Exhibit 6

Noise Analysis

Noise Discipline Report

WSDOT—Environmental Services—Air, Noise, Energy

April, 2019

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Washington State Department of Transportation

SR 520: I-5/Mercer St to SR 520/Portage Bay I-5 Interchange Improvements (I-5 Express Lanes Connection Project)

I-5 MP 167.20 to MP 168.39

SR 520 MP 0.00 to 0.45

Noise Discipline Report

This Report is a Supplement to the SR 520, I-5 to Medina: Bridge Replacement and HOV Project Noise Discipline Report Addendum and Errata dated May 2011

April, 2019

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Executive Summary

Project Objectives

The SR 520: I-5/Mercer St to SR 520/Portage Bay I-5 Interchange Improvements (I-5 Express Lanes Connection Project) is a modification of the SR 520, I-5 to Medina – Bridge Replacement and HOV Project that was approved by a Record of Decision (ROD) dated August 4, 2011 to include extend the previously-evaluated project limits and to include a reversible ramp between the I-5 express lanes and Mercer Street; and restriped I-5 express lanes to retain the existing four general-purpose lanes while adding a transit/HOV lane. The project will extend from MP 167.14 to MP 168.39 on I-5 and MP 0.00 to MP 0.51 on SR 520 within a heavily urbanized area of downtown Seattle, Washington. The Type 1 activity included in this project requiring a traffic noise analysis is the addition of a through traffic lane from between SR 520 and I-5.

Current Noise Environment

- The project area is located within WSDOT right-of-way in an urbanized corridor near downtown Seattle which includes single- and multi-family residences, parks, mid-to-high rise apartments, and condominiums. Surrounding land use include churches, schools, commercial businesses, hotels, medical facilities, and undeveloped land.
- The primary noise source in the noise study area is vehicle traffic on I-5 and SR 520. Local road noise, noise from commercial businesses, and periodic noise from aircrafts and rail lines all contribute to noise levels in the study area.
- Existing noise walls are located in both directions of I-5 north of E. Roanoke Street with one noise wall located south of E. Roanoke Street along I-5 southbound. Large retaining walls are located along both directions of I-5 and SR 520 as both highways are depressed within the study area.

Noise Impacts Considering the New Alignment

- Existing condition (2018) noise abatement criteria impacts—445 residences, 5 parks (Eastlake Triangle, I-5 Colonnade, St Marks Greenbelt, Lakeview Place, and Bellevue Place) and two trails (East Howe Street Hill Climb and Melrose Trail) represented by 331 modeling sites would approach or exceed the NAC.
- No Build (2030) noise abatement criteria impacts—450 residences and the same 5 parks and two trails represented by 335 modeling sites (includes all sites with NAC impacts under existing condition) would approach or exceed the NAC.
- Build (2030) noise abatement criteria impacts—451 residences and the same 5 parks and 2 trails represented by 336 modeling sites (includes all sites with NAC impacts under existing

condition) would approach or exceed the NAC and all but two of the residences at the same modeling location with NAC impacts under No Build 2030.

- Build (2030) – no substantial increase impacts (of 10 dBA or greater over existing noise levels) are predicted.

Abatement Recommended

Noise abatement was considered at five locations where traffic noise impacts were predicted with impacts consistent with the 2011 noise study for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project not reanalyzed as discussed in the Traffic Noise Levels Section of this report. Noise abatement was considered at all five locations with noise barriers evaluated at four of five impact locations. The fifth impact area is located east of I-5 from the northbound I-5 off-ramp at Lakeview Boulevard to the northbound I-5 off-ramp to SR 520 was not evaluated for noise barrier placement as a structural assessment conducted in October of 2018 determined construction of a noise barrier atop the viaduct structure located in this area was not feasible (WSDOT, 2018).

Of the four noise barriers evaluated in this report, two noise barrier alignments were found to meet WSDOT Criteria for the placement of a feasible noise barrier. However, neither noise barrier that met WSDOT Feasible Criteria also met WSDOT Criteria for Reasonableness.

Project Construction and Future Planning

During project construction, areas adjacent to the project would be exposed to construction noise in addition to traffic-related noise. Impacts during construction are of short duration, and standard specifications for noise control would minimize or eliminate impacts during construction.

A copy of this final report will be made available to local jurisdictions by WSDOT. This report will serve to inform the local planning departments of the effects of the highway and highway-construction-related noise in the area studied. The information contained within this report can assist local officials in their planning process.

At the time of this report, several undeveloped or vacant lots were located near the proposed project improvements. Per the WSDOT Traffic Noise Policy, if building permits have been submitted for undeveloped properties, the proposed development needs to be included in the noise study. A review of the City of Seattle's land use and building permits was conducted in January 2019. The review did not identify permits that have been submitted to develop structures that were not already under construction that include noise-sensitive land uses that are included in WSDOT and FHWA noise-regulated land uses NAC B, C, D, or F at properties located within the noise study area. All permitted developments identified at the time of the permit review have been considered in this noise study. More information on related research conducted at the time of this report is presented in Appendix B of this report.

Based on the modeling results and future traffic volumes and speeds included in this report, areas within 300 to 400 feet of the proposed project improvements along I-5 and SR 520 may experience noise levels that exceed the WSDOT residential noise abatement criteria of 66 dBA. The range of distances presented accounts for the varying terrain and shielding, which result in higher traffic noise levels farther from I-5

and SR 520 in areas located higher than the source of traffic noise with direct line-of-sight to traffic. Commercial areas located within 150 to 250 feet of I-5 and SR 520 may exceed the commercial abatement criteria of 71 dBA. Undeveloped lands located closer to I-5 and SR 520 would likely experience higher noise levels due to the higher future traffic volumes and local roadways. It is recommended that local officials use this information as a guide when developing future land use plans, zoning, or building code requirements. The use of this information may assist local government with future development plans and thereby result in development that is consistent with the noise environment.

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Introduction

Project Description and Purpose

The "Project" will include a new reversible HOV direct access ramp providing a direct access connection between the future SR 520 HOV lanes and the existing reversible I-5 express roadway (to and from the south). This is a modification of the SR 520, I-5 to Medina – Bridge Replacement and HOV Project that was approved by a Record of Decision (ROD) dated August 4, 2011. As described in that ROD, the existing I-5 to SR 520 ramps will be partially rebuilt to accommodate the new reversible HOV direct access ramp and also be forward compatible with the future Portage Bay Bridge replacement project. Interchange ramps that will be partially rebuilt include the NB and SB I-5 ramps to EB SR 520, the WB SR 520 ramps to NB and SB I-5, and the existing WB SR 520 off-ramp to E Roanoke St. These project elements were evaluated in the SR 520, I-5 to Medina: Bridge Replacement and HOV Project Noise Discipline Report Addendum and Errata dated May 2011 and the SR 520, I-5 to Medina: Bridge Replacement and HOV Project Noise Discipline Report dated December 2009. The current analysis is supplemental to the analysis included in those reports.

The prior analysis did not include a reversible HOV direct access connection from Mercer St.to the I-5 express lanes by modifying the existing SB I-5 express lane off-ramp to Mercer St.

The project is located in King County, Washington as shown on Exhibit 1. The goal of the project is to extend SR 520's new transit/HOV system onto the I-5 express lanes, creating a direct bus and carpool connection between SR 520, South Lake Union, and downtown Seattle. The added project will extend from MP 167.14 to MP 168.39 on I-5 and from MP 0.00 to MP 0.51 on SR 520 within a heavily urbanized area of downtown Seattle, Washington (Exhibit 1).

Type 1 Trigger for Noise Analysis

A traffic noise analysis is required by law[1] for federally funded projects and required by state policy[2] for other funded projects that:

- Involve construction of a new highway,
- Significantly change the horizontal or vertical alignment,
- Increase the number of through traffic lanes on an existing highway, or
- Alter terrain to create new line-of-sight to traffic for noise-sensitive receivers.

The Type 1 Trigger is that this project extends the limits of the Type 1 SR 520, I-5 to Medina – Bridge Replacement and HOV Project. Therefore, a traffic noise analysis is required for the project. A summary of the noise analysis and abatement process is included in Appendix A.

[1] 23 CFR 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise"
[2] 2011 WSDOT Traffic Noise Policy and Procedures

Noise Relevant Project Information

The following is a list of items relevant to the traffic noise analysis for the existing, No-Build, and Build conditions, including:

- The project includes an additional through lane capacity improvements in both directions of SR 520 and I-5.
- The project would change existing accesses to and from I-5 and SR 520.
- The reversible I-5 express lanes are located between I-5 northbound and I-5 southbound lanes.
- The project is depressed and on-structure within the project area. Traffic noise is partially shielded from most nearby noise-sensitive land uses by terrain, highway related structures, retaining walls, or existing noise walls.
- Noise-sensitive land uses are located along I-5 and SR 520 throughout the project area with most land to the east of I-5 located at a higher elevation and most land to the west of I-5 located at a higher elevation.
- The project would maintain existing I-5 and SR 520 posted speed limits within the project area.
- The Year for Existing is 2018 and the Future Year for Build and No-Build conditions is 2030.

Exhibit 1: Project Vicinity Map

SR 520 – I-5 Express Lanes Connection Project
Noise Discipline Report

Source: WSP USA, 2019

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Characteristics of Sound and Noise

An overview of sound and noise can be found in the Noise Discipline Report Addendum and Errata for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project (May, 2011).

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Traffic Noise Analysis Methodology

Determination of the Traffic Noise Study Area

The noise study area was determined using 23 CFR 772 (federal traffic noise policy) requiring identification of all existing land uses, and undeveloped lands permitted for development that may include noise-sensitive land uses. A 500-foot limit from project improvements was used as the noise study boundary and was confirmed as a sufficient study distance during field reconnaissance and field measurements. The noise study limits extend along SR 520 from MP 0.00 to MP 0.51 and from on I-5 from MP 167.14 to MP 168.39 extending to I-5 on- and off-ramps at Mercer Street and Fairview Avenue N., as shown on Exhibit 1. The portion of the Project along SR 520 from MP 0.00 to MP 0.51 and from on I-5 from approximately MP 168 to MP 168.39 has already been evaluated in the SR 520, I-5 to Medina: Bridge Replacement and HOV Project Noise Discipline Report Addendum and Errata dated May 2011. In that area, this study is only a validation that the current project design has not changed substantially from the prior analysis.

As shown in Exhibit 2, the noise study area is an urbanized corridor in downtown Seattle which includes a variety of land uses. Mid-to-high rise office buildings, apartments, and condominiums characterize much of the southern portion of the noise study area. The northern portion of the noise study area is characterized by mostly residential land uses, both single-family and multi-family. A few churches, medical facilities, trails, and parks are also located within the noise study area. I-5 Colonnade Park is located on a steep slope under the I-5 freeway, and it includes a series of bike paths, trails, and an off-leash pet area.

Short term noise events from aircrafts, railroad trains, traffic on side street traffic all contribute to the noise environment in the study area; however, the primary noise source throughout much of the study area is from vehicles travelling on I-5. Throughout much of the noise study area I-5 is located on-structure and is depressed beneath the elevation of nearby parcels.

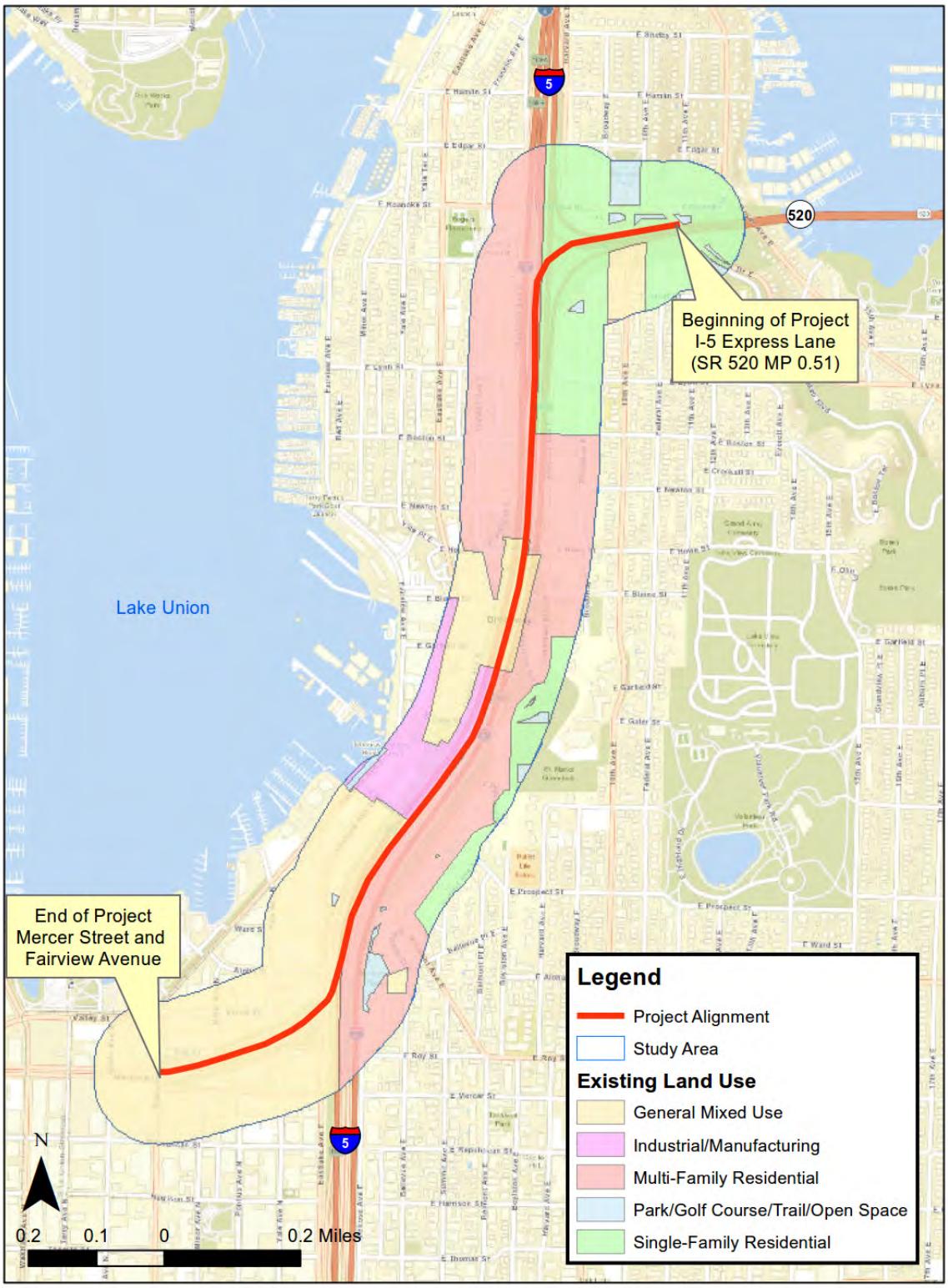
A review of the City of Seattle Planning Department's online land use and building permits in December 2018, indicated that several permits had been submitted to develop structures that includes residences, commercial uses, or other WSDOT and FHWA noise-regulated land uses NAC B, C, D, or F at the properties along the corridor. Many of these develops are underway with the developments identified in the review included in the analysis. More information on this research effort is presented in Appendix B of this report.

Traffic Noise Measurement

Ambient noise levels were measured to identify major noise sources in the project area and validate the noise model. Traffic noise measurements are not used to describe Existing conditions, which are modeled after the noise model has been validated.

15-minute L_{eq} measurements were collected at nineteen locations representative of sound level environments within the study area during free-flowing traffic conditions. FHWA allows 15-minute L_{eq} measurements to represent the $L_{eq}(h)$. These traffic noise measurements are not a representation of "average" existing noise levels and are not used to determine whether noise

Exhibit 2: Existing Land Use in Project Vicinity



SR 520 – I-5 Express Lanes Connection Project
Noise Discipline Report WSP USA, 2019

abatement measures are warranted. The traffic noise measurements are made to complete the traffic noise model validation process, which is described in the next section.

Measurements were conducted on August 15, 17, and 24, and September 7, and October 22, 2018, with a calibrated Larson Davis Model 820 (Type 1) noise meter, which complies with ANSI S1.4 for a Type I instrument accuracy. The sound level meter was calibrated before and after each measurement and the noise meter is calibrated annually by the manufacturer, Larson Davis.

Traffic counts and meteorological conditions were also recorded during field measurements for model validation. Noise measurement data and observed traffic and meteorological conditions during measurements are provided in the field data sheets in Appendix G.

Short-term existing traffic noise levels were monitored at nineteen locations. The noise measurement locations and results are described in Exhibit 5. Noise levels at the eighteen short-term measurement sites ranged from 66 dBA L_{eq} to 80 dBA L_{eq}, depending on the proximity and direction to I-5 and SR 520, and local roadways in the area. All noise measurements were performed during satisfactory weather conditions for performing noise measurements.

Traffic Noise Model Validation

FHWA's Traffic Noise Model (TNM) Version 2.5 (FHWA, 2004) was used for validation and to predict future L_{eq}(h) traffic noise levels. TNM Version 2.5 is the most current version of the noise model. TNM calculates precise estimates of noise levels at discrete points. The model estimates the sound levels from a series of straight-line roadway segments. TNM also considers the effects of existing barriers, topography, vegetation, and atmospheric absorption. Noise from sources other than traffic is not included, so when non-traffic noise is present, such as aircraft noise, TNM will under predict the total noise level. To create the model, design files outlining major roadways, topographical features, and sensitive receptors were imported into the TNM model as background features and the corresponding values were entered manually. Aerial photographs and site visits were used to verify site conditions.

WSDOT provided all base maps and project design maps for use in the noise study. As standard practice, base maps were exported as DXF files and imported into the TNM package. In addition, ArcGIS was used to develop the TNM model. Major roadways, topographical features, and sensitive receptors were digitized into the model. The United States Geological Survey (USGS) 7.5-minute Digital Elevation Model was also used (USGS 2018).

To ensure that the noise model used to predict traffic noise impacts accurately reflects the sound levels in the noise study area, a model is constructed using the same traffic volumes, speed, and vehicle types that were present during the sound level measurements. Modeled values must be within ±2.0 dBA of the measured levels for the model to be validated.

Exhibit 3 describes the validation locations and the comparison of measured to modeled values. Traffic counted during the measurements is included in Appendix C. Exhibit 6 shows the measured and modeled receiver locations. Traffic volumes, vehicle mix, and speed data collected during each validation measurement is included in Appendix C. Each of the eighteen short-term measured sites

was found to model within ±2 dBA of the measured levels (Exhibit 3). Because a 2- to 3-dBA change in noise levels is barely perceptible to the average human ear, an agreement of ±2 dBA is acceptable for noise model validation purposes.

Exhibit 3: Existing Noise Measurement Data and Noise Model Validation Results

Site #/Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
Site 1—2637 Boylston Ave. E	8/15/18	12:55	71.2	69.2	2.0
Site 2—615 E Lynn St.	8/15/18	12:55	66.6	65.2	1.4
Site 3—2203 Boylston Ave. E	8/15/18	13:25	72.4	71.9	0.5
Site 4—2003 Boylston Ave. E	8/15/18	13:25	70.7	69.5	1.2
Site 5—Adjacent to 2348 Harvard Ave. E	8/17/18	10:10	72.4	72.1	0.3
Site 6—806 E Lynn St.	8/17/18	10:45	71.6	72.1	-0.5
Site 7—2371 Boylston Ave. E	8/17/18	11:40	68	66.8	1.2
Site 8—1964 Harvard Ave. E	8/24/18	11:25	74.5	73.4	1.1
Site 9—1924 Harvard Ave. E	8/24/18	11:25	77.2	75.6	1.6
Site 10—E Howe Hill Climb (ped path)	8/24/18	11:50	71.1	70.2	0.9
Site 11—1575 Lakeview Blvd.	8/24/18	11:50	75.9	75	0.9
Site 12—2636 Harvard Ave. E	9/7/18	10:25	71.1	69.6	1.5
Site 13—Fire Station 22, East Lawn	9/7/18	10:50	68.1	69.5	-1.4
Site 14—2408 Broadway Ave. E	9/7/18	11:40	71.6	69.8	1.8
Site 15—Sidewalk near 1014 Lakeview Blvd	10/22/18	12:00	77.5	77.5	0.0
Site 16—Melrose Trail	10/22/18	12:28	80.3	80.7	-0.4
Site 17—Adjacent to 611 Pontius Ave. N	10/22/18	13:10	67.5	67.8	-0.3
Site 18—Minor Ave. N and Roy St.	10/22/18	13:45	66.1	65.6	0.5
Site 19—Eastlake Triangle Park	10/22/18	14:20	72.3	70.6	1.7

Notes:
Short term measured noise levels were used for model validation near existing roadways.
Sites M13, M15, M17 and M18 were used for model validation only.

The modeled receiver locations are shown in Exhibits 4 through 7. Some validation sites were not taken at the optimal modeling location that represent the most frequent human outdoor use area and therefore are not used for peak-hour traffic noise predictions. Five-hundred and forty-six sites were modeled to represent the 1,022 outdoor use areas for all noise-sensitive locations within the study area.

Exhibit 4: Traffic Noise Measurement and Modeling Locations

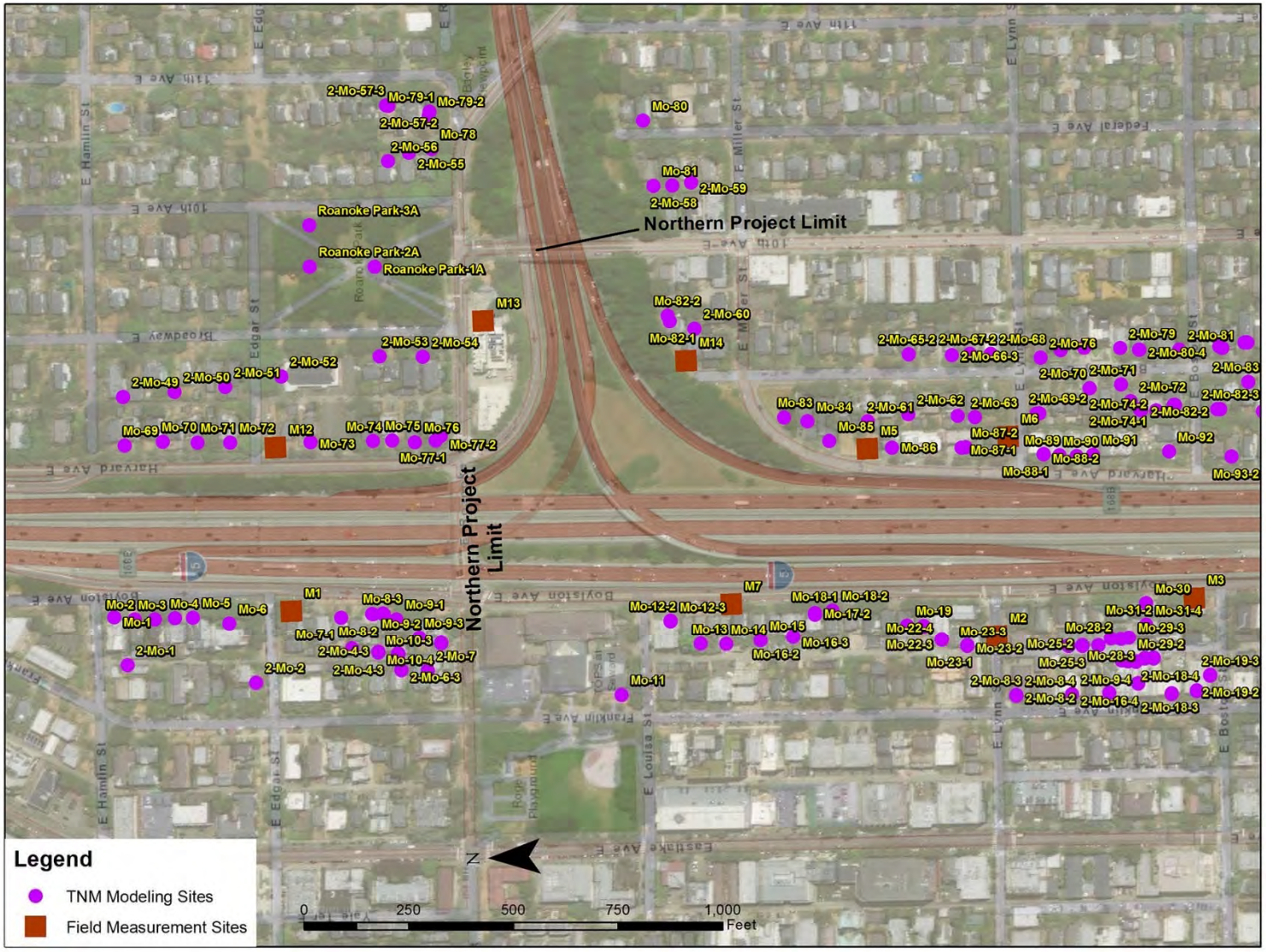


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Exhibit 5: Traffic Noise Measurement and Modeling Locations

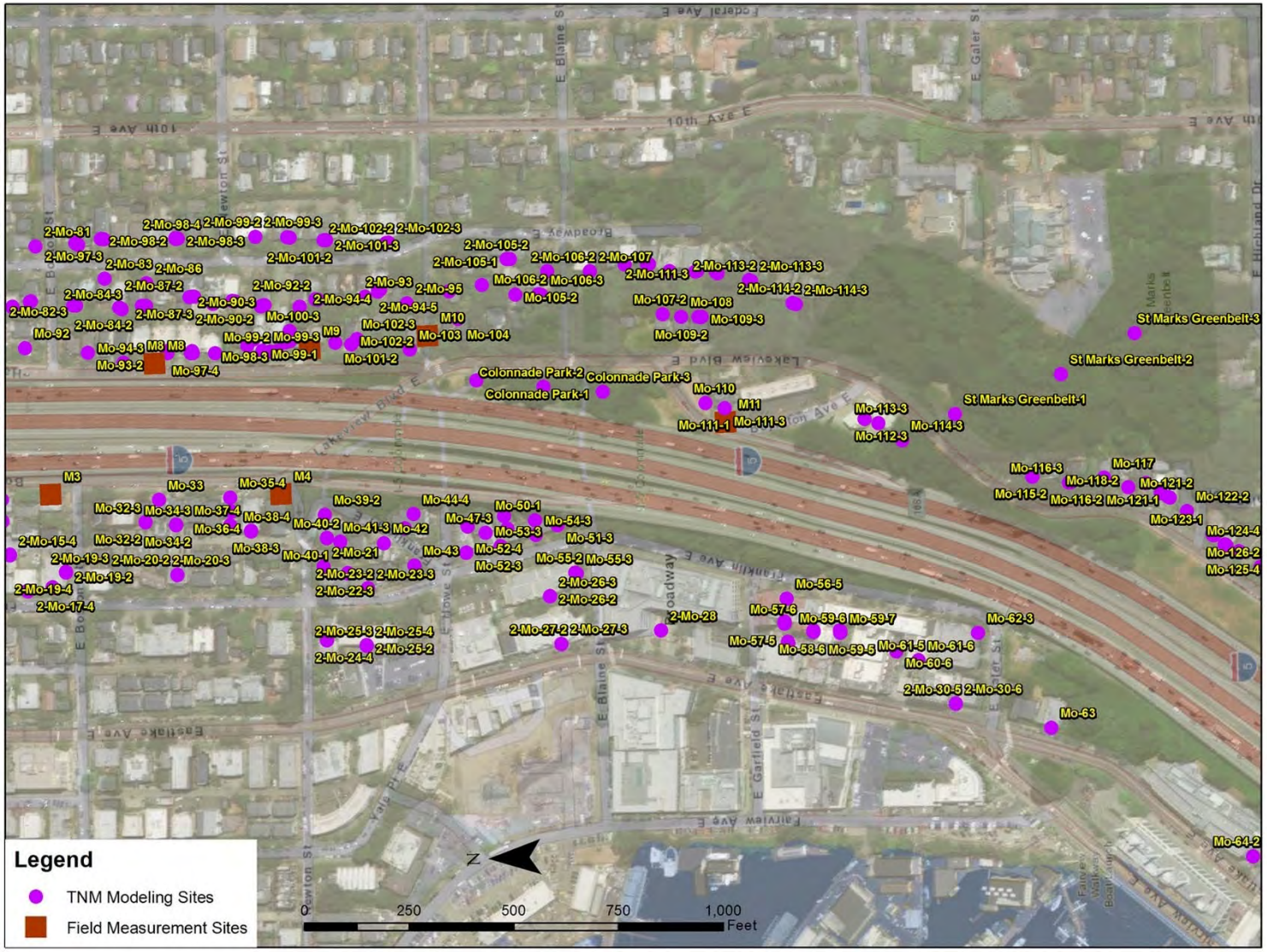

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Exhibit 6: Traffic Noise Measurement and Modeling Locations

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Exhibit 7: Traffic Noise Measurement and Modeling Locations

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Traffic Noise Levels

Description of Study Area

The study area and all modeled noise sensitive receivers are shown in Exhibits 4 through 7.

Operational Traffic Noise

Existing (2018), No Build (2030), and Build (2030) noise levels were modeled at the 1,022 modeling locations to represent 546 properties that could be affected by noise from the project. The modeling locations represent outdoor areas of frequent human use, such as common, ground-floor use areas, or benches or play areas.

Predicted noise levels were based on PM peak-hour traffic volumes to estimate Existing Conditions 2018 and future year 2030 noise levels with (Build) and without the project (No Build). A comparison of modeled noise levels resulting from PM peak traffic volumes and AM peak traffic volumes was conducted that confirmed the use of PM peak-hour traffic as the worst-case traffic volumes resulting in the highest noise levels. Traffic information including speed, volume, and vehicle mix data for existing and future traffic conditions with and without the project is included in Appendix C. A summary of impacts by condition is presented here:

- Existing condition (2018) noise abatement criteria impacts—445 residences, 5 parks (Eastlake Triangle, I-5 Colonnade, St Marks Greenbelt, Lakeview Place, and Bellevue Place) and two trails (East Howe Street Hill Climb and Melrose Trail) represented by 331 modeling sites would approach or exceed the NAC.

- No Build (2030) noise abatement criteria impacts—450 residences and the same 5 parks and two trails represented by 335 modeling sites (includes all sites with NAC impacts under existing condition) would approach or exceed the NAC.

- Build (2030) noise abatement criteria impacts—451 residences and the same 5 parks and 2 trails represented by 336 modeling sites (includes all sites with NAC impacts under existing condition) would approach or exceed the NAC and all but two of the residences at the same modeling location with NAC impacts under No Build 2030.

- Build (2030) – no substantial increase impacts (of 10 dBA or greater over existing noise levels) are predicted.

Existing (2018) Noise Levels

Existing modeled worst-hour traffic noise levels for residential areas range from 53 dBA to 79 dBA (Exhibit 8). The modeled noise levels at these receivers depend on the proximity of the receiver to the existing roadways, primarily I-5 and SR 520. Of the 546 total modeled receivers, 331 receivers currently experience traffic noise levels that approach or exceed the NAC of 67 dBA. The 331 receivers represent 445 residences, 5 parks (Eastlake Triangle, I-5 Colonnade, St Marks Greenbelt,

Lakeview Place, and Bellevue Place) and two trails (East Howe Street Hill Climb and Melrose Trail). Existing traffic noise levels for all modeled receivers are shown in Exhibit 8.

Design Year (2030) Traffic Noise Levels—No Build

Future No Build modeled worst-hour traffic noise levels for residential areas range from 53 dBA to 79 dBA (Exhibit 8) as under existing conditions. The modeled noise levels at these receivers depend on the proximity of the receiver to the existing roadways, primarily I-5 and SR 520. Of the 546 total receivers, the same 331 receivers that currently experience traffic noise levels above the NAC of 66 dBA are predicted to continue to experience traffic noise levels that approach or exceed the NAC of 67 dBA along with four additional receivers totaling 335 receivers predicted to experience traffic noise levels approach or exceed the NAC without the project in 2030. The 335 receivers represent the same 445 residences described for impacts under existing conditions in addition to four receivers that represent five additional residences, totaling 450 residences and the same 5 parks and two trails described for impacts under existing conditions. Roadway traffic noise levels under the No Build Alternative would not result in a large change in noise levels over time due to a steady increase in traffic volumes on the existing roadway network. No Build traffic noise levels in the year 2030 for all modeled receivers are within 1 dBA of existing noise levels and are shown in Exhibit 8. No substantial increase impacts are predicted under 2030 No Build conditions.

Design Year (2030) Traffic Noise Levels—Build (Pre-Noise Abatement)

Future Build traffic noise levels represent transportation improvements associated with the SR 520/I-5 Express Lanes Connection Project prior to noise abatement evaluated in the Traffic Noise Abatement section of this report. Future Build modeled worst-hour traffic noise levels for residential areas range from 53 dBA to 79 dBA (Exhibit 8) as under existing conditions and No Build 2030. The modeled noise levels at these receivers depend primarily on the proximity of the receiver to the I-5 and SR 520 alignment. Of the 546 total receivers, all 331 of the receivers that currently experience traffic noise levels above the NAC of 66 dBA are predicted to continue to experience traffic noise levels that approach or exceed the NAC of 67 dBA.

In total 336 receivers (representing 451 residences, 5 parks (Eastlake Triangle, I-5 Colonnade, St Marks Greenbelt, Lakeview Place, and Bellevue Place) and two trails (East Howe Street Hill Climb and Melrose Trail) are predicted to experience traffic noise levels above the NAC in 2030. Build Alternative would not result in a large change in noise levels over time due to a steady increase in traffic volumes on the existing roadway network. Build traffic noise levels in the year 2030 for all modeled receivers are within 1 dBA of existing noise levels and 2030 No Build noise levels as shown in Exhibit 8. No substantial increase impacts are predicted under 2030 No Build conditions.

Exhibit 8: Modeled Noise Levels

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
M1	Residential	B/66	1	**68**	**69**	**69**
M2	Residential	B/66	1	65	65	**66**
M3	Residential	B/66	1	**72**	**72**	**72**
M4	Residential	B/66	1	**70**	**71**	**71**
M5	Residential	B/66	1	**72**	**72**	**71**
M6	Residential	B/66	1	**67**	**67**	**67**
M7	Residential	B/66	1	**70**	**71**	**71**
M8	Residential	B/66	1	**76**	**76**	**76**
M9	Residential	B/66	1	**78**	**78**	**78**
M10	Trail	C/66	1	**74**	**74**	**74**
M11	Residential	B/66	1	**78**	**78**	**78**
M12	Residential	B/66	1	**71**	**72**	**71**
M14	Residential	B/66	1	**70**	**71**	**71**
M16	Trail	C/66	1	**79**	**79**	**79**
M19	Park	C/66	1	**72**	**72**	**73**
Mo-1	Residential	B/66	1	**69**	**70**	**70**
Mo-2	Residential	B/66	1	**69**	**69**	**69**
Mo-3	Residential	B/66	1	**69**	**70**	**70**
Mo-4	Residential	B/66	1	**68**	**68**	**68**
Mo-5	Residential	B/66	1	**68**	**69**	**69**
Mo-6	Residential	B/66	1	**67**	**68**	**67**
Mo-7-1	Residential	B/66	1	**67**	**68**	**68**
Mo-7-2	Residential	B/66	1	**71**	**71**	**71**
Mo-7-3	Residential	B/66	1	**74**	**74**	**74**
Mo-8-1	Residential	B/66	1	**68**	**69**	**69**
Mo-8-2	Residential	B/66	1	**71**	**72**	**71**
Mo-8-3	Residential	B/66	1	**74**	**75**	**75**
Mo-9-1	Residential	B/66	1	**68**	**68**	**68**
Mo-9-2	Residential	B/66	1	64	65	65
Mo-9-3	Residential	B/66	1	**67**	**67**	**67**
Mo-10-2	Residential	B/66	1	**68**	**68**	**68**
Mo-10-3	Residential	B/66	1	**70**	**70**	**70**
Mo-10-4	Residential	B/66	1	**72**	**72**	**72**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-11	Residential	B/66	1	57	58	58
Mo-12-2	Residential	B/66	2	**72**	**72**	**72**
Mo-12-3	Residential	B/66	2	**74**	**74**	**74**
Mo-13	Residential	B/66	1	59	60	60
Mo-14	Residential	B/66	1	61	61	61
Mo-15	Residential	B/66	1	54	54	55
Mo-16-1	Residential	B/66	2	58	59	59
Mo-16-2	Residential	B/66	2	62	62	62
Mo-16-3	Residential	B/66	2	**66**	**66**	65
Mo-17-1	Residential	B/66	1	**68**	**68**	**68**
Mo-17-2	Residential	B/66	1	**72**	**72**	**71**
Mo-18-1	Residential	B/66	1	**69**	**69**	**68**
Mo-18-2	Residential	B/66	1	**73**	**73**	**71**
Mo-19	Residential	B/66	1	60	60	60
Mo-20-1	Residential	B/66	1	60	61	61
Mo-20-2	Residential	B/66	1	65	65	64
Mo-21-2	Residential	B/66	1	62	63	63
Mo-22-3	Residential	B/66	2	65	65	65
Mo-22-4	Residential	B/66	2	**70**	**70**	**70**
Mo-23-1	Residential	B/66	2	58	59	59
Mo-23-2	Residential	B/66	3	64	64	64
Mo-23-3	Residential	B/66	3	**66**	**66**	**66**
Mo-24-2	Residential	B/66	2	62	62	62
Mo-24-3	Residential	B/66	2	65	65	65
Mo-25-2	Residential	B/66	2	62	62	62
Mo-25-3	Residential	B/66	2	65	65	65
Mo-26-2	Residential	B/66	2	62	62	62
Mo-26-3	Residential	B/66	2	65	65	65
Mo-27-2	Residential	B/66	2	63	63	64
Mo-27-3	Residential	B/66	2	**66**	**66**	**66**
Mo-28-2	Residential	B/66	2	64	64	64
Mo-28-3	Residential	B/66	2	**66**	**66**	**66**
Mo-29-2	Residential	B/66	2	63	63	63
Mo-29-3	Residential	B/66	2	**66**	**66**	**66**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-30	Residential	B/66	3	**71**	**71**	**71**
Mo-31-2	Residential	B/66	3	65	65	65
Mo-31-4	Residential	B/66	3	**75**	**76**	**76**
Mo-32-2	Residential	B/66	1	64	64	64
Mo-32-3	Residential	B/66	1	**67**	**67**	**67**
Mo-33	Residential	B/66	1	**70**	**70**	**70**
Mo-34-1	Residential	B/66	1	62	63	63
Mo-34-2	Residential	B/66	1	64	64	64
Mo-34-3	Residential	B/66	1	**66**	**66**	**66**
Mo-35-4	Residential	B/66	1	**77**	**77**	**77**
Mo-36-4	Residential	B/66	1	**75**	**75**	**75**
Mo-37-4	Residential	B/66	1	**72**	**72**	**73**
Mo-38-2	Residential	B/66	2	**66**	**66**	**66**
Mo-38-3	Residential	B/66	2	**67**	**68**	**68**
Mo-38-4	Residential	B/66	2	**70**	**71**	**71**
Mo-39-2	Residential	B/66	1	**68**	**68**	**68**
Mo-40-1	Residential	B/66	1	63	64	64
Mo-40-2	Residential	B/66	1	**66**	**66**	**66**
Mo-41-3	Residential	B/66	1	**68**	**68**	**68**
Mo-42	Residential	B/66	2	63	64	64
Mo-43	Residential	B/66	2	62	63	63
Mo-44-4	Residential	B/66	1	**68**	**68**	**68**
Mo-45-3	Residential	B/66	3	**66**	**66**	**66**
Mo-45-2	Residential	B/66	3	65	65	65
Mo-46-2	Residential	B/66	2	63	63	63
Mo-46-3	Residential	B/66	2	65	65	65
Mo-47-3	Residential	B/66	2	64	64	64
Mo-48-1	Residential	B/66	2	58	59	59
Mo-48-3	Residential	B/66	2	65	65	65
Mo-49-1	Residential	B/66	2	58	59	59
Mo-50-1	Residential	B/66	3	59	59	59
Mo-51-1	Residential	B/66	1	59	59	59
Mo-51-3	Residential	B/66	1	61	62	62
Mo-52-3	Residential	B/66	2	63	63	63

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-52-4	Residential	B/66	2	65	65	65
Mo-53-3	Residential	B/66	4	63	63	63
Mo-54-3	Residential	B/66	3	64	64	64
Mo-55-2	Residential	B/66	1	64	64	64
Mo-55-3	Residential	B/66	1	65	65	65
Mo-56-5	Residential	B/66	1	**66**	**66**	**66**
Mo-57-1	Residential	B/66	1	61	61	61
Mo-57-2	Residential	B/66	2	61	62	62
Mo-57-3	Residential	B/66	2	62	62	62
Mo-57-4	Residential	B/66	2	63	63	63
Mo-57-5	Residential	B/66	2	64	64	64
Mo-57-6	Residential	B/66	2	65	65	65
Mo-58-2	Residential	B/66	1	62	62	62
Mo-58-3	Residential	B/66	1	63	63	63
Mo-58-4	Residential	B/66	1	64	64	64
Mo-58-5	Residential	B/66	1	65	65	65
Mo-58-6	Residential	B/66	1	**68**	**68**	**68**
Mo-59-2	Residential	B/66	1	62	62	62
Mo-59-3	Residential	B/66	1	62	63	63
Mo-59-4	Residential	B/66	1	64	64	64
Mo-59-5	Residential	B/66	1	65	65	65
Mo-59-6	Residential	B/66	1	**67**	**67**	**67**
Mo-59-7	Residential	B/66	1	**71**	**71**	**71**
Mo-60-6	Residential	B/66	7	**66**	**66**	**66**
Mo-61-5	Residential	B/66	4	**66**	**66**	**66**
Mo-61-6	Residential	B/66	4	**67**	**67**	**67**
Mo-62-3	Residential	B/66	1	**71**	**71**	**71**
Mo-63	Residential	B/66	1	**68**	**68**	**68**
Mo-64-2	Residential	B/66	1	**66**	**66**	**66**
Mo-65-6	Residential	B/66	1	**67**	**68**	**68**
Mo-66	Residential	B/66	1	**67**	**67**	**67**
Mo-67-1	Residential	B/66	1	**67**	**67**	**67**
Mo-67-2	Residential	B/66	1	65	65	65
Mo-67-3	Residential	B/66	1	**66**	**66**	**66**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-67-4	Residential	B/66	1	**67**	**67**	**67**
Mo-67-5	Residential	B/66	1	65	65	65
Mo-68	Residential	B/66	1	64	64	64
Mo-69	Residential	B/66	2	**71**	**72**	**72**
Mo-70	Residential	B/66	2	**70**	**70**	**70**
Mo-71	Residential	B/66	1	**70**	**70**	**70**
Mo-72	Residential	B/66	1	**70**	**70**	**70**
Mo-73	Residential	B/66	1	**70**	**70**	**70**
Mo-74	Residential	B/66	1	**70**	**70**	**70**
Mo-75	Residential	B/66	1	**71**	**71**	**71**
Mo-76	Residential	B/66	1	**72**	**72**	**72**
Mo-77-1	Residential	B/66	1	**74**	**74**	**74**
Mo-77-2	Residential	B/66	1	**75**	**76**	**76**
Mo-78	Residential	B/66	1	**66**	**67**	**67**
Mo-79-1	Residential	B/66	1	**67**	**68**	**69**
Mo-79-2	Residential	B/66	1	**70**	**71**	**71**
Mo-80	Residential	B/66	1	60	60	61
Mo-81	Residential	B/66	1	64	64	65
Mo-82-1	Residential	B/66	1	**69**	**69**	**69**
Mo-82-2	Residential	B/66	1	**71**	**71**	**71**
Mo-83	Residential	B/66	1	**66**	**66**	**66**
Mo-84	Residential	B/66	1	65	65	**66**
Mo-85	Residential	B/66	1	65	65	65
Mo-86	Residential	B/66	1	**69**	**70**	**69**
Mo-87-1	Residential	B/66	1	**69**	**69**	**69**
Mo-87-2	Residential	B/66	1	**74**	**74**	**73**
Mo-88-1	Residential	B/66	1	**70**	**70**	**70**
Mo-88-2	Residential	B/66	1	**75**	**75**	**75**
Mo-89	Residential	B/66	1	**70**	**70**	**70**
Mo-90	Residential	B/66	1	**70**	**70**	**70**
Mo-91	Residential	B/66	1	**70**	**70**	**70**
Mo-92	Residential	B/66	1	**72**	**72**	**72**
Mo-95-1	Residential	B/66	2	**72**	**72**	**72**
Mo-95-2	Residential	B/66	2	**76**	**76**	**76**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-95-3	Residential	B/66	2	**77**	**77**	**77**
Mo-96-1	Residential	B/66	2	**73**	**73**	**73**
Mo-96-2	Residential	B/66	2	**76**	**77**	**77**
Mo-96-3	Residential	B/66	2	**77**	**77**	**77**
Mo-93-2	Residential	B/66	2	**76**	**76**	**76**
Mo-94-3	Residential	B/66	2	**79**	**79**	**79**
Mo-97-4	Residential	B/66	1	**78**	**78**	**78**
Mo-98-1	Residential	B/66	1	**76**	**76**	**76**
Mo-98-3	Residential	B/66	1	**77**	**77**	**77**
Mo-99-1	Residential	B/66	1	**77**	**77**	**77**
Mo-99-2	Residential	B/66	1	**78**	**78**	**78**
Mo-99-3	Residential	B/66	1	**78**	**78**	**78**
Mo-100-1	Residential	B/66	1	**76**	**77**	**77**
Mo-100-2	Residential	B/66	1	**77**	**77**	**77**
Mo-100-3	Residential	B/66	1	**76**	**76**	**76**
Mo-101-2	Residential	B/66	1	**77**	**77**	**77**
Mo-102-2	Residential	B/66	1	**77**	**77**	**77**
Mo-102-3	Residential	B/66	1	**76**	**77**	**77**
Mo-103	Residential	B/66	1	**71**	**71**	**71**
Mo-104	Residential	B/66	1	**69**	**69**	**69**
Mo-105-2	Residential	B/66	1	**70**	**70**	**70**
Mo-106-2	Residential	B/66	1	**73**	**74**	**74**
Mo-106-3	Residential	B/66	1	**74**	**74**	**74**
Mo-107-2	Residential	B/66	1	**68**	**68**	**68**
Mo-108	Residential	B/66	1	65	65	65
Mo-109-1	Residential	B/66	1	**66**	**66**	**66**
Mo-109-2	Residential	B/66	1	**68**	**68**	**68**
Mo-109-3	Residential	B/66	1	**72**	**72**	**72**
Mo-110	Residential	B/66	1	**74**	**75**	**75**
Mo-111-1	Residential	B/66	3	**75**	**75**	**75**
Mo-111-3	Residential	B/66	3	**78**	**78**	**78**
Mo-112-3	Residential	B/66	3	**76**	**76**	**76**
Mo-113-3	Residential	B/66	4	**76**	**76**	**76**
Mo-114-3	Residential	B/66	1	**77**	**77**	**77**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-115-1	Residential	B/66	1	**75**	**75**	**75**
Mo-115-2	Residential	B/66	1	**75**	**76**	**76**
Mo-116-1	Residential	B/66	1	**75**	**75**	**75**
Mo-116-2	Residential	B/66	1	**76**	**76**	**76**
Mo-116-3	Residential	B/66	1	**76**	**77**	**77**
Mo-117	Residential	B/66	1	**70**	**70**	**70**
Mo-118-2	Residential	B/66	1	**73**	**73**	**73**
Mo-119-2	Residential	B/66	1	**72**	**72**	**72**
Mo-120-1	Residential	B/66	1	**71**	**71**	**71**
Mo-120-2	Residential	B/66	1	**73**	**73**	**73**
Mo-121-1	Residential	B/66	1	**71**	**71**	**71**
Mo-121-2	Residential	B/66	1	**73**	**73**	**73**
Mo-122-2	Residential	B/66	1	**73**	**73**	**73**
Mo-123-1	Residential	B/66	1	**71**	**71**	**71**
Mo-123-2	Residential	B/66	1	**73**	**74**	**74**
Mo-123-3	Residential	B/66	1	**75**	**75**	**75**
Mo-123-4	Residential	B/66	1	**75**	**75**	**75**
Mo-124-1	Residential	B/66	1	**71**	**71**	**71**
Mo-124-2	Residential	B/66	1	**74**	**74**	**74**
Mo-124-3	Residential	B/66	1	**75**	**75**	**75**
Mo-124-4	Residential	B/66	1	**75**	**75**	**75**
Mo-125-2	Residential	B/66	1	**72**	**72**	**72**
Mo-125-3	Residential	B/66	1	**74**	**74**	**74**
Mo-125-4	Residential	B/66	1	**75**	**75**	**75**
Mo-126-2	Residential	B/66	1	**74**	**74**	**74**
Mo-126-3	Residential	B/66	1	**75**	**75**	**75**
Mo-126-4	Residential	B/66	1	**75**	**75**	**75**
Mo-127	Residential	B/66	1	**72**	**72**	**72**
Mo-128-2	Residential	B/66	2	**73**	**74**	**74**
Mo-128-3	Residential	B/66	3	**74**	**75**	**75**
Mo-128-4	Residential	B/66	3	**75**	**75**	**75**
Mo-129-2	Residential	B/66	2	**74**	**74**	**74**
Mo-129-3	Residential	B/66	2	**75**	**75**	**75**
Mo-129-4	Residential	B/66	2	**75**	**75**	**75**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-129-5	Residential	B/66	2	**75**	**75**	**75**
Mo-130-2	Residential	B/66	1	**74**	**74**	**74**
Mo-131-2	Residential	B/66	1	**73**	**74**	**74**
Mo-131-3	Residential	B/66	1	**74**	**75**	**75**
Mo-131-4	Residential	B/66	1	**75**	**75**	**75**
Mo-131-5	Residential	B/66	1	**75**	**75**	**75**
Mo-131-6	Residential	B/66	1	**75**	**75**	**75**
Mo-132-2	Residential	B/66	1	**74**	**74**	**74**
Mo-132-3	Residential	B/66	1	**75**	**75**	**75**
Mo-132-4	Residential	B/66	1	**75**	**75**	**75**
Mo-133-2	Residential	B/66	1	**74**	**74**	**74**
Mo-134-1	Residential	B/66	1	**72**	**72**	**72**
Mo-134-2	Residential	B/66	1	**74**	**74**	**74**
Mo-135-1	Residential	B/66	1	**71**	**71**	**71**
Mo-135-2	Residential	B/66	1	**73**	**73**	**73**
Mo-135-3	Residential	B/66	1	**74**	**74**	**74**
Mo-136-2	Residential	B/66	1	**73**	**73**	**73**
Mo-136-3	Residential	B/66	1	**74**	**74**	**74**
Mo-136-4	Residential	B/66	1	**75**	**75**	**75**
Mo-137-2	Residential	B/66	1	**74**	**74**	**74**
Mo-137-3	Residential	B/66	1	**74**	**75**	**75**
Mo-137-4	Residential	B/66	1	**74**	**75**	**75**
Mo-138-1	Residential	B/66	1	**73**	**73**	**73**
Mo-138-2	Residential	B/66	1	**75**	**75**	**75**
Mo-139-1	Residential	B/66	1	**69**	**70**	**70**
Mo-139-2	Residential	B/66	1	**71**	**71**	**71**
Mo-139-3	Residential	B/66	1	**72**	**72**	**72**
Mo-140-1	Residential	B/66	1	**75**	**75**	**75**
Mo-140-6	Residential	B/66	1	**76**	**77**	**77**
Mo-141-6	Residential	B/66	1	**77**	**77**	**77**
Mo-142	Residential	B/66	1	**70**	**70**	**70**
Mo-143	Residential	B/66	1	**74**	**70**	**70**
Mo-144	Residential	B/66	1	**73**	**73**	**73**
Mo-145	Residential	B/66	1	**74**	**74**	**74**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Mo-146-1	Residential	B/66	1	**75**	**76**	**76**
Mo-146-2	Residential	B/66	2	**72**	**72**	**72**
Mo-146-3	Residential	B/66	2	**73**	**73**	**73**
Mo-147-2	Residential	B/66	1	**76**	**77**	**77**
Mo-147-3	Residential	B/66	1	**72**	**73**	**73**
Mo-148-1	Residential	B/66	4	**74**	**75**	**75**
Mo-148-2	Residential	B/66	4	**75**	**75**	**75**
Mo-148-3	Residential	B/66	4	**75**	**75**	**75**
Mo-148-4	Residential	B/66	4	**75**	**75**	**75**
Mo-148-5	Residential	B/66	4	**73**	**73**	**73**
Mo-149-1	Residential	B/66	4	**77**	**77**	**77**
Mo-149-2	Residential	B/66	4	**78**	**78**	**78**
Mo-149-3	Residential	B/66	4	**78**	**78**	**78**
Mo-149-4	Residential	B/66	4	**78**	**78**	**78**
Mo-149-5	Residential	B/66	4	**78**	**78**	**78**
Mo-150	Residential	B/66	1	**71**	**71**	**71**
Mo-151	Residential	B/66	20	65	65	65
Mo-152	Residential	B/66	10	55	55	55
Mo-153	Residential	B/66	20	64	64	64
Mo-154	Residential	B/66	50	63	63	63
2-Mo-1	Residential	B/66	2	60	61	61
2-Mo-2	Residential	B/66	2	58	59	59
2-Mo-3-2	Residential	B/66	2	62	63	63
2-Mo-4-2	Residential	B/66	2	63	63	63
2-Mo-4-3	Residential	B/66	2	65	65	65
2-Mo-4-3	Residential	B/66	2	65	65	65
2-Mo-5-2	Residential	B/66	2	62	63	63
2-Mo-5-3	Residential	B/66	2	65	65	65
2-Mo-6-3	Residential	B/66	2	64	64	64
2-Mo-7	Residential	B/66	1	61	61	61
2-Mo-8-2	Residential	B/66	1	60	60	60
2-Mo-8-3	Residential	B/66	2	62	62	62
2-Mo-8-4	Residential	B/66	2	64	64	64
2-Mo-9-4	Residential	B/66	1	62	62	62

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-10-2	Residential	B/66	1	59	59	59
2-Mo-11-3	Residential	B/66	1	64	64	64
2-Mo-11-4	Residential	B/66	1	**66**	**66**	**66**
2-Mo-12-3	Residential	B/66	1	64	64	64
2-Mo-12-4	Residential	B/66	1	**66**	**66**	**66**
2-Mo-13-3	Residential	B/66	1	64	64	64
2-Mo-13-4	Residential	B/66	1	**66**	**66**	**66**
2-Mo-14-3	Residential	B/66	1	65	65	65
2-Mo-14-4	Residential	B/66	1	**66**	**67**	**67**
2-Mo-15-3	Residential	B/66	1	65	65	65
2-Mo-15-4	Residential	B/66	1	67	67	67
2-Mo-16-3	Residential	B/66	5	62	62	62
2-Mo-16-4	Residential	B/66	5	63	64	64
2-Mo-17-2	Residential	B/66	2	60	61	61
2-Mo-17-3	Residential	B/66	2	62	63	63
2-Mo-17-4	Residential	B/66	2	64	64	64
2-Mo-18-2	Residential	B/66	1	62	62	62
2-Mo-18-3	Residential	B/66	1	63	64	64
2-Mo-18-4	Residential	B/66	1	65	65	**66**
2-Mo-19-4	Residential	B/66	1	**67**	**67**	**67**
2-Mo-19-2	Residential	B/66	2	63	63	63
2-Mo-19-3	Residential	B/66	2	65	65	65
2-Mo-20-2	Residential	B/66	2	60	61	61
2-Mo-20-3	Residential	B/66	1	62	62	62
2-Mo-21	Residential	B/66	1	62	62	62
2-Mo-22-2	Residential	B/66	2	62	62	62
2-Mo-22-3	Residential	B/66	1	**66**	**66**	**66**
2-Mo-23-2	Residential	B/66	2	62	62	62
2-Mo-23-3	Residential	B/66	1	64	64	64
2-Mo-24-2	Residential	B/66	3	60	60	60
2-Mo-24-3	Residential	B/66	2	61	62	62
2-Mo-24-4	Residential	B/66	2	63	63	63
2-Mo-25-2	Residential	B/66	7	60	60	60
2-Mo-25-3	Residential	B/66	7	61	61	61

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-25-4	Residential	B/66	7	62	62	63
2-Mo-26-2	Residential	B/66	4	63	63	63
2-Mo-26-3	Residential	B/66	4	64	65	65
2-Mo-27-2	Residential	B/66	5	63	63	63
2-Mo-27-3	Residential	B/66	5	64	64	64
2-Mo-28	Residential	B/66	1	63	64	64
2-Mo-29-2	Residential	B/66	3	62	62	62
2-Mo-29-3	Residential	B/66	3	62	63	63
2-Mo-29-4	Residential	B/66	3	63	63	63
2-Mo-29-5	Residential	B/66	3	64	64	64
2-Mo-29-6	Residential	B/66	3	65	65	65
2-Mo-30-5	Residential	B/66	1	**69**	**69**	**69**
2-Mo-30-6	Residential	B/66	1	**69**	**70**	**70**
2-Mo-31-2	Residential	B/66	1	60	61	61
2-Mo-31-3	Residential	B/66	1	61	61	61
2-Mo-31-4	Residential	B/66	1	61	62	62
2-Mo-31-5	Residential	B/66	1	62	62	62
2-Mo-31-6	Residential	B/66	1	64	64	64
2-Mo-31-7	Residential	B/66	1	65	65	65
2-Mo-32-3	Residential	B/66	1	61	62	62
2-Mo-33	Residential	B/66	1	59	60	60
2-Mo-34	Residential	B/66	1	61	62	62
2-Mo-35	Residential	B/66	2	**69**	**69**	**69**
2-Mo-36	Residential	B/66	1	**69**	**69**	**69**
2-Mo-37	Residential	B/66	1	58	58	58
2-Mo-38-2	Residential	B/66	1	64	64	64
2-Mo-39-2	Residential	B/66	5	61	61	62
2-Mo-39-3	Residential	B/66	5	63	63	63
2-Mo-39-4	Residential	B/66	5	64	64	64
2-Mo-39-5	Residential	B/66	5	65	65	65
2-Mo-39-6	Residential	B/66	5	**70**	**70**	**70**
2-Mo-40-2	Residential	B/66	5	61	61	61
2-Mo-40-3	Residential	B/66	5	61	62	62
2-Mo-40-4	Residential	B/66	5	62	62	62

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-40-5	Residential	B/66	5	63	63	63
2-Mo-40-6	Residential	B/66	5	64	64	64
2-Mo-41-2	Residential	B/66	6	60	60	60
2-Mo-41-3	Residential	B/66	6	61	61	61
2-Mo-41-4	Residential	B/66	6	61	61	61
2-Mo-41-5	Residential	B/66	6	62	62	62
2-Mo-41-6	Residential	B/66	6	63	63	63
2-Mo-42	Residential	B/66	1	**66**	**67**	**67**
2-Mo-43-2	Residential	B/66	3	53	53	53
2-Mo-43-3	Residential	B/66	3	55	55	55
2-Mo-43-4	Residential	B/66	3	56	56	56
2-Mo-44	Residential	B/66	3	58	58	58
2-Mo-45	Residential	B/66	3	58	59	59
2-Mo-46	Residential	B/66	4	55	56	56
2-Mo-47-2	Residential	B/66	5	58	58	58
2-Mo-47-3	Residential	B/66	5	59	59	59
2-Mo-47-4	Residential	B/66	5	61	61	61
2-Mo-47-5	Residential	B/66	5	61	62	62
2-Mo-47-6	Residential	B/66	5	62	62	62
2-Mo-48-1	Residential	B/66	7	58	59	59
2-Mo-48-2	Residential	B/66	7	60	60	60
2-Mo-48-3	Residential	B/66	7	60	60	60
2-Mo-49	Residential	B/66	1	65	**66**	**66**
2-Mo-50	Residential	B/66	2	62	63	63
2-Mo-51	Residential	B/66	2	63	63	63
2-Mo-52	Residential	B/66	1	62	62	62
2-Mo-53	Residential	B/66	2	63	63	63
2-Mo-54	Residential	B/66	2	**69**	**69**	**69**
2-Mo-55	Residential	B/66	1	63	64	64
2-Mo-56	Residential	B/66	1	60	61	61
2-Mo-57-2	Residential	B/66	1	65	**66**	**66**
2-Mo-57-3	Residential	B/66	1	**67**	**68**	**68**
2-Mo-58	Residential	B/66	1	62	63	63
2-Mo-59	Residential	B/66	1	61	61	61

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-60	Residential	B/66	1	63	63	63
2-Mo-61	Residential	B/66	2	63	63	63
2-Mo-62	Residential	B/66	3	63	63	63
2-Mo-63	Residential	B/66	3	63	64	63
2-Mo-64-2	Residential	B/66	1	**67**	**67**	**66**
2-Mo-65-2	Residential	B/66	1	61	61	61
2-Mo-66-3	Residential	B/66	1	65	65	65
2-Mo-67-2	Residential	B/66	1	63	64	63
2-Mo-68	Residential	B/66	1	60	60	61
2-Mo-69-1	Residential	B/66	1	**67**	**67**	**66**
2-Mo-69-2	Residential	B/66	1	**71**	**71**	**71**
2-Mo-70	Residential	B/66	1	63	63	63
2-Mo-71	Residential	B/66	1	63	63	63
2-Mo-72	Residential	B/66	1	**66**	**66**	**66**
2-Mo-73-1	Residential	B/66	1	**66**	**66**	**66**
2-Mo-73-2	Residential	B/66	1	**70**	**71**	**70**
2-Mo-73-4	Residential	B/66	1	**74**	**74**	**74**
2-Mo-74-1	Residential	B/66	1	**67**	**67**	**67**
2-Mo-74-2	Residential	B/66	1	**71**	**71**	**71**
2-Mo-75-1	Residential	B/66	1	**68**	**68**	**68**
2-Mo-75-2	Residential	B/66	1	**71**	**71**	**71**
2-Mo-75-3	Residential	B/66	1	**73**	**73**	**73**
2-Mo-76	Residential	B/66	1	60	60	61
2-Mo-77-2	Residential	B/66	1	65	**66**	65
2-Mo-78-2	Residential	B/66	2	64	65	64
2-Mo-78-3	Residential	B/66	2	**67**	**68**	**67**
2-Mo-78-4	Residential	B/66	2	**69**	**69**	**69**
2-Mo-78-5	Residential	B/66	2	**70**	**71**	**70**
2-Mo-79	Residential	B/66	1	59	59	59
2-Mo-80-2	Residential	B/66	1	63	64	63
2-Mo-80-3	Residential	B/66	1	**67**	**67**	**67**
2-Mo-80-4	Residential	B/66	1	59	60	60
2-Mo-81	Residential	B/66	3	61	62	62
2-Mo-82-2	Residential	B/66	1	**71**	**71**	**71**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-82-3	Residential	B/66	1	**73**	**73**	**73**
2-Mo-83	Residential	B/66	1	61	62	61
2-Mo-84-2	Residential	B/66	1	**71**	**71**	**71**
2-Mo-84-3	Residential	B/66	1	**73**	**74**	**74**
2-Mo-85-1	Residential	B/66	1	**67**	**67**	**67**
2-Mo-85-2	Residential	B/66	1	**70**	**70**	**70**
2-Mo-85-3	Residential	B/66	1	**73**	**73**	**73**
2-Mo-86	Residential	B/66	2	62	63	63
2-Mo-87-1	Residential	B/66	1	**66**	**67**	**67**
2-Mo-87-2	Residential	B/66	1	**69**	**69**	**69**
2-Mo-87-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-88-3	Residential	B/66	1	**70**	**71**	**71**
2-Mo-89-1	Residential	B/66	1	**67**	**67**	**67**
2-Mo-89-2	Residential	B/66	1	**69**	**69**	**69**
2-Mo-89-3	Residential	B/66	1	**71**	**71**	**71**
2-Mo-90-1	Residential	B/66	1	**67**	**67**	**67**
2-Mo-90-2	Residential	B/66	1	**69**	**69**	**69**
2-Mo-90-3	Residential	B/66	1	**71**	**71**	**71**
2-Mo-91-1	Residential	B/66	1	**69**	**69**	**69**
2-Mo-91-2	Residential	B/66	1	**70**	**71**	**71**
2-Mo-91-3	Residential	B/66	1	**72**	**73**	**73**
2-Mo-91-4	Residential	B/66	1	**69**	**69**	**69**
2-Mo-92-1	Residential	B/66	1	**71**	**71**	**71**
2-Mo-92-2	Residential	B/66	1	**72**	**73**	**73**
2-Mo-93	Residential	B/66	1	**72**	**72**	**72**
2-Mo-94-2	Residential	B/66	1	**71**	**71**	**71**
2-Mo-94-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-94-4	Residential	B/66	1	**69**	**69**	**69**
2-Mo-94-5	Residential	B/66	1	**69**	**69**	**69**
2-Mo-95	Residential	B/66	1	**70**	**70**	**70**
2-Mo-96-1	Residential	B/66	2	63	63	63
2-Mo-96-2	Residential	B/66	2	65	**66**	65
2-Mo-96-3	Residential	B/66	2	**66**	**66**	**66**
2-Mo-97-2	Residential	B/66	1	64	64	64

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-97-3	Residential	B/66	1	65	**66**	65
2-Mo-98-1	Residential	B/66	1	63	63	63
2-Mo-98-2	Residential	B/66	1	64	64	64
2-Mo-98-3	Residential	B/66	1	**66**	**66**	**66**
2-Mo-98-4	Residential	B/66	1	63	63	63
2-Mo-99-2	Residential	B/66	2	64	65	65
2-Mo-99-3	Residential	B/66	2	**66**	**66**	**66**
2-Mo-100-2	Residential	B/66	2	65	65	65
2-Mo-100-3	Residential	B/66	2	**66**	**67**	**67**
2-Mo-101-2	Residential	B/66	2	**66**	**67**	**67**
2-Mo-101-3	Residential	B/66	2	**68**	**68**	**68**
2-Mo-102-2	Residential	B/66	3	**69**	**70**	**70**
2-Mo-102-3	Residential	B/66	3	**70**	**70**	**70**
2-Mo-103	Residential	B/66	2	**69**	**69**	**69**
2-Mo-104-2	Residential	B/66	12	**70**	**70**	**70**
2-Mo-105-1	Residential	B/66	1	**66**	**67**	**67**
2-Mo-105-2	Residential	B/66	2	**68**	**69**	**69**
2-Mo-106-2	Residential	B/66	1	**70**	**71**	**71**
2-Mo-107	Residential	B/66	1	**72**	**72**	**72**
2-Mo-108-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-109-2	Residential	B/66	1	**72**	**72**	**72**
2-Mo-109-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-110-2	Residential	B/66	2	**72**	**72**	**72**
2-Mo-110-3	Residential	B/66	2	**72**	**72**	**72**
2-Mo-111-2	Residential	B/66	1	**72**	**72**	**72**
2-Mo-111-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-112-2	Residential	B/66	1	**72**	**72**	**72**
2-Mo-112-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-113-2	Residential	B/66	1	**72**	**72**	**72**
2-Mo-113-3	Residential	B/66	1	**72**	**72**	**72**
2-Mo-114-2	Residential	B/66	1	**72**	**73**	**73**
2-Mo-114-3	Residential	B/66	1	**73**	**73**	**73**
2-Mo-115-2	Residential	B/66	2	63	63	63
2-Mo-116-2	Residential	B/66	1	64	64	64

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
2-Mo-117-2	Residential	B/66	3	**67**	**68**	**68**
2-Mo-117-3	Residential	B/66	3	**68**	**68**	**68**
2-Mo-117-4	Residential	B/66	3	**68**	**69**	**69**
2-Mo-118-2	Residential	B/66	3	**66**	**66**	**66**
2-Mo-118-3	Residential	B/66	3	**67**	**67**	**67**
2-Mo-118-4	Residential	B/66	3	**67**	**68**	**68**
2-Mo-119	Residential	B/66	1	**66**	**66**	**66**
2-Mo-120-2	Residential	B/66	1	**69**	**70**	**70**
2-Mo-121	Residential	B/66	1	**68**	**68**	**68**
2-Mo-122	Residential	B/66	1	**66**	**66**	**66**
2-Mo-123	Residential	B/66	1	**68**	**68**	**69**
2-Mo-124	Residential	B/66	1	**68**	**68**	**68**
2-Mo-125	Residential	B/66	1	**66**	**66**	**66**
2-Mo-126-2	Residential	B/66	1	63	63	63
2-Mo-127-2	Residential	B/66	2	**67**	**67**	**67**
2-Mo-127-3	Residential	B/66	2	**68**	**68**	**68**
Roanoke Park-1A	Park	C/66	1	62	62	62
Roanoke Park-2A	Park	C/66	1	59	59	60
Roanoke Park-3A	Park	C/66	1	58	58	58
Colonnade Park-1	Park	C/66	1	**74**	**74**	**74**
Colonnade Park-2	Park	C/66	1	**71**	**71**	**71**
Colonnade Park-3	Park	C/66	1	**71**	**71**	**71**
St Marks Greenbelt-1	Park	C/66	1	**68**	**68**	**68**
St Marks Greenbelt-2	Park	C/66	1	**72**	**72**	**72**
St Marks Greenbelt-3	Park	C/66	1	**69**	**69**	**69**
Lakeview Place Park	Park	C/66	1	**72**	**73**	**73**

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2030 (L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)
Bellevue Place Park	Park	C/66	1	**72**	**73**	**73**
HR-3	Residential	B/66	1	**70**	**69**	**70**
HR-14	Residential	B/66	1	64	64	64
CH-2	Residential	B/66	1	**71**	**70**	**70**
CH-13	Residential	B/66	1	**69**	**69**	**69**
CH-14	Residential	B/66	1	62	62	62
CH-15	Residential	B/66	1	62	62	62

Notes:
*Noise Abatement Criteria Impacts are noted by **bolded** values.*
"M" site represents field measurement site and modeled site
"Mo" site represents modeled only site
"HR" and "CH" sites represent noise sensitive locations presented in the 2011 noise study not represented by other modeled sites.
See 2011 Noise Discipline Report for definitions of Activity Categories.
[1] 66 dBA is the approach limit for the activity categories B and C NAC of 67 dBA (Exhibit 3)
[2] Appendix D provides Residential Equivalency Calculations for Sites M10, M16, M19, Roanoke Park, Colonnade Park, St Marks Greenbelt, Lakeview Place Park, and Bellevue Place Park.

Exhibit 9: Modeled 2030 Build Noise Abatement Criteria Impacts

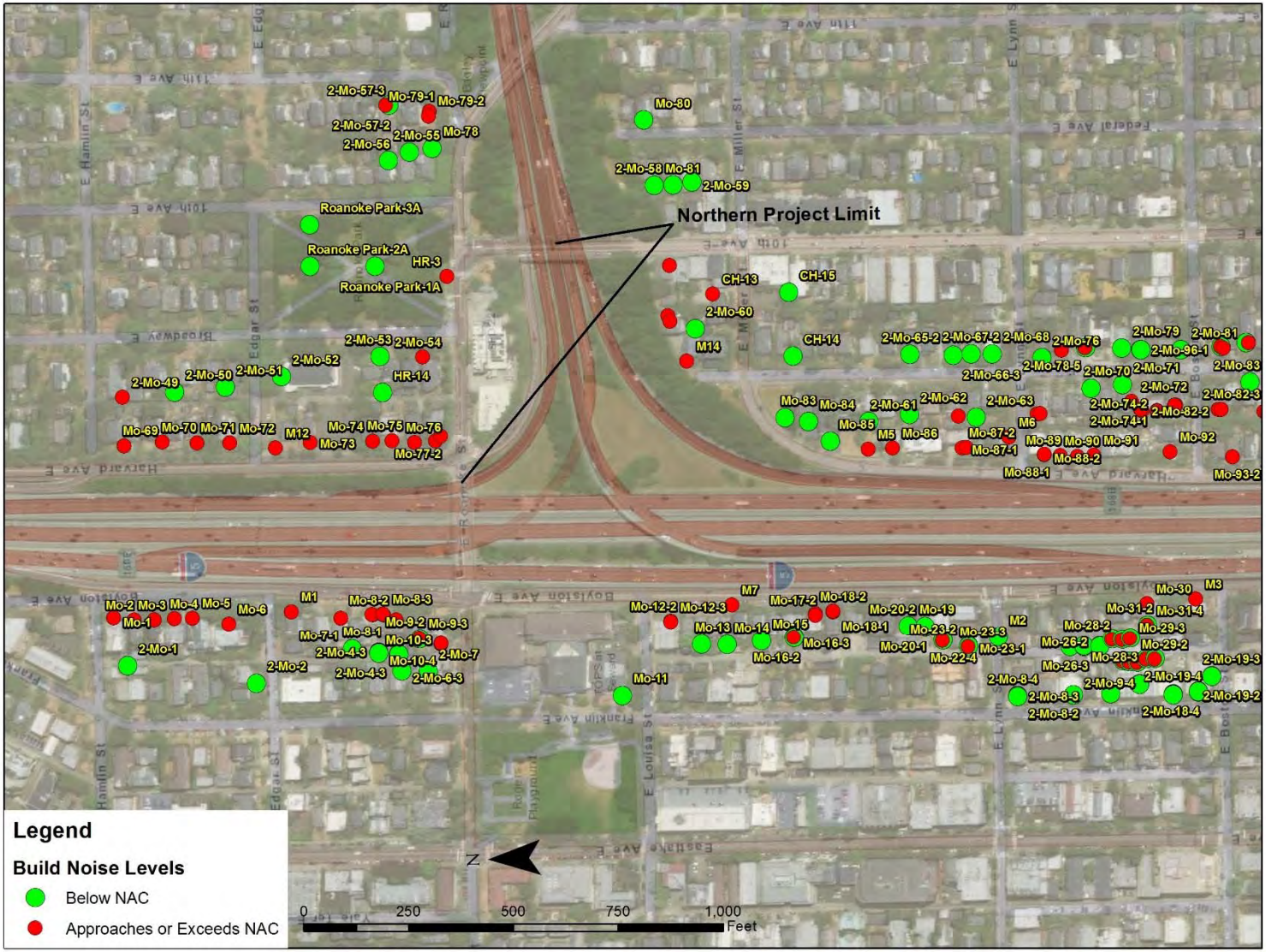

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Exhibit 10: Modeled 2030 Build Noise Abatement Criteria Impacts

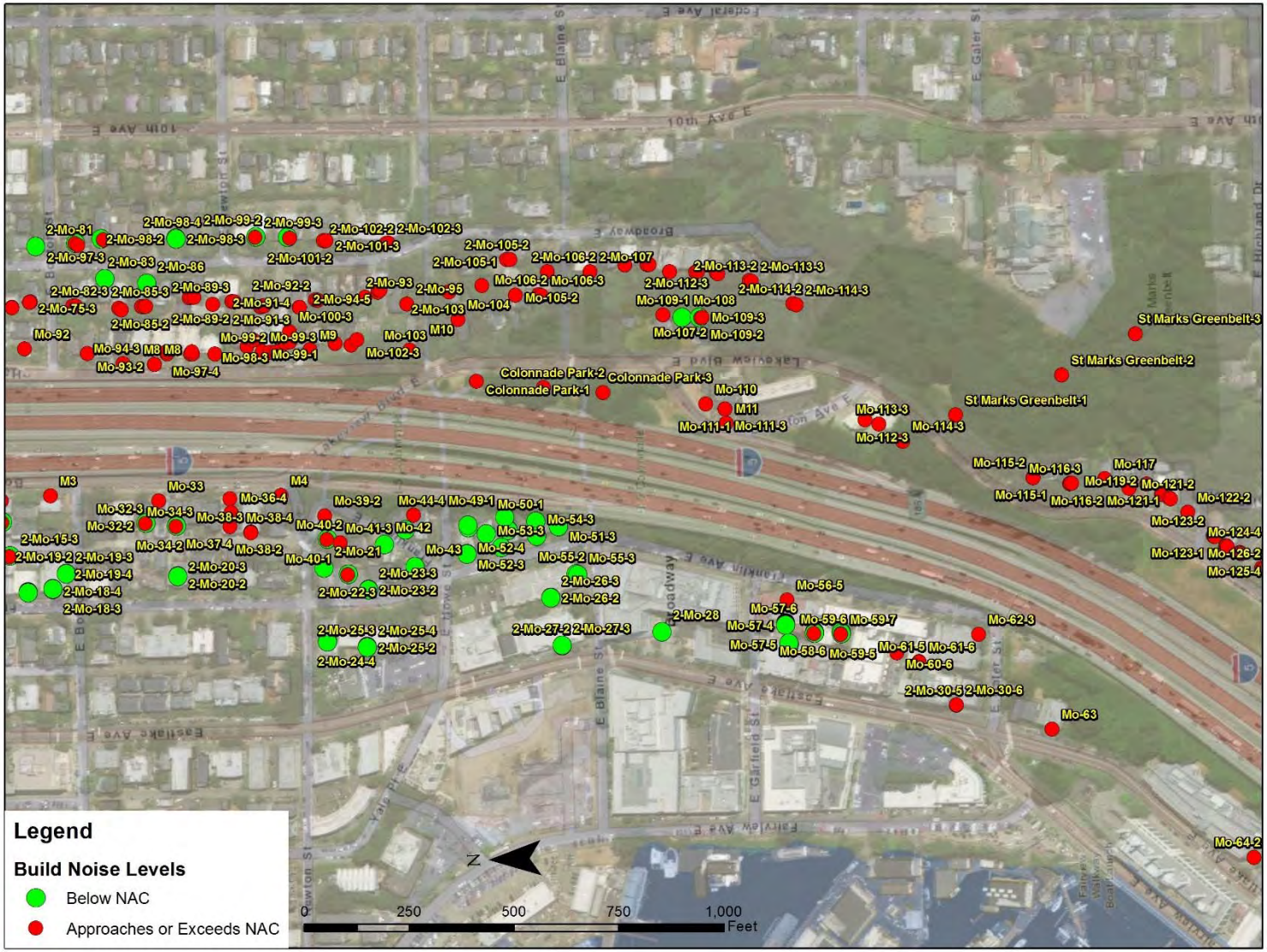

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Exhibit 11: Modeled 2030 Build Noise Abatement Criteria Impacts

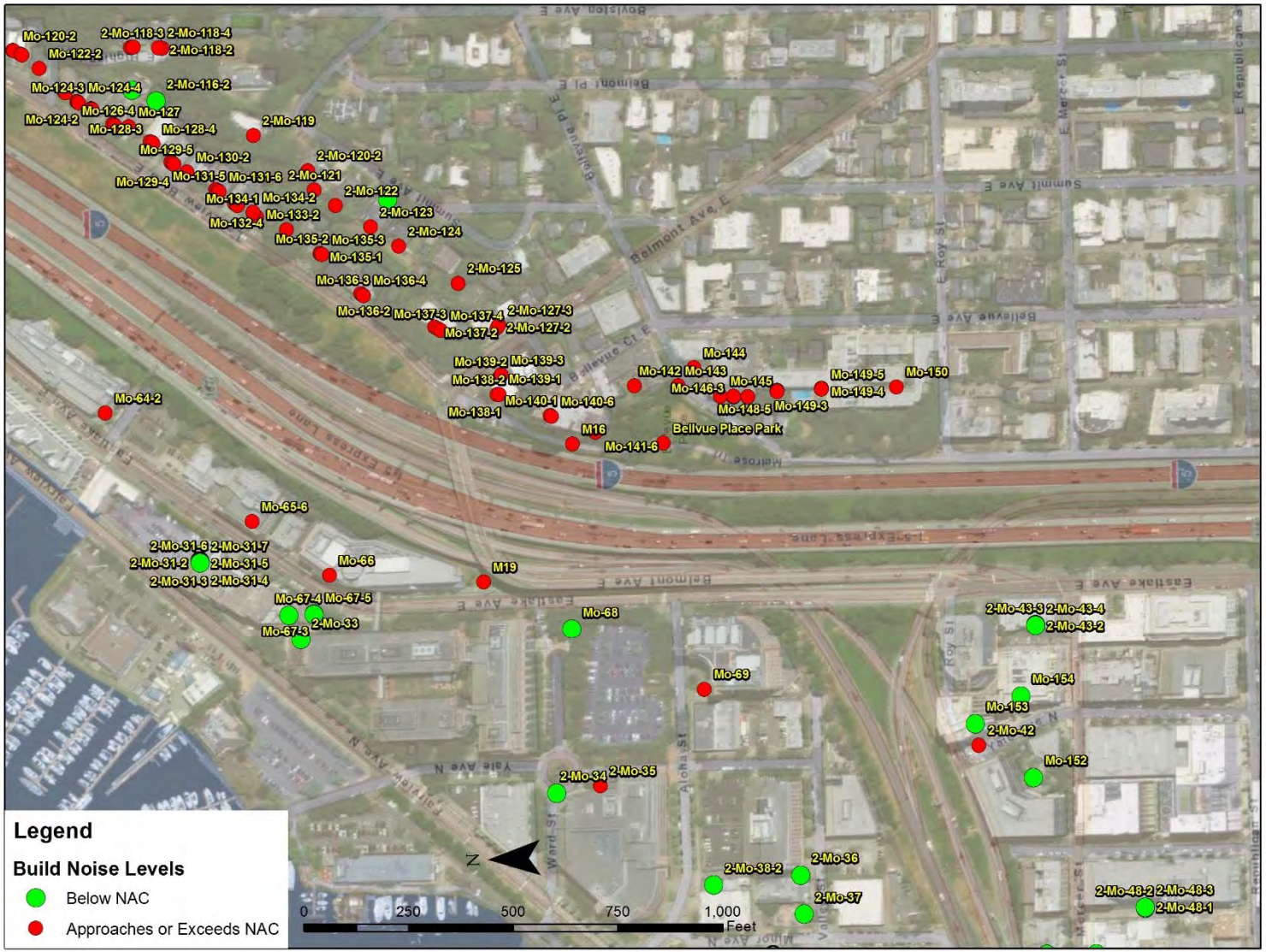

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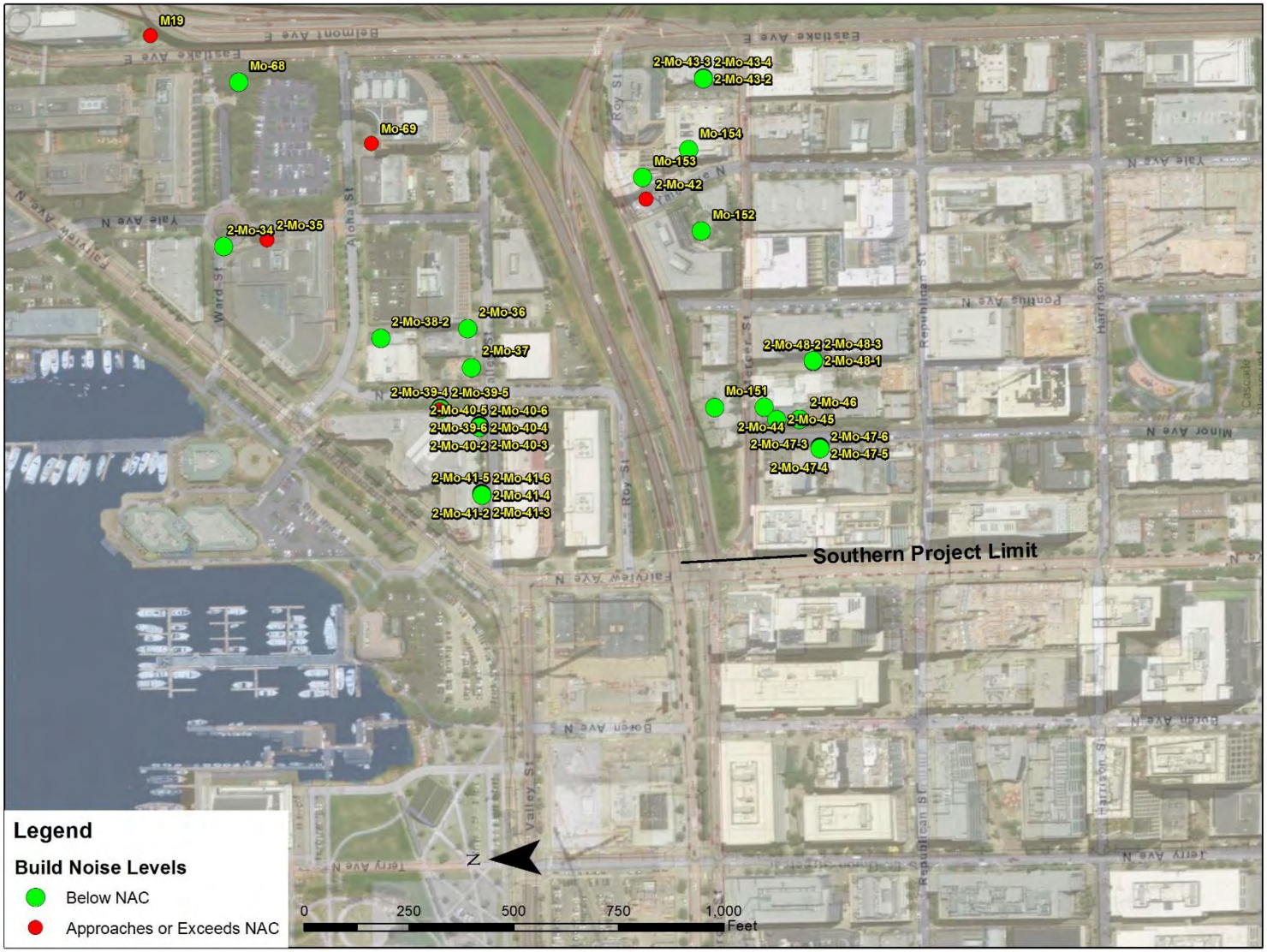
Exhibit 12: Modeled 2030 Build Noise Abatement Criteria Impacts



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Comparison to 2011 Results

Exhibit 13 compares the current modeling to the results from the SR 520, I-5 to Medina: Bridge Replacement and HOV Project Noise Discipline Report Addendum and Errata dated May 2011 for receivers in the western portions of the Roanoke and North Capitol Hill neighborhoods as identified in Exhibit 21 of the report from 2011. Current modeled noise levels are within 1 dBA greater to 3 dBA lower than modeled results presented in the 2011 noise analysis. The modeling results did not identify any new noise impacts relative to the prior modeling in this area. With consistent results between the two models, the impacts and mitigation included in the 2011 noise study is not re-evaluated in this report and continues to represent the project condition.

Exhibit 13: Comparison to 2011 Model Results

Site ID from 2011 Report / Current Site ID	2011 Results(L_{eq}) (dBA)	Build without barriers 2030 (L_{eq}) (dBA)	Absolute Change from 2011
HR-1 / Mo-77	**78**	**76**	2
HR-2 / 2-Mo-54	**75**	**72**	3
HR-3 / HR-3	**71**	**70**	1
HR-13 / Roanoke Park 1A	**64**	**62**	2
HR-14 / HR-14	67	**64**	3
HR-15 / Mo-74	**74**	**71**	3
HR-16 / 2-Mo-52	**64**	**62**	2
CH-1 / M14	**72**	**71**	1
CH-2 / CH-2	**73**	**70**	3
CH-13 / CH-13	**69**	**69**	0
CH-14 / CH-14	**64**	**62**	2
CH-15 / CH-15	**65**	**62**	3
CH-28 / Mo-85	**69**	**69**	0
CH-29 / 2-Mo-65-2	**60**	**61**	1

Traffic Noise Abatement

Traffic Noise Abatement—Background

Noise abatement, including noise barrier evaluation, is necessary only where frequent human use occurs and where a lower noise level would provide benefits (FHWA, 1982). To be effective, the barrier must block the line-of-sight between the highest point of a noise source and the receptor. It must be long enough to prevent sounds from passing around the ends (flanking), have no openings (i.e., side streets), and be dense enough so that noise will not be transmitted through it. Intervening rows of buildings that are not noise sensitive could also be used as barriers (FHWA, 1973). Access limitations, location in relation to surrounding roadways, and the low number of noise-sensitive land uses at some impact locations prevent feasible and reasonable noise barrier placement to effectively reduce traffic noise levels predicted for the project as discussed below.

Abatement was considered for this project because traffic noise impacts are predicted at 336 modeled sites. The 336 modeled sites are grouped in five discrete areas where noise barrier placement was considered. Areas where impacts are predicted were evaluated to determine if a feasible noise barrier could be constructed as described below.

Feasibility

Feasibility is a combination of acoustic and engineering considerations. All of the following must occur for abatement (e.g., noise barrier) to be considered feasible.

- Abatement must be physically constructible.
- The majority of first row receivers experiencing noise impacts must obtain a minimum 5 dBA of noise reduction as a result of abatement (insertion loss), assuring that every reasonable effort will be made to assess outdoor use areas as appropriate.

Noise barriers were not evaluated for the west side of I-5 between Mercer Street and East Newton Street because it is not structurally feasible to retrofit the I-5 viaduct structure in this area to accommodate noise barriers, as documented in the October 2018 structural assessment (Appendix H) (WSDOT, 2018).

For this project, five discrete areas of impacts were considered for noise abatement. Impacts consistent with the 2011 noise study for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project are not reanalyzed and the noise barrier evaluation in that report continues to be applicable in the Roanoke and North Capitol Hill neighborhoods. Noise barriers were evaluated at four of the five impact areas located beyond the project limits on the 2011 study to determine whether abatement could sufficiently reduce traffic noise levels. The fifth impact area located east of I-5 from the northbound I-5 off-ramp at Lakeview Boulevard to the northbound I-5 off-ramp to SR 520 was not evaluated for noise barrier placement as a structural assessment conducted in October of 2018 (Appendix H) determined construction of a noise barrier atop the viaduct structure located in this area was not feasible (WSDOT, 2018).

Four noise barriers were evaluated along the project corridor on both sides of the proposed SR 520/I-5 Express Lanes alignment. All noise barriers were evaluated within WSDOT right-of-way or near the edge of the roadway shoulder or along the WSDOT right-of-way line. Each evaluated noise barrier location is described below and includes consideration of multiple barrier heights and lengths to achieve WSDOT criteria for feasibility and reasonableness.

Two of the four evaluated barrier locations meet WSDOT Feasibility Criteria, as shown in Exhibit 14. Noise barrier locations are shown in Exhibit 15 and Exhibit 16.

Noise Barrier EB1 (At Right-of-Way)—Sites Mo-115-1 through Mo-137-4, St. Marks Greenbelt-2, St. Marks Greenbelt-3, Lakeview Place Park, 2-Mo-117-2 through 2-Mo-125

Noise Barrier EB1 was evaluated on the eastern edge of I-5 right-of-way (ROW) and edge-of-slope adjacent to Lakeview Boulevard between Belmont Avenue East and Boylston Avenue East. The location of Noise Barrier EB1 is shown in Exhibit 15. Noise Barrier EB1 (ROW) was evaluated to reduce noise levels at residences located east of I-5 predicted to experience noise abatement criteria impacts. Noise Barrier EB1 (ROW) was evaluated at heights up to 28 feet tall and 1,667 feet long in this location. A minimum feasible barrier height of 24 feet tall and 1,667 feet long would reduce traffic noise levels by at least 5 dBA at 15 of the 28 impacted first row homes in this area. Since this barrier is feasible, the next step is to determine if there is a barrier configuration that is reasonable as well. Additional noise wall dimensions were evaluated as part of the reasonableness determination described later in this chapter.

Noise Barrier EB1 (At I-5 Edge of Shoulder)—Sites Mo-115-1 through Mo-137-4, St. Marks Greenbelt-2, St. Marks Greenbelt-3, Lakeview Place Park, 2-Mo-117-2 through 2-Mo-125

Noise Barrier EB1 was evaluated on the eastern edge of shoulder (EOS) of I-5 located atop the I-5 northbound retaining wall in this location (see Exhibit 15). Noise Barrier EB1 was evaluated to reduce noise levels at residences located east of I-5 predicted to experience noise abatement criteria impacts. Noise Barrier EB1 was evaluated at heights up to 28 feet tall and approximately 1,650 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier EB1 (EOS) was not able to provide the necessary 5 dBA reduction at any of impacted sites located behind the barrier. By not providing the necessary noise reduction at impacted sites located behind the barrier, Noise Barrier EB1 (EOS) does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier EB2 —Sites M16, Mo-138-1 through Mo-150, 2-Mo-127-2, 2-Mo-127-3, and Bellevue Place Park

Noise Barrier EB2 was evaluated on the eastern edge of shoulder of I-5 located atop the I-5 northbound retaining wall south of the Lakeview Boulevard overcrossing. The location of Noise Barrier EB2 is shown in Exhibit 15. Noise Barrier EB2 was evaluated to reduce noise levels at residences located east of I-5 predicted to experience noise abatement criteria impacts. Noise Barrier EB2 was evaluated at heights up to 24 feet tall and approximately 1,300 feet long in this location. At barrier heights up to 24 feet tall, Noise Barrier EB2 could provide the necessary 5 dBA reduction at only three of the 66 impacted sites located behind the barrier. By not providing

the necessary noise reduction at impacted sites located behind the barrier, Noise Barrier EB2 does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier WB1—Sites Mo-69, 2-Mo-36, 2-Mo-39-5, 2-Mo-39-6

Noise Barrier WB1 was evaluated on the edge of pavement of the I-5 southbound off-ramp to Mercer Street from where the ramp passes under Eastlake Avenue East to Fairview Avenue North. The location of Noise Barrier WB1 is shown in Exhibit 16. Noise Barrier WB1 was evaluated to reduce noise levels at outdoor use locations located north of Mercer Street predicted to experience noise abatement criteria impacts. Noise Barrier WB1 was evaluated at heights up to 20 feet tall and approximately 1,200 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier WB1 could provide the necessary 5 dBA reduction at the one first row home located behind the barrier. Since this barrier is feasible, the next step is to determine if there is a barrier configuration that is reasonable as well. Additional noise wall dimensions were evaluated as part of the reasonableness determination described later in this chapter.

Noise Barrier WB2—Site 2-Mo-42

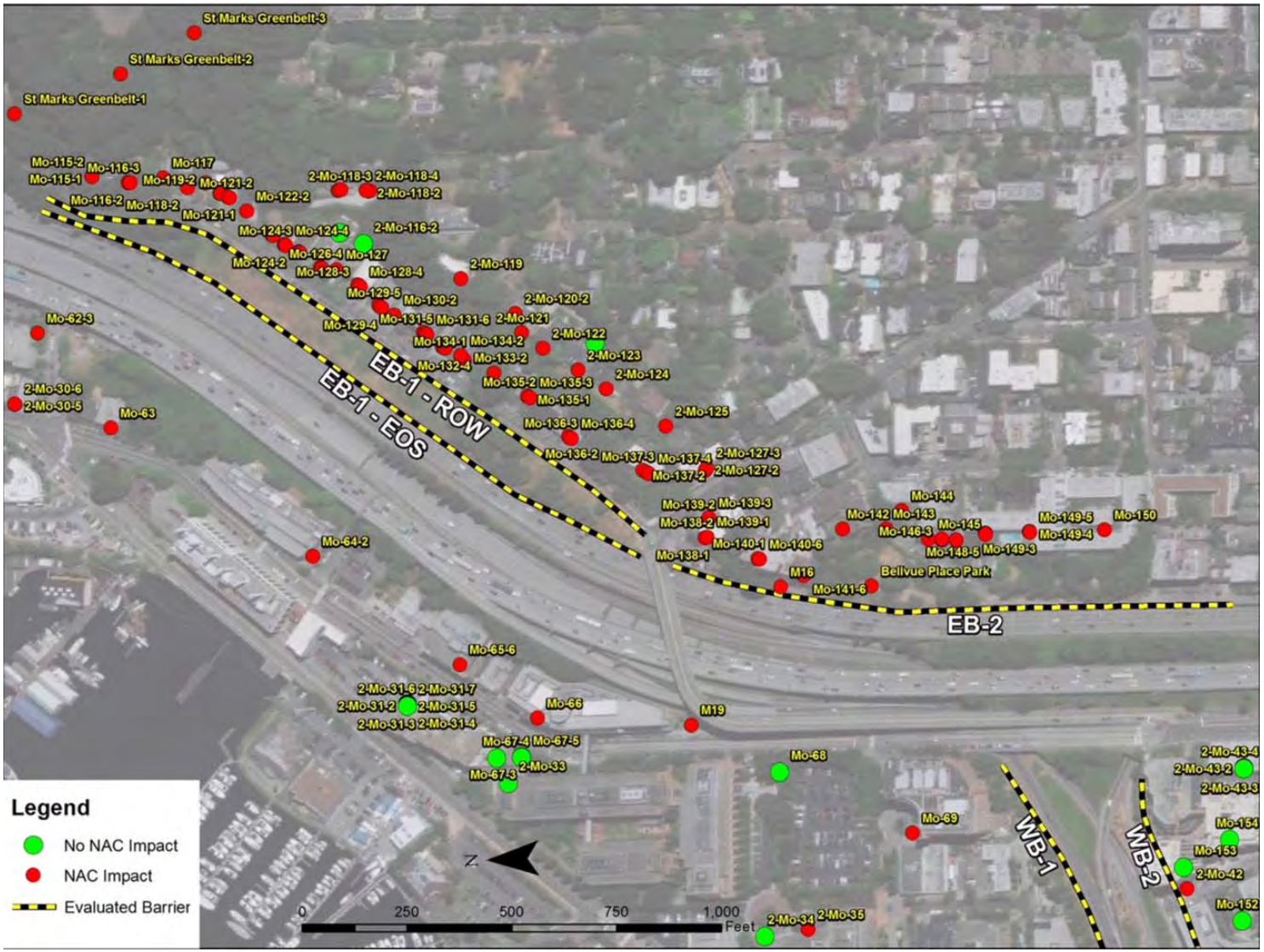
Noise Barrier WB2 was evaluated on the edge of pavement of the I-5 southbound on-ramp from Mercer Street from Fairview Avenue North to where the ramp passes under Eastlake Avenue East. The location of Noise Barrier WB2 is shown in Exhibit 16. Noise Barrier WB2 was evaluated to reduce noise levels at one first row residence located south of Mercer Street predicted to experience noise abatement criteria impacts. Noise Barrier WB2 was evaluated at heights up to 20 feet tall and 1,100 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier WB2 was not able to provide the necessary 5 dBA reduction at the any first-row homes located behind the barrier. By not providing the necessary noise reduction at impacted sites, Noise Barrier WB2 does not meet WSDOT Feasibility Criteria and is not recommended.

Exhibit 14: Feasibility Analysis

Noise Barrier	1st Row Receptors			Min. Design Goal NW		- 10 dBA in 1st Row		Feasible? Yes/No
	Site & Land Use	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	Insertion Loss (dBA)	% 1st Row ≥ 5 dBA	Insertion Loss (dBA)	% 1st Row ≥ 5 dBA	
EB1 (at ROW)	Mo-115-2, Mo-118-2, Mo-119-2, Mo-120-2, Mo-121-2, Mo-122-2, Mo-123-4, Mo-124-4, Mo-126-4, Mo-127, Mo-128-4, Mo-129-5, Mo-130-2, Mo-131-6, Mo-132-4, Mo-133-2, Mo-134-2, Mo-135-3, Mo-136-4, Mo-137-4 (all Cat B), St Marks Greenbelt-2 (C), Lakeview Place Park(C)	70 - 77	70 - 77	5 - 9	54%	N/A	N/A	Yes
EB1 (at EOS)	Mo-115-1 – Mo-137-4 (all Cat B), St Marks Greenbelt-1, 3 (C), Lakeview Place Park (C)	69 - 77	69 - 77	0 - 4	0%	N/A	N/A	No
EB2	M16 (C), Mo-138-1 – Mo-150 (all Cat B), Bellevue Place Park (C)	69 - 79	70 - 79	0 - 15	5%	N/A	N/A	No
WB1	Mo-69 (Cat B)	73	73	5	100%	N/A	N/A	Yes
WB2	2-Mo-42 (Cat B)	67	67	1	0%	N/A	N/A	No

Notes:
construction)
"M" site represents field measurement and modeled site
See Exhibit 3 for definitions of Activity Categories.

Exhibit 15: 2030 Build Evaluated Noise Barriers — EB-1 and EB-2



SR 520 – I-5 Express Lanes Connection Project
Noise Discipline Report

WSP USA, 2019

Exhibit 16: 2030 Build Evaluated Noise Barriers — WB-1 and WB-2

SR 520 – I-5 Express Lanes Connection Project
Noise Discipline Report WSP USA, 2019

Reasonableness of Noise Barriers

Since abatement is feasible at two locations [Noise Barriers EB1 at ROW and WB1], the reasonableness of abatement was evaluated at both locations. Noise walls, or other types of abatement, will only be constructed by WSDOT if they have been determined to be reasonable by satisfying three criteria:

1. Cost Effectiveness

Noise abatement meets cost effectiveness criteria if the cost of minimum feasible noise abatement is equal to or less than the allowable cost of abatement for each noise wall location analyzed. Based on noise wall costs from 2007-2010, the current average cost for Washington State is $51.61 per square foot ($ft^2$) of wall area. The cost is applied to the allowed wall surface area (ft^2) to generate the allowable cost per qualified resident described in Exhibit 18. The allowable cost per receiver, based on Build condition traffic noise levels is described in Exhibit 17. The information provided in Exhibit 17 is included in the WSDOT Noise Policy (WSDOT, 2012).

Exhibit 17: Reasonableness Allowances

Column A Design Year Traffic Sound Decibel Level (dBA)	Column B Noise Level Increase as a Result of the Project (dBA)[2]	Column C Allowed Wall Surface Area Per Qualified Residence or Residential Equivalent	Column D Allowed Cost Per Qualified Residence or Residential Equivalent[1]
66		700 Square Feet	$36,127
67		768 Square Feet	$39,636
68		836 Square Feet	$43,146
69		904 Square Feet	$46,655
70		972 Square Feet	$50,165
71	10 (substantial, step 1) [3]	1,040 Square Feet	$53,674
72	11 (substantial, step 1)	1,108 Square Feet	$57,184
73	12 (substantial, step 1)	1,176 Square Feet	$60,693
74	13 (substantial, step 1)	1,244 Square Feet	$64,203
75	14 (substantial, step 1)	1,312 Square Feet	$67,712
76	15 (substantial, step 2)[4]	1,380 Square Feet	$71,222

Notes
(1) Current costs based on $51.61 per square foot constructed cost developed in 2011.
(2) If the noise level increases 10 dBA or more as the result of the project (Column B), regardless of Design Year traffic sound level, follow the allowed wall surface and cost for the level of increase in Column C in lieu of the total design year sound decibel level in Column A. For total highway related sound levels at 76 or more dBA or the project results in an increase of 15 or more decibels, continue increasing the allowance at the rate provided in the table unless circumstances determined on a case-by case basis require an alternative methodology for determining allowance.
(3) Step 1 is when the noise levels are 10 to 14 dBA over Existing condition traffic noise as a result of the transportation project.
(4) Step 2 is when the noise levels are 15 or more dBA over Existing condition traffic noise as a result of the transportation project (or total highway related noise levels are between 76 and 79 decibels). Additional consideration for abatement may be considered under these circumstances.

The approximate costs reflected in the reasonableness evaluation are based on statewide average construction costs, and may not reflect site-specific complexities. Any additional costs of placing each noise barrier on property not owned by WSDOT or costs associated with noise barrier construction (conflicts from utilities, steep slopes, ground conditions, etc.) will be included in the final design state evaluation of this barrier to confirm whether or not the barrier meets the reasonableness criteria.

2. Design Goal Achievement

The minimum feasibility design goal for abatement on all projects is at least 5 dBA of noise reduction for the majority of front row receivers with noise impacts and, for reasonableness, at least 7 dBA of reduction for one or more receivers. Noise walls cannot be recommended if they do not achieve the design goal. In addition to the design goal requirement, WSDOT makes a reasonable effort to get 10 dBA or greater insertion loss (noise reduction) at the first row of receivers for all projects where abatement is recommended.

Exhibit 18 and Exhibit 19 describe the allowable cost per receiver and the cost of the minimum barrier size to achieve the design goal at both feasible noise barriers (Noise Barriers EB1 at ROW and WB1). While some first-row receivers would experience a greater than 10 dBA reduction, no barriers were evaluated that would receive 10 dBA of reduction for the majority of first row receivers.

Noise Barrier EB1 (At Right-of-Way)—Sites Mo-115-1 through Mo-137-4, St. Marks Greenbelt-2, St. Marks Greenbelt-3, Lakeview Place Park, 2-Mo-117-2 through 2-Mo-125

Noise Barrier EB1 was evaluated on the eastern edge of I-5 right-of-way (ROW) and edge-of-slope adjacent to Lakeview Boulevard between Belmont Avenue East and Boylston Avenue East. The location of Noise Barrier EB1 is shown in Exhibit 15. Noise Barrier EB1 (ROW) was evaluated to reduce noise levels at residences located east of I-5 predicted to experience noise abatement criteria impacts. Noise Barrier EB1 (ROW) was evaluated at heights up to 28 feet tall and 1,667 feet long in this location. A minimum feasible barrier height of 24 feet tall and 1,667 feet long would reduce traffic noise levels by at least 5 dBA at 15 of the 28 impacted first row homes in this area. A barrier height of 24 feet tall and 1,667 feet long would achieve WSDOT's design goal of at least a 7-dBA noise reduction at 6 first row locations and benefit a total of 41 receiver locations, which represent 46 residential equivalent units. At a height of 24 feet, the barrier would cost approximately $2,064,812 compared to a reasonable allowance of $2,893,501.

To provide additional noise reduction at homes located behind Noise Barrier EB1 that are predicted to experience NAC impacts with the 24-foot-tall barrier design, a 28-foot-tall barrier height was evaluated. A barrier height of 28 feet tall and 1,667 feet long would reduce traffic noise levels by at least 5 dBA at 15 of the 28 impacted first row homes in this area and achieve WSDOT's design goal of at least a 7-dBA noise reduction at 9 first row locations. At a height of 28-feet-tall Noise Barrier EB1 would benefit a total of 50 receiver locations, which represent 58 residential equivalent units. At a height of 28 feet, the barrier would cost approximately $2,408,948 compared to a reasonable allowance of $3,614,763.

The planning level cost of $2,408,948 includes typical noise barrier construction at an average cost of $51.61 per square foot of wall area.

Additional non-typical construction costs were added to the planned-level cost of Noise Barrier EB1 due to: special design requirements for wall heights exceeding 18 feet tall; the barrier's location along the edge of a slope; probable poor soil conditions; and site specific peak ground acceleration of more than double that considered in standard plan design. The combination of these non-typical construction conditions would require larger and deeper foundations and increase the estimated construction cost of Noise Barrier EB1 to between $120 and $150 per square foot. Applying the low end of the range of non-typical construction costs per square foot of $120 to Noise Barrier EB1 results in a total of $5,601,120 in construction costs, which is an additional $3,192,172 in estimated construction costs above the typical planning level cost of $2,408,948 for Noise Barrier EB1. The site-specific planning-level cost estimate of 5,601,120 is higher than the reasonable allowance of $3,614,763.

Due to the allowable cost of Noise Barrier EB1 being less than the construction cost of the barrier, the noise barrier does not meet the WSDOT Reasonableness Criteria and is not recommended.

Noise Barrier WB1—Sites Mo-69, 2-Mo-36, 2-Mo-39-5, 2-Mo-39-6

Noise Barrier WB1 was evaluated on the edge of pavement of the I-5 southbound off-ramp to Mercer Street from where the ramp passes under Eastlake Avenue East to Fairview Avenue North. The location of Noise Barrier WB1 is shown in Exhibit 16. Noise Barrier WB1 was evaluated to reduce noise levels at outdoor use locations located north of Mercer Street predicted to experience noise abatement criteria impacts. Noise Barrier WB1 was evaluated at heights up to 20 feet tall and approximately 1,200 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier WB1 could provide the necessary 5 dBA reduction at the one first row home located behind the barrier. Raising the height of WB1 does not provide sufficient noise reduction to meet WSDOT's design goal of at least a 7-dBA noise at one location behind the noise barrier.

Due to Noise Barrier NB1 not being able to meet WSDOT's design goal, the noise barrier does not meet the WSDOT Reasonableness Criteria and is not recommended.

Exhibit 18: Reasonableness Evaluation for Cost—Noise Barrier EB1 at ROW – 28 Feet Tall

Site and Land Use Category	Dwelling Units/ Residential Equivalency	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	Reasonableness Allowance		Minimum Design Goal Noise Wall		- 10 dBA in Majority of 1st Row	
				Per Modeled Receiver	Total Cost	Total Cost	Insertion Loss (dBA)	Total Cost	Insertion Loss (dBA)
Mo-115-1	1	**75**	**75**	$67,708	$3,614,763	$5,601,120	5	N/A	N/A
Mo-115-2	1	**76**	**76**	$71,217			6	N/A	N/A
Mo-116-1	1	**75**	**75**	$67,708			6	N/A	N/A
Mo-116-2	1	**76**	**76**	$71,217			5	N/A	N/A
Mo-118-2	1	**73**	**73**	$60,690			6	N/A	N/A
Mo-119-2	1	**72**	**72**	$57,181			6	N/A	N/A
Mo-120-1	1	**71**	**71**	$53,672			6	N/A	N/A
Mo-120-2	1	**73**	**73**	$60,690			6	N/A	N/A
Mo-121-1	1	**71**	**71**	$53,672			6	N/A	N/A
Mo-121-2	1	**73**	**73**	$60,690			6	N/A	N/A
Mo-122-2	1	**73**	**73**	$60,690			6	N/A	N/A
Mo-123-1	1	**71**	**71**	$53,672			6	N/A	N/A
Mo-123-2	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-123-3	1	**75**	**75**	$67,708			8	N/A	N/A
Mo-123-4	1	**75**	**75**	$67,708			6	N/A	N/A
Mo-124-1	1	**71**	**71**	$53,672			6	N/A	N/A
Mo-124-2	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-124-3	1	**75**	**75**	$67,708			8	N/A	N/A
Mo-124-4	1	**75**	**75**	$67,708			6	N/A	N/A
Mo-125-2	1	**72**	**72**	$57,181			7	N/A	N/A
Mo-125-3	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-125-4	1	**75**	**75**	$67,708			8	N/A	N/A
Mo-126-2	1	**74**	**74**	$64,199			8	N/A	N/A

Site and Land Use Category	Dwelling Units/ Residential Equivalency	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	Reasonableness Allowance		Minimum Design Goal Noise Wall		- 10 dBA in Majority of 1st Row	
				Per Modeled Receiver	Total Cost	Total Cost	Insertion Loss (dBA)	Total Cost	Insertion Loss (dBA)
Mo-126-3	1	**75**	**75**	$67,708			8	N/A	N/A
Mo-126-4	1	**75**	**75**	$67,708			5	N/A	N/A
Mo-127	1	**72**	**72**	$57,181			9	N/A	N/A
Mo-128-2	2	**74**	**74**	$64,199			9	N/A	N/A
Mo-128-3	3	**75**	**75**	$67,708			9	N/A	N/A
Mo-128-4	3	**75**	**75**	$67,708			6	N/A	N/A
Mo-129-2	2	**74**	**74**	$64,199			9	N/A	N/A
Mo-129-3	2	**75**	**75**	$67,708			8	N/A	N/A
Mo-130-2	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-131-2	1	**74**	**74**	$64,199			9	N/A	N/A
Mo-131-3	1	**75**	**75**	$67,708			9	N/A	N/A
Mo-131-4	1	**75**	**75**	$67,708			6	N/A	N/A
Mo-132-2	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-132-3	1	**75**	**75**	$67,708			8	N/A	N/A
Mo-133-2	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-134-1	1	**72**	**72**	$57,181			8	N/A	N/A
Mo-134-2	1	**74**	**74**	$64,199			9	N/A	N/A
Mo-135-1	1	**71**	**71**	$53,672			8	N/A	N/A
Mo-135-2	1	**73**	**73**	$60,690			8	N/A	N/A
Mo-135-3	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-136-2	1	**73**	**73**	$60,690			7	N/A	N/A
Mo-136-3	1	**74**	**74**	$64,199			8	N/A	N/A
Mo-136-4	1	**75**	**75**	$67,708			7	N/A	N/A

Site and Land Use Category	Dwelling Units/ Residential Equivalency	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	Reasonableness Allowance		Minimum Design Goal Noise Wall		- 10 dBA in Majority of 1st Row	
				Per Modeled Receiver	Total Cost	Total Cost	Insertion Loss (dBA)	Total Cost	Insertion Loss (dBA)
St Marks Greenbelt-2	1	**72**	**72**	$57,181			9	N/A	N/A
Lakeview Place Park	1	**73**	**73**	$60,690			9	N/A	N/A
2-Mo-115-2	2	63	63	$36,127			6	N/A	N/A
2-Mo-116-2	1	64	64	$36,127			6	N/A	N/A
					Design Goal Achieved?	Yes		No	
					Cost Effective?	No		No	

Notes
*Noise Abatement Criteria Impacts are noted by **bolded** values.*
Reasonableness cost based on $51.61/ft^2
N/A = Noise reduction not achieved by evaluated noise barrier
See Exhibit 3 for definitions of Activity Categories.

Exhibit 19: Reasonableness Evaluation for Cost—Noise Barrier WB1 – 20 Feet Tall

Site and Land Use Category	Dwelling Units/ Residential Equivalency	Existing (L_{eq}) (dBA)	Build (L_{eq}) (dBA)	Reasonableness Allowance		Minimum Design Goal Noise Wall		- 10 dBA in Majority of 1st Row	
				Per Modeled Receiver	Total Cost	Total Cost	Insertion Loss (dBA)	Total Cost	Insertion Loss (dBA)
Mo-69	1	**73**	**73**	$60,690	$107,233	$0	5	N/A	N/A
2-Mo-36	1	**69**	**69**	$46,654			5	N/A	N/A
					Design Goal Achieved?	No		No	
					Cost Effective?	No		No	

Notes
*Noise Abatement Criteria Impacts are noted by **bolded** values.*
Reasonableness cost based on $51.61/ft^2
N/A = Noise reduction not achieved by evaluated noise barrier
See Exhibit 3 for definitions of Activity Categories.

3. Desire for Abatement from Public within the Noise Study Area

Public involvement must occur when traffic noise abatement is recommended for Type I projects, even when public involvement is not required as part of the National Environmental Policy Act or State Environmental Policy Act processes. Public opinion must be considered when making a determination of reasonableness for traffic noise abatement. Noise abatement will not be planned if more than 50 percent of eligible property owners oppose the proposed noise abatement. The final determination whether to construct a noise wall or other abatement that is recommend in the traffic noise analysis cannot be made until public outreach has occurred.

Traffic Noise Abatement Summary

Noise abatement was considered at five locations where traffic noise impacts were predicted. Noise barriers were evaluated in this report at four of the five impact locations. Two of the four noise barrier alignments evaluated were found to meet WSDOT Criteria for the placement of a feasible noise barrier. However, neither noise barrier that met WSDOT Feasible Criteria also met WSDOT Criteria for Reasonableness.

The fifth impact area is located east of I-5 from the northbound I-5 off-ramp at Lakeview Boulevard to the northbound I-5 off-ramp to SR 520 was not evaluated for noise barrier placement as a structural assessment conducted in October of 2018 determined construction of a noise barrier atop the viaduct structure located in this area was not feasible (WSDOT, 2018).

Impacts consistent with the 2011 noise study for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project were not reanalyzed in this report and the noise barrier evaluation in the 2011 report remains applicable in the Roanoke and North Capitol Hill neighborhoods.

Construction Noise

An evaluation of construction noise related to the project can be found in the Noise Discipline Report Addendum and Errata for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project (May, 2011).

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APPENDIX A—Traffic Noise Analysis and Abatement Process

When are noise reports and/or recommendations final?

The noise abatement process from the preparation of a noise wall to the final noise wall design (or decision not to build) can be confusing. The following process attempts to provide some clarification to project teams and outlines a recommended "standard" process, but acknowledges that variations to this process are likely because of the differences between projects.

Environmental Discipline Reports

The noise analyst works with the project team to model project elements affecting noise that include traffic, topography, and the location of noise-sensitive receivers. If traffic noise impacts are discovered through modeling, then abatement is evaluated.

Abatement is compared to the feasibility (constructability, effectiveness) and reasonableness (allowable barrier size/cost) for a "standard" project. If abatement is feasible and reasonable, the report recommends the optimal (cost to benefit) noise barrier.

The traffic noise discipline report can be finalized.

Design Phase

Design Phase and Public Involvement steps (below) may be incorporated before the report is finalized.

The project office reviews the recommended noise wall height and horizontal alignment to determine if there are any conflicts that were not realized at the time the discipline report was prepared.

If conflicts from utilities, steep slopes, etc. are present, the details and costs of the conflicts are provided to the noise analyst by the project team. The noise analyst will then add any additional ("but for" the noise wall) costs to the reasonableness evaluation.

If noise wall costs including accommodation of conflicts are still less than the allowable costs for the noise wall, the barrier height and/or alignment are re-evaluated and a new barrier will be recommended. If barrier costs plus the new costs exceed the allowable costs, the barrier may not be recommended by the WSDOT Air, Noise, and Energy (ANE) Program.

If a noise wall is recommended, the ANE Program will review and confirm noise wall dimensions throughout the design process.

Public Involvement

If abatement is recommended in the Traffic Noise Discipline Report, public outreach to determine public desires for abatement must occur. The noise wall discussion may be introduced to the public

before the Design Phase, but should happen after the noise wall alignment, height, and length (or other abatement description) is established so that people can understand any effects of the noise wall (or other abatement) on their community.

The final determination whether to construct a noise wall or other abatement that is recommend in the traffic noise analysis cannot be made until public outreach has occurred.

Final Steps

Any updates to the Traffic Noise Discipline report to clarify changes that occurred during the Design Phase or from Public Involvement can be made at the project engineering office's discretion. Addendum or supplementary memorandum to clarify changes can also be added to the discipline report or project file.

The noise wall is constructed or a letter from the ANE Program is added to the project file clarifying why a noise wall was not constructed.

Appendix B—Permitted Future Land Use

Appendix B presents the results of a review of available building permits from the City of Seattle. At the time of this report, several undeveloped or vacant lots are located near the proposed project improvements. According to the WSDOT Traffic Noise Policy, if building permits have been submitted for undeveloped properties, the proposed development needs to be included in the noise study.

The information was researched from available online files on the City of Seattle's websites in January of 2019. The review did not identify permits that have been submitted to develop structures that were not already under construction that include noise-sensitive land uses that are included in WSDOT and FHWA noise-regulated land uses NAC B, C, D, or F at properties located within the noise study area. All permitted developments identified at the time of the permit review have been considered in this noise study. More information on related research conducted at the time of this report is presented in Appendix B of this report.

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Appendix C—Traffic Data

Appendix C provides traffic data collected during field measurements on August 15, 17 and 24, September 7, and October 22, 2018. The data includes traffic volumes, speeds, and vehicle mix by roadway for each noise measurement location. Worst-Hour Existing 2018, 2040 No Build, and 2040 Build traffic data were provided by WSDOT's SR 520/I-5 Express Lanes Connection Project Team.

Exhibit C-1: Measured Traffic Volumes during Validation Measurement

Measurement #	Street Address	Date	Roadway	15-Minute Counts			
				Autos	MT	HT	Speed (mph)
M1	2637 Boylston Ave E	8/15/2018	I-5 NB	920	33	27	65 (+/-5mph)
			I-5 NB Express	568	26	22	65 (+/-5mph)
			I-5 SB	1092	56	48	65 (+/-5mph)
			Boylston NB	44	0	0	25-35
			Boylston SB	36	1	0	25-35
			Lynn EB	24	1	0	10-20
			Lynn WB	20	0	0	10-20
M2	615 Lynn St	8/15/2018	I-5 NB	920	33	27	60-70
			I-5 NB Express	568	26	22	60-70
			I-5 SB	1092	56	48	60-70
			Boylston NB	44	0	0	25-35
			Boylston SB	36	1	0	25-35
			Lynn EB	24	1	0	10-20
			Lynn WB	20	0	0	10-20
M3	2203 Boylston Ave E	8/15/2018	I-5 NB	930	37	19	60
			I-5 NB Express	630	15	25	65
			I-5 SB	1121	96	43	40-50
			Boylston NB	35	2	0	35
			Boylston SB	87	2	0	35
M4	2003 Boylston Ave E	8/15/2018	I-5 NB	930	37	19	60
			I-5 NB Express	630	15	25	65
			I-5 SB	1121	96	43	40-50
			Boylston NB	52	1	0	20-35
			Boylston SB	116	2	0	20-35
M5	Vacant Lot Adjacent to 2348 Harvard Ave E	8/17/2018	I-5 NB	1260	85	49	60-70
			I-5 SB Express	721	30	6	60-70
			I-5 SB	1114	12	54	60-70
			I-5 SB On from 520	334	8	5	40-50
			I-5 NB Off to 520	110	8	0	55-65
M6	806 E Lynn St	8/17/2018	I-5 NB	1159	64	45	60-70
			I-5 SB Express	582	13	10	60-70
			I-5 SB	1022	10	36	55-65
			I-5 SB On from 520	368	5	5	40-50
			I-5 NB Off to 520	103	9	0	55-65
M7	2371 Boylston Ave E	8/17/2018	I-5 NB	1017	48	27	60-70
			I-5 NB Express	509	24	23	60-70
			I-5 SB	1335	15	52	55-65
			I-5 NB On from 520	175	4	2	40-50
			-5 SB Off to Boylstor	98	1	0	30-40
			Boylston SB (SB only)	40	0	0	30
M8	1964 Harvard Ave E	8/24/2018	I-5 NB	1233	57	22	45-50 (w/2min@30)
			I-5 NB Express	519	18	19	50-60
			I-5 SB	1669	59	32	40-50
			Harvard NB	15	0	0	20-25
			Harvard SB	2	0	0	20-25
M9	1924 Harvard Ave E	8/24/2018	I-5 NB	1233	57	22	45-50 (w/2min@30)
			I-5 NB Express	519	18	19	50-60
			I-5 SB	1669	59	32	40-50
			Harvard NB	15	0	0	20-25
			Harvard SB	2	0	0	20-25
M10	E Howe Hillclimb east of Lakeview Blvd	8/24/2018	I-5 NB	885	40	20	45-50
			I-5 NB Express	392	10	20	50-60
			I-5 SB	1075	49	14	30-45
			Lakeview Blvd NB	122	0	1	20-35
			Lakeview Blvd SB	25	0	0	20-35

Source: WSP, 2019.

Exhibit C-2: Measured Traffic Volumes during Validation Measurement (continued)

Measurement #	Street Address	Date	Roadway	15-Minute Counts			
				Autos	MT	HT	Speed (mph)
M11	1575 Lakeview Blvd	8/24/2018	I-5 NB	885	40	20	45-50
			I-5 NB Express	392	10	20	50-60
			I-5 SB	1075	49	14	30-45
			-5 NB Off to Lakeviev	95	0	0	30-45
M12	2636 Harvard Ave E	9/7/2018	I-5 NB	1229	35	35	60-65
			I-5 SB Express	691	25	13	65
			I-5 SB	1071	57	36	65
			Harvard NB	152	2	1	40
			Harvard SB	50	0	0	30
M13	Fire Station 22, East Lawn	9/7/2018	I-5 NB	1101	26	30	60-65
			I-5 SB Express	424	11	9	65
			I-5 SB	1094	66	35	65
			Roanoke EB	116	4	0	20
			Roanoke WB	115	2	1	20
			SR520 EB from I-5 NB	277	9	3	45
			SR520 EB from I-5 EX	103	5	2	35
			SR520 WB to I-5 SB	273	9	0	40
			SR520 WB to I-5 EX	141	5	1	35
			SR520 WB to I-5 NB	27	0	0	35
M14	2408 Broadway Ave E	9/7/2018	I-5 NB	964	19	27	65
			I-5 NB Express	468	34	34	65
			I-5 SB	1238	68	43	65
			SR520 EB from I-5 NB	407	12	4	45
			SR520 EB from I-5 EX	153	8	3	35
			SR520 WB to I-5 SB	403	12	0	40
			SR520 WB to I-5 EX	201	7	1	35
			SR520 WB to I-5 NB	41	0	0	35
M15	Near 1014 Lakeview Blvd	10/22/2018	I-5 NB	1224	54	31	60-65
			I-5 NB Express	409	5	27	60-65
			I-5 SB	1352	32	40	55-65
			I-5 SB Off to Eastlake	174	3	6	40-50
			Lakeview Blvd E NB	30	2	0	25-35
			Lakeview Blvd E SB	52	1	0	20-30
M16	Melrose Trail	10/22/2018	I-5 NB	1281	40	32	60-65
			I-5 NB Express	396	6	33	60-65
			I-5 SB	1443	46	42	55-65
			I-5 SB Off to Eastlake	185	4	4	40-50
M17	Adjacent to 611 Pontius Ave N Parking	10/22/2018	I-5 NB	1335	30	27	60-65
			I-5 NB Express	435	12	6	50-60
			I-5 SB	1425	51	57	50-60
			EB Mercer to I-5 SB	225	5	8	25-40
			B Mercer to I-5 NB/E	221	3	3	35-45
			WB Mercer from I-5	379	5	3	30--40
M18	Minor Ave N and Roy Street	10/22/2018	I-5 NB	1301	33	17	50-60
			I-5 NB Express	507	14	11	50-60
			I-5 SB	1460	53	55	50-60
			EB Mercer to I-5 SB	219	9	12	15-30
			EB Mercer to I-5 NB	149	3	5	30-40
			EB Mercer to I-5 EX	127	4	8	30-40
			WB Mercer from I-5	451	14	4	30-40
M19	Eastlake Triangle	10/22/2018	I-5 NB	1290	31	22	50-60
			I-5 NB Express	573	9	12	60-65
			I-5 SB	1557	63	51	50-55
			Eastlake Ave NB	18	0	0	30-35
			Eastlake Ave SB	44	0	0	30-35

Source: WSP, 2019.

Exhibit C-3: Modeled Hourly Traffic Volumes 2018 Existing – I-5 Southbound

	Mainline	Boylston Off	Mainline	Off to SR520	Mainline	On from SR520	Mainline	Boylston On	Mainline	Mercer Off	Mainline
Auto	5911	480	5463	1449	4015	2366	6382	448	6830	951	5878
MT	248	0	229	61	169	99	268	19	287	40	247
HT	193	0	196	47	131	77	208	15	223	31	192

Source: WSDOT, 2018.

Exhibit C-4: Modeled Hourly Traffic Volumes 2018 Existing – I-5 Northbound

NB Main	Mainline	Mercer On	Mainline	Lakeview Off	Mainline	SR520 Off	Mainline	SR520 On	Mainline	Harvard On	Mainline
Auto	4701	1030	5731	301	5431	1689	3742	823	4564	468	5032
MT	182	40	222	12	210	65	145	32	176	18	195
HT	118	26	144	8	136	42	94	21	114	12	126

Source: WSDOT, 2018.

Exhibit C-5: Modeled Hourly Traffic Volumes 2030 No Build and Build – I-5 Southbound

	Mainline	Boylston Off	Mainline	Off to SR520	Mainline	On from SR520	Mainline	Boylston On	Mainline	Mercer Off	Mainline
Auto	6620	480	6002	1480	4523	2366	6889	488	7377	1116	6262
MT	278	0	252	62	190	99	289	20	310	47	263
HT	216	0	196	48	147	77	225	16	240	36	204

Source: WSDOT, 2018.

Exhibit C-6: Modeled Hourly Traffic Volumes 2030 No Build and Build – I-5 Northbound

	Mainline	Boylston Off	Mainline	Off to SR520	Mainline	On from SR520	Mainline	Boylston On	Mainline	Mercer Off	Mainline
Auto	4838	1234	6073	418	5654	1689	3965	862	4826	510	5337
MT	187	48	235	16	219	65	153	33	187	20	206
HT	121	31	152	10	142	42	99	22	121	13	134

Source: WSDOT, 2018.

Exhibit C-7: Modeled Hourly Traffic Volumes 2018 Existing – I-5 Express Lanes

Exp Main	Mainline	Mercer St Off
4924	1182	3742
160	38	122
190	46	144

Source: WSDOT, 2018.

Exhibit C-8: Modeled Hourly Traffic Volumes 2030 No Build and Build – I-5 Express Lanes

Exp Main	Mainline	Mercer St Off
5171	1448	3723
168	47	121
199	56	143

Source: WSDOT, 2018.

Appendix D—Modeling Site Descriptions

Appendix D provides additional information on modeling site locations and residential equivalency calculations.

Exhibit D-1: Modeled Site Descriptions and Residential Equivalency Calculations

Site ID	Land Use / Site Description	Usage Factor Calculation (Hours/Day, Days/Week, Months/Year)[3]	Average Users at Site	Average Number of People Per Household[4]	Dwelling Units Residential Equivalency[5]
M10	East Howe St Hill Climb (ped)	(16/24)*(7/7)*(12/12) = 0.67	3[6]	2.53	1
M16	Melrose Trail	(16/24)*(7/7)*(12/12) = 0.67	3[7]	2.53	1
M19	Eastlake Avenue Triangle Park	(16/24)*(7/7)*(12/12) = 0.67	3[8]	2.53	1
Roanoke Park-1A and 2A	Park Sitting Area	(10/24)*(7/7)*(5/12) = 0.17	5[9]	2.53	1
Roanoke Park-3A	Park Playground	(10/24)*(7/7)*(5/12) = 0.17	10[10]	2.53	1
Colonnade Park-1, 2 and 3	Bicycle Trail	(16/24)*(7/7)*(12/12) = 0.67	3[11]	2.53	1
Saint Marks Greenbelt-1, 2 and 3	Walking Trail	(16/24)*(7/7)*(12/12) = 0.67	3[12]	2.53	1
Lakeview Place Park	Park	(16/24)*(7/7)*(12/12) = 0.67	3[13]	2.53	1
Bellevue Place Park	Park	(16/24)*(7/7)*(12/12) = 0.67	3[14]	2.53	1

Source: WSP USA, 2018

[3] Calculated using WSDOT's Residential Equivalency Calculations, unless noted
[4] Average number of people per household in Washington State 2.53 (WSDOT, 2012)
[5] Dwelling Units Residential Equivalency = Usage Factor x Average Users at site ÷ Average Number of People per Household
[6] Based on observed use
[7] Based on observed use
[8] Estimated based on size of park
[9] Estimated based on size of park
[10] Estimated based on size of playground
[11] Based on observed bicycle and pedestrian counts
[12] Based on observed use
[13] Estimated based on size of park
[14] Estimated based on size of park

APPENDIX E—TNM Barrier Graphics

Appendix E contains TNM noise barrier graphics for the three locations evaluated for noise barrier placement that met WSDOT criteria for a feasible noise barrier.

Exhibit E-1: TNM Noise Barrier Graphic—Noise Barrier EB1

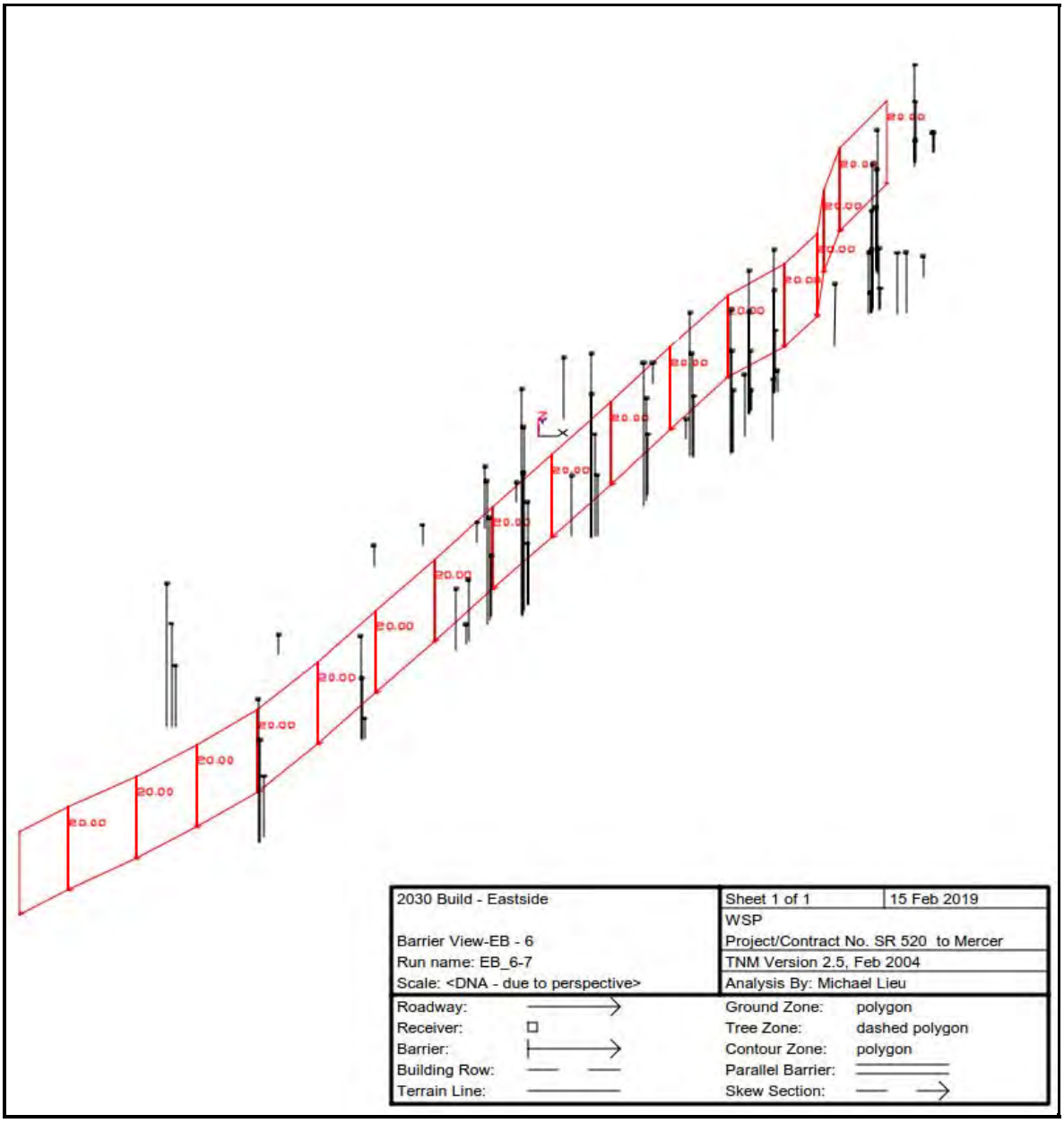
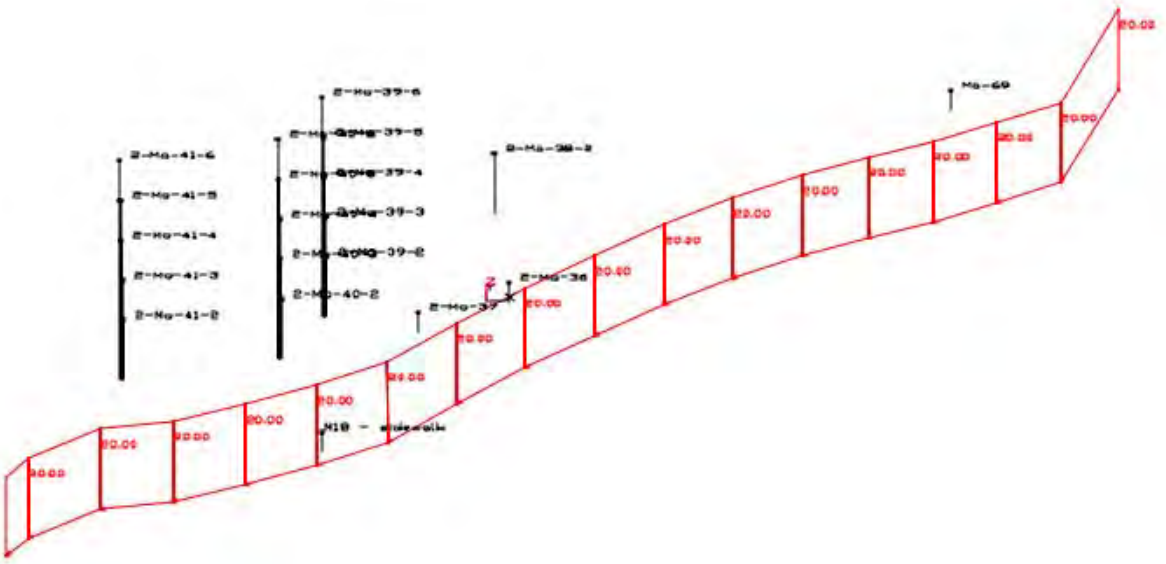


Exhibit E-3: TNM Noise Barrier Graphic—Noise Barrier WB1



Build - Westside		Sheet 1 of 1	5 Mar 2019
		WSP	
Barrier View-WB-1		Project/Contract No. SR 520 to Mercer	
Run name: WB_1-2		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: Michael Lieu	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

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APPENDIX F—TNM Data

TNM v2.5 files of all noise modeling files are provided electronically with the Noise Discipline Report. Modeling files developed for this report are as follows:

Validation Models:

- SR520_Val_Site1
- SR520_Val_Site2
- SR520_Val_Site3
- SR520_Val_Site4
- SR520_Val_Site5
- SR520_Val_Site6
- SR520_Val_Site7
- SR520_Val_Site8
- SR520_Val_Site9
- SR520_Val_Site10
- SR520_Val_Site11
- SR520_Val_Site12
- SR520_Val_Site13
- SR520_Val_Site14
- SR520_Val_Site15
- SR520_Val_Site16
- SR520_Val_Site17
- SR520_Val_Site18
- SR520_Val_Site19

Existing Conditions Model:

- SR520_Eastside_Existing
- SR520_Westside_Existing
- SR520_South Mercer_Existing
- SR520_Additional_Parks_Eastside_Existing

No Build Model:

- SR520_Eastside_No Build
- SR520_Westside_No Build
- SR520_South Mercer_No Build
- SR520_Additional_Parks_Eastside_No Build

Build Models:

- SR520_Eastside_Build
- SR520_Westside_Build
- SR520_South Mercer_Build

- SR520_Additional_Parks_Eastside_Build
- SR520_EB_3-6_Parks (EB1 referenced as EB6)
- SR520_EB_6-7 (EB1 referenced as EB6; EB2 refenced as EB7)
- SR520_EB_6-7_EOS (EB1 referenced as EB6; EB2 refenced as EB7)
- SR520_EB_6-7_Parks (EB1 referenced as EB6; EB2 refenced as EB7)
- SR520_WB_1-2
- SR520_WB2_South Mercer

APPENDIX G—Field Data Sheets

Appendix G contains data sheets from the field that describe the locations where noise measurements were taken on August 15, 17 and 24, September 7, and October 22, 2018.

Exhibit G-1: 15-Minute Validation Measurement Sites 1 and 2—2637 Boylston Ave E and 615 Lynn St—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: (1) (2) OBSERVER(s): Romero, Frohnin
START DATE & TIME: 8/15/18 12:55 END DATE & TIME: 8/15/18 1:10
ADDRESS: (1) 2637 Boylston Ave E (2) 615 Lynn St (2nd Row)

Weather

TEMP: 77 °F HUMIDITY: 60 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-2 MPH DIR: N NE E SE S SW (W) NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK PARTLY (CLOUDY) OVRCST FOG DRIZZLE RAIN Other: ____

Acoustic Measurements

INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec #	Start Time	End Time							
1	12:55	1:10	L_{eq} 71.2	L_{max} 77.9	L_{min} 67.7	L_{90} 69.1	L_{50} 70.6	L_{10} 73.1	
2	12:55	1:10	L_{eq} 66.6	L_{max} 78.9	L_{min} 62.1	L_{90} 64.1	L_{50} 66.1	L_{10} 68.3	

COMMENTS:

Source Info and Traffic Counts

BOLYSTON LYNN I-5

PRIMARY NOISE(S): TRAFFIC (Roadway Type: ____) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: I-5 EX

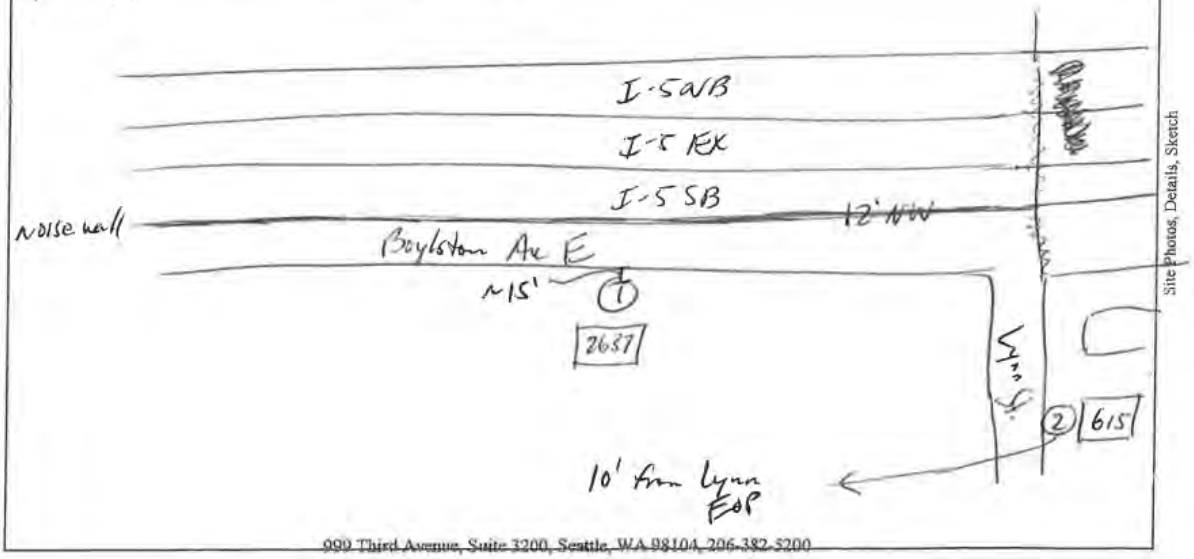
	COUNT #1 DURATION: 15 -MINUTE		SPEED (mph)		COUNT #2: 15 -MINUTE		SPEED (mph)	
	(NB/EB)	SB/WB	(NB/EB)	SB/WB	(NB/EB)	SB/WB	NB/EB	(SB/WB)
AUTOS:	44	36	24	20	920	1092	____	568
MED. TRUCKS:	0	1	1	0	33	56	____	26
HVY TRUCKS:	0	0	0	0	27	48	____	22
BUSES:								
MOTORCYCLES:	(25-35 mph)		(10-20 mph)		(65 mph)	(65 mph +/-5 mph)		(65 mph +/-5 mph)

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Site Photos, Details, Sketch

TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHYSICAL SETTING: Residential Front Yards
SITE SKETCH / (PHOTOGRAPHS): Digital on File. Locations in GIS.



999 Third Avenue, Suite 3200, Seattle, WA 98104, 206-382-5200

Exhibit G-2: 15-Minute Validation Measurement Sites 3 and 4—2203 and 2003 Boylston Ave E—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

SITE IDENTIFICATION: (3) 2203 Boylston Ave E. OBSERVER(s): Romero, Frohnin
START DATE & TIME: 8/15/18 13:25 END DATE & TIME: 8/15/18 13:40
ADDRESS: (4) 2003 Boylston Ave E

ID

TEMP: 77 °F HUMIDITY: 60 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK PARTLY (CLOUDY OVRCST) FOG DRIZZLE RAIN Other: ____

Weather

INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec # / Start Time / End Time
3 / 13:25 / 13:40: L_{eq} 72.4, L_{max} 78.1, L_{min} 67.3, L_{90} 68.4, L_{50} 71.7, L_{10} 74.8,
4 / 13:25 / 13:40: L_{eq} 70.7, L_{max} 80.7, L_{min} 64.4, L_{90} 67.4, L_{50} 70.2, L_{10} 72.4,
COMMENTS:

Acoustic Measurements

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 / I-5 EX / BOYLSTON) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

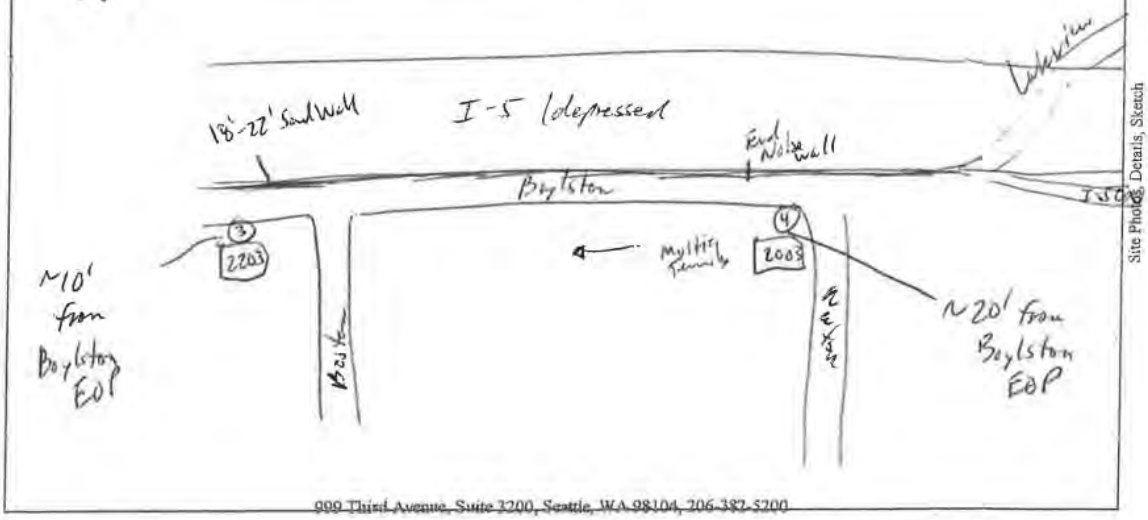
	COUNT #1 DURATION: 15-MINUTE		SPEED (mph)		COUNT #2: 15-MINUTE		SPEED (mph)	
	(3) NB/EB	(4) SB/WB	NB/EB	SB/WB	(3) NB/EB	(4) SB/WB	NB/EB	SB/WB
AUTOS:	930	1121	630		52	116		
MED. TRUCKS:	37	96	15		1	2		
HVY TRUCKS:	19	43	25		0	0		
BUSES:								
MOTORCYCLES:	(60mph)	(40-50mph)	(65mph)		(20-35mph)	(20-35mph)		

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Source Info and Traffic Counts

TERRAIN: HARD SOFT MIXED FLAT OTHER: ____
PHYSICAL SETTING:
SITE SKETCH / PHOTOGRAPHS: Digital on File. GPS locations separate.



Site Photos, Details, Sketch

999 Third Avenue, Suite 3200, Seattle, WA 98104, 206-382-5200

Exhibit G-3: 15-Minute Validation Measurement Site 5—Vacant Lot Adjacent to 2348 Harvard Ave E—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

SITE IDENTIFICATION: 5 OBSERVER(s): Romero, Frohnsin
START DATE & TIME: 8/17/18 10:10 END DATE & TIME: 8/17/18 10:25
ADDRESS: Vacant lot Adj to 2348 Harvard Ave E.

TEMP: 62 °F HUMIDITY: 67 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 3-5 MPH DIR: N NE E SE S (SW) W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other: _____

INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

Rec #	Start Time	End Time							
5	10:10	10:25	L_{eq} 72.4	L_{max} 76.2	L_{min} 69.6	L_{90} 71.3	L_{50} 72.3	L_{10} 73.3	
/	/	:	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	

COMMENTS:

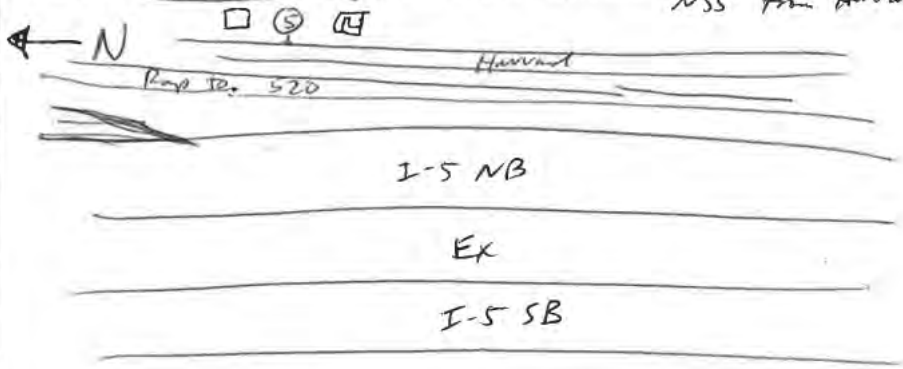
PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 / (I-5 EX) / I-5 Ramps) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	1260	1114		721		110	334		
MED. TRUCKS:	85	12		30		8	8		
HVY TRUCKS:	49	54		6		0	5		
BUSES:	(60/70 mph)		(60-70 mph)		(55-65 mph)		(40-50 mph)		
MOTORCYCLES:									

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: _____

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Vacant Lot
SITE SKETCH / PHOTOGRAPHS: Digital on File, w/ GIS coordinates. N35' from Harvad EOP



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ID | Weather | Acoustic Measurements | Source Info and Traffic Counts | Site Photos, Details, Sketch

Exhibit G-4: 15-Minute Validation Measurement Site 6—806 E Lynn St—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: (6) OBSERVER(s): Romero, Fishing
START DATE & TIME: 8/17/16 10:45 END DATE & TIME: 8/17/16 11:00
ADDRESS: 806 E. Lynn St.

Weather

TEMP: 62 °F HUMIDITY: 67 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 3-5 MPH DIR: N NE E SE S (SW) W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other: ____

Acoustic Measurements

INSTRUMENT: LD820, PRM828, 2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec # Start Time / End Time
6 / 10:45 / 11:00 : L_{eq} 71.6, L_{max} 75.9, L_{min} 68.2, L_{90} 70.2, L_{50} 71.4, L_{10} 72.7, ____
___ / ___ / ___ : L_{eq} ___, L_{max} ___, L_{min} ___, L_{90} ___, L_{50} ___, L_{10} ___, ____
COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 EX I-5 SB) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 15 -MINUTE	NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB	COUNT #2: 0-MINUTE NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB
AUTOS:	1159 / 1022	___ / 582	103 / 368	___ / ___
MED. TRUCKS:	64 / 10	___ / 13	9 / 5	___ / ___
HVY TRUCKS:	45 / 36	___ / 10	0 / 5	___ / ___
BUSES:	4 / (55-65 mph)	___ / (60-70 mph)	___ / ___	___ / ___
MOTORCYCLES:	(60-70 mph) / ___	___ / ___	___ / ___	___ / ___

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Residential front yard
SITE SKETCH / PHOTOGRAPHS: Digital on File. w/ GIS coordinates

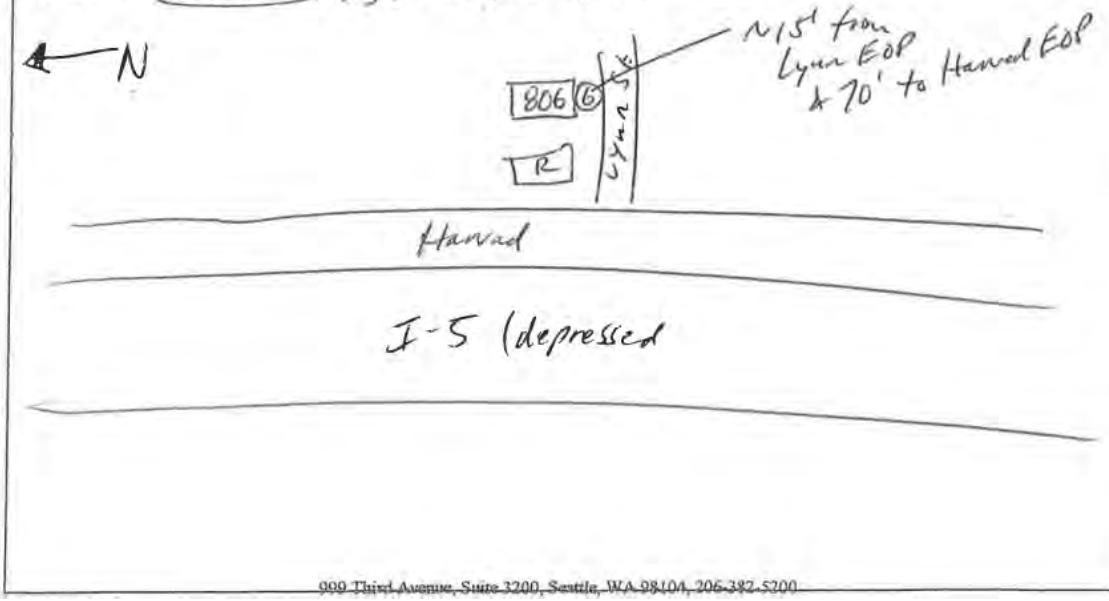

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Exhibit G-5: 15-Minute Validation Measurement Site 7—2371 Boylston Ave E—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: 7 OBSERVER(s): Romero, Frohnmayer
START DATE & TIME: 8/17/18 11:40 END DATE & TIME: 8/17/18 11:55
ADDRESS: 2371 Boylston Ave E.

Weather

TEMP: 70 °F HUMIDITY: 60 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE E SE S (SW) W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other: _____

Acoustic Measurements

INSTRUMENT: LD820, PRMB28, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 22137
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

Rec #	Start Time	End Time								
7	11:40	11:55	L_{eq} 68.0	L_{max} 74.0	L_{min} 64.0	L_{90} 66.1	L_{50} 67.6	L_{10} 69.7		
___	___	___	L_{eq} ___	L_{max} ___	L_{min} ___	L_{90} ___	L_{50} ___	L_{10} ___		

COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 NB EX) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Boylston SB (1-way)

COUNT #1 DURATION: 15 -MINUTE	SPEED (mph)	COUNT #2: OFF-MINUTE	SPEED (mph)
NB/EB / (SB/WB)	NB/EB / SB/WB	NB/EB / (SB/WB)	NB/EB / (SB/WB)
AUTOS: 1017 / 1335	50/1 ___	175 / 98	___ / 40
MED. TRUCKS: 48 / 15	24 / ___	4 / 1	___ / 0
HVY TRUCKS: 27 / 52	23 / ___	2 / 0	___ / 0
BUSES:			
MOTORCYCLES: (60-70mph) (55-65mph)	(60-70mph) ___	(40-50mph) (30-40mph)	___ / (30mph)

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: _____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Residential Front Yard
SITE SKETCH / PHOTOGRAPHS: Digital on File. GIS coordinates taken at measurement location

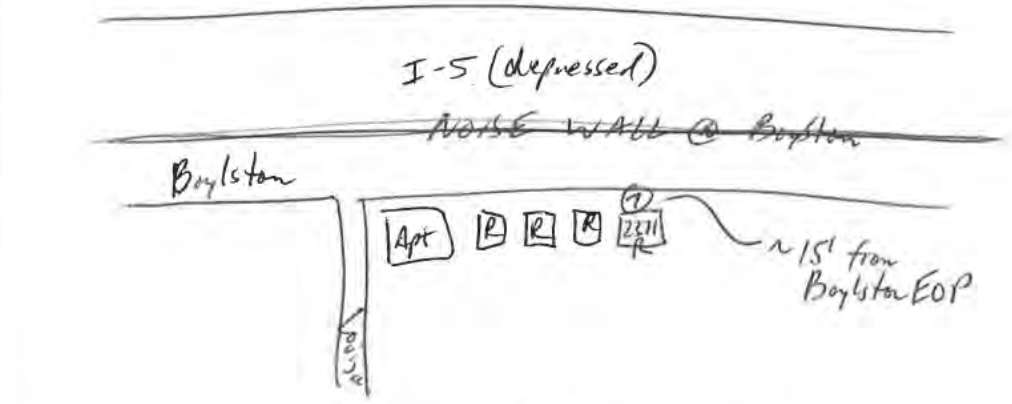

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Exhibit G-6: 15-Minute Validation Measurement Sites 8 and 9—1964 and 1924 Harvard Ave E—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: (8) 1964-66-68 (9) 1928 sideroad (closed) OBSERVER(s): Ramos
START DATE & TIME: 8/24/18 11:25 am END DATE & TIME: 8/24/18 11:40 am
ADDRESS: (8) 1964 Harvard Ave E (9) 1928 Harvard Ave E.

Weather

TEMP: 60 °F HUMIDITY: 30 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK PARTLY (CLOUDY) OVRCST FOG DRIZZLE RAIN Other: _____

Acoustic Measurements

INSTRUMENT: LD 820, PRM828, Mi2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LD CAL 200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

Rec #	Start Time / End Time							
8	11:25 / 11:40	L_{eq} 74.5	L_{max} 76.9	L_{min} 72.0	L_{90} 73.7	L_{50} 74.6	L_{10} 75.3	
9	11:25 / 11:40	L_{eq} 77.2	L_{max} 81.2	L_{min} 73.5	L_{90} 75.3	L_{50} 77.1	L_{10} 78.8	

COMMENTS:

(8) only

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Bayston

	COUNT #1 DURATION: MAIN 15 -MINUTE MAIN EXPRESS				COUNT #2: 15 -MINUTE		SPEED (mph)	
	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS:	1233	1669	519				15	2
MED. TRUCKS:	57	59	18				0	0
HVY TRUCKS:	22	32	19				0	0
BUSES:	(45-50mph)	(40-50mph)	(50-60mph)				(20mph)	(25mph)
MOTORCYCLES:	2 (1-2 min @ 30mph)							

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: ~~distant AIRCRAFT~~ overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: _____

Site Photos, Details, Sketch

TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHYSICAL SETTING: Front Access to Res at Grange & Sidewalk
SITE SKETCH / PHOTOGRAPHS: Digital photos on file w/ GIS coordinates.

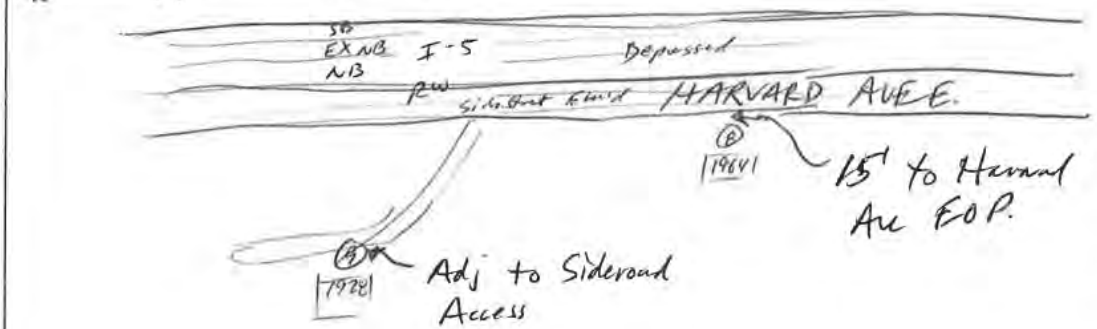

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Exhibit G-7: 15-Minute Validation Measurement Sites 10 and 11—E Howe Hill Climb and 1575 Lakeview Blvd—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

SITE IDENTIFICATION: (10) E Howe St. Hillclimb (11) 1575 Lakeview Blvd OBSERVER(s): Romero, Frohaing, Cavanagh
START DATE & TIME: 8/24/18 11:50 END DATE & TIME: 12:05 8/24/18
ADDRESS: E. Howe Hillclimb & 1575 Lake View Blvd

ID

TEMP: 60 °F HUMIDITY: 30 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other: ____

Weather

INSTRUMENT: LD820 Pan828, Mic2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 22139
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec # / Start Time / End Time
10 / 11:50 / 12:05 : L_{eq} 71.1, L_{max} 82.4, L_{min} 67.2, L_{90} 68.8, L_{50} 70.3, L_{10} 72.6, ____
11 / 11:50 / 12:05 : L_{eq} 75.9, L_{max} 84.8, L_{min} 72.8, L_{90} 73.9, L_{50} 75.3, L_{10} 77.2, ____
COMMENTS: Traffic slowed < 30mph @ 11-min mark so measurement was stopped LHT

Acoustic Measurements

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 NB EB) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Lakeview Blvd E 15 min

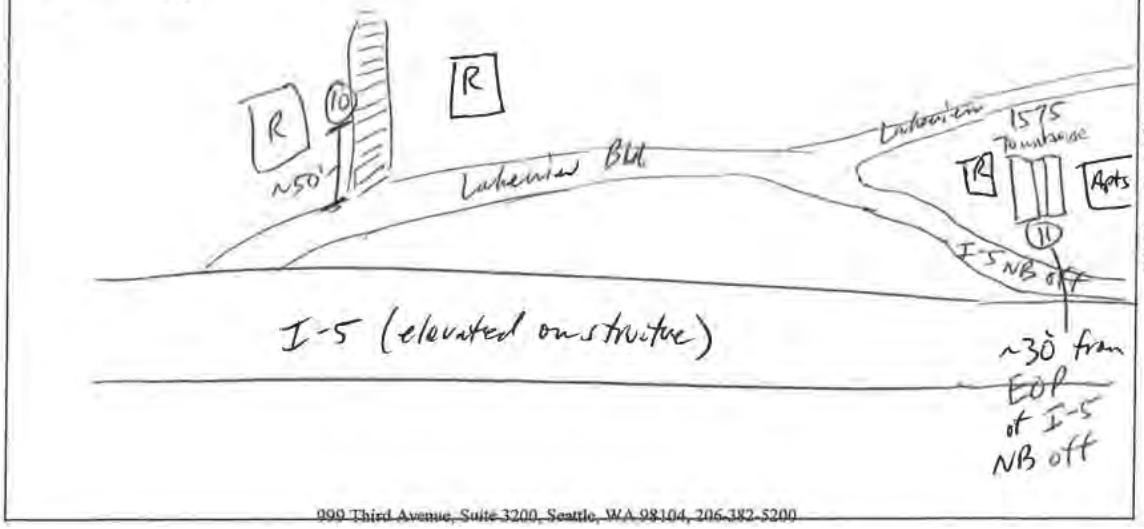
	COUNT #1 DURATION: 15 -MINUTE		SPEED (mph)		COUNT #2: 15 -MINUTE		SPEED (mph)	
	MAIN (NB/EB)	(SB/WB) MAIN	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS:	885	1075	392		122	25	(122)	25
MED. TRUCKS:	40	49	10		0	0	(20-35 mph)	
HVY TRUCKS:	20	14	20		1	0	I-5 NB off ramp to L	
BUSES:	(45-50mph)	(30-45mph)	(50-60mph)		(20-35 mph)			
MOTORCYCLES:							95 / 0	
							(30-45mph) all auto	

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Source Info and Traffic Counts

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Hillclimb between residences & Townhouses along I-5 NB off-ramp
SITE SKETCH / PHOTOGRAPHS: Digital on file w/ GIS coordinates of measurement location



Site Photos, Details, Sketch

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Exhibit G-8: 15-Minute Validation Measurement Site 12—Adjacent to 2636 Harvard Ave E—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 (12) 2636 Job # 160330S-BX

SITE IDENTIFICATION: Adj to home on Harvard OBSERVER(s): Romero, Frohnin, Carmody
START DATE & TIME: 9/7/18 10:25 am END DATE & TIME: 9/7/18 10:40 am
ADDRESS: Adj. to Res @ 2636 Harvard Ave E.

ID

TEMP: 66 °F HUMIDITY: 20 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-2 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other: ____

Weather

INSTRUMENT: LD820, PRM828, MC2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec # / Start Time / End Time

12 / 10:25 / 10:40: L_{eq} 71.1, L_{max} 82.1, L_{min} 67.5, L_{90} 69.1, L_{50} 70.7, L_{10} 72.6, ____
____ / ____ / ____: L_{eq} ____, L_{max} ____, L_{min} ____, L_{90} ____, L_{50} ____, L_{10} ____, ____
COMMENTS:

Acoustic Measurements

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Harvard

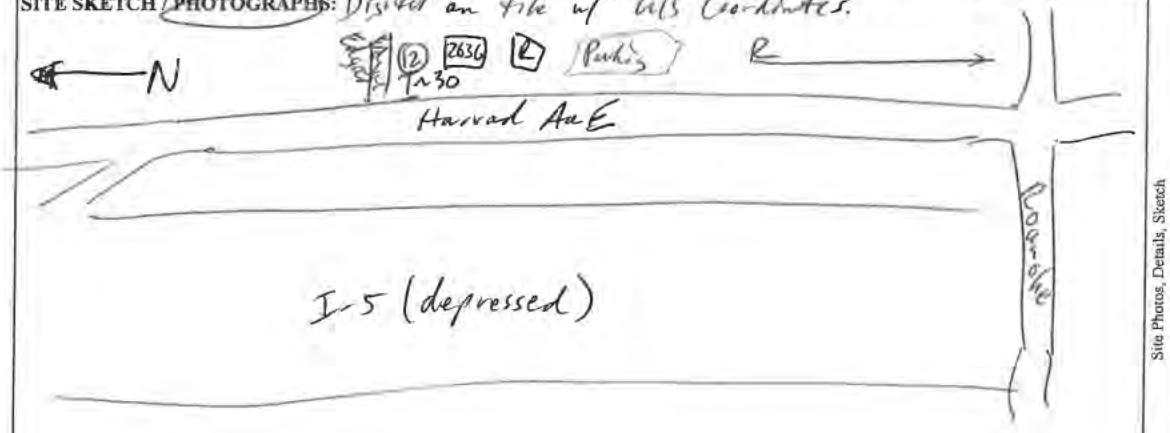
	COUNT #1 DURATION: 15 -MINUTE		SPEED (mph)		COUNT #2: I-5 -MINUTE		SPEED (mph)	
	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS:	____	107	____	69	229	____	52	50
MED. TRUCKS:	____	57	____	25	35	____	2	0
HVY TRUCKS:	____	36	____	13	35	____	1	0
BUSES:	____	(65 mph)	____	(65 mph)	(60-65 mph)	____	(40 mph)	(30 mph)
MOTORCYCLES:	____	____	____	____	____	____	____	____

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Source Info and Traffic Counts

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Adj to Residential front yard facing Harvard & I-5.
SITE SKETCH / PHOTOGRAPHS: Digital on file w/ GPS Coordinates.



Site Photos, Details, Sketch

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Exhibit G-9: 15-Minute Validation Measurement Site 13—Fire Station 22, East Lawn—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 (13) Job # 1603115-BX

ID

SITE IDENTIFICATION: Fire Station Lawn OBSERVER(s): Romero, Frohaug, Cavanaugh
START DATE & TIME: 9/7/18 10:50am END DATE & TIME: 9/7/18 11:05
ADDRESS: Fire Station Lawn (Station 22 @ 901 E. Roanoke St)

Weather

TEMP: 66 °F HUMIDITY: 20 % R.H. WIND: CALM ~~LIGHT~~ MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other: ____

Acoustic Measurements

INSTRUMENT: LO820 Rion828, Mic2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: CAL LD 200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec #	Start Time	End Time								
13	10:50	11:05	L_{eq} 68.1	L_{max} 77.5	L_{min} 62.8	L_{90} 66.0	L_{50} 67.5	L_{10} 69.8		
			L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}		

COMMENTS: Express lanes closed @ 13-min mark of measurement.

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: multiple) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Roanoke

	COUNT #1 DURATION: 15 -MINUTE		SPEED (mph)		COUNT #2: ____ -MINUTE		SPEED (mph)	
	(NB/~~EB~~) MAIN	(SB/~~WB~~) MAIN	NB/EB	(SB/~~WB~~) EX	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS:	1001	1094	____	424	____	____	116	115
MED. TRUCKS:	26	66	____	11	____	____	4	2
HVY TRUCKS:	30	35	____	9	____	____	0	1
BUSES:			____		____	____		
MOTORCYCLES:	(60-65mph)	(65mph)	____	(65mph)	____	____	(20 mph)	(20 mph)

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

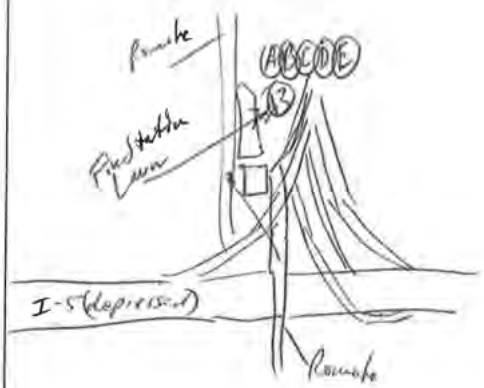
OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Side Yard @ Fire Station 22
SITE SKETCH / PHOTOGRAPHS? Digital on file w/ GIS Coordinate.

15-minute Counts

	Autos	MT	HT	mph
(A) 520 EB from I-5 NB	467	12	4	45
(B) 520 EB from I-5 Ex	153	8	3	35
(C) 520 WB from I-5 SB	403	12	0	40
(D) 520 WB from I-5 Ex	201	7	1	35
(E) 520 WB to I-5 NB	41	0	0	35



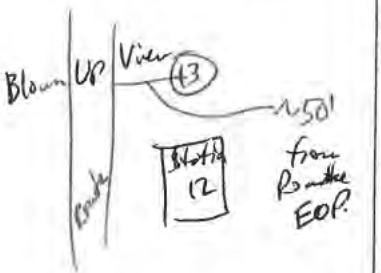


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Exhibit G-10: 15-Minute Validation Measurement Site 14—2408 Broadway Ave E—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 (14) Job #

SITE IDENTIFICATION: 2408 Broadway Ave E. OBSERVER(s): Romero, Fishering, Cavanagh
START DATE & TIME: 9/7/18 11:40 END DATE & TIME: 9/7/18 11:50
ADDRESS: 2408 Broadway Ave E.

ID

TEMP: 66 °F HUMIDITY: 20 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other:

Weather

INSTRUMENT: LD820 PRM828, MIC2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: CAL200 (LD) SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER:

Rec # Start Time / End Time
14 / 11:40 / 11:55: L_{eq} 76.6, L_{max} 74.9, L_{min} 66.9, L_{90} 70.2, L_{50} 71.6, L_{10} 72.8,
___ / ___ / ___: L_{eq} ___, L_{max} ___, L_{min} ___, L_{90} ___, L_{50} ___, L_{10} ___,
COMMENTS:

Acoustic Measurements

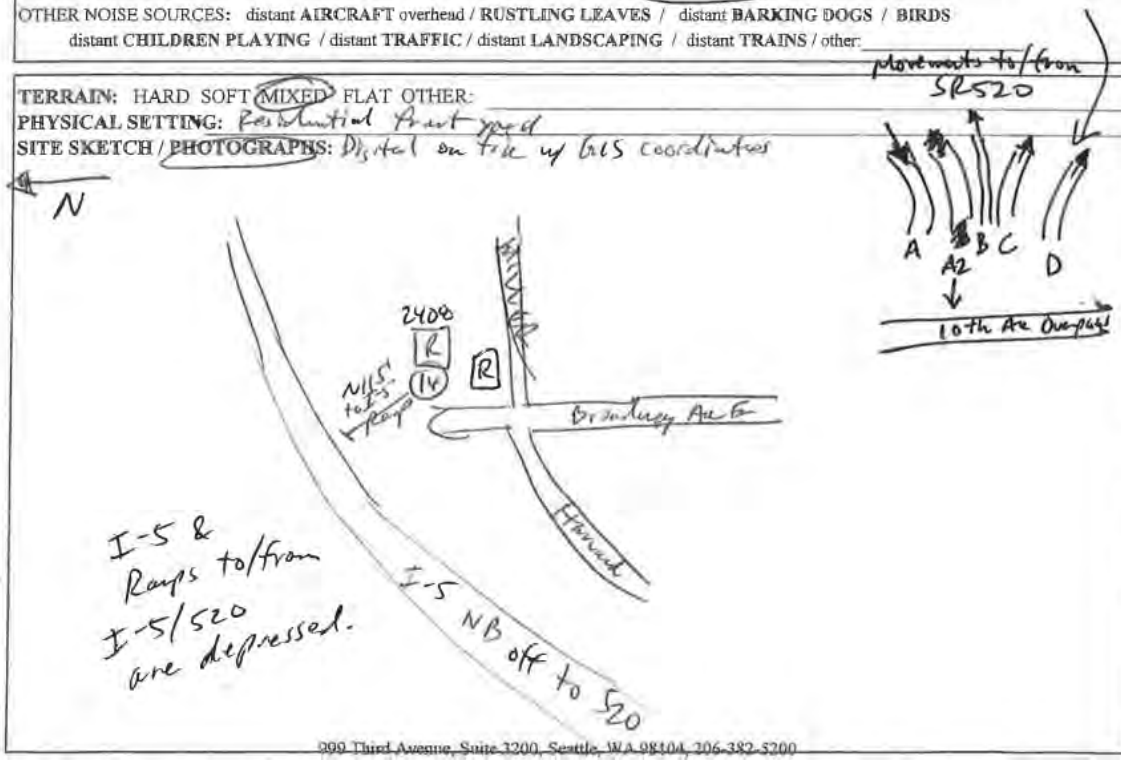
PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: 520 @ 10th Ave overpass
COUNT #1 DURATION: 15 -MINUTE SPEED (mph) COUNT #2: 15 -MINUTE SPEED (mph)

	NB/EB	NB off to 520	SB/WB	NBEX	A	A2	B	C	D	NB/EB	SB/WB
AUTOS:	964	332	1238	468	407	153	403			201	41
MED. TRUCKS:	19	11	68	34	12	08	12			7	0
HVY TRUCKS:	27	2	43	34	4	3	0			1	0
BUSES:											
MOTORCYCLES:	(65 mph)	(55 mph)	(65 mph)	(65 mph)	(45 mph)	(35)	(40 mph)			(35 mph)	(35 mph)

SPEED ESTIMATED BY: RADAR / DRIVING / (OBSERVER)
OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other:

Source Info and Traffic Counts

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Residential front yard
SITE SKETCH / PHOTOGRAPHS: Digital on file w/ GIS coordinates



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Site Photos, Details, Sketch

Exhibit G-11: 15-Minute Validation Measurement Site 15—Lakeview Blvd sidewalk near 1014 Lakeview Blvd —Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

SITE IDENTIFICATION: 15 OBSERVER(s): Romero, Frothingham
START DATE & TIME: 10/22/18, 12:00 END DATE & TIME: 10/22/18 12:15
ADDRESS: Lakeview Blvd sidewalk, north of Belmont/Bridgeside

TEMP: 50 °F HUMIDITY: 40 % R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ___MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other: ___

INSTRUMENT: LD820, PRM828, 2560 TYPE 1 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: ___
Rec # Start Time / End Time
15 / 12:00 12:15: L_{eq} 77.5, L_{max} 83.7, L_{min} 73.5, L_{90} 75.9, L_{50} 77.4, L_{10} 78.8, ___
___ / ___ / ___: L_{eq} ___, L_{max} ___, L_{min} ___, L_{90} ___, L_{50} ___, L_{10} ___, ___
COMMENTS: I-5 SB I-5 NB Lakeview

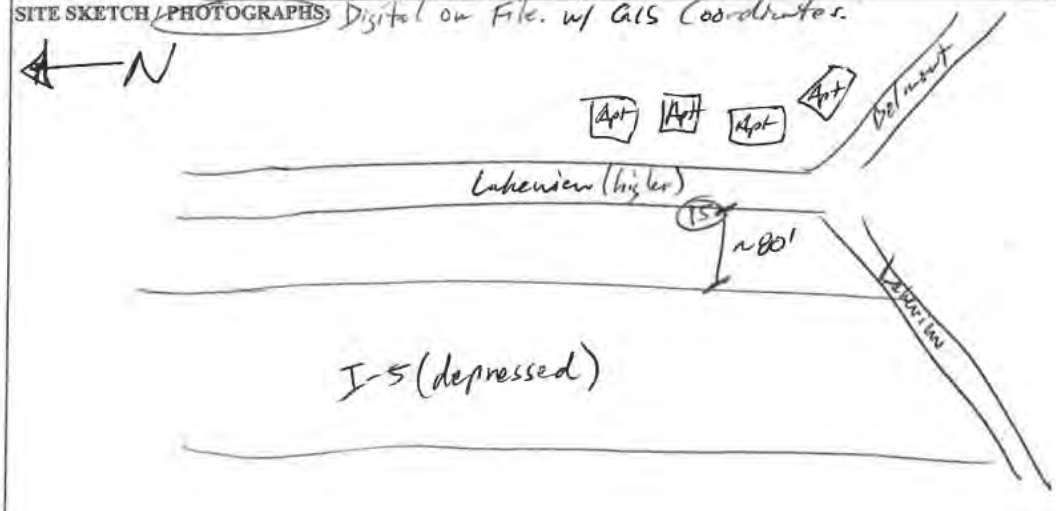
PRIMARY NOISE(S): TRAFFIC (Roadway Type: ___) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
COUNT #1 DURATION: 15 -MINUTE SPEED (mph) COUNT #2: 15 -MINUTE SPEED (mph)

	NB/EB / SB/WB	NB/EB / SB/WB	NB/EB / SB/WB	NB/EB / SB/WB
AUTOS:	224 / 1352	407 / 174	30 / 50	___ / ___
MED. TRUCKS:	54 / 32	5 / 3	2 / 1	___ / ___
HVY TRUCKS:	31 / 40	27 / 6	0 / 0	___ / ___
BUSES:				___ / ___
MOTORCYCLES:	(60-65mph) (55-65mph)	(60-65) (40-50)	(25-35mph) (20-30mph)	___ / ___

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ___

TERRAIN: HARD SOFT MIXED FLAT OTHER: ___
PHYSICAL SETTING: Sidewalk overlook I-5
SITE SKETCH / PHOTOGRAPHS: Digital on File. w/ GIS Coordinates.



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ID | Weather | Acoustic Measurements | Source Info and Traffic Counts | Site Photos, Details, Sketch

Exhibit G-12: 15-Minute Validation Measurement Site 16—Melrose Trail—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: SR520 / I-5 Job # 160330S-BK

ID

SITE IDENTIFICATION: 16 OBSERVER(s): Romero
START DATE & TIME: 10/22/18 12:28 END DATE & TIME: 10/22/18 12:43
ADDRESS: Melrose Trail, south of Lakeview Blvd overcrossing

Weather

TEMP: 50 °F HUMIDITY: 47 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY (OVRCST) FOG DRIZZLE RAIN Other: _____

Acoustic Measurements

INSTRUMENT: LD820, PRM828, 2560 TYPE: (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

Rec #	Start Time	End Time	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	
16	12:28	12:43	80.3	92.7	75.7	78.3	80.1	81.7	
____	____	____	____	____	____	____	____	____	____

COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 Ex / I-5 Off Ramp) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 15-MINUTE	SPEED (mph) NB/EB / SB/WB	COUNT #2: 15-MINUTE	SPEED (mph) NB/EB / SB/WB
AUTOS: 128 / 1443	396 / ____	____ / 185	____ / ____
MED. TRUCKS: 40 / 46	6 / ____	____ / 4	____ / ____
HVY TRUCKS: 32 / 42	33 / ____	____ / 4	____ / ____
BUSES:			
MOTORCYCLES: (60-65 mph) (55-65 mph)	(60-65 mph)	____ / (40-50 mph)	____ / ____

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: _____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHYSICAL SETTING: Public Trail overlooking I-5 NB
SITE SKETCH / PHOTOGRAPHS: Digital on File. and GIS Coordinates taken.

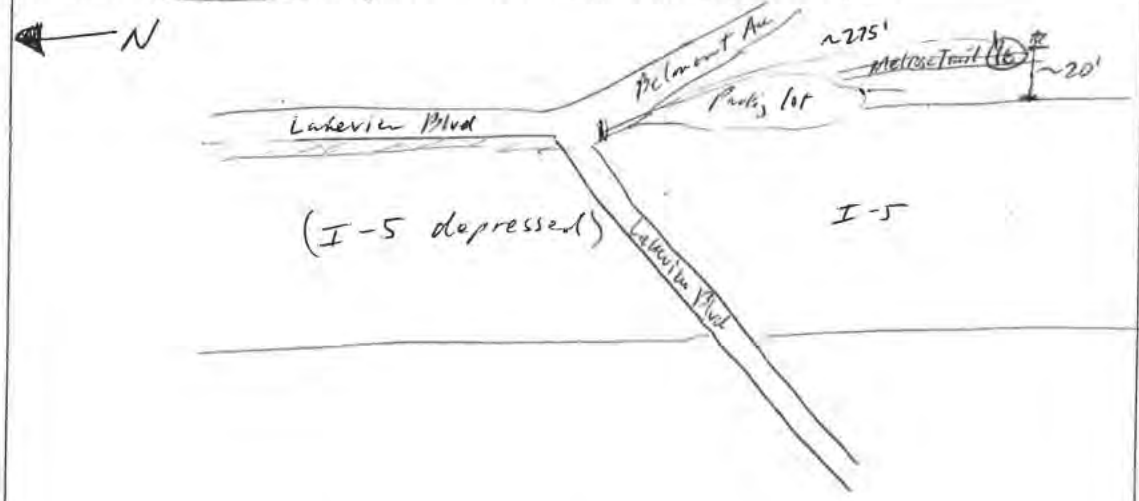

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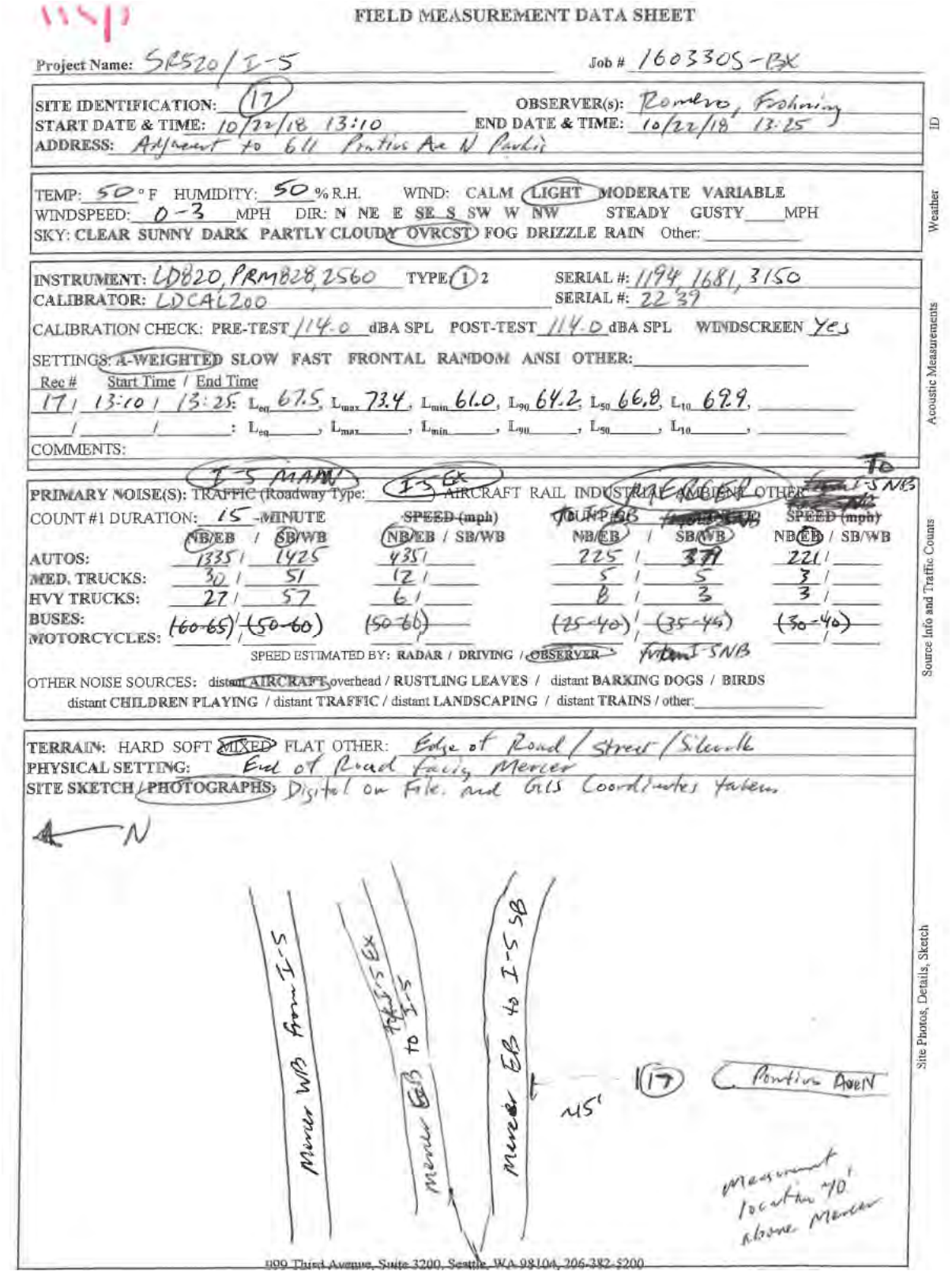
Exhibit G-13: 15-Minute Validation Measurement Site 17—Adjacent to 611 Pontius Ave N—Field Data Sheet



FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BK

ID
SITE IDENTIFICATION: 17 OBSERVER(s): Romero, Frohning
START DATE & TIME: 10/22/18 13:10 END DATE & TIME: 10/22/18 13:25
ADDRESS: Adjacent to 611 Pontius Ave N Parkin

Weather
TEMP: 50 °F HUMIDITY: 50 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ___MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY (OVRCST) FOG DRIZZLE RAIN Other: ___

Acoustic Measurements
INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER: ___

Rec #	Start Time	End Time							
17	13:10	13:25	L_{eq} 67.5	L_{max} 73.4	L_{min} 61.0	L_{90} 64.2	L_{50} 66.8	L_{10} 69.9	
___	___	___	L_{eq} ___	L_{max} ___	L_{min} ___	L_{90} ___	L_{50} ___	L_{10} ___	

COMMENTS:

Source Info and Traffic Counts
PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 MAIN) (I-5 Ex) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: To I-5 NB

COUNT #1 DURATION: 15 -MINUTE

	SPEED (mph) NB/EB / SB/WB		COUNT #2 NB/EB / SB/WB		SPEED (mph) NB/EB / SB/WB	
AUTOS:	1335 / 1425	43 51 / ___	225 / 377		221 / ___	
MED. TRUCKS:	30 / 51	12 / ___	5 / 5		3 / ___	
HVY TRUCKS:	27 / 57	6 / ___	6 / 3		3 / ___	
BUSES:	(60-65) / (50-60)	(50-60) / ___	(25-40) / (35-45)		(30-40) / ___	
MOTORCYCLES:	___ / ___	___ / ___	___ / ___		___ / ___	

SPEED ESTIMATED BY: RADAR / DRIVING / (OBSERVER) From I-5 NB

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ___

Site Photos, Details, Sketch
TERRAIN: HARD SOFT (MIXED) FLAT OTHER: Edge of Road / Street / Sidewalk
PHYSICAL SETTING: End of Road facing Mercer
SITE SKETCH / (PHOTOGRAPHS): Digital on File. and GIS Coordinates Taken.

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Exhibit G-14: 15-Minute Validation Measurement Site 18—Minor Ave N/Roy Street—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: 18 OBSERVER(s): Romero
START DATE & TIME: 10/22/18 13:45 END DATE & TIME: 10/22/18 14:00
ADDRESS: Minor Ave N/Roy Street

Weather

TEMP: 52 °F HUMIDITY: 50 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY (OVRCST) FOG DRIZZLE RAIN Other: ____

Acoustic Measurements

INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec #	Start Time	End Time							
18	13:45	14:00	L_{eq} 66.1	L_{max} 74.3	L_{min} 59.6	L_{90} 63.2	L_{50} 65.3	L_{10} 68.6	
____	____	____	L_{eq} ____	L_{max} ____	L_{min} ____	L_{90} ____	L_{50} ____	L_{10} ____	

COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 NB EX / AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Mercer

COUNT #1 DURATION: 15 -MINUTE

	SPEED (mph) NB/EB / SB/WB			COUNT #2: ____ -MINUTE			SPEED (mph) NB/EB / SB/WB	
	NB/EB	SB/WB	NB/EB / SB/WB	NB/EB	SB/WB	NB/EB / SB/WB		
AUTOS:	1301	1460	50/71	219	149	127/45		
MED. TRUCKS:	33	53	14/	9	3	4/14		
HVY TRUCKS:	17	55	11/	12	5	8/4		
BUSES:								
MOTORCYCLES:	(50-60)	(50-60)	(50-60)/	15-30	(30-40)	(30/40)		

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT MIXED FLAT OTHER: General flat
PHYSICAL SETTING: Measurement on sidewalk facing Mercer
SITE SKETCH / PHOTOGRAPHS: Digital on File.

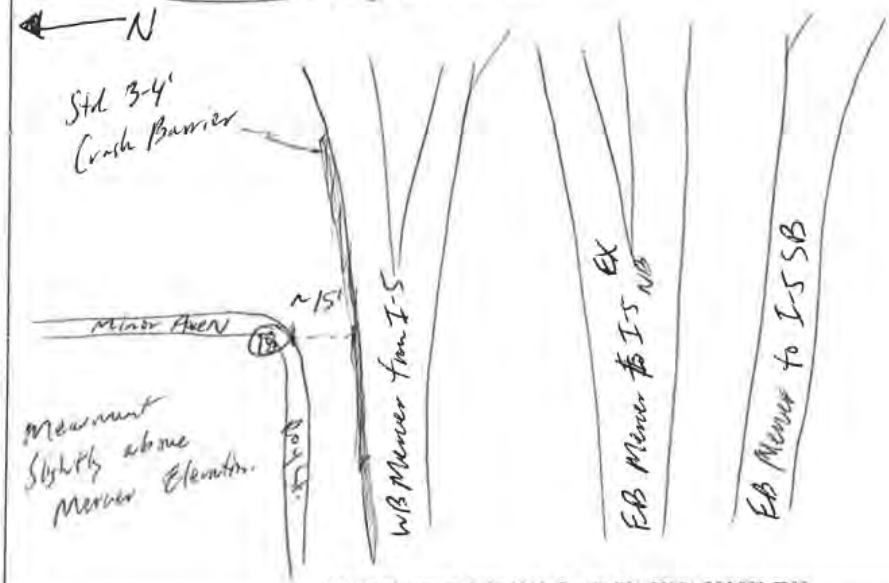

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Exhibit G-15: 15-Minute Validation Measurement Site 19—Eastlake Triangle—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: SR520/I-5 Job # 160330S-BX

ID

SITE IDENTIFICATION: (19) OBSERVER(s): Romero
START DATE & TIME: 10/22/18 14:20 END DATE & TIME: 10/22/18 14:35
ADDRESS: Eastlake Triangle (open space @ (50th st 1100 Eastlake Ave E)

Weather

TEMP: 56 °F HUMIDITY: 40 % R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-2 MPH DIR: N NE E SE S SW W NW STEADY GUSTY ____MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other: _____

Acoustic Measurements

INSTRUMENT: LD820, PRM828, 2560 TYPE (1) 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN Yes
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

Rec #	Start Time	End Time							
19	14:20	14:35	L_{eq} 72.3	L_{max} 76.5	L_{min} 68.0	L_{90} 69.6	L_{50} 72.1	L_{10} 74.3	
/	/	/	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	

COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: I-5 NB EX) AIRCRAFT RAIL INDUSTRIAL AMBIENT (Eastlake Ave) OTHER:

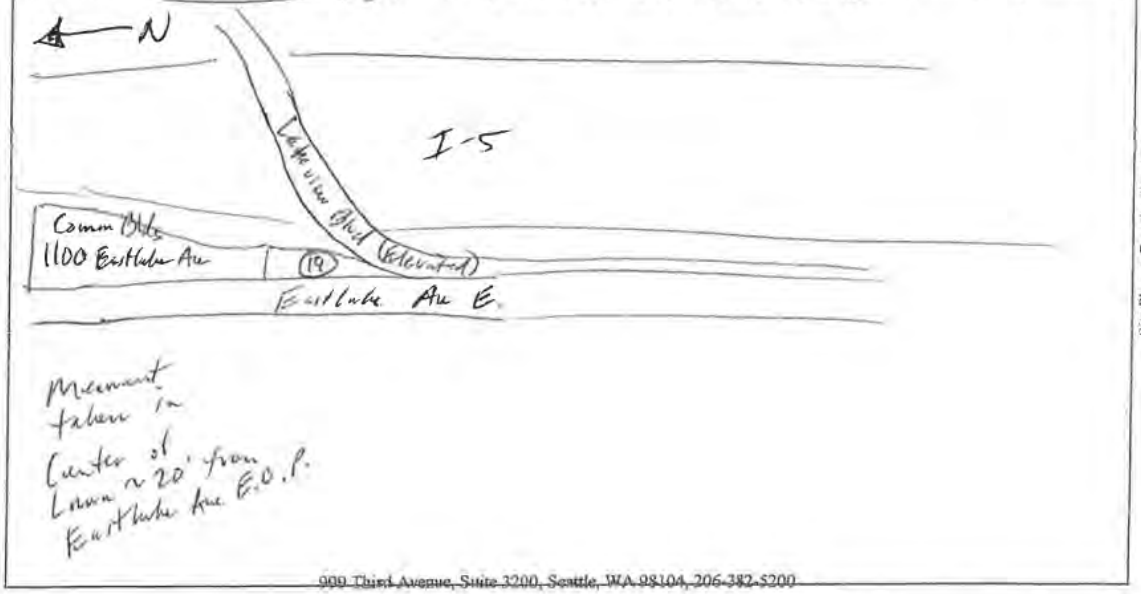
COUNT #1 DURATION: 15 -MINUTE	NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB	COUNT #2: ____ -MINUTE	NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB
AUTOS:	1290 / 1557	57 / 31		18 / 44	/
MED. TRUCKS:	31 / 63	9 /		0 / 0	/
HVY TRUCKS:	22 / 51	12 /		0 / 0	/
BUSES:	(50-60) / (50-55)	(60-65) /		(30 / 35)	/
MOTORCYCLES:	/	/		/	/

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS
distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: _____

Site Photos, Details, Sketch

TERRAIN: HARD SOFT MIXED FLAT OTHER: Eastlake Triangle (small open space)
PHYSICAL SETTING: Grassy Lawn (Public Use) with development surrounding
SITE SKETCH / PHOTOGRAPHS: Digital on File. and GIS coordinates @ Measurment location



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APPENDIX H—I-5 Structural Assessment

WSDOT

SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM

STATE ROUTE 520

MEMORANDUM

TO:	LAWRENCE SPURGEON	**CONTRACT & TASK ORDER:**	Y11848 TASK CC.00
FROM:	BRETT KNECHTEL	**FILE CODE:**	
DATE:	10/26/18		
COPIES TO:			

Subject: I-5 E. Galer St. to Lakeview Blvd. Viaduct Qualitative Structure Assessment for potential addition of Noise Walls

Conclusion:

The addition of up to 12-foot tall noise walls to the I-5 E. Galer St. to Lakeview Blvd. Viaduct is not feasible.

Brief Summary of Existing Conditions:

The I-5 E. Galer St. to Lakeview Blvd. Viaduct constructed in the early 1960s is comprised of separate bridges for the I-5 northbound, southbound and reversible lanes. The existing Viaduct bridges share several as-built details such as 5.5-inch concrete deck thickness and the use of prestressed concrete hollow columns with bell footings and approximate 4-foot cast-in-place, reinforced concrete plug connection details. These details do not meet current WSDOT standards. The simple span construction consisting of approximately 90-foot spans and the placement of the exterior prestressed concrete girders directly below the existing traffic barriers also do not reflect current WSDOT practice.

Qualitative Assessment:

The possibility of adding up to 12-foot tall noise walls to the exterior sides the existing Viaduct would require the ability to safely connect those noise walls with an updated traffic barrier section to the existing concrete deck and the ability of the existing bridges to transmit the new vertical and lateral loads safely to the foundation.

Significant strengthening of the existing 5.5-inch concrete deck to accommodate the additional loads from the noise walls would be required and may not feasible. The location of the exterior girders directly below the existing barriers also significantly impedes the potential for localized strengthening of the deck.

The existing exterior prestressed concrete girders would be loaded in a manor not consistent with the original design. The girders may be able to accommodate some increase in vertical loads; however, potential torsion effects from the lateral loads on the noise walls and barriers would need to be addressed and may not be feasible.

Existing bridges on the SR 520 corridor with similar prestressed concrete hollow columns and connection details have previously been identified as seismically vulnerable with no practical means of retrofit. Potentially adding noise walls to seismically vulnerable structures would not meet the “do no harm” criteria for bridge modifications in the current WSDOT Bridge Design Manual and would likely require strengthening of the existing bridge that may not be practical/possible.

Lastly, previous retrofit concepts for similar bridges on the SR 520 corridor included upgrading all structural elements to current standards to meet the required 75 year design life.