Table 7. Summary of Noise Mitigation for North Spokane Corridor

Freeway Segment	Side of Road	Assessment of Proposed Sound Wall								
		Height Meters (Feet)	Length Meters (Feet)	Est. Cost ($1,000)	Number of Benefiting Residences	Cost per Residence	Mitigation Feasible?	10-dBA Insertion Loss?	Mitigation Reasonable?*	Affected Residences Remaining if Barrier was Constructed
8C Shady Slope Neighborhood Berm SSB and Barrier US2RAMP	NE	2.4 (8) 3.7 (12) 4.9 (16)	305 (1,000) 305 (1,000) 305 (1,000	$116 $180 $250	3 5 5	$38,500 $36,000 $50,000	yes yes yes	no no no	no no no	2 0 0
8C Shady Slope Road to Farwell Road Barrier CSW	SW	2.4 (8) 4.3 (14)	335 (1,100) 335 (1,100)	$194 $340	2 2	$97,000 $170,000	no yes	no yes	no no	0 0
8C US 2 to Farwell Road Barrier CNE	NE	2.4 (8) 4.3 (14)	335 (1,100) 335 (1,100)	$194 $340	1 1	$194,000 $340,000	no yes	no no	no no	0 0

* Estimated construction cost for Shady Slope Berm (SSB) is $3 per cubic yard. Estimated construction cost for concrete walls is based on $22.10 per square foot. For construction of reasonable sound walls, it is possible that equivalent noise reduction could be attained using less expensive materials than those used in the cost estimates. Such cost considerations and material specifications would be evaluated by WSDOT at the time of final project design.

The total number of residences receiving beneficial noise reduction from the barrier is listed in Table 7 for each segment. The cost per residence receiving benefit is then calculated and shown using cost criteria provided by WSDOT. It is possible that equivalent noise reduction could be attained using less expensive materials than those used in the following estimates. Such cost considerations would be evaluated by WSDOT at the time of final project design. Table 8 shows the allowed cost per residence based on the design year sound levels. All noise abatement measures under consideration were evaluated to reduce to the extent possible all impacts in the respective areas (i.e., within 152 meters [approximately 500 feet] of the right-of-way). The right-hand column of Table 7 shows the number of homes that would still be impacted after construction of the indicated noise wall, regardless of whether the wall is feasible or reasonable.

Table 8. Allowance for Residential Noise Abatement Measures

Freeway Segment	Design Year Sound Levels (dBA)	Allowed Cost per Household ($)	Number of Benefiting Residences
Segment 8C (northeast side), Shady Slope Neighborhood (SSB plus US2RAMP)			
Closest residence	70	$21,500	2
Residences within 500 feet of right-of way	65-70	$19,000	5
Segments 8B and 8C (southwest side), Shady Slope Road to Farwell Road (CSW wall)			
Closest residence	70	$21,500	1
Residences within 500 feet of right-of way	60-70	$15,500	2
Segment 8C (northwest side), US 2 to Farwell Road (CNE wall)			
Closest residence	63	$15,500	1
Residences within 500 feet of right-of way	63	$15,500	1

Although the estimated cost and benefit of the noise abatement measure is shown in Table 7 and discussed below, other factors would be considered by WSDOT before recommending specific abatement measures. For example, public opinion may greatly affect the final decision on whether to construct a particular abatement measure.

4.2.1 Sub-Segment 8C (Shady Slope Neighborhood)

As shown in Figure 1, a residential neighborhood is on the northeast side of the NSC between Shady Slope Road and US 2. This neighborhood could be affected by noise from the elevated section of the NSC overpass and the proposed new connecting ramp between westbound US 2 and southbound NSC. The proposed connecting ramp passes close to many existing homes. The eastern half of the connecting ramp is in a depressed roadway that provides a natural noise barrier, but the western half of the ramp is either at grade or on an elevated ramp. The ground elevation at this neighborhood rises to the north, so the homes are higher than the NSC mainline and most of the connecting ramp.

As shown in Figure 2 and Table 5, 5 existing homes would be affected by noise from the NSC mainline and the connecting ramp. Without construction of special noise walls the neighborhood would be partially shielded by two roadway embankments: the Shady Slope Road overpass, and the sidewall of the depressed roadway on the east end of the connecting ramp. A combination of two additional noise barrier walls (shown as Berm SSB and Barrier US2RAMP in Figure 3) was evaluated. Berm SSB would be an earth berm constructed on the northeast side of the NSC between the Shady Slope Road overpass and US 2. Barrier US2RAMP would be a concrete wall constructed along the north side of the connecting ramp, alongside the parts of the ramp that are not in a depressed roadway.

As shown in Figure 2 and Table 5, the assumed background noise level at the neighborhood is 53 dBA, and traffic noise impacts would occur at 5 homes if no noise barriers were constructed. The noise level would not exceed 66 dBA at any of the homes, but the noise level would exceed 10 dBA above background.

As shown in Figure 3 and Table 7 the combination of Berm SSB and Barrier US2RAMP could abate noise impacts at the Shady Slope neighborhood. All of the noise barrier heights evaluated (ranging from 8 to 16 feet) provided at least 7 dBA of reduction at the closest residence, although none of the heights provided 10 dBA of reduction. Construction of 8-foot-high barriers would abate the impacts at 3 of the 5 affected homes, while 12-foot barriers would abate the impacts at all 5 homes. However, the cost of those barriers (expressed as dollars per benefiting home) exceeds WSDOT's reasonableness criteria.

4.2.2 Sub-Segment 8C (Southwest Side of NSC; Shady Slope Road to Farwell Road)

As shown in Figure 2, a residential development is between the high school and the NSC alignment. However, most of the development will be naturally shielded from freeway noise by the embankments for the Shady Slope Road overpass. As indicated in Table 5, the NSC would affect only one home north of US 2 and one church south of US 2, with most of the noise originating from elevated section of the NSC overpass on the south side of US 2. As shown in Figure 3 and Table 7, a 1,100-foot-long noise wall on the southwest side of the elevated section (Barrier CSW) would reduce noise levels to less than 10 dBA above baseline. However, the cost of the wall (expressed as dollars per benefiting household) would exceed WSDOT's reasonableness criterion.

4.2.3 Sub-Segment 8C (Northeast side of NSC; US 2 to Farwell Road)

As shown in Figure 2, there are few homes east of the NSC alignment between US 2 and Farwell Road. Only one of them would be affected by noise from the NSC and the connecting ramp between NSC and US 2. Most of the connecting ramp is in a depressed roadway, 20 feet below grade where it passes near existing homes and businesses. The affected home is affected mainly by noise from the elevated section of the NSC on the south side of US 2. As shown in Figure 3 and Table 7, a 1,100-foot-long noise wall along the east side of the elevated section of the NSC overpass (Barrier CNE) would reduce noise levels to less than 10 dBA above baseline. However, the cost of the noise wall (expressed as dollars per benefiting household) would be much higher than WSDOT's reasonableness criterion.

4.3 Impacts Remaining after Consideration of Noise Abatement Measures

Based on the noise impact analysis for the NSC between Shady Slope Road and Farwell Road, 8 existing homes would be affected by the proposed NSC overpass over US 2. All of the homes would be subject to a substantial noise increase (10 dBA higher than baseline) rather than exceeding the 66-dBA NAC. Although none of the noise barriers evaluated for this study satisfied WSDOT's reasonableness criteria, WSDOT will further consider a combination of two barriers to abate noise levels at the Shady Slope neighborhood:

- Berm SSB on the northeast side of the NSC between the Shady Slope Road overpass and US 2; and
- Barrier US2RAMP on the north side of the connecting ramp between westbound US 2 and southbound NSC.

As indicated in Table 7, the combination of those two noise walls would benefit 5 existing homes (i.e., they would receive at least a 3-dBA reduction in estimated sound levels). In those segments of the alignment where sound walls are neither feasible nor reasonable, 3 residences or churches would remain affected after completion of the proposed project (see Table 7).

5 REFERENCES

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