of-way). Since the Draft EIS was published in April 2015, Sound Transit has advanced the design of the western alignment (i.e., the Preferred Alternative), resulting in some changes to the configuration analyzed in the Draft EIS. For example, the Preferred Kent/Des Moines Station location requires an alignment farther west away from the I-5/ Kent-Des Moines Road interchange. Similarly, to avoid impacts on the Puget Sound Energy substation at S 221st Street, the refined design has shifted east. This shift would not affect the SR 509 Extension, based on its 2003 design documented in FHWA's Record of Decision (ROD).

[1] The western limit of the right-of-way is not a straight line. The boundary changes at 90-degree angles throughout the corridor, as shown on Exhibits J-2a through 2d. The light rail guideway cannot follow such angles. Accordingly, the Preferred Alternative alignment does not exactly follow the right-of-way edge.

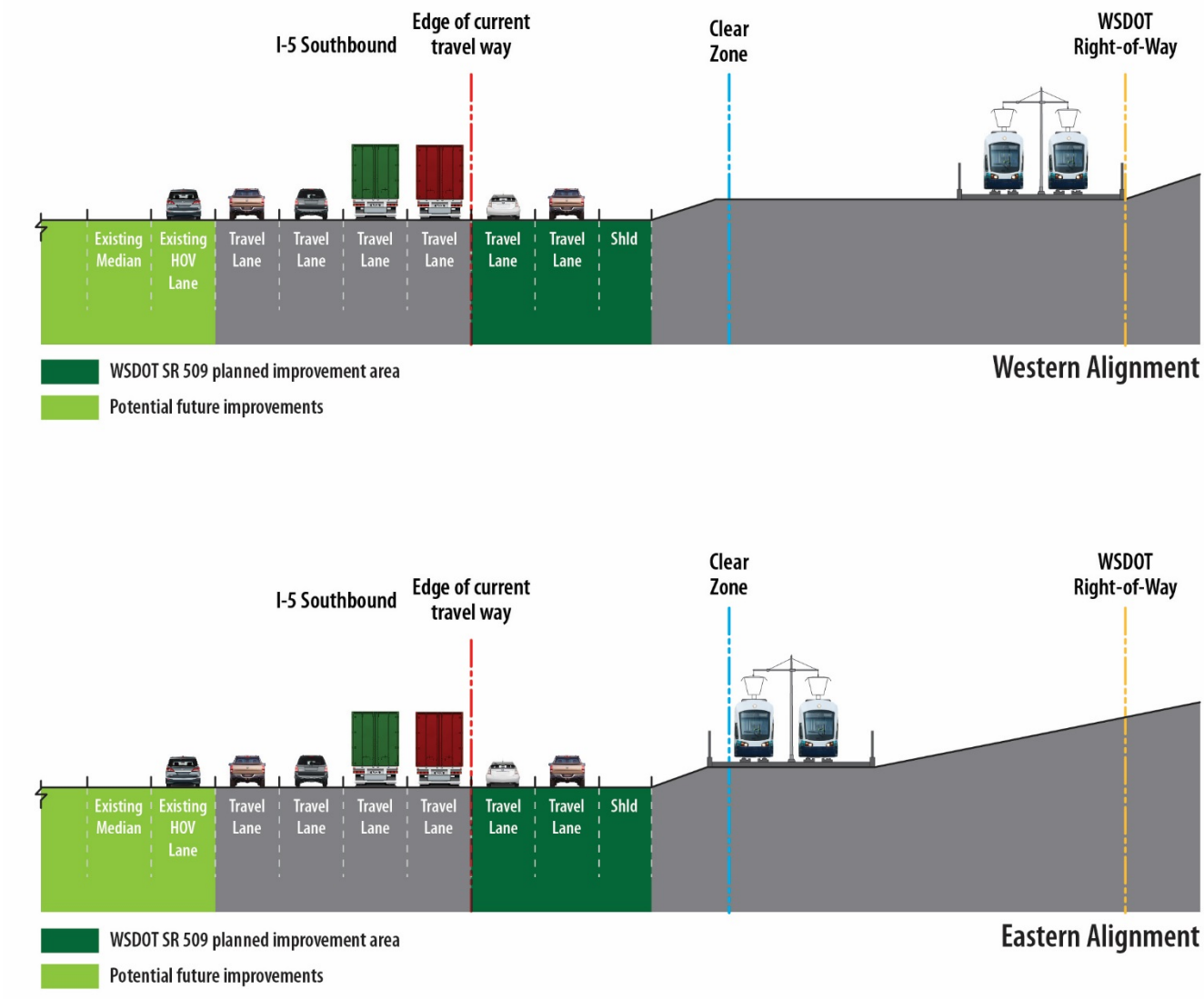


EXHIBIT J-1
Potential Locations of Preferred Alternative within WSDOT Right-of-Way (looking south)

This appendix examines an eastern alignment about 15 to 20 feet east of the Preferred Alternative. It compares the implications of both configurations for environmental impacts as well as impacts on future use of the right-of-way for highway purposes as described above. This shift would be possible for approximately 14,250 feet, or 2.7 miles, between S 240th Street and S 317th Street.

Sound Transit must secure agreements and approvals from WSDOT and FHWA to use the I-5 right-of-way for the Preferred Alternative, or to modify other parts of the freeway, such as shoulders or existing sound walls. Sound Transit has coordinated with FHWA and WSDOT during conceptual and preliminary design to identify where the FWLE alternatives could potentially use the I-5 right-of-way. Final approvals for the Preferred Alternative would not occur until final design. Continued coordination with

FHWA and WSDOT during final design could result in adjustments to the precise location of the Preferred Alternative within the I-5 right-of-way.

J.2 Comparison of Impacts

The comparison of the western and eastern alignments focused on resources with a potential difference in impacts between the two alignments, including transportation (i.e., highway safety), property acquisitions (i.e., I-5 right-of-way), noise, visual quality, ecosystems, hazardous materials (i.e., Midway Landfill), and social impacts.

The SR 509 Extension received a ROD in 2003 and is funded through the "Connecting Washington" transportation bill passed in 2015. WSDOT is evaluating potential design changes to the 2003 project design and expects to make decisions about the changes in 2017. WSDOT is also evaluating the timing for construction of the SR 509 Extension. Given the uncertainty in the ultimate configuration and construction schedule, and following advice from FHWA, the FWLE impacts analysis assumed the 2003 design and considered two future scenarios: with and without the SR 509 Extension.

Exhibit J-1 is a representative cross section of the I-5 southbound lanes in the FWLE corridor, showing the western limits of the I-5 right-of-way and the western limit of the current travel way. The WSDOT improvement areas shown in green represent planned and potential future WSDOT improvements, including the SR 509 Extension. The outside two lanes and shoulder shown in dark green represent I-5 widening planned as part of the SR 509 Extension as designed and documented in FHWA's ROD. The light green area reflects potential additional improvements that WSDOT has considered in the I-5 median. They have not undergone environmental review, are not identified in approved plans, and are not funded. If they are eventually implemented, they can be accommodated in the median.

To facilitate an understanding of location-specific impacts, Exhibit J-2 documents the implications of both alignment configurations in six general areas along the corridor. These areas were defined based on the characteristics of the adjacent land uses (i.e., residential, landfill, wetland, etc.). The results of the analysis are summarized in Table J-1.[2]

[2] Quantified impacts identified in Chapter 4 of this Final EIS assume the western alignment.

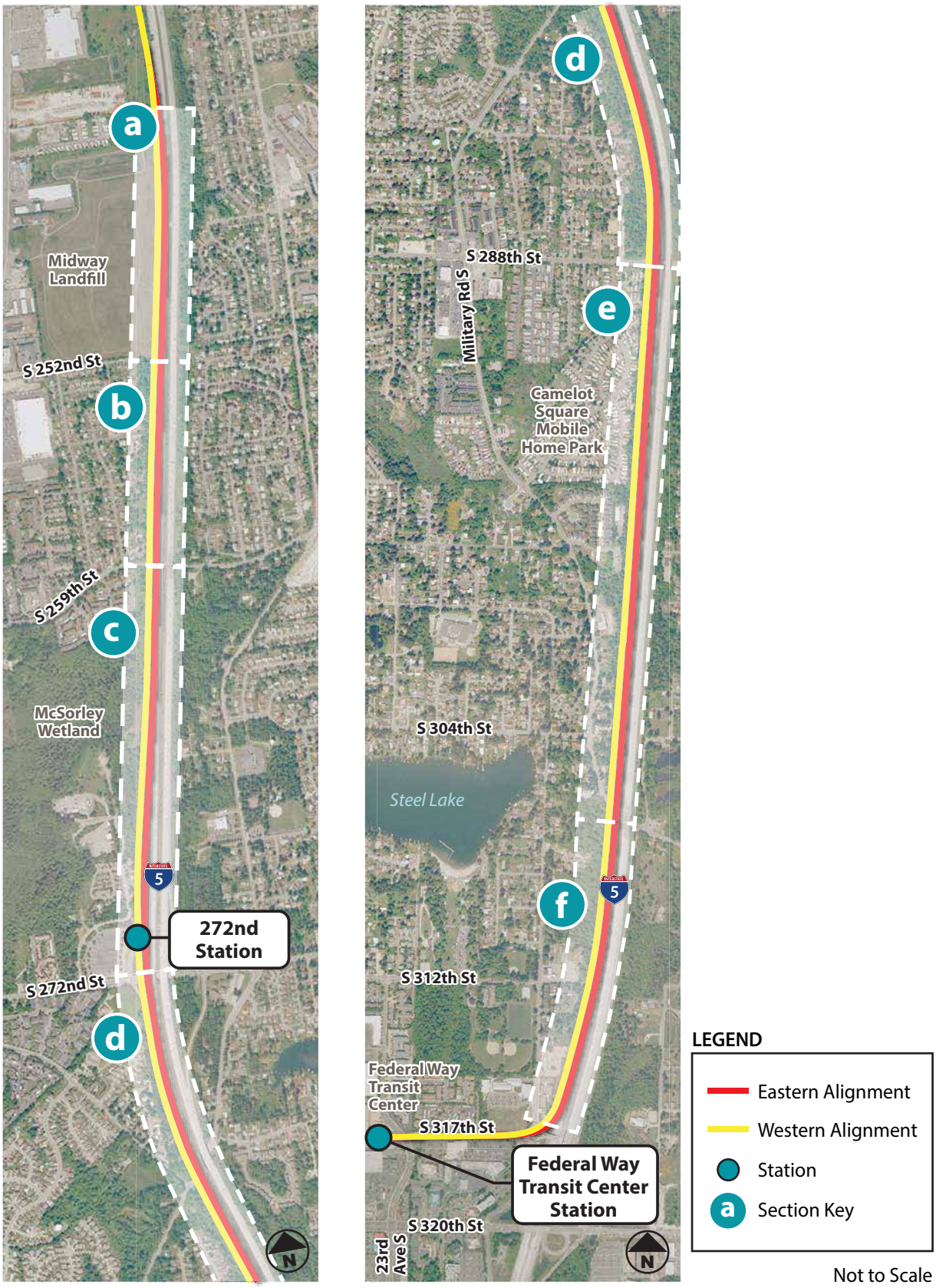
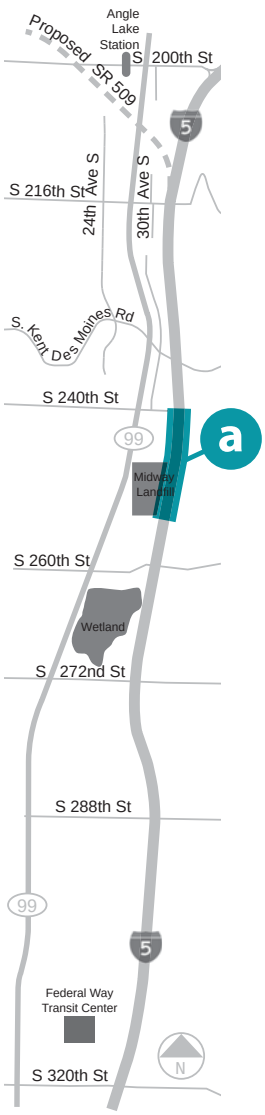


EXHIBIT J-2
Key Map for Comparison of Impacts to I-5 Corridor

a Midway Landfill – S 244th St to S 252nd St



Existing Condition:

- No guardrail, slopes up to west, cleared grass area
- Approximate distance between edge of pavement and right-of-way limit is 190 feet for the section shown below

Eastern Alignment:

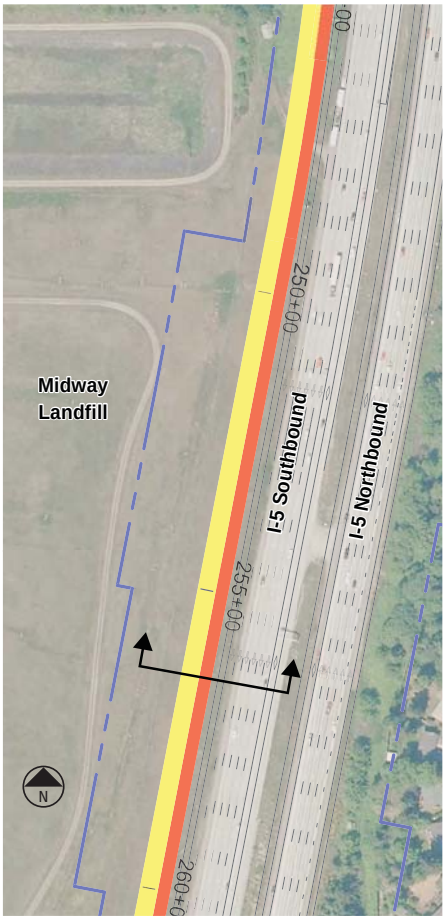
- Larger right-of-way remnant (3.4 acres)
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

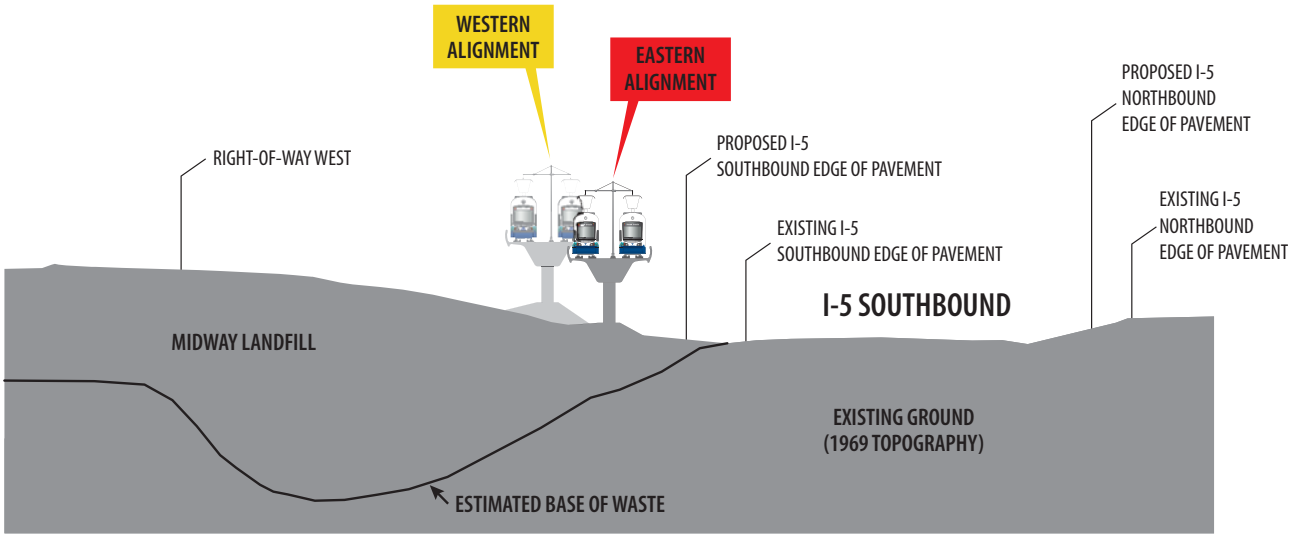
Western Alignment:

- Greater risk of encountering hazardous materials and groundwater
- Greater volume of waste removal

Note:

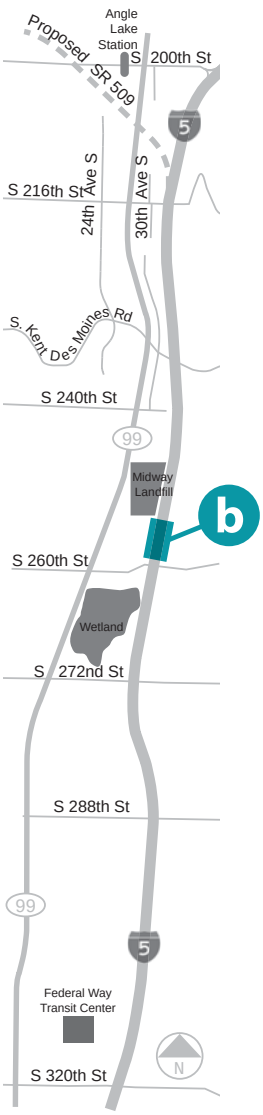
- Landfill length 2,000 ft; 15 shafts





Not to Scale

b Single-Family Residences – S 252nd St to S 259th St



Existing Condition:

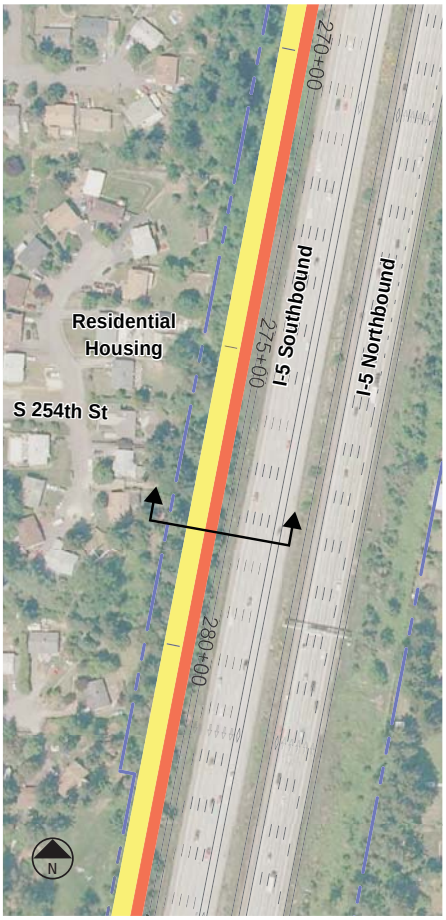
- Guardrail at S 259th St, slopes up to west, berm/bushes/mature trees
- Approximate distance between edge of pavement and right-of-way limit is 115 feet for the section shown below

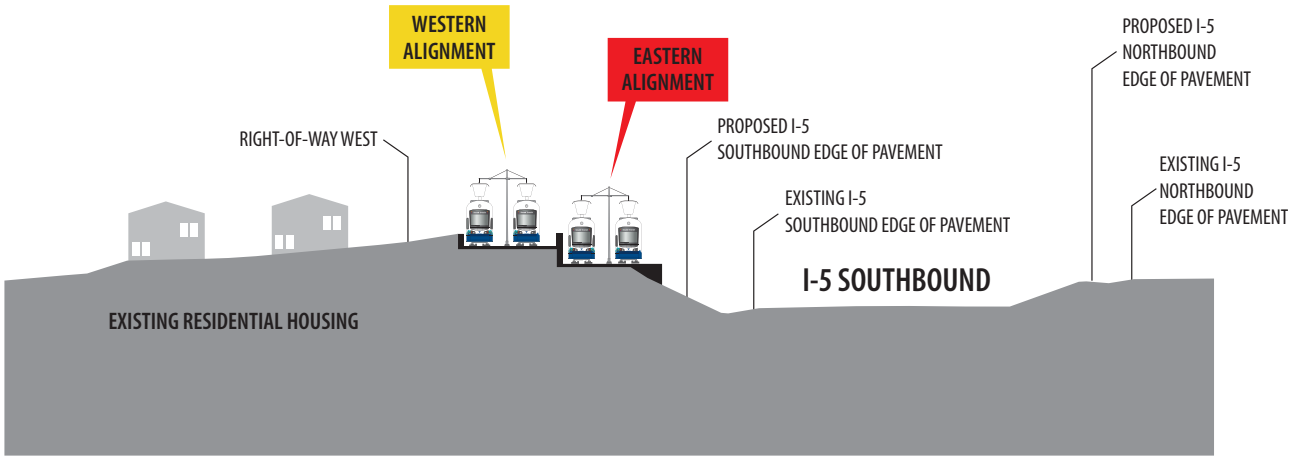
Eastern Alignment:

- Precludes opportunity for clear zone or other uses
- Larger right-of-way remnant (5.0 vs. 0.7 acres)
- Minor opportunity to reduce visual impacts at 5 to 10 homes
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

Western Alignment:

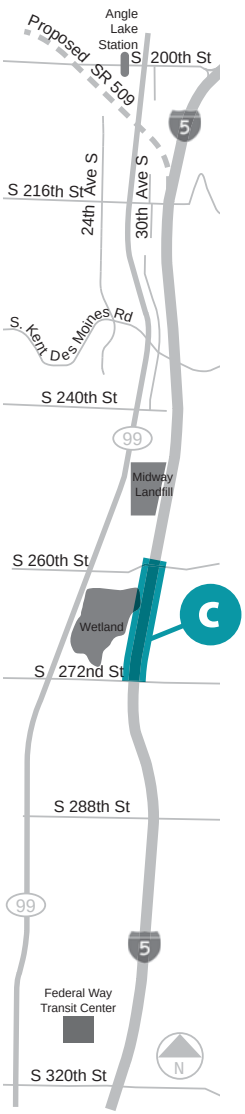
- Visual impacts may be greater at some homes





Not to Scale

C McSorley Creek Wetlands – S 259th St to S 272nd St



Existing Condition:

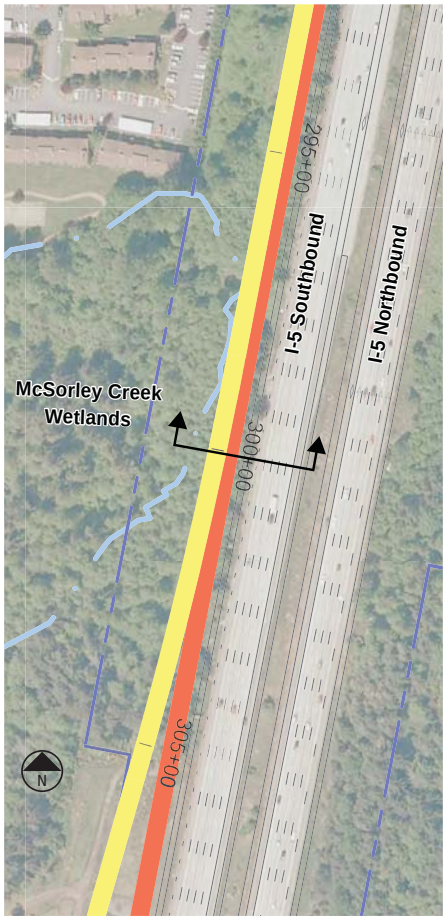
- Guardrail along north half, slopes down to west, mature trees, short detention basin clearing
- Approximate distance between edge of pavement and right-of-way limit is 190 feet for the section shown below

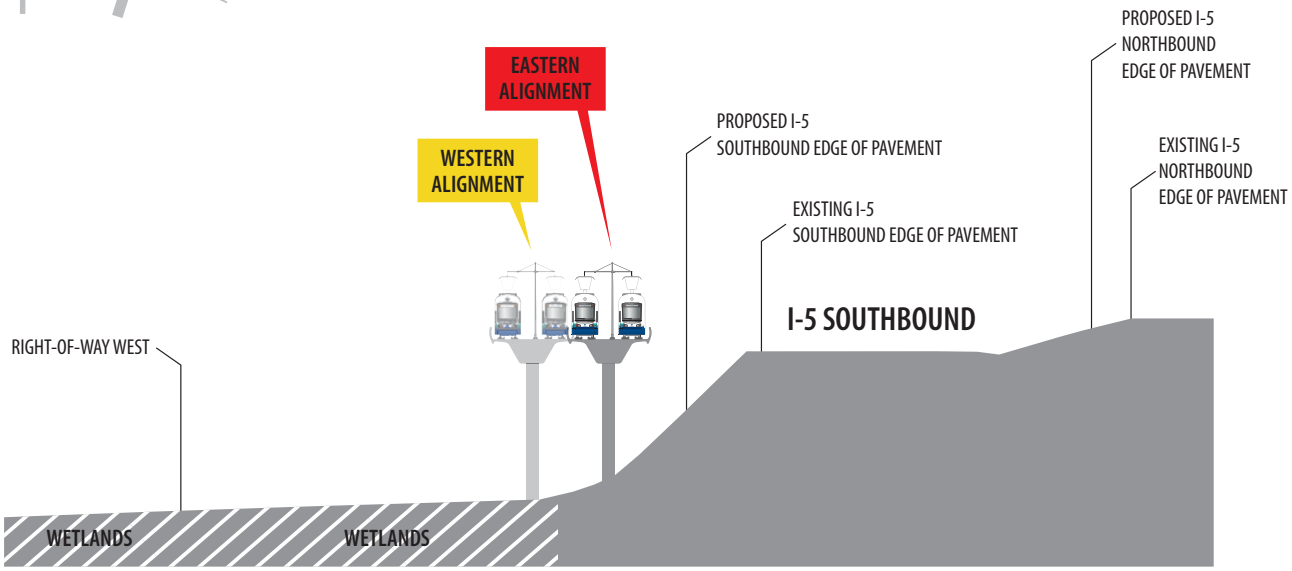
Eastern Alignment:

- Larger right-of-way remnant (1.6 vs. 3.3 acres)
- Avoids wetland impacts to McSorley Creek Wetlands
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

Western Alignment:

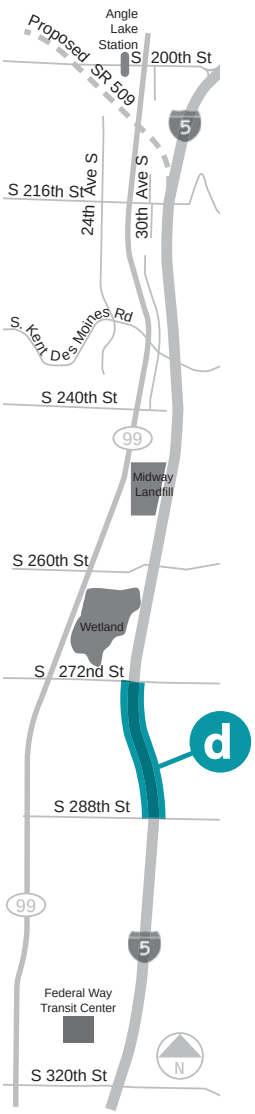
- Some wetland impacts (<0.1 acre permanent) to McSorley Creek wetland





Not to Scale

d Single-Family Residences – S 272nd St to S 288th St



Existing Condition:

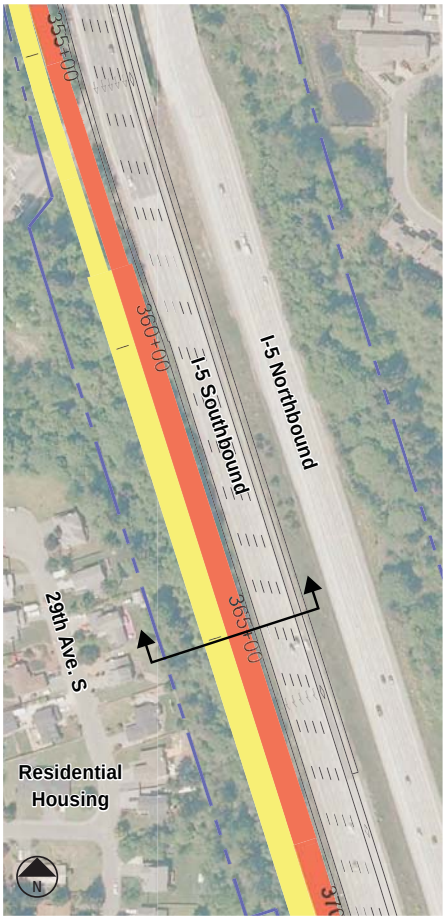
- Guardrail at S 272nd St and S 288th St, slopes up to west along north half, bushes/mature trees, creek at S 288th St
- Approximate distance between edge of pavement and right-of-way limit is 165 feet for the section shown below

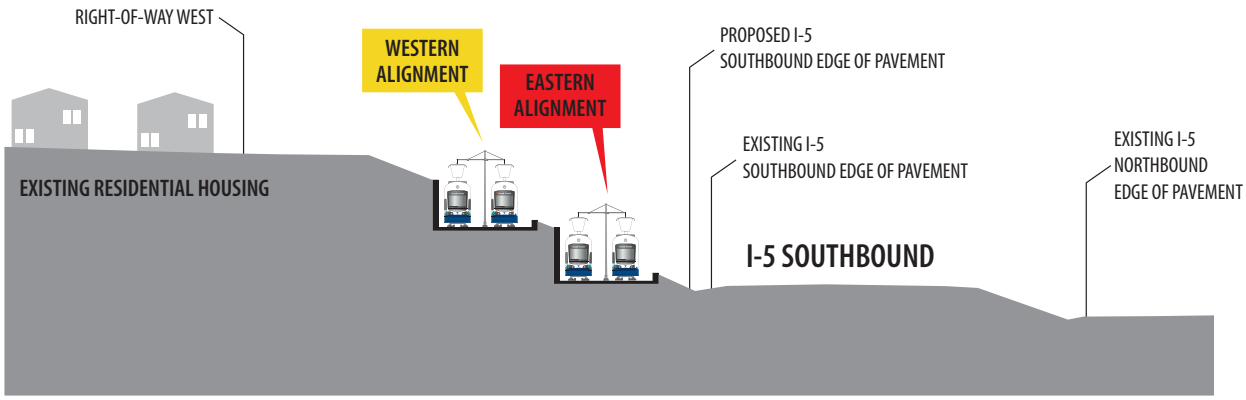
Eastern Alignment:

- Precludes opportunity for clear zone or other uses
- Larger right-of-way remnant (4.8 vs. 2.8 acres)
- Minor opportunity to reduce visual impacts at up to 10 homes
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

Western Alignment:

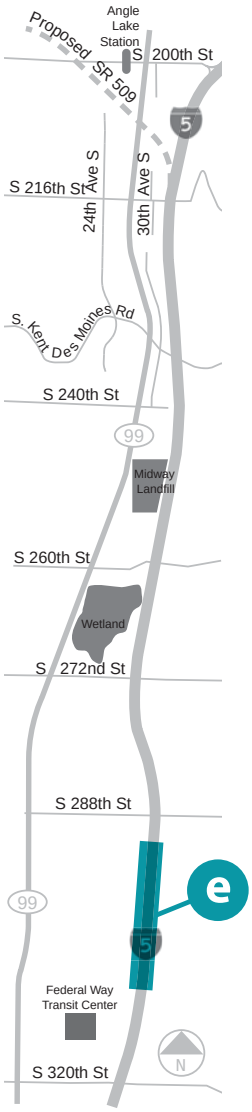
- Visual impacts may be greater at some homes





Not to Scale

e Mobile Home Park and Single-Family Residences – S 288th St to Military Road



Existing Condition:

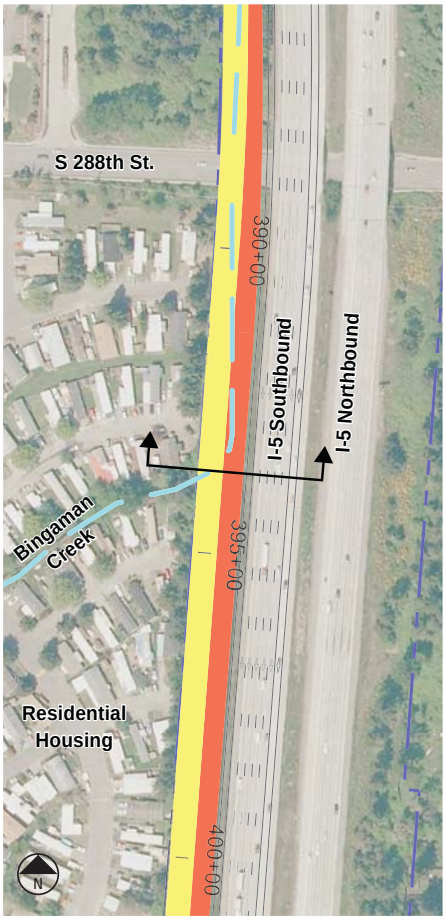
- Noise wall/concrete barrier at mobile home park, slopes down to west, mature trees/creek west of noise wall
- Approximate distance between edge of pavement and right-of-way limit is 95 feet for the section shown below

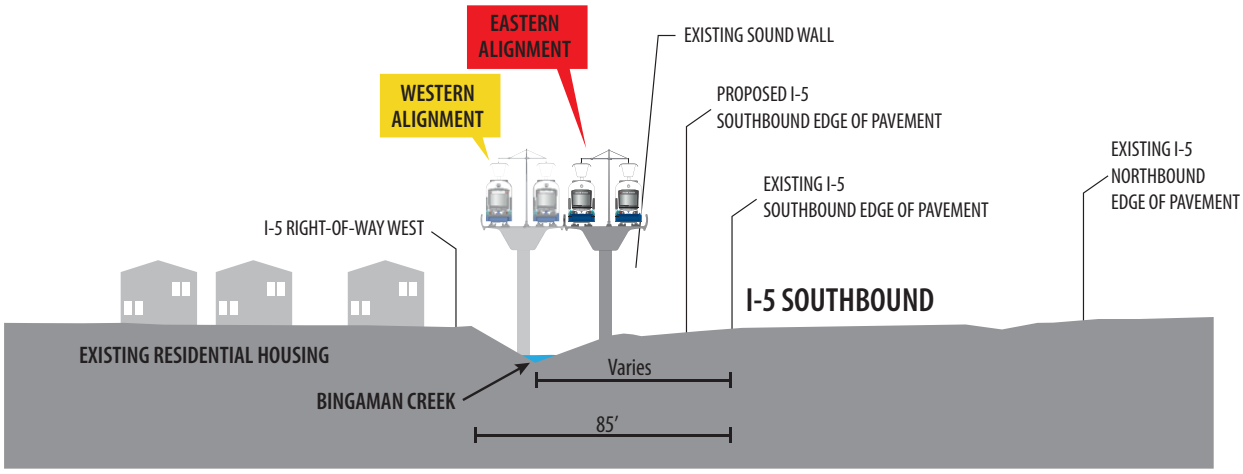
Eastern Alignment:

- Precludes opportunity for clear zone or other uses
- Larger right-of-way remnant (6.0 vs. 1.3 acres)
- More room for Bingaman Creek realignment
- Opportunity to reduce visual impacts at about 40 homes
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

Western Alignment:

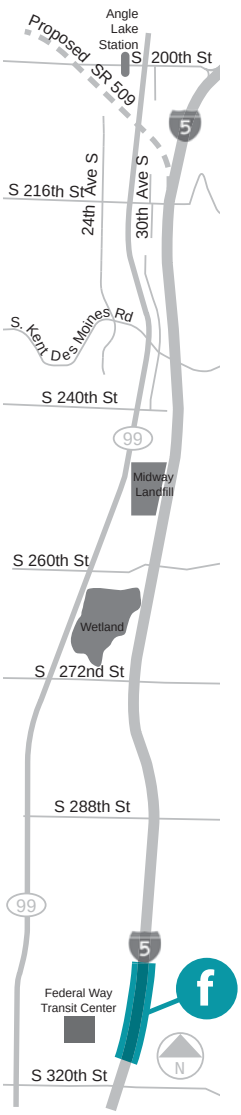
- More transit noise impacts, but could be mitigated
- Visual impacts may be greater at some homes





Not to Scale

f Multi-Family Residences – Military Road to S 317th St



Existing Condition:

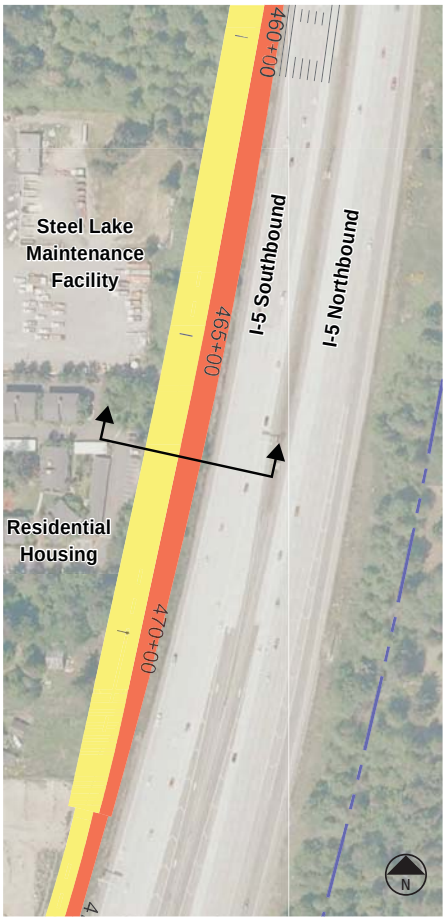
- Guardrail at Military Road and S 317th St, slopes up to west, berm bushes/mature trees
- Approximate distance between edge of pavement and right-of-way limit is 130 feet for the section shown below

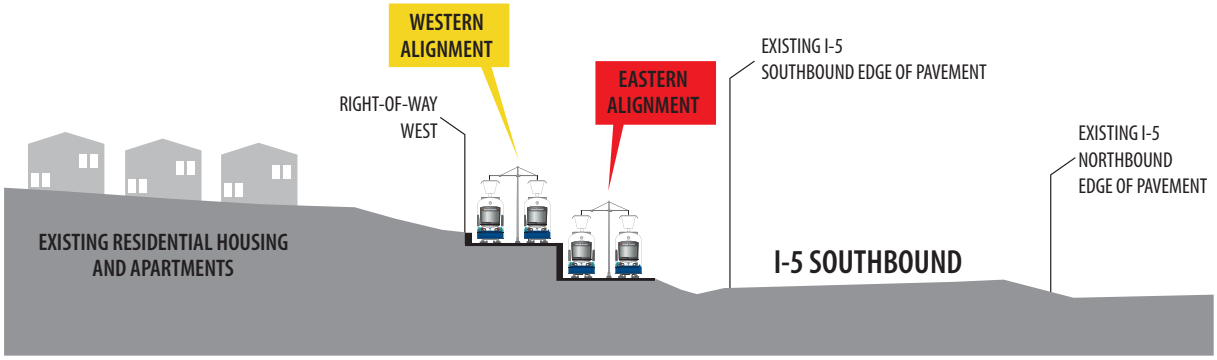
Eastern Alignment:

- Precludes opportunity for clear zone or other uses
- Larger right-of-way remnant (4.3 vs. 0.2 acres)
- Potential to increase visual impacts at about 10 homes
- Less separation between roadway and structure
- Less space for future improvements
- Less space for right-of-way maintenance

Western Alignment:

- Less visual impacts because of vegetation maintained between light rail and I-5





Not to Scale

TABLE J-1
Comparison of Western and Eastern Alignment Configurations

Resource	Measure	Western Alignment	Eastern Alignment
Transportation (Highway Safety)	Length (feet) of clear zone removed by the FWLE without SR 509 Extension	0	2,300
Transportation (Highway Safety)	Length (feet) of clear zone removed by the FWLE with SR 509 Extension	0	13,300
Property Acquisitions	Acres of remnant right-of-way (limited or no use for future highway improvements)	11.7	30.1
Noise[a]	Number of noise impacts	555 moderate, 74 severe	556 moderate, 67 severe
Visual and Aesthetic Resources[b]	Adjacent residences where visual quality would be lowered	160	110
Ecosystems	Acres of vegetation removal	38	39
	Acres of wetland impacts (McSorley Creek)	<0.1	0
	Acres of wetland buffer impacts (McSorley Creek)	0.6	0.6
	Total acres of wetland impacts	0.7	0.6

[a] Noise impacts would be mitigated.

[b] Eastern alignment would minimize but not eliminate visual impacts at some locations.

J.2.1 Clear Zone Impacts

The American Association of State Highway and Transportation Officials (AASHTO) *Roadside Design Guide* (AASHTO, 2011) defines a clear roadside border area or clear zone as an unobstructed, relatively flat area beyond the edge of the traveled way (i.e., the general purpose lanes) that allows a driver to stop safely or regain control of a vehicle that leaves the traveled way.

Geometric considerations define the extent of a clear zone, along with factors like terrain, speed limits, average traffic volumes, and fixed objects in the area. The clear zone for I-5 through the FWLE study area varies between 30 feet and 45 feet, measured from the outside lane line of the nearest lane (i.e., the shoulder is included within the clear zone) (WSDOT, 2015a). Where minimum clear zone conditions cannot be met, longitudinal barriers (guardrail, barrier, or walls) or impact attenuators can be provided to “shield” vehicles from roadside hazards. These hazards generally include:

- Non-recoverable slopes (slopes steeper than 1 foot vertical to 4 feet horizontal)
- Trees
- Signs and signal supports
- Communications cabinets
- Power poles
- Other landscaping elements
- Street grade separation

Table J-2 documents the southbound I-5 roadside conditions between S 211th Street and S 317th Street without and with the SR 509 Extension. It shows how the available clear zone would change with the FWLE western and eastern alignments. The table includes the lengths of existing

barriers along I-5 as well as those proposed for the SR 509 Extension; the length of clear zone impact due to the FWLE alignments; and the resulting length of available clear zone along I-5. Exhibits J-3 and J-4 show where the western and eastern alignments would be located within a clear zone without and with the SR 509 Extension, respectively.

TABLE J-2
Southbound I-5 No Build and Preferred Alternative Alignments Clear Zone Summary (between S 211th Street and S 317th Street)

Condition	Without SR 509 Extension			With SR 509 Extension		
	No Build	Western Alignment	Eastern Alignment	No Build	Western Alignment	Eastern Alignment
Length of Barrier Provided (in feet)[a]	11,500	11,500 (+0)	13,800 (+2,300)	20,900	20,900 (+0)	34,200 (+13,300)
Length of Available Clear Zone (in feet)[b]	22,900	22,900	20,600	15,100	15,100	1,800
Total Segment Length (in feet)[c]	34,400	34,400	34,400	36,000	36,000	36,000

Note: Values shown in parentheses represent the additional length of the corridor where the FWLE would be located in an existing clear zone. Mitigation, such as barrier or guardrails, may be required with the project in these locations.

[a] Represents areas where barriers currently exist and/or are proposed with the SR 509 Extension. These areas include shielding to protect highway infrastructure, tree stands, steep side slopes, or other landscaping elements, or are used to protect grade-separated crossings.

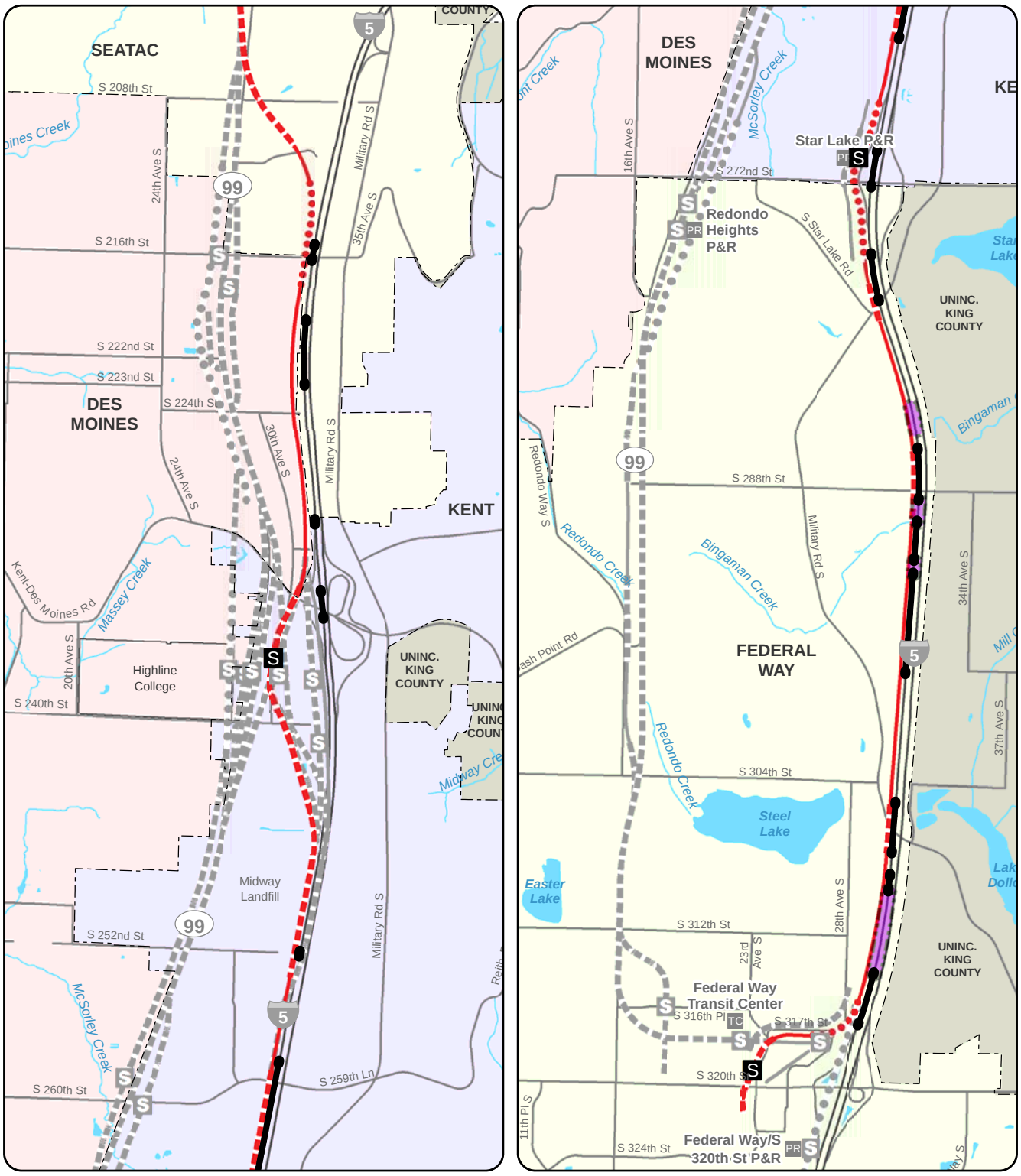
[b] Represents areas where existing or future conditions meet the definition of a clear zone.

[c] The clear zone distance with the SR 509 Extension is 1,600 feet longer because it accounts for the clear zone of the future SR 509 between SR 99 and I-5.

Within the FWLE study area, an existing 22,900 feet of clear zone (approximately two-thirds of the total length) is present along I-5 southbound without the SR 509 Extension. The remaining one-third (11,500 feet) is currently shielded by guardrail or barrier. The shielded segments of the southbound I-5 roadside include 9,300 feet where WSDOT could potentially create a clear zone by alteration of, removal, or relocation of the roadside hazards previously described. Approximately 2,200 feet of barrier currently shields grade-separated streets (e.g., bridges) and a clear zone cannot be created.

If built before the FWLE, the SR 509 Extension would provide 15,100 feet of clear zone along I-5 southbound. It proposes about 20,900 feet of longitudinal barrier, increasing the shielded segments of southbound I-5 by 9,400 feet compared to the scenario without the SR 509 Extension. Approximately 2,900 feet of the I-5 southbound roadside barrier would shield grade-separated streets (e.g., bridges) and a clear zone cannot be created.

The potential for impacts on the I-5 southbound clear zone are described below for the light rail operation and construction conditions. Both of these conditions are evaluated with and without the SR 509 Extension to understand the potential cumulative impact of both projects.



Legend

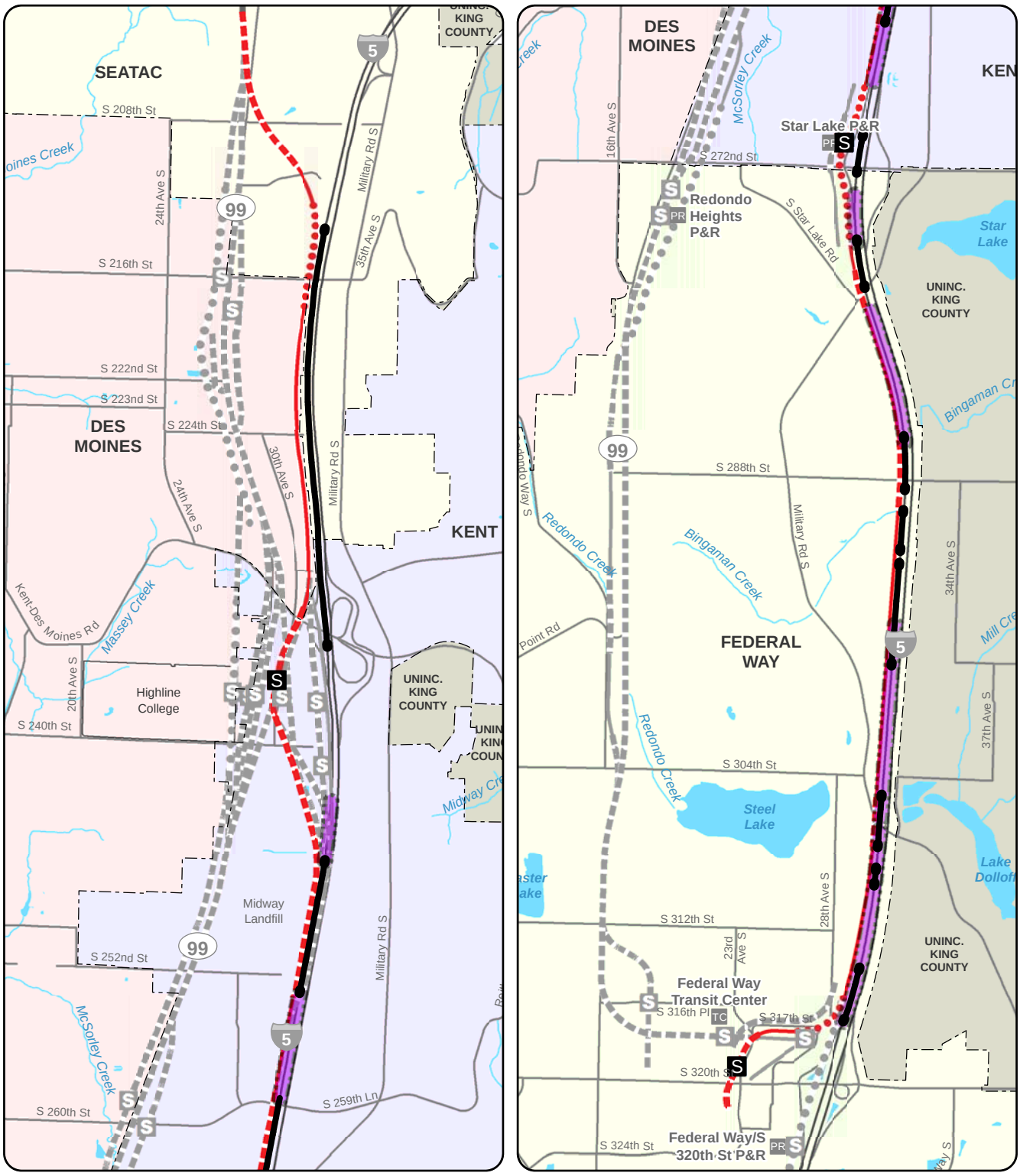
Preferred Alternative	Other Alternatives		
At-Grade	At-Grade	Existing Barrier	City Boundary
Elevated	Elevated	Eastern Alignment Impacts to the Clear Zone	Street
Trench	Trench		Stream
Station	Station		Waterbody

Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2015).

N

0 0.25 0.5 1 Miles

EXHIBIT J-3
I-5 Clear Zone Impacts
Without SR 509
Federal Way Link Extension



Legend

Preferred Alternative
- At-Grade
- Elevated
- Trench
- Station

Other Alternatives
- At-Grade
- Elevated
- Trench
- Station

- SR 509 Barrier
- Eastern Alignment Impacts to the Clear Zone
- City Boundary
- Street
- Stream
- Waterbody

Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2015).

N

0 0.25 0.5 1 Miles

EXHIBIT J-4
I-5 Clear Zone Impacts
With SR 509
Federal Way Link Extension

J.2.1.1 Operation

The impacts on the clear zone identified in Table J-2 and an assessment of potential changes in crash rates associated with the changes in the clear zone are described in this section.

Without SR 509 Extension

Without the SR 509 Extension, the western alignment would be at least 30 feet away from the existing edge of traveled way in all locations. It would be farther than 30 feet away in many locations. This alignment would not impact the existing clear zone along I-5 southbound. It would also preserve the potential for developing future clear zones along the I-5 southbound lanes. This condition would have no change in crash rates and therefore no impacts on the safety conditions along I-5.

Without the SR 509 Extension, the eastern alignment would affect a short portion of the I-5 southbound clear zone. It would eliminate approximately 2,300 feet of the existing clear zone between S 284th Street and S 317th Street.

Based on the methodologies described in the *Highway Safety Manual* (HSM; AASHTO, 2014), this reduction in clear zone could increase crashes by approximately one crash every 4 years on southbound I-5 between S 284th Street and S 317th Street. This section of I-5 southbound had approximately 380 crashes between 2007 and 2011.

With SR 509 Extension

Assuming the 2003 design of the SR 509 Extension is constructed before or concurrent with the FWLE, the western alignment would have no impact on the I-5 southbound mainline clear zone, while the eastern alignment would impact approximately 13,300 feet of it at locations dispersed between S 211th Street and S 317th Street. Based on HSM methodologies, the eastern alignment could increase crashes by approximately one crash every 2 years between S 211th Street and S 317th Street. This section of I-5 had approximately 480 crashes between 2007 and 2011.

Highway Maintenance Activities

WSDOT routinely performs maintenance activities along I-5. Maintenance activities generally include mowing, stormwater facility maintanence, spraying noxious weeds, accessing Intelligent Transportation System equipment and signs, and removing invasive plant species. These activities are generally performed within 10 feet of the edge of pavement. To perform them, WSDOT will typically park vehicles on the shoulder and provide advance warning signage to drivers. For maintanence access west of the guideway, such as servicing stormwater facilities and removing invasive weeds, the guideway would provide vertical clearances of at least 16.5 feet to allow access from I-5, or in some areas the right-of-way could be accessed from local streets.

The FWLE could accommodate WSDOT's current maintenance activities in all areas of the corridor with each alignment and condition. The most constrained condition would be the eastern alignment with the SR 509 Extension. A minimum 10-foot buffer between the edge of pavement and the light rail guideway would still remain to allow maintenance activities.

J.2.1.2 Construction

This section discusses construction vehicle access, the impacts on the existing and potential clear zone during the FWLE construction, and potential changes in crash rates associated with the changes in the

clear zone. Heavy civil construction activity in any specific location is expected to range from 1 to 4 years.

Appendix G, Construction Preliminary Impacts, Construction Staging Areas, and Haul Route Assumptions, of the Transportation Technical Report (Appendix G1 of the Final EIS) shows the proposed construction staging areas and truck haul routes. They would be the same for the western and eastern alignments, generally adjacent to where project construction would occur, with staging areas generally near the station areas.

Access to the construction area would only be provided from arterials, local streets, and I-5 interchange areas. No direct access would be provided from the I-5 mainline for either the western or eastern alignment except for construction under the S 216th Street bridge and for removal of trees along the right-of-way. Both alignments would have the same potential access points to the construction area along I-5 in the vicinity of:

- S 208th Street
- S 216th Street
- S 224th Street
- 30th Avenue S (multiple locations)
- I-5 Kent-Des Moines Road southbound ramps
- S 252nd Street
- S 259th Place
- 26th Avenue S
- S 272nd Street
- Military Road (three locations)
- S 288th Street
- S 317th Street

Without SR 509 Extension

If the SR 509 Extension is not built before or concurrently with the FLWE, construction vehicle access would be provided via a temporary construction road adjacent to the guideway. This road would be at least 15 feet wide and may be up to 30 feet wide to allow for two-way construction vehicle traffic. With the western alignment, the road would be west of the alignment between S 204th Street and Kent-Des Moines Road and east of the alignment from Kent-Des Moines Road to S 317th Street. The construction road for the eastern alignment would be similar to the western alignment, except it would be west of the alignment between S 288th Street and S 317th Street to maximize the distance between the I-5 edge of pavement and the guideway.

Both alignments would temporarily reduce the clear zone along most of I-5 southbound through the study area. A temporary construction barrier would be placed near the southbound I-5 edge of pavement for approximately 22,900 feet where barriers are not already present. Based on the HSM methodologies, this temporary barrier (between S 211th Street and S 317th Street) could result in an increase of up to four crashes per year for the western alignment, and up to five crashes per year for the eastern alignment during the construction period.

With SR 509 Extension

If the SR 509 Extension is built before or concurrently with the FWLE, construction vehicle access would be provided via a temporary construction road like the one described above. For the western alignment, it would be in the same location as described above. For the eastern alignment, it would always be west of the alignment (between S 204th Street and S 317th Street).

As shown in Table J-2, the SR 509 Extension would reduce the clear zone along many sections of I-5 through the study area. Even so, both alignments would have temporary impacts on the I-5 southbound clear zone. About 1,000 feet of clear zone would remain during construction. A temporary construction barrier would be placed for approximately 15,100 feet near the southbound I-5 edge of pavement where barriers would not already be present. Based on the HSM methodologies, this could result in an increase of up to three crashes per year with the western alignment and up to four crashes per year with the eastern alignment during the construction period.

J.2.1.3 Clear Zone Mitigation

During operations, the eastern alignment reduces the available clear zone with and without the SR 509 Extension, while the western alignment does not affect it with and without the SR 509 Extension. Where the project unavoidably reduces the available clear zone, Sound Transit would work with WSDOT and FHWA to identify appropriate mitigation, such as regrading to reestablish a clear zone or installing guardrail, barriers, and/or walls. Impacted stormwater facilities might be relocated or modified; access for maintenance activities would be provided.

J.2.2 Property Acquisitions

Sound Transit quantified the area in the I-5 right-of-way that would be left unusable or with restricted access on the west side of the light rail, as shown in Exhibit J-2 cross-sections a, c, and d. The eastern alignment would have more than twice as much remnant area as the western alignment (30.1 acres vs. 11.7 acres). Therefore, although both alignment configurations would accommodate all currently planned highway improvements, use of the I-5 right-of-way would reduce the area available for use by currently undefined and unplanned highway projects in the future. These projects could include highway expansion or other infrastructure improvements such as stormwater facilites or sound walls. Limiting the space available for future projects could also increase the costs of these projects during construction if more expensive construction methods are needed or a more expensive design is needed, such as an enclosed stormwater system instead of drainage ditches.

J.2.3 Noise and Vibration

The detailed noise and vibration analysis for the Final EIS was performed for approximately 3,100 properties along the I-5 corridor. For this appendix, an eastern alignment 15 feet to the east of the Preferred Alternative was assumed and the final noise model was run for the places where this shift would be possible.

Moving light rail farther away from noise-sensitive receivers, as shown in Exhibit J-2 cross-sections b, d, and e, would slightly reduce the number and severity of impacts. Doubling the distance between a receiver and a linear noise source (like a light rail guideway) typically reduces noise by 3 decibels (dB), and even more when the topography provides shielding. For comparison, a 3-dB reduction in noise is barely perceptible to most people, a 5-dB change is clearly perceptible, and a 10-dB reduction is typically perceived by humans as a halving of the noise level. Mature trees and dense vegetation do not normally provide a noticeable noise reduction unless they are at least 100 feet thick, where a reduction of 3 dB or more is possible. Front-line noise-sensitive receivers along I-5 (e.g., receivers directly adjacent to I-5 with no structural shielding) are generally between 60 and 125 feet from the

western alignment, with some as close as 25 to 50 feet. Shifting the light rail 15 to 20 feet to the east would reduce noise levels by 1 to 3 dB, depending on the location and topographical conditions between the light rail alignment and the homes. Most sites would have less than a 2-dB change.

The western alignment would have 629 light-rail noise impacts, of which 555 are moderate and 74 are severe. Approximately 400 of these would occur north of Kent-Des Moines Road and would not vary between the western and eastern alignments evaluated in this appendix. Shifting 15 feet to the east would reduce seven severe impacts to moderate impacts and eliminate six moderate impacts. Sound Transit would mitigate impacts with sound walls or other noise mitigation measures. Mitigating to below impact criteria levels, however, does not mean that noise from the light rail guideway is eliminated altogether. The closer the light rail guideway is to homes, the greater the chances that residents would be able to hear the trains, even if the noise levels are below levels that constitute an impact.

Vibration impacts would also occur with both alignments. The western alignment would have 56 impacts at the Camelot Square Mobile Home Park. All vibration impacts occur within 50 to 100 feet of the guideway. The eastern alignment would slightly reduce vibration impacts because of the increased distance from receivers to the guideway.

J.2.4 Visual and Aesthetic Resources

The mix of vegetation types varies in the undeveloped portion of the I-5 right-of-way. Closer to the existing travel lanes, the vegetation is a mix of mowed grass, shrubs, and trees. In general, mature trees and dense vegetation are most intact along the western boundaries of the right-of-way, adjacent to residences. The dense trees and vegetation provide a visual barrier or buffer between many residential areas and the freeway.

Both alignments would remove similar amounts of this visual buffer between residences and I-5. The western alignment would reduce visual quality at about 160 residences between Kent-Des Moines Road and S 320th Street. There are some trees on either side of the alignment beyond the project permanent footprint that need to be assessed during final design to determine if they actually need to be removed. The assessment of reduced visual quality is conservative because it assumes all of these trees would be removed. Fewer residences might be impacted or the impact might be minimized if not all of these trees are removed. The eastern aligment could further reduce these impacts at up to 60 of these residences, depending on how many of these trees would actually need to be removed. There would also be about 10 additional impacts from tree removals that are limited to the eastern alignment.

Both alignments would impact approximately 0.6 acre of designated state resource conservation areas at the western edge of the I-5 right-of-way in three areas south of S 272nd Street and south of S 312th Street. These properties were purchased by WSDOT to provide a visual buffer and have specific mitigation requirements described in the 2015 *Roadside Policy Manual* (WSDOT, 2015b). With the SR 509 Extension, visual impacts would be similar to the western alignment.

J.2.5 Ecosystems

The western alignment would have a less than 0.1-acre impact on the McSorley Creek wetland complex and 0.6-acre impact on the McSorley Creek wetland buffer. An eastern alignment would avoid impacts on this wetland and would reduce impacts on its buffer by less than 0.1 acre, as shown in Exhibit J-2 cross-section c. The eastern alignment would impact some wetlands not impacted by the western alignment, but would reduce overall wetland impacts from 0.7 acre to 0.6 acre. Both alignments would clear a similar area of vegetation, and therefore have similar impacts on ecosystem functions.

The western alignment would permanently clear a little less forested upland habitat (about 37.7 acres vs. 38.9 acres). The eastern alignment would remove more upland habitat due to the additional distance it would travel to the east when entering and exiting the right-of-way to and from station areas and the additional distance between access roads and ancillary facilities and the shifted alignment (Exhibit J-5). While the eastern alignment would remove more forested upland habitat, the WSDOT Roadside Policy Manual would require less mitigation because of the types and size of trees impacted.

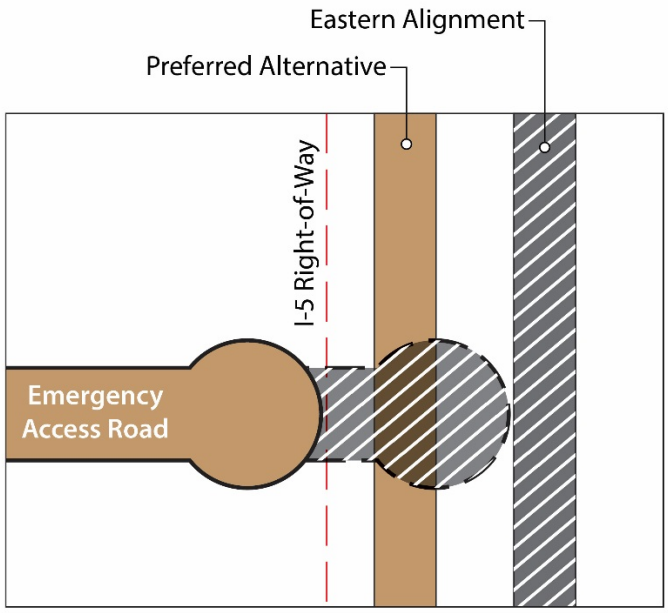


EXHIBIT J-5
Emergency Access Road Comparison

Bingaman Creek extends along I-5 for approximately 1,000 feet north and south of S 288th Street. The existing WSDOT culverts under I-5 and S 288th Street in this area have been identified as fish passage barriers and may be replaced in the future by WSDOT. A western alignment would realign approximately 1,000 feet of the creek under the guideway, impacting 0.2 acre of stream and 2.3 acres of stream buffer. If the alignment were shifted to the east, the stream would still be realigned around the columns, but with more room for realignment and for stream buffer restoration, particularly south of S 288th Street, and for the S 288th Street culvert replacement.

J.2.6 Hazardous Materials

Both alignment configurations would cross the Midway Landfill, requiring either removal of the waste for drilled shafts for an elevated guideway or compaction of the waste to support an at-grade guideway, as shown in Exhibit J-2 cross-section a. The depth of landfill waste under the western alignment is up to 65 feet deep, and under the eastern alignment it is approximately 40 feet. Shifting the alignment to the east would thus reduce the amount of waste removed. Drilled shafts (if used) would also be farther from groundwater in this area, reducing the potential for groundwater

contamination (Exhibit J-6). Deeper shafts would also have higher capital costs and higher cost for waste removal.

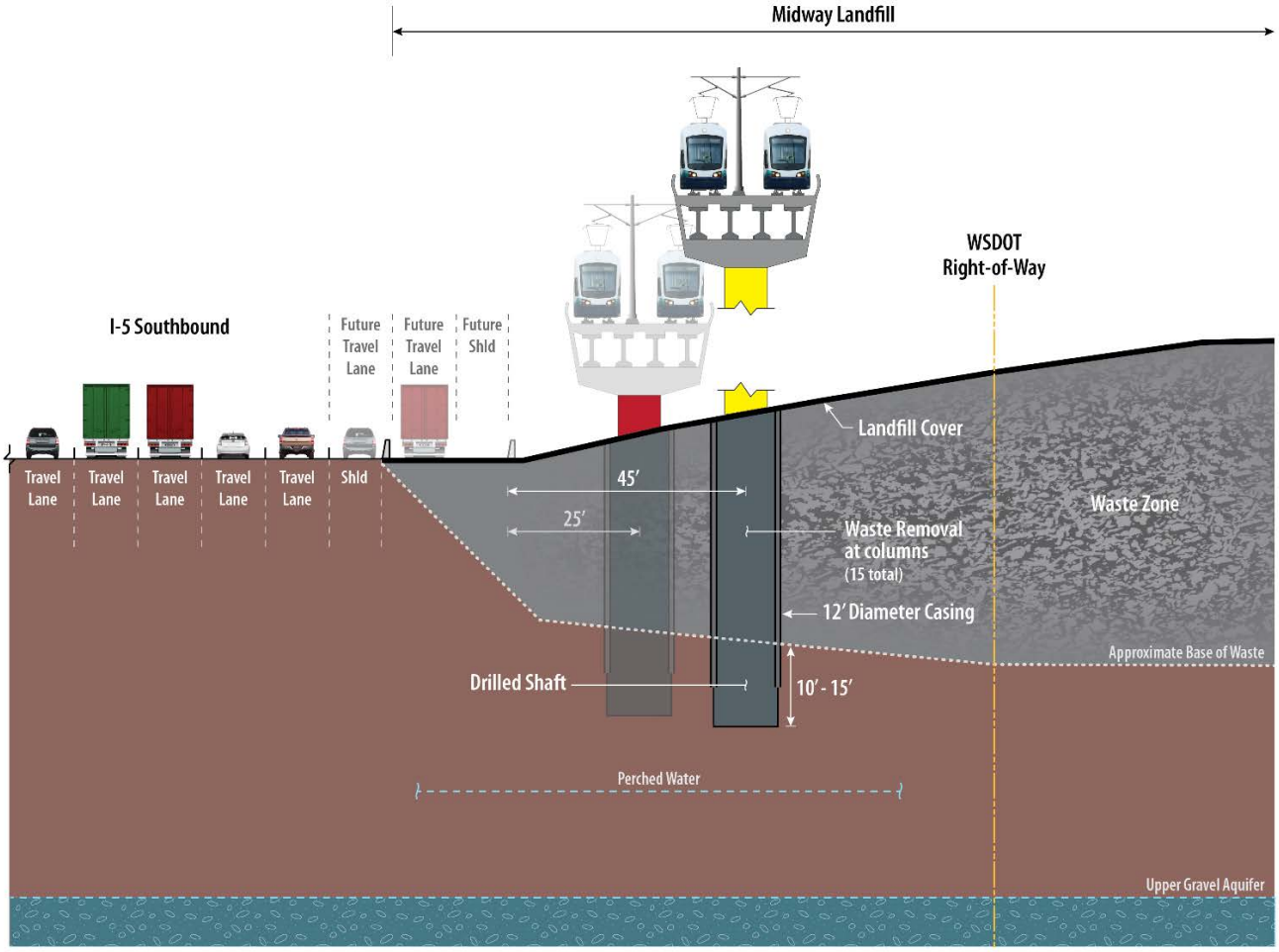


EXHIBIT J-6
Cross-section of Western and Eastern Alignments at Midway Landfill

J.2.7 Social

The western alignment would be closer to neighborhoods and therefore would have somewhat greater noise, vibration, and visual impacts as described above. According to U.S. Census data, some of these neighborhoods may include over 50 percent minority and up to 50 percent low-income populations (see Chapter 7, Environmental Justice, for additional demographic information). In addition to long-term impacts, the intensity of construction-related impacts in adjacent neighborhoods would be greater with the western alignment. An alignment farther east would in some places allow for more vegetative screening of the alignment and would decrease noise and vibration impacts on the residences.

J.3 Conclusion

FHWA and WSDOT recognize that site-specific constraints along the undeveloped right-of-way exist and may require flexibility to adjust the location of the light rail guideway to avoid or minimize potential impacts. For example, moving a guideway closer to the pavement from the edge of the right-of-way in some locations could reduce visual and noise impacts; it may avoid or reduce impacts on

wetlands or other natural features at a specific location; it may resolve constructability issues or increased costs due to working in or around existing infrastructure in the area; and it may mitigate or avoid other potential impacts that would exist if the guideway were on the edge of the right-of-way. Sound Transit, the Federal Transit Administration (FTA), and the highway agencies will continue to work collectively to perform this balancing of potential impacts, costs, and benefits with effects on safety, future highway needs, and interstate maintenance and operations.

Collectively, Sound Transit, FTA, and the highway agencies have identified at least two places in the I-5 alignment where this balancing of needs would be appropriate. One such location is where the light rail alignment approaches the Camelot Mobile Home Park south of S 288th Street (Exhibit J-2 cross-section d), where shifting the alignment east may be necessary to mitigate impacts on residents and, perhaps, Bingaman Creek.

The other location is where the alignment crosses the Midway Landfill (Exhibit J-2 cross-section a). A more eastern alignment may be proposed if there are constructability risks with the western alignment in the vicinity of the Midway Landfill. Information collected from geotechnical borings during preliminary design have not indicated any constructability risks that make the eastern alignment preferable.

Following the ROD, further design refinements will continue during final design and permitting. Consultation with the highway agencies, other interested agencies, and the public will also continue in tandem with the design advancement.

J.4 References

American Association of State Highway and Transportation Officials (AASHTO). 2014. *Highway Safety Manual* (HSM). http://www.highwaysafetymanual.org/.

American Association of State Highway and Transportation Officials (AASHTO). 2011. *Roadside Design Guide.*

Federal Highway Administration (FHWA). 2003. *Record of Decision for State Route 509: Corridor Completion/I-5/South Access Road Project, Southwest King County, Washington*. http://www.wsdot.wa.gov/NR/rdonlyres/71522A69-E32A-490E-B8F0-2AF8AC0B6C47/0/SR509_ROD_with_signature.pdf.

Washington State Department of Transportation (WSDOT). 2015a. *WSDOT Design Manual*. M 22.01-12. http://www.wsdot.wa.gov/Publications/Manuals/M22-01.htm. November 2015.

Washington State Department of Transportation (WSDOT). 2015b. *Roadside Policy Manual*. M3110. http://www.wsdot.wa.gov/Publications/Manuals/M3110.htm. August 2015.

Washington State Department of Transportation (WSDOT). 2014. I-5 - SR 509 Corridor Completion and Freight Improvement Project website. http://www.wsdot.wa.gov/Projects/I5/SR509FreightCongestionRelief.