

## MEMORANDUM

**DATE:** July 7, 2023  
**TO:** Jeffrey Perrigo, PE  
**FROM:** Christian Nichols, PE  
**SUBJECT:** SR 522 BRT – Noise Impact Regulations

The intent of this memo is to provide context regarding the WSDOT Noise Policy and its implementation in the Sound Transit 522 project through Lake Forest Park.

### Regulations and Standards

The following sections identify the regulations and standards applicable for this type of project from the SR 522 Bus Rapid Transit (BRT) SEPA Environmental Checklist – Appendix E Noise and Vibration Technical Memo:

#### Section 4

*The assessment of potential noise and vibration impacts from the project was based on the current Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (September 2018), which this report refers to as the FTA Manual (2018). Other regulatory information and ordinances reviewed and applicable to the project include the Washington Administrative Code (WAC) and codes and ordinances from the cities of Seattle, Shoreline, Lake Forest Park, Kenmore and Bothell.*

*The FTA criteria recommend the use of the Federal Highway Administration (FHWA) regulations for traffic noise analysis on roadways directly affected by the project. In Washington state this would be the WSDOT regulations. However, traffic noise is only considered if the project includes certain specific elements. Section 4.1.5 discusses in more detail the FHWA and WSDOT regulations and criteria with respect to traffic noise.*

#### Section 4.1

*Based on FTA's guidance and a review of the design specifics of the project, the project study team followed the General Assessment as defined in the FTA Manual (2018) for the noise analysis.*

#### Section 4.1.5

*WSDOT is responsible for implementing the FHWA regulations in Washington state. Under FHQA and WSDOT regulations, traffic noise studies are performed only for projects meeting one or more of the following criteria,<sup>1</sup> as noted in the 2020 WSDOT Noise Policy below.*

## 2020 WSDOT Noise Policy

Below is the introduction from the WSDOT Noise Policy document further explaining the requirements of the FHWA and how the WSDOT Noise Policy and its implementation complies with those requirements:

*The Federal Highway Administration (FHWA) requires state departments of transportation to develop noise policies that will apply to projects within that state. FHWA considers the procedures outlined in the WSDOT Environmental Procedures Manual (EPM) and on the WSDOT Air Quality, Noise, and Energy Program webpage to be an extension and refinement of the requirements set out in 23 CFR 772 for roadway related traffic noise when applied to projects that require FHWA approval in Washington State, including projects administered by local agencies. Fulfillment of the procedures set out in the document assures that the federal noise standard for roadway traffic noise is met.*

Project traffic noise is assessed for the criterion below:

#### Type 1 Project – Qualifying Highway Projects

Type 1 activity criteria apply equally to roadways, bus lanes, re-striping for new lanes...and auxiliary lanes.

A traffic noise analysis is required by law for federally funded projects and required by state policy and procedures for roadway project that incorporate any one of the following elements:

1. Construction of a highway in a new location
2. Physical changes to the horizontal or vertical alignment of an existing highway where there is either:
  - a. Moving the existing highway horizontally which halves the distance between the nearest edge of the travelled lane and the closest receptor's outdoor use area, or
  - b. Significantly altering the vertical alignment of an existing highway that exposes a new line-of-sight between the receptor and the traffic noise source.
3. Increases the number of through traffic lanes on an existing highway which can include High-Occupancy Vehicle (HOV) lane, High Occupancy Toll (HOT) lane, bus lane, truck

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<sup>1</sup> SR 522 (BRT) SEPA Environmental Checklist – App E Noise and Vibration Technical Report

climbing lane or addition of an auxiliary lane of 2,500 feet in length or more except when the auxiliary lane is a turn lane.

4. The addition of a new or substantial alteration of an existing weigh station, rest stop, ride-share lot or toll plaza.

The following discussion from SR 522 Bus Rapid Transit (BRT) SEPA Environmental Checklist – Appendix E Noise and Vibration Technical Report summarizes the determination for the portion of the project within Lake Forest Park based on the criterion identified above.

## SEPA – App E Noise and Vibration Technical Report

Within the Noise and Vibration Technical Report, the Lake Forest Park portion of the project was delineated as Segment 2 of the four project segments.

*In Segment 2, the proposed widening of SR 522 near NE 165<sup>th</sup> Street was evaluated to determine whether it would meet FHWA Type 1 requirements for a detailed noise analysis (as described in Section 4.1.4). Five analysis locations were evaluated to determine whether the project's roadway realignment would move the nearest travel lane at least half the distance closer to the exterior use at each of the properties and, therefore, would meet the FHWA and WSDOT criterion requiring a Type 1 noise analysis. As shown in Table 7-6, the proposed widening would not reduce the distance between any noise-sensitive properties and the proposed roadway by at least half the distance between the existing properties and the existing roadway, and the resulting changes in traffic noise would not result in a perceptible change in traffic noise levels. Therefore, because the project fails to meet the Type 1 criterion for modifications to the horizontal alignment in Segment 2, a detailed noise analysis is not required.<sup>2</sup>*

**Table 7-6 Segment 2: FHWA Type 1 traffic noise analysis**

Receiver <sup>1</sup>	Current Distance <sup>2</sup> (ft)	Distance with Project <sup>3</sup> (ft)	Change in Distance <sup>4</sup> (ft)	dB Change	Half Current Distance <sup>5</sup> (ft)	Current Distance Reduced by Half or More
M-1	59	57	2	0.1	29.5	No
M-2	59	55	4	0.3	29.5	No
M-3	55	52	3	0.2	27.5	No
M-4	71	66	5	0.3	35.5	No
M-5	66	62	4	0.3	33	No

<sup>1</sup>Analysis sites are shown in Figure 7-1.

<sup>2</sup>Current Distance = Distance between the noise-sensitive property and the existing nearest travel lane.

<sup>3</sup>Distance with Project = Distance between the noise-sensitive property and the proposed nearest travel lane.

<sup>4</sup>Change in Distance = Difference (in feet) between the current distance and the proposed distance with the project.

<sup>5</sup>Half Current Distance = The minimum distance that the proposed nearest travel lane would have to be realigned to meet the FHWA criteria requiring a Type 1 noise analysis.

<sup>2</sup> SR 522 (BRT) SEPA Environmental Checklist – App E Noise and Vibration Technical Report

As the project was determined not to meet the Type 1 criterion and not requiring a noise analysis, there is no additional documentation regarding the noise impacts other than what was included in the SEPA Environmental Checklist. As such no study was conducted regarding the sound reflections from proposed barriers or walls along the project corridor.

## Federal Transit Administration (FTA) Evaluation of Reflected Noise from a Single Noise Barrier

The following is from the FTA Field Evaluation of Reflected Noise from a Single Noise Barrier. These sections are intended to offer some context for the change in noise after barrier construction.

*Conventional thinking is that an increase less than 3 dB should be just barely perceptible... One hypothesis tested in this research is that the noticeability and annoyance caused by the reflections might be due to other factors... In particular, the higher frequencies are more likely to be reflected (as opposed to diffusely reflected) back across the road. These higher frequencies may stand out more in the total received sound, changing the character of the sound. Given possible existing negative feelings about the highway among residents who did not qualify for a sound wall, a change in the sound character could be sufficient for those residents to experience increased annoyance from the traffic noise.*

*Another aspect of this phenomenon may be a factor that was noted in a study of a Caltrans project where sound absorption was added to a previously reflective far-side noise barrier along U.S. 101 in San Rafael, California (Menge and Barrett 2011). A resident observed, "It's a significant change. . . . The white noise that you hear is gone. What's missing is the 'shhhhh.'" This comment supports the concept that higher frequency spectral content is enhanced by the barrier reflections, or at least is attenuated less than low-frequency content. The comment also suggests the potential effect of the reflected sound on the overall time history or time signature of the total received sound. When a single vehicle passes by in the absence of a far-wall barrier, the sound that is perceived originates from the vehicle's location. When a reflective far wall is introduced, however, a receptor perceives not only the sound coming directly from the vehicle, but also the sound reflected off the far wall, which comes from a different point along the road. The relationship between the actual (direct) source and the reflected source changes as the vehicle proceeds through the area in front of the barrier. As a result, the time signature of the pass-by is lengthened. When multiple vehicles are present, the character of the normal rise and fall of the sound level of the vehicle pass-by also changes, affecting receptors' ability to pinpoint the direction of the sound. For curved barriers this effect can be further heightened due to multiple reflections.*

## City of Lake Forest Park Municipal Code

The following language was recently adopted by City Council on June 20, 2023:

The applicant shall provide documentation of how the retaining wall design satisfies, or exceeds, applicable WSDOT traffic noise policy and procedures. The documentation should include an assessment of noise impacts from the proposed design, including consideration of tree and vegetation removal, reflected noise, and proximity to residences, as well as proposed reflection and absorption techniques such as the use of tilted retaining walls to direct noise upward and variations in the facade to break up low to high frequencies.

## Summary

As shown in Appendix E Noise and Vibration Technical Report of the SEPA Environmental Checklist for this SR 522 BRT project a noise analysis was not required because the project did not meet the Type 1 project criterion.

Given a noise analysis was not conducted, there was no analysis or discussion regarding reflective noise for the proposed installation of a retaining wall along SR 522 within Lake Forest Park. The information and assessment included in the SEPA Environmental Checklist appears to comply with the regulations and standards for this project, though there is no discussion of reflective noise impacts.