Noise Discipline Report – Final

US 395 North Spokane Corridor Project

WSDOT—Environmental Services—Air, Noise, Energy

December 31, 2018

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Washington State Department of Transportation

US 395 North Spokane Corridor Project

MP 158.51 to MP 160.46

Noise Discipline Report – Final

December 31, 2018

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Project Objectives

The segment of US 395 North Spokane Corridor (NSC) between E. Mission Avenue and E. Columbia Avenue in Spokane (MP 158.51 to MP 160.46) experiences routine congestion (Exhibit 1). This project improves mobility by allowing motorists and freight to move north and south through metropolitan Spokane, from I-90 to US 395 at Wandermere. The Washington State Department of Transportation (WSDOT) has identified that shifting traffic on US 395 eastward on to the proposed alignment will decrease travel time, fuel usage, and congestion, while improving safety by reducing collisions on local arterials.

The US 395 North Spokane Corridor Project (the project) is located within the city limits of Spokane, in Spokane County, Washington. The project will shift the current US 395 alignment to the east onto vacant and vacated land and construct sign structures, illumination, intelligent transportation systems (ITS) and other supporting project features as required. The highway alignment shift along with capacity improvements, which are Type I activities for noise analysis purposes as defined by the Federal Highway Administration (FHWA) and WSDOT.

Current Noise Environment

- The project area is located within WSDOT right-of-way with single-family residential, commercial, and light industrial development in the noise study area. Other land uses located within the noise study area include Wild Horse Park, Hillyard Museum Park, and Centennial Trail. Surrounding land use includes areas of undeveloped land with predominately residential and vacant land located throughout the area. No existing noise walls are located within the noise study area.
- The primary noise source along the western half of the noise study area is vehicle traffic noise on N. Greene Street and N. Market Street. Local road noise is often the primary noise source in the communities located east of the noise study area, especially those located north of the Spokane River that area located several hundred feet from N. Market Street. Short-term noise events from the nearby Burlington Northern Railroad tracks, aircraft flying to and from Spokane International Airport located several miles to the southwest, commercial businesses, and traffic on side streets all contribute to the noise levels in the study area.

Noise Impacts Considering the New Alignment

- Existing condition (2018) noise abatement criteria impacts—35 residences represented by 20 modeling sites would approach or exceed the NAC.
- No Build (2040) noise abatement criteria impacts—41 residences and the Centennial Trail represented by 24 modeling sites (includes 35 residences at 20 modeling locations with NAC impacts under existing condition) would approach or exceed the NAC.

- Build (2040) noise abatement criteria impacts—89 residences and the Centennial Trail and Wild Horse park represented by 50 modeling sites which includes all but two of the residences at one modeling location with NAC impacts under existing condition and all but two of the residences at the same modeling location with NAC impacts under No Build 2040.

- Build (2040) – substantial increase impacts (of 10 dBA or greater over existing noise levels) would occur at 64 residences and Wild Horse Park represented by 28 modeling sites which include 33 residences and Wild Horse Park represented by 13 modeling sites where noise abatement criteria impacts are predicted.

Abatement Recommended

Noise abatement was considered at nine locations where traffic noise impacts were predicted. Noise barriers were evaluated to reduce noise levels at all nine locations where future noise levels would approach or exceed the NAC and/or result in substantial increase impacts of noise level increases of 10 dBA or more over existing noise levels. Three locations where noise barriers were evaluated would meet WSDOT Criteria for the placement of a feasible noise barrier. However, only one location – Noise Barrier NB2 – meets both WSDOT Criteria for the placement of a feasible and reasonable noise barrier.

Noise Barrier NB2 is located along the eastern edge of pavement of the proposed US 395 alignment from E. Euclid Avenue to north of Wild Horse Park. Noise Barrier NB2 was evaluated to reduce noise levels at residences and one park with noise criteria impacts and substantial increase impacts as high as 22 dBA over existing noise levels in this area east of the proposed US 395 alignment along N. Ralph Street. The location of the noise barrier is shown on Exhibit 11 and Exhibit 17. At a height of 10 feet and 2,302 feet long, Noise Barrier NB2 would provide at least a 5-dBA noise reduction to 8 of the 10 first row receivers, which represent a total of 21 residential equivalent units, resulting in a reasonable allowance of $2,168,237. At 10 feet tall, Noise Barrier NB2 would also achieve over a 10-dBA reduction at three receivers representing five homes located behind the barrier. Additional noise barrier heights and lengths were evaluated for Noise Barrier NB2; however, at 10 feet tall, Noise Barrier NB2 provides reduction to lower noise levels below WSDOT NAC at all but four receiver locations, which represent ten residential equivalent units.

Because Noise Barrier NB2 meets WSDOT requirements for placement, Noise Barrier NB2 will be further evaluated in the final design of the US 395 NSC Project. To be included in the project, any barrier location must also be reviewed to ensure it meets sight distance safety requirements. 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, etc.) will be included in the final design stage evaluation of this barrier. The final determination whether to construct a noise wall or other abatement that is recommended in the traffic noise analysis also will consider views expressed during the public outreach process. Additional information regarding the evaluation of Noise Barrier NB2 is provided in the Traffic Noise Abatement section of this report.

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 Spokane's and Spokane County's land use and building permits was conducted in October 2018. The review identified no active permits or approvals on file with the City or County. No future developments that include noise-regulated land uses 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 the proposed US 395 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 US 395 in areas located higher than US 395 with direct line-of-sight to traffic. Commercial areas located within 100 to 150 feet of US 395 may exceed the commercial abatement criteria of 71 dBA. Undeveloped lands located closer US 395 would likely experience higher noise levels due to the higher future traffic volumes on US 395 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 segment of US 395 North Spokane Corridor (NSC) between E. Mission Avenue and E. Columbia Avenue in Spokane (MP 158.51 to MP 160.46) experiences routine congestion. This project improves mobility by allowing motorists and freight to move north and south through metropolitan Spokane, from I-90 to US 395 at Wandermere. The Washington State Department of Transportation (WSDOT) has identified that shifting traffic on US 395 eastward on to the proposed alignment will decrease travel time, fuel usage, and congestion, while improving safety by reducing collisions on local arterials.

The US 395 North Spokane Corridor Project (the project) will shift the current US 395 alignment to the east onto vacant and vacated land and construct sign structures, illumination, intelligent transportation systems (ITS) and other supporting project features as required.

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 included in this project is the construction of additional through traffic lanes on US 395 and a significant change in the horizontal and vertical alignments of US 395. Therefore, a traffic noise analysis is required for the project. A summary of the noise analysis and abatement process is included in Appendix A.

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 US 395.
- The project includes a US 395 alignment located east of its existing alignment that follows N. Greene Street and N. Market Street.

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

- New on- and off-ramps are included in the proposed US 395 alignment.
- Noise-sensitive land uses are located east and west of US 395. Wild Horse Park is located east of US 395 and Hillyard Museum Park is located to the west of the project area. The Centennial Trail passes under US 395 just north of the Spokane River. Several structures including homes have been removed from the areas near the new US 395 alignment in recent years. The proposed US 395 project alignment shifts traffic closer to noise-sensitive land uses located to the east of the existing US 395 alignment.
- Topography generally slopes north to south throughout much of the project area toward the Spokane River. Existing topography includes large stockpiled soils located near the proposed US 395 alignment between the Spokane River and E. Jackson Avenue.
- No existing noise barriers are located along US 395 or along local roadways in the noise study area.
- Traffic noise from N. Market Street and N. Greene Street are the primary sources of noise in the study area with contributions from local roadways.
- The project would increase travel speeds of 40 miles per hour (posted) on N. Market Street and N. Greene Street to 60 miles per hour (posted) on the proposed US 395 alignment.
- The Year for Existing is 2018 and the Future Year for Build and No-Build conditions is 2040.

Exhibit 1: Project Vicinity Map

US 395 North Spokane Corridor Project
Noise Discipline Report

Source: WSDOT, 2018

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Characteristics of Sound and Noise

Definition of Sound

Sound is created when objects vibrate, resulting in a minute variation in surrounding atmospheric pressure, called sound pressure. The human response to sound depends on the magnitude of a sound as a function of its frequency and time pattern (EPA, 1974). Magnitude is a measure of the physical sound energy in the air. The range of magnitude the ear can hear, from the faintest to the loudest sound, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). Loudness refers to how people subjectively judge a sound and varies between people.

Sound is measured using the logarithmic decibel scale, so doubling the number of noise sources, such as the number of cars on a roadway, increases noise levels by 3 dBA. Therefore, when you combine two noise sources emitting 60 dBA, the combined noise level is 63 dBA, not 120 dBA. The human ear can barely perceive a 3 dBA increase, while a 5 dBA increase is about one and one-half times as loud. A 10 dBA increase appears to be a doubling in noise level to most listeners. A tenfold increase in the number of noise sources will add 10 dBA.

In addition to magnitude, humans also respond to a sound's frequency or pitch. The human ear is very effective at perceiving frequencies between 1,000 and 5,000 Hz, with less efficiency outside this range. Environmental noise is composed of many frequencies. A-weighting (dBA) of sound levels is applied electronically by a sound level meter and combines the many frequencies into one sound level that simulates how an average person hears sounds of low to moderate magnitude.

Definition of Noise

Noise is unwanted or unpleasant sound. Noise is a subjective term because, as described above, sound levels are perceived differently by different people. Magnitudes of typical noise levels are presented in Exhibit 2.

Traffic Noise Sources

An increase in traffic volumes, vehicle speeds, or the amount of heavy trucks will increase traffic noise levels. Traffic noise is a combination of noises from the engine, exhaust, and tires. Defective mufflers, truck compression braking, steep grades, the terrain and vegetation near the roadway, shielding by barriers and buildings and the distance from the road can also contribute to the traffic noise heard at the roadside.

Exhibit 2: Typical Noise Levels

NOISE SOURCE OR ACTIVITY		SUBJECTIVE IMPRESSION	RELATIVE LOUDNESS (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)*	90		2 times as loud
Garbage disposal (2 feet) **Pneumatic drill (50 feet)**	80	**Moderately loud**	**Reference loudness**
Vacuum cleaner (10 feet) Passenger car at 65 mph (25 feet)*	70		1/2 as loud
Typical office environment	60		1/4 as loud
Light auto traffic (100 feet)*	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	
High quality recording studio	20		
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Sources: Beranek (1988) and U.S. EPA (1974)

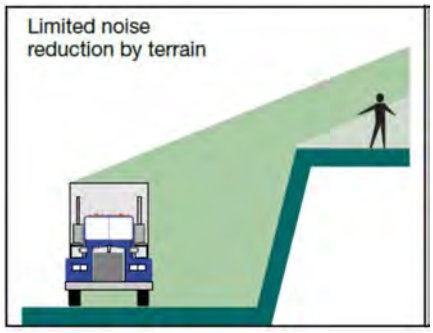
Sound Propagation

Sound propagation, or how far the sound travels, is affected by the terrain and the elevation of the receiver relative to the noise source. Noise levels can be reduced by breaking the line of sight between the receiver and the noise source.

- Level ground: noise travels in a straight path between the source and receiver.

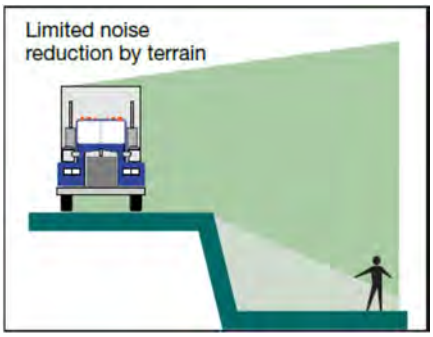
Level Ground

- Depressed source/elevated receiver: terrain may act like a partial noise barrier and reduce noise levels if it crests between the source and receiver.



Depressed source/elevated receiver

- Elevated source/depressed receiver: the edge of the roadway acts as a partial noise barrier. Even a short barrier, like a concrete safety barrier, can reduce noise levels.



Elevated source/depressed receiver

Line and Point Sources

Noise levels decrease with distance from the noise source. For a line source, like a highway, noise levels decrease 3 dBA for every doubling of distance, e.g., from 50 feet to 100 feet between the source and the receiver over hard ground (concrete, pavement) or 4.5 dBA over soft ground (grass). For point source, like most construction noise, the levels decrease between 6 and 7.5 dBA for every doubling of distance.

Effects of Noise

The Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) are based on speech interference, which is a well-documented effect that is relatively reproducible in human response studies. Environmental noise indirectly affects human welfare by interfering with sleep, thought, and conversation. Prolonged exposure to very high levels of environmental noise can cause hearing loss and the Environmental Protection Agency (EPA) has established a protective level of 70 dBA $L_{eq}(24)$[3] for hearing loss. Noise also can affect some types of wildlife during certain activities.

Noise Level Descriptors

The equivalent sound level (L_{eq}) is a measure of the average noise level during a specified period of time. A one-hour period, or hourly L_{eq} [$L_{eq}(h)$], is used to measure highway noise. L_{eq} is a measure of total noise during a time period that places more emphasis on occasional high noise levels that accompany general background noise levels. For example, if you have two different sounds, and one

[3] U.S. EPA, 1974

contains twice as much energy, but lasts only half as long as the other, the two would have the same L_{eq} noise levels.

Either the total noise energy or the highest instantaneous noise level can describe short-term noise levels, such as those from a single truck passing by. The sound exposure level (SEL) is a measure of total sound energy from an event, and is used to calculate what the L_{eq} would be over a period in time when several noise events occur. L_{max} is the maximum sound level that occurs during a single event and is related to impacts on speech interference and sleep disruption. L_{min} is the minimum sound level during a period of time.

With L_n, "n" is the percent of time that a sound level is exceeded and is used to describe the range and pattern of sound levels experienced during the measurement period. For example, the L_{10} level is the noise level that is exceeded 10 percent of the time. Sound varies in the environment and people will generally find a higher, but constant, sound level more tolerable than a quiet background level interrupted by higher sound level events. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in an otherwise quiet area if both environments have the same L_{eq}.

Noise Regulations and Impact Criteria

Traffic noise impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed the NAC established by the FHWA, or substantially exceed existing noise levels[4]. WSDOT considers a noise impact to occur if predicted $L_{eq}(h)$ noise levels approach within 1 dBA of the NAC. The FHWA NAC specify exterior $L_{eq}(h)$ noise levels for various land activity categories as described in Exhibit 3. WSDOT also considers an increase of 10 dBA or more to be a substantial increase and a traffic noise impact.

Along with the federal noise impact criteria, most cities in Washington, including those in the project area, rely, at least in part, on the Washington State Noise Control Ordinance (WAC 173-60). The WAC 173-60 establishes residential, commercial, and industrial noise limits, along with construction noise limits. Traffic noise from public roadways is exempt from the WAC 173-60. Project construction would need to adhere to the ordinances applicable in the individual jurisdictions, which are based on the WAC noise control ordinance. Local noise ordinances can include different provisions from the state law.

The City of Spokane and Spokane County code similarly limit sounds that create a disturbance. Sounds resulting from public works projects operating between 10:00 p.m. ad 7:00 a.m. are generally exempt from the noise provisions in the local codes. If construction noise results in complaints from the community or when construction activities occur closer than 1,000 feet from occupied residences, construction timing may be subject to restrictions.

[4] U.S. Department of Transportation, 1982, Noise Abatement Council

Exhibit 3: FHWA Noise Abatement Criteria by Land Use

Activity Category	L_{eq}(h) at Evaluation Location (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residential (single and multi-family units)
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F. Includes undeveloped land permitted for these activities.
F	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	-	Undeveloped lands that are not permitted

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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 the proposed US 395 alignment from just south of N. Greene Street at E. Mission Avenue to just north of E. Columbia Avenue between N. Market Street and N. Freya Street to include improvements related to the future US 395/E. Wellesley Avenue Interchange improvements, as shown on Exhibit 6.

The project area is located within WSDOT right-of-way with mostly single-family residential development located west of the project area south of the Spokane River and located east of the project area north of the Spokane River. Commercial land use are located along N. Market Street north of the Spokane River. Institutional land use and office space is located east of N. Greene Street and south of the Spokane River. The Centennial Trail runs along the Spokane River passing under US395. Other noise-sensitive land uses located within the noise study area include Wild Horse Park and Hillyard Museum Park. Surrounding land use includes areas of undeveloped land with predominately residential and vacant land located throughout the area. No existing noise walls are located in the noise study area (Exhibit 4).

Short-term noise events from the nearby Burlington Northern Railroad tracks, aircraft flying to and from Spokane International Airport located several miles to the southwest, commercial businesses, and traffic on side streets all contribute to the noise environment in the study area. The primary noise source to along the western half of the project area is vehicle traffic noise on N. Greene Street and N. Market Street. Local road noise is often the primary noise source in the communities located east of the project area, especially those located north of the Spokane River that area located several hundred feet from N. Market Street. Throughout much of the noise study area, land surrounding the existing US 395 route is at a similar elevation as US 395 with the exception of the areas located just north and just south of the Spokane River where US 395 is located at a higher elevation on the bridge spanning the river.

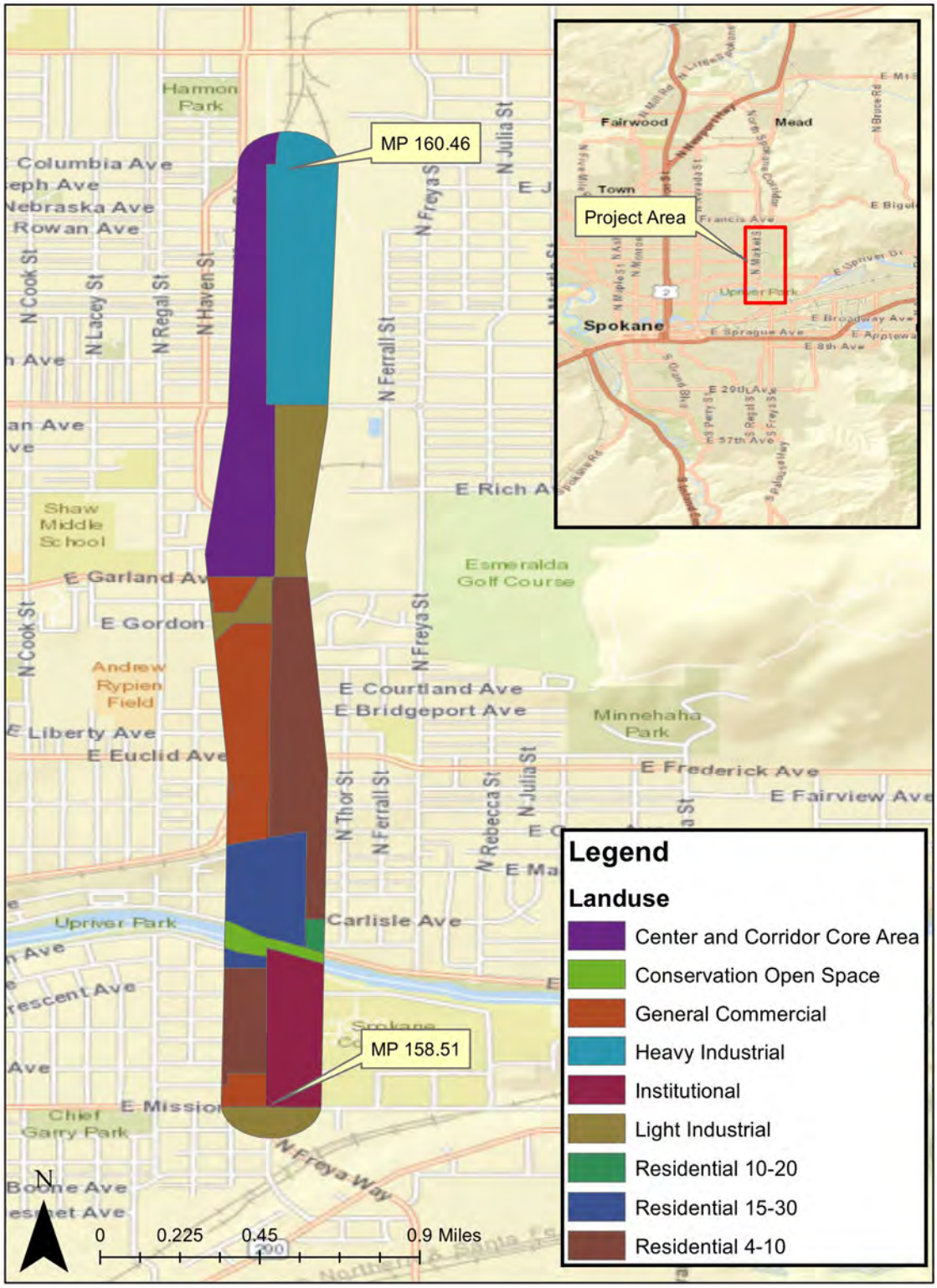
A review of the City of Spokane's and Spokane County's land use and building permits was conducted in October 2018. The review identified no permits or approvals on file with the City or the County. No future developments that include noise-regulated land uses have been considered in this noise study. More information on this research effort is presented in Appendix B of this report.

Traffic Noise Measurement

15-minute L_{eq} measurements were collected at eighteen 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

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.

Exhibit 4: Existing Land Use in Project Vicinity



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Measurements were conducted on October 11 and 12, 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 eighteen locations. The noise measurement locations and results are described in Exhibit 5. Noise levels at the eighteen short-term measurement sites ranged from 50 dBA L_{eq} to 72 dBA L_{eq}, depending on the proximity and direction to US 395, 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 5 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 5). 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.

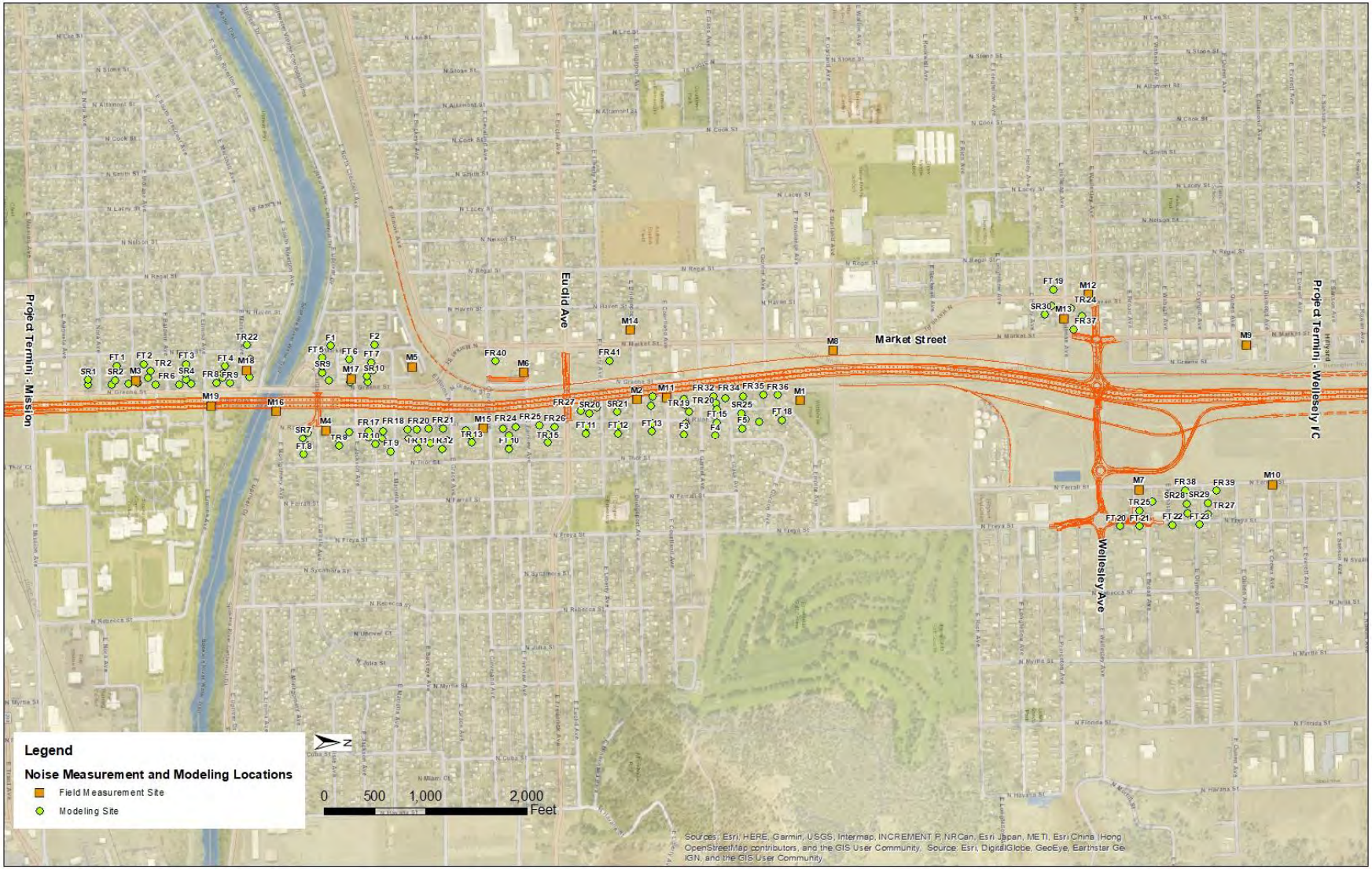
Exhibit 5: Existing Noise Measurement Data and Noise Model Validation Results

Site #/Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
Site 1—Wild Horse Park	10/11/18	7:55	52.6	53.5	0.9
Site 2—3221 E Bridgeport Ave.	10/11/18	9:00	53.3	53.9	0.6
Site 3—3213 E Indiana Ave.	10/11/18	9:41	68.5	67.3	-1.2
Site 4—3303 E Carlisle Ave.	10/11/18	10:21	57.5	58.9	1.4
Site 5—3117 E Marietta Ave.	10/11/18	10:55	56.7	58.5	1.8
Site 6—3124 E Fairview Ave.	10/11/18	11:30	59.8	61.8	2.0
Site 7—3503 E Broad Ave.	10/11/18	12:30	49.5	50.6	1.1
Site 8—N Market St./E Garland Ave.	10/11/18	14:40	67.0	66.9	-0.1
Site 9—N Market St./E Queen Ave.	10/11/18	15:18	61.1	59.1	-2.0
Site 10—N Farrell St./E Crown Ave.	10/11/18	15:45	52.1	51.1	-1.0
Site 11—3218 E Courtland Ave.	10/11/18	16:30	55.8	55.1	-0.7
Site 12—2924 E Wellesley Ave.	10/12/18	8:45	72.1	71.2	-0.9
Site 13—3018 E Hoffman Ave.	10/12/18	9:15	58.9	58.4	-0.5
Site 14—3018 E Bridgeport Ave.	10/12/18	10:00	63.6	63.7	0.1
Site 15—3306 E Cleveland Ave.	10/12/18	10:47	56.5	58.5	2.0
Site 16—Centennial Trail	10/12/18	12:05	63.1	61.7	-1.4
Site 17—3126 E Jackson Ave.	10/12/18	12:40	65.9	66.8	0.9
Site 18—3111 E Marshall Ave.	10/12/18	13:15	62.6	61.6	-1.0

Notes:
Short term measured noise levels were used for model validation near existing roadways.

The modeled receiver locations are shown in Exhibit 6. 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. One-hundred and forty-six sites were modeled to represent the 322 outdoor use areas for all noise-sensitive locations within the study area.

Exhibit 6: 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 Exhibit 6.

Operational Traffic Noise

Existing (2018), No Build (2040), and Build (2040) noise levels were modeled at the 146 modeling locations to represent 322 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 2040 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—35 residences represented by 20 modeling sites would approach or exceed the NAC.
- No Build (2040) noise abatement criteria impacts—41 residences and the Centennial Trail represented by 24 modeling sites (includes 35 residences at 20 modeling locations with NAC impacts under existing condition) would approach or exceed the NAC.
- Build (2040) noise abatement criteria impacts—89 residences and the Centennial Trail and Wild Horse park represented by 50 modeling sites which includes all but two of the residences at one modeling location with NAC impacts under existing condition and all but two of the residences at the same modeling location with NAC impacts under No Build 2040.
- Build (2040) – substantial increase impacts (of 10 dBA or greater over existing noise levels) would occur at 64 residences and Wild Horse Park represented by 28 modeling sites which include 33 residences and Wild Horse Park represented by 13 modeling sites where noise abatement criteria impacts are predicted.

Existing (2018) Noise Levels

Existing modeled worst-hour traffic noise levels for residential areas range from 47 dBA to 71 dBA (Exhibit 7). The modeled noise levels at these receivers depend on the proximity of the receiver to the existing roadways, primarily N. Greene Street and N. Market Street. Of the 146 total modeled receivers, 20 receivers currently experience traffic noise levels that approach or exceed the NAC of 67 dBA. The 20 receivers represent 35 residences. Existing traffic noise levels for all modeled receivers are shown in Exhibit 7.

Design Year (2040) Traffic Noise Levels—No Build

Future No Build modeled worst-hour traffic noise levels for residential areas range from 48 dBA to 72 dBA (Exhibit 7). The modeled noise levels at these receivers depend on the proximity of the receiver to the existing roadways, primarily N. Greene Street and N. Market Street. Of the 146 total receivers, the same 20 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 24 receivers predicted to experience traffic noise levels approach or exceed the NAC without the project in 2040. The 24 receivers represent the same 35 residences described for impacts under existing conditions in addition to four receivers that represent six additional residences and the Centennial Trail, totaling 41 residences and one trail. 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 2040 for all modeled receivers are within 4 dBA of existing noise levels with most within 1 dBA of existing noise levels and are shown in Exhibit 7. No substantial increase impacts are predicted under 2040 No Build conditions.

Design Year (2040) Traffic Noise Levels—Build (Pre-Noise Abatement)

Future Build traffic noise levels represent transportation improvements associated with the US 395 NSC 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 59 dBA to 75 dBA (Exhibit 7). The modeled noise levels at these receivers depend primarily on the proximity of the receiver to the proposed US 395 alignment and to a lesser degree other existing roadways. Of the 146 total receivers, 19 of the 20 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 50 receivers (representing 89 residences, Wild Horse Park, and Centennial Trail) are predicted to experience traffic noise levels above the NAC, and 28 receivers (representing 64 residences and Wild Horse Park) are predicted to experience substantial increase impacts in 2040. With 13 receivers (representing 33 residences and Wild Horse Park) predicted to experience NAC impacts and substantial increase impacts, the total 2040 Build combined impacts at discrete locations is 66 receivers representing 119 residences, Wild Horse Park, and the Centennial Trail.

Roadway traffic noise levels under the Build Alternative would result in a large change in noise levels to areas east of the existing alignment which is currently located several hundred feet from traffic located on US 395. Build traffic noise levels in the year 2040 for modeled receivers are over 20 dBA higher than existing noise levels in some areas located east of the proposed US 395 alignment and are shown in Exhibit 7. All model locations and noise abatement criteria and substantial increase impacts are shown in Exhibit 8.

Exhibit 7: 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 2040 (L_{eq}) (dBA)	Build without barriers 2040 (L_{eq}) (dBA)
F1	Residential	B/66	2	58	59	61
F2	Residential	B/66	2	58	59	62
F3	Residential	B/66	4	50	50	62
F4	Residential	B/66	3	49	49	63
F5	Residential	B/66	3	49	48	61
FR1	Residential	B/66	1	68	68	67
FR10	Residential	B/66	1	67	68	67
FR11	Residential	B/66	1	61	62	64
FR12	Residential	B/66	1	61	62	67
FR13	Residential	B/66	8	69	70	69
FR14	Residential	B/66	4	70	71	70
FR15	Residential	B/66	1	71	72	71
FR16	Residential	B/66	1	61	62	67
FR17	Residential	B/66	1	61	62	67
FR18	Residential	B/66	2	61	62	67
FR19	Residential	B/66	2	61	62	67
FR2	Residential	B/66	1	69	69	69
FR20	Residential	B/66	2	61	62	67
FR21	Residential	B/66	1	61	62	69
FR22	Residential	B/66	1	59	60	68
FR23	Residential	B/66	1	59	59	67
FR24	Residential	B/66	1	59	60	67
FR25	Residential	B/66	1	61	61	67
FR26	Residential	B/66	1	60	61	66
FR27	Residential	B/66	1	56	57	Take
FR28	Residential	B/66	1	55	56	Take
FR29	Residential	B/66	4	57	58	Take
FR3	Residential	B/66	1	68	68	68
FR30	Residential	B/66	2	57	57	Take
FR31	Residential	B/66	2	54	55	69
FR32	Residential	B/66	1	53	54	75
FR33	Residential	B/66	3	54	55	74
FR34	Residential	B/66	3	55	56	74
FR35	Residential	B/66	3	56	57	74
FR36	Residential	B/66	3	57	57	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 2040 (L_{eq}) (dBA)	Build without barriers 2040 (L_{eq}) (dBA)
FR37	Residential	B/66	4	66	67	68
FR38	Residential	B/66	2	50	52	61
FR39	Residential	B/66	1	49	52	60
FR4	Residential	B/66	1	68	68	68
FR40	Residential	B/66	1	66	67	69
FR41	Residential	B/66	2	65	66	67
FR5	Residential	B/66	1	69	70	69
FR6	Residential	B/66	1	70	71	70
FR7	Residential	B/66	1	69	69	68
FR8	Residential	B/66	1	70	70	69
FR9	Residential	B/66	1	70	71	70
FT1	Residential	B/66	2	57	57	61
FT10	Residential	B/66	2	51	52	59
FT11	Residential	B/66	2	55	55	63
FT12	Residential	B/66	2	52	52	63
FT13	Residential	B/66	2	52	52	63
FT14	Residential	B/66	2	55	54	64
FT15	Residential	B/66	2	55	53	65
FT16	Residential	B/66	2	51	50	63
FT17	Residential	B/66	2	51	50	61
FT18	Residential	B/66	2	53	53	65
FT19	Residential	B/66	2	67	68	65
FT2	Residential	B/66	2	57	57	60
FT20	Residential	B/66	2	59	63	62
FT21	Residential	B/66	2	58	61	61
FT22	Residential	B/66	2	58	62	61
FT23	Residential	B/66	2	58	62	60
FT3	Residential	B/66	2	56	57	62
FT4	Residential	B/66	2	59	59	62
FT5	Residential	B/66	2	61	62	63
FT6	Residential	B/66	8	59	59	63
FT7	Residential	B/66	2	61	61	63
FT8	Residential	B/66	2	57	58	63
FT9	Residential	B/66	2	53	54	61
M1	Park	C/66	1	56	56	70
M10	Residential	B/66	1	47	50	61

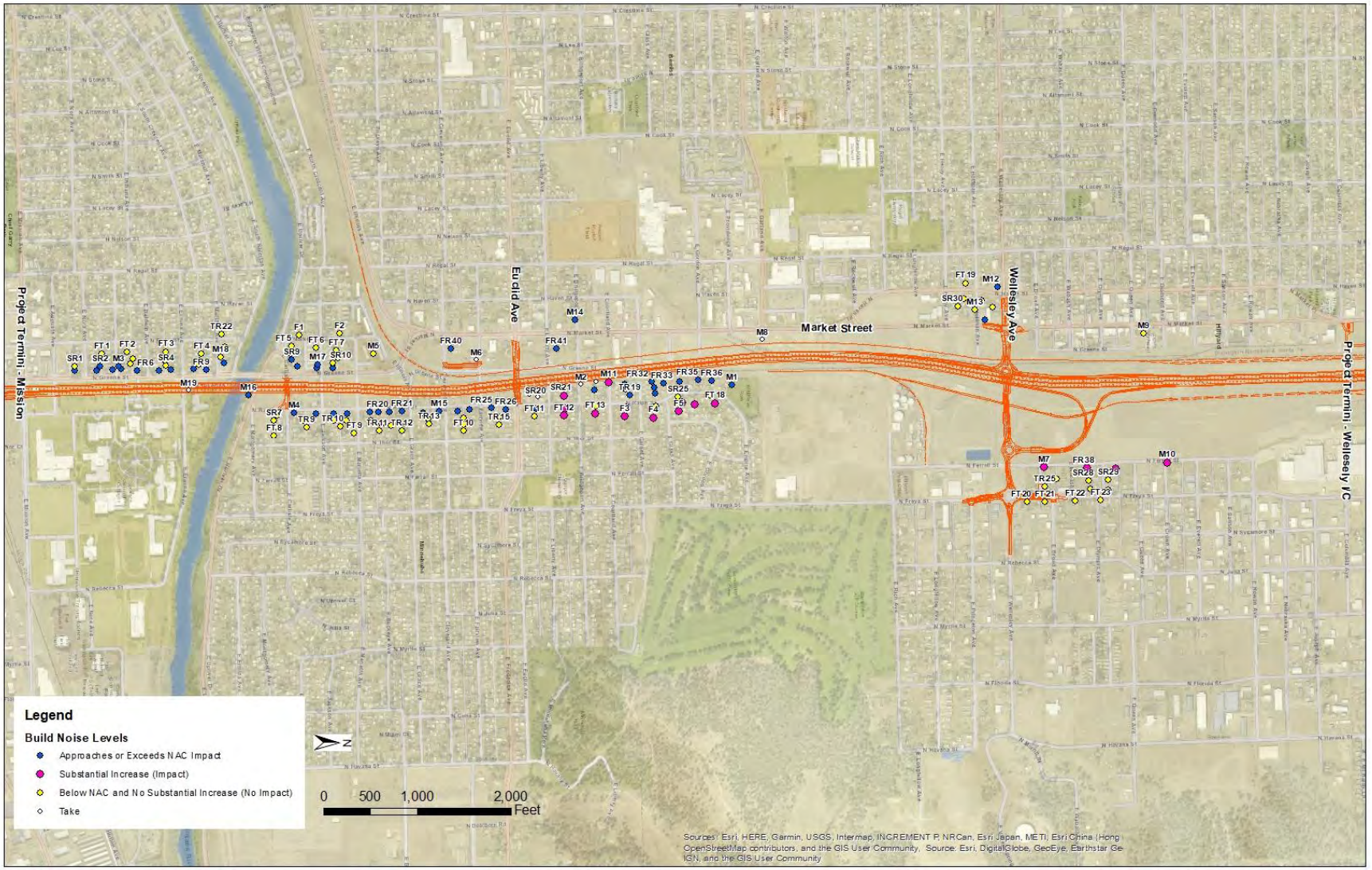
Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2040 (L_{eq}) (dBA)	Build without barriers 2040 (L_{eq}) (dBA)
M11	Residential	B/66	1	55	56	65
M12	Residential	B/66	1	71	72	71
M13	Residential	B/66	4	63	64	65
M14	Residential	B/66	1	65	66	66
M15	Residential	B/66	1	60	60	68
M16	Trail	C/66	1	65	66	66
M17	Residential	B/66	4	67	67	67
M18	Residential	B/66	1	64	65	65
M19	Commercial	E/71	1	67	68	Take
M2	Residential	B/66	1	57	58	Take
M3	Residential	B/66	0	66	66	66
M4	Residential	B/66	1	62	63	66
M5	Residential	B/66	15	62	63	65
M6	Residential	B/66	1	63	63	Take
M7	Residential	B/66	2	53	55	65
M8	Residential	B/66	0	67	68	Take
M9	Park	C/66	1	57	57	63
SR1	Residential	B/66	1	61	61	62
SR10	Residential	B/66	1	64	65	65
SR11	Residential	B/66	1	57	58	63
SR12	Residential	B/66	1	57	58	63
SR13	Residential	B/66	4	58	58	63
SR14	Residential	B/66	2	56	56	61
SR15	Residential	B/66	4	54	55	62
SR16	Residential	B/66	1	53	54	61
SR17	Residential	B/66	2	57	57	65
SR18	Residential	B/66	2	54	55	63
SR19	Residential	B/66	2	57	57	63
SR2	Residential	B/66	2	65	66	66
SR20	Residential	B/66	2	56	56	Take
SR21	Residential	B/66	2	53	54	64
SR22	Residential	B/66	4	55	55	67
SR23	Residential	B/66	4	52	53	68
SR24	Residential	B/66	1	53	54	72
SR25	Residential	B/66	4	57	55	65
SR26	Residential	B/66	4	57	56	65

Site ID	Land Use	Land Use Category/ NAC[1] (L_{eq}) (dBA)	Dwelling Units/ Residential Equivalency[2]	Existing 2018 (L_{eq}) (dBA)	No-Build 2040 (L_{eq}) (dBA)	Build without barriers 2040 (L_{eq}) (dBA)
SR27	Residential	B/66	4	52	55	60
SR28	Residential	B/66	3	52	55	60
SR29	Residential	B/66	2	51	55	59
SR3	Residential	B/66	2	64	64	64
SR30	Residential	B/66	4	59	60	59
SR31	Residential	B/66	2	63	64	65
SR4	Residential	B/66	2	65	65	65
SR5	Residential	B/66	2	63	64	64
SR6	Residential	B/66	1	62	62	64
SR7	Residential	B/66	1	60	61	64
SR8	Residential	B/66	2	59	59	64
SR9	Residential	B/66	1	65	65	66
TR1	Residential	B/66	4	60	60	63
TR10	Residential	B/66	4	55	55	61
TR11	Residential	B/66	3	55	56	61
TR12	Residential	B/66	3	53	53	61
TR13	Residential	B/66	4	54	55	63
TR14	Residential	B/66	4	52	53	61
TR15	Residential	B/66	4	54	55	61
TR16	Residential	B/66	3	57	56	66
TR17	Residential	B/66	2	55	54	65
TR18	Residential	B/66	2	57	55	65
TR19	Residential	B/66	4	51	50	66
TR2	Residential	B/66	4	60	61	63
TR20	Residential	B/66	2	53	53	70
TR21	Residential	B/66	2	59	60	61
TR22	Residential	B/66	1	57	57	60
TR23	Residential	B/66	2	63	64	62
TR24	Residential	B/66	2	65	65	64
TR25	Residential	B/66	2	55	58	61
TR26	Residential	B/66	2	55	58	60
TR27	Residential	B/66	2	55	59	60
TR3	Residential	B/66	2	60	60	62
TR4	Residential	B/66	2	61	62	63
TR5	Residential	B/66	2	63	64	65
TR6	Residential	B/66	8	62	63	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 2040 (L_{eq}) (dBA)	Build without barriers 2040 (L_{eq}) (dBA)
TR7	Residential	B/66	2	63	64	65
TR8	Residential	B/66	2	57	58	64
TR9	Residential	B/66	2	56	57	62

Notes:
Noise Abatement Criteria Impacts are noted by bolded values.
Substantial Increase Impacts are noted by shaded values.
"FR" site represents first row receiver
"SR" site represents second row receiver
"TR" site represents third row receiver
"FR" site represents fourth row receiver
"F" site represents fifth row receiver
"M" site represents field measurement site and modeled site
Site M19 was only used as a modeled site
"Take" represents modeled locations that are within the project improvement area. These locations are not included for consideration for impacts or mitigation.
See Exhibit 3 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 M1, M9, and M16.

Exhibit 8: Modeled 2035 Build Noise Abatement Criteria Impacts



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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 66 modeled sites. The 66 modeled sites are grouped in nine 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.

For this project, nine discrete areas of impacts were considered for noise abatement. Noise barriers were evaluated at all nine impact areas to determine whether abatement could sufficiently reduce traffic noise levels. Noise barriers were evaluated along the project corridor on both sides of the proposed US 395 alignment. All noise barriers were evaluated within WSDOT right-of-way or near the edge of the roadway shoulder. Each evaluated noise barrier location is described below and includes consideration of multiple barrier heights and lengths in an attempt to achieve WSDOT criteria for feasibility and reasonableness.

Three of the nine evaluated barrier locations meet WSDOT Feasibility Criteria, as shown in Exhibit 9. Noise barrier locations are shown in Exhibit 10 through Exhibit 12.

Noise Barrier NB1—Sites M4, M15, M16, M4, FR12, and FR16 through FR26

Noise Barrier NB1 is located on structure one the east side of the US 395 elevated structure from the bridge spanning the Spokane River northward to E. Euclid Avenue. The location of the noise barrier is shown on Exhibit 10. Noise Barrier NB1 was evaluated to reduce noise levels at residences

and the Centennial Trail with noise criteria impacts and substantial increase impacts located east of the proposed alignment. The barrier was evaluated at heights up to 20 feet tall and 3,250 feet long in this location. A minimum feasible barrier height of 18 feet tall and 3,250 feet long would reduce traffic noise levels by at least 5 dBA at 13 of the 17 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 NB2—Sites F3 through F5, FR31 through FR36, SR21 through SR24, TR16, TR17, TR19, TR20, M1, FT12, FT13, and FT16 through FT18

Noise Barrier NB2 is located along the eastern edge of pavement of the proposed US 395 alignment from E. Euclid Avenue to north of Wild Horse Park. Noise Barrier NB2 was evaluated to reduce noise levels at residences and one park with noise criteria impacts and substantial increase impacts located east of the proposed alignment. The location of Noise Barrier NB2 is shown on Exhibit 11. The barrier was evaluated at heights up to 20 feet and a length of 2,302 feet in this location. A minimum feasible barrier height of 10 feet tall and 2,302 feet long would reduce traffic noise levels by at least 5 dBA at 21 of the 25 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 NB3—Sites M7, M10, FR38, and FR39

Noise Barrier NB3 was evaluated along the eastern edge of pavement of the proposed US 395 northbound on-ramp from E. Wellesley Avenue to reduce noise levels at residences located along N. Ferrall Street predicted to experience substantial increase impacts. The location of the noise barrier is shown on Exhibit 12. The barrier was evaluated at heights up to 20 feet and a length of 1,799 feet in this location. A minimum feasible barrier height of 16 feet tall and 1,799 feet long would reduce traffic noise levels by at least 5 dBA at four of the six first row homes predicted to experience substantial increase impacts. 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 SB1—Sites FR1 through FR10, SR2, and M3

Noise Barrier SB1 was evaluated on the edge of the elevated structure of US 395 from E. Mission Avenue to the southern end of the bridge spanning the Spokane River. The location of Noise Barrier SB1 is shown in Exhibit 10. Noise Barrier SB1 was evaluated to reduce noise levels at residences located west of US 395 predicted to experience noise abatement criteria impacts. Noise Barrier SB1 was evaluated at heights up to 20 feet tall and 2,100 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier SB1 was not able to provide the necessary 5 dBA reduction at any of first row sites. By not providing the necessary noise reduction at impacted sites located behind the barrier, Noise Barrier SB1 does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier SB2—Sites FR13 through FR15, SR9, and M17

Noise Barrier SB2 was evaluated on the edge of structure of US 395 from the northern end of the elevated bridge spanning the Spokane River to E. Grace Avenue. The location of Noise Barrier SB2 is shown in Exhibit 10. Noise Barrier SB2 was evaluated to reduce noise levels at residences located west of US 395 predicted to experience noise abatement criteria impacts. Noise Barrier SB2 was evaluated at heights up to 20 feet tall and 1,600 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier SB2 was not able to provide the necessary 5 dBA reduction at any of first row sites. By not providing the necessary noise reduction at impacted sites located behind the barrier, Noise Barrier SB2 does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier SB3—Site FR40

Noise Barrier SB3 was evaluated on the edge of pavement of the proposed US 395 southbound lanes from north of E. Grace Avenue to E. Euclid Avenue. The location of Noise Barrier SB3 is shown in Exhibit 10. Noise Barrier SB3 was evaluated to reduce noise levels at one first row residence located west of US 395 predicted to experience noise abatement criteria impacts. Noise Barrier SB3 was evaluated at heights up to 20 feet tall and 1,200 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier SB3 was not able to provide the necessary 5 dBA reduction at the one first row home located behind the barrier. By not providing the necessary noise reduction at impacted site, Noise Barrier SB3 does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier SB4—Site FR41

Noise Barrier SB4 was evaluated on the edge of pavement of the proposed US 395 southbound lanes from south of E. Liberty Avenue to north of E. Bridgeport Avenue. The location of Noise Barrier SB4 is shown in Exhibit 11. Noise Barrier SB4 was evaluated to reduce noise levels at two first row residences located west of US 395 predicted to experience noise abatement criteria impacts. Noise Barrier SB4 was evaluated at heights up to 20 feet tall and 500 feet long in this location. At barrier heights up to 20 feet tall, Noise Barrier SB4 was not able to provide the necessary 5 dBA reduction at the two first row homes located behind the barrier. By not providing the necessary noise reduction at impacted sites, Noise Barrier SB4 does not meet WSDOT Feasibility Criteria and is not recommended.

Noise Barrier SB5 and SB6—Sites FR37 and M12

Noise Barrier SB5 and Noise Barrier SB6 were evaluated as a barrier system with Noise Barrier SB5 located on the edge of pavement of the southbound on-ramp to US 395 from E. Wellesley Avenue and SB6 located on the edge of pavement on the southbound US 395 mainline at the E. Wellesley Avenue Interchange. The location of both noise barriers is shown in Exhibit 11 and Exhibit 12. The barrier system was evaluated to reduce noise levels at two first row locations representing four residences and one park located west of the proposed US 395/E. Wellesley Avenue Interchange predicted to experience noise abatement criteria impacts. The two noise

barriers were evaluated together at heights up to 20 feet tall and at a combined length of 913 feet long in this area. At barrier heights up to 20 feet tall, the two noise barriers were not able to provide the necessary 5 dBA reduction at either of the two first row locations located behind the barrier. By not providing the necessary noise reduction at impacted sites, Noise Barrier SB5 and Noise Barrier SB6 do not meet WSDOT Feasibility Criteria and in not recommended.

Exhibit 9: 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	
NB1	M4 (B), M15 (B), M16 (C), FR12 (B), FR16-FR26 (B)	59 - 62	64 - 69	5 - 7	76%	N/A	N/A	Yes
NB2	M1 (C), FR31-FR36, SR21, SR22 (all Cat B)	53 - 57	64 - 75	5 - 11	84%	11	16%	Yes
NB3	M7, M10, FR38, FR39 (all Cat B)	47 - 53	60 - 65	5 – 7	67%	N/A	N/A	Yes
SB1	FR1-FR10, M3 (all Cat B)	66 - 70	66 - 70	0 - 1	0%	N/A	N/A	No
SB2	FR13-FR15, M17 (B)	62 - 71	65 - 71	0 - 2	0%	N/A	N/A	No
SB3	FR40 (Cat B)	66	69	3	0%	N/A	N/A	No
SB4	FR 41 (Cat B)	65	67	2	0%	N/A	N/A	No
SB5 & SB6	FR37 (Cat B)	66	68	2	0%	N/A	N/A	No

Notes:
"FR" site represents first row receiver
"SR" site represents second row receiver (used when first row receiver was no longer present after project construction)
"M" site represents field measurement and modeled site
See Exhibit 3 for definitions of Activity Categories.

Exhibit 10: 2040 Build Evaluated Noise Barriers — Project Area South (E Mission Ave. to E Euclid Ave.)

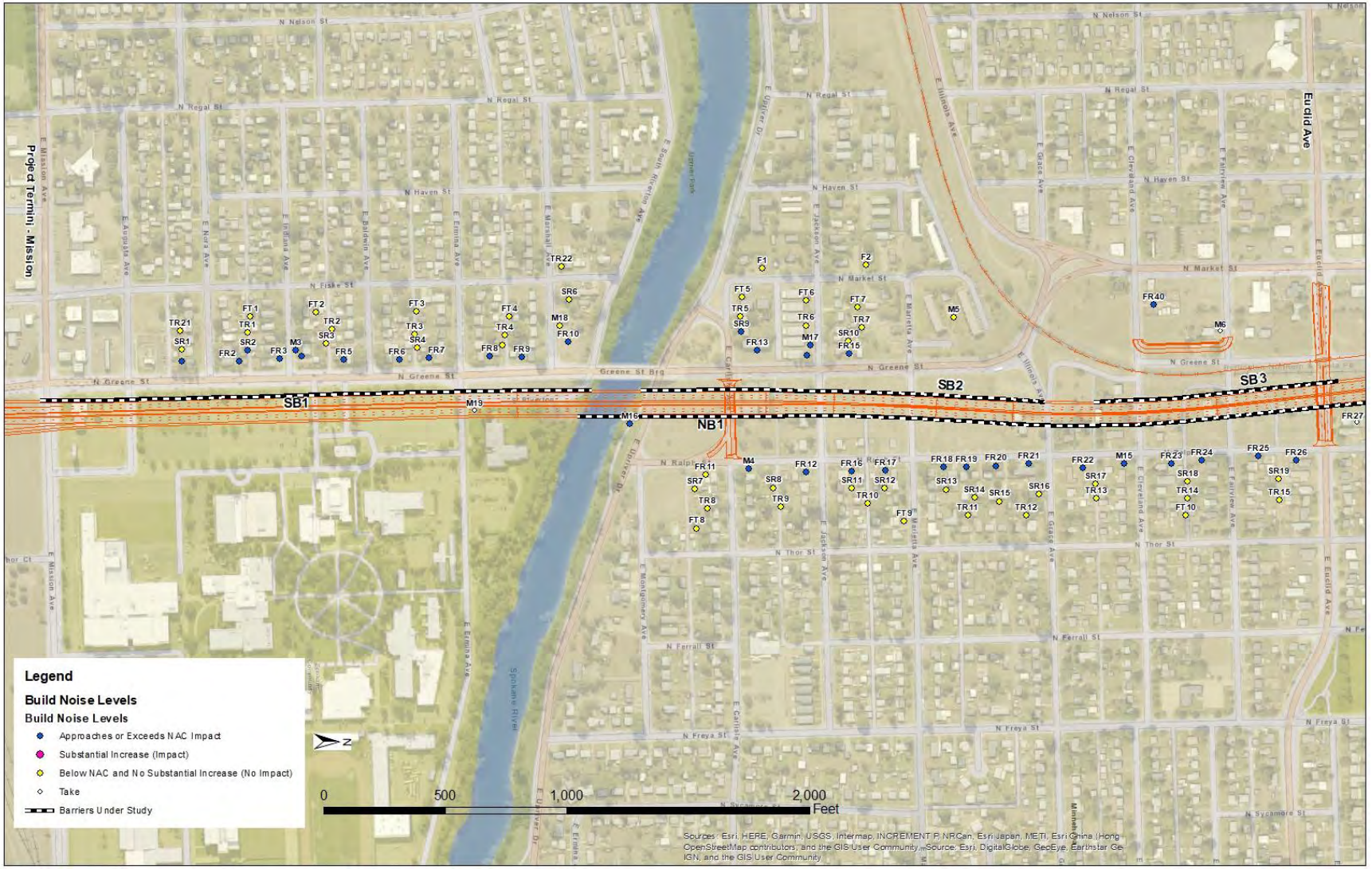

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Exhibit 11: 2040 Build Evaluated Noise Barriers — Project Area Central (E Euclid Ave. to E Wellesley Ave.)

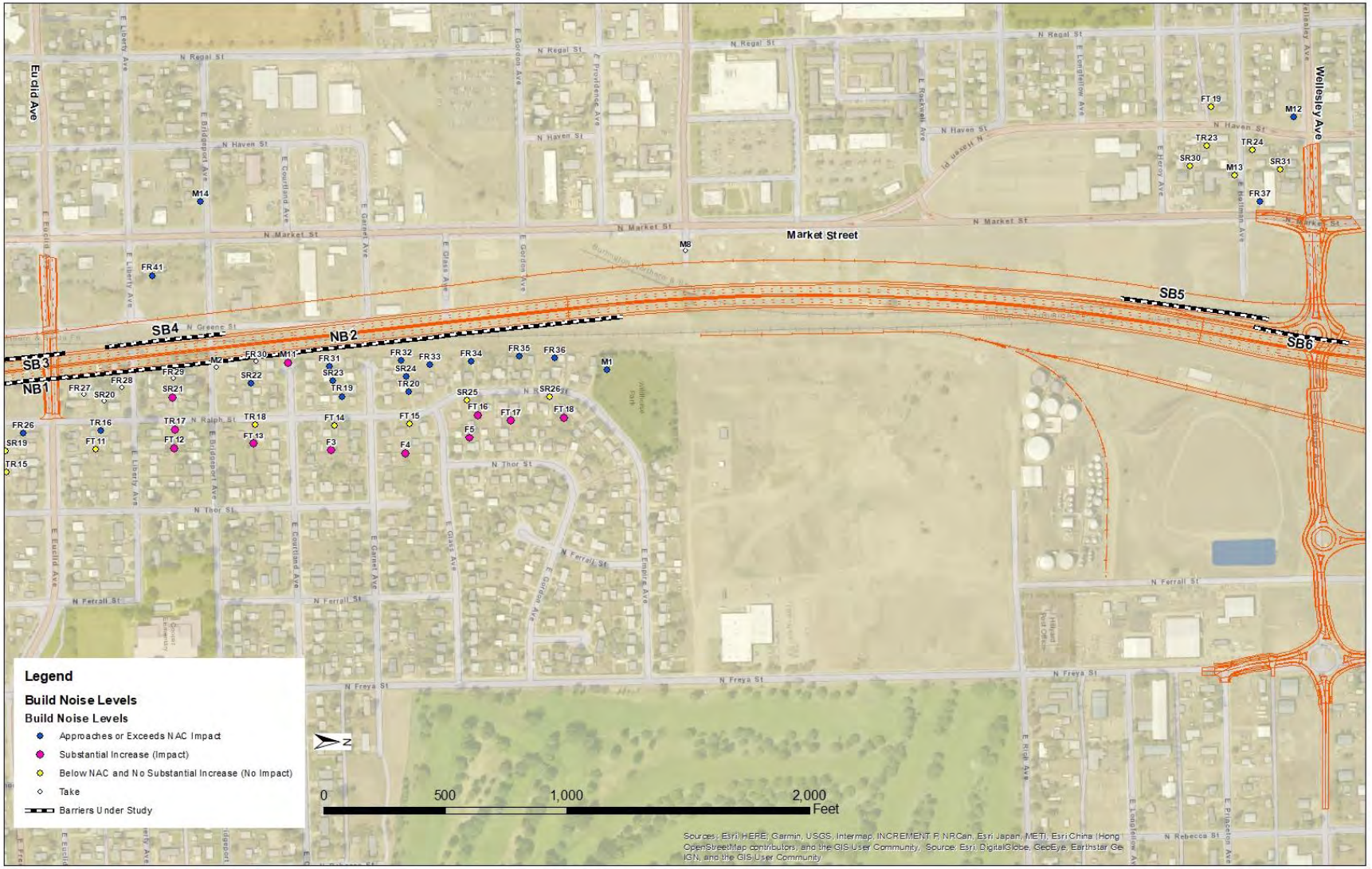

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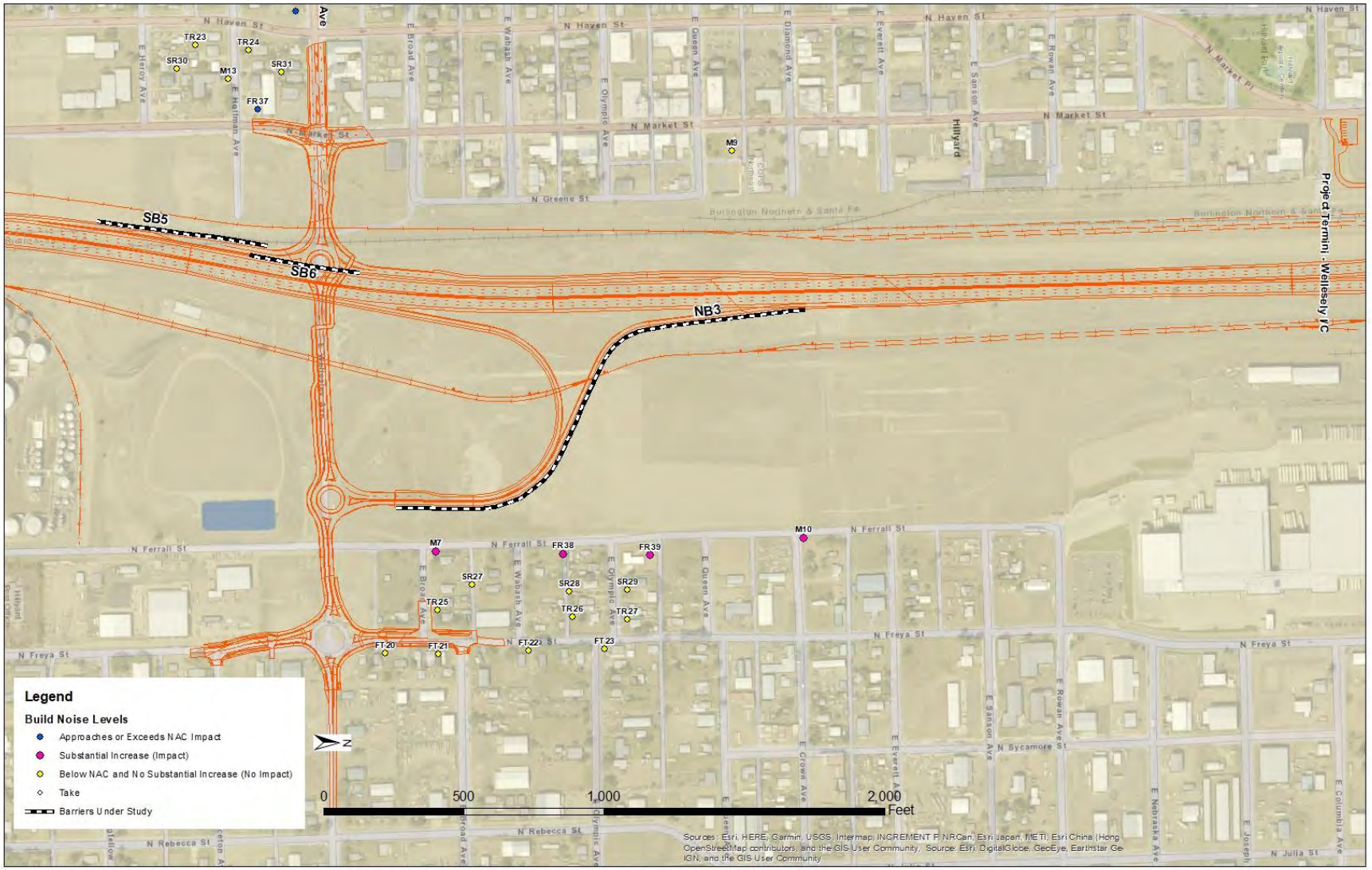
Exhibit 12: 2040 Build Evaluated Noise Barriers — Project Area North (E Wellesley Ave. to E Columbia Ave. Vicinity)



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Reasonableness of Noise Barriers

Since abatement is feasible at three locations [Noise Barriers NB1, NB2, and NB3], the reasonableness of abatement was evaluated at each of the three 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 13. The allowable cost per receiver, based on Build condition traffic noise levels is described in Exhibit 13. The information provided in Exhibit 18 is included in the WSDOT Noise Policy (WSDOT, 2012). An average cost of $140.00 per square foot of wall area was used for Noise Barrier NB1 due to the barrier's location along the edge of an elevated structure.

Exhibit 13: 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 14 through Exhibit 16 describe the allowable cost per receiver and the cost of the minimum barrier size to achieve the design goal at all feasible noise barriers (Noise Barriers NB1, NB2, and NB3). 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 NB1— Sites M4, M15, M16, FR12 and FR16 through FR26

Noise Barrier NB1 is located on structure one the east side of the US 395 elevated structure from the bridge spanning the Spokane River northward to E. Euclid Avenue. The location of the noise barrier is shown on Exhibit 10. Noise Barrier NB1 was evaluated to reduce noise levels at residences and the Centennial Trail with noise criteria impacts and substantial increase impacts located east of the proposed alignment. The barrier was evaluated at heights up to 20 feet tall and 3,250 feet long in this location. A minimum feasible barrier height of 18 feet tall and 3,250 feet long would achieve WSDOT's design goal of at least a 7-dBA noise reduction at Site FR22. At a height of 18 feet, the barrier would cost approximately $8,190,000. An average cost of $140.00 per square foot of wall area was used for Noise Barrier NB1 due to the barrier's location along the edge of an elevated structure. The barrier would benefit 26 receiver locations, which represent 54 residential equivalent units, resulting in a reasonable allowance of $2,010,514. Additional noise barrier heights and lengths were evaluated for Noise Barrier NB1; however, WSDOT Reasonableness Criteria were not met with all other barrier designs.

Due to the allowable cost of Noise Barrier NB1 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 NB2— Sites F3 through F5, FR31 through FR36, SR21 through SR24, TR16, TR17, TR19, TR20, M1, FT12, FT13, andFT16 through FT18

Noise Barrier NB2 is located along the eastern edge of pavement of the proposed US 395 alignment from E. Euclid Avenue to north of Wild Horse Park. Noise Barrier NB2 was evaluated to reduce noise levels at residences and one park with noise criteria impacts and substantial increase impacts as high as 22 dBA over existing noise levels at residences located east of the proposed US 395 alignment, north of E. Euclid Avenue. The location of Noise Barrier NB2 is shown on Exhibit 11.

The barrier was evaluated at heights up to 20 feet and a length of 2,302 feet in this location. A barrier height of 10 feet tall and 2,302 feet long would achieve WSDOT's design goal of at least a 7-dBA noise reduction and benefit 18 receiver locations, which represent 47 residential equivalent units. At a height of 10 feet, the barrier would cost approximately $1,188,062 compared to a reasonable allowance of $2,168,237. At 10 feet tall, Noise Barrier NB2 would also achieve over a 10-dBA reduction at five first row homes located behind the barrier. Additional noise barrier heights were evaluated for Noise Barrier NB2; however, at 10 feet tall, Noise Barrier NB2 provides reduction to lower noise levels below WSDOT NAC at all but four receiver locations, which represent ten residential equivalent units.

Because Noise Barrier NB2 meets WSDOT requirements for placement, Noise Barrier NB2 will be further evaluated in the final design of the US 395 NSC Project.

Noise Barrier NB3— Sites M7, M10, FR38, and FR39

Noise Barrier NB3 evaluated along the eastern edge of pavement of the proposed US 395 northbound on-ramp from E. Wellesley Avenue to reduce noise levels at residences located along N. Ferrall Street predicted to experience substantial increase impacts. The location of the noise barrier is shown on Exhibit 12. The barrier was evaluated at heights up to 20 feet and a length of 1,799 feet in this location. By raising the minimum feasible barrier height of 16 feet tall to 18 feet tall at 1,799 feet long Noise Barrier NB3 would achieve WSDOT's design goal of at least a 7-dBA noise reduction at Site FR38. Noise Barrier NB3 at this height and length would cost approximately $1,671,235. That barrier would benefit the two receiver locations, which represents four residential equivalent units, resulting in a reasonable allowance of $144,508. Additional noise barrier heights and lengths were evaluated for Noise Barrier NB3; however, WSDOT Reasonableness Criteria were not met with all other barrier designs.

Due to the allowable cost of Noise Barrier NB3 being less than the construction cost of the barrier, the noise barrier does not meet the WSDOT Reasonableness Criteria and is not recommended.

Exhibit 14: Reasonableness Evaluation for Cost—Noise Barrier NB1 - 18 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)
FR12	1	61	67	$39,636	$2,010,514	$8,190,000	5	N/A	N/A
FR16	1	61	67	$39,636			5	N/A	N/A
FR17	1	61	67	$39,636			5	N/A	N/A
FR18	2	61	67	$39,636			5	N/A	N/A
FR19	2	61	67	$39,636			5	N/A	N/A
FR20	2	61	67	$39,636			5	N/A	N/A
FR21	1	61	69	$46,655			6	N/A	N/A
FR22	1	59	68	$43,146			7	N/A	N/A
M15	1	60	68	$43,146			6	N/A	N/A
FR23	1	59	67	$39,636			5	N/A	N/A
SR8	2	59	64	$36,127			5	N/A	N/A
SR11	1	57	63	$36,127			5	N/A	N/A
SR12	1	57	63	$36,127			6	N/A	N/A
SR13	4	58	63	$36,127			5	N/A	N/A
SR14	2	56	61	$36,127			5	N/A	N/A
SR15	4	54	62	$36,127			5	N/A	N/A
SR16	1	53	61	$36,127			6	N/A	N/A
SR17	2	57	65	$36,127			7	N/A	N/A
SR18	2	54	63	$36,127			5	N/A	N/A
TR9	2	56	62	$36,127			5	N/A	N/A
TR10	4	55	61	$36,127			6	N/A	N/A
TR11	3	55	61	$36,127			5	N/A	N/A
TR12	3	53	61	$36,127			5	N/A	N/A
TR13	4	54	63	$36,127			7	N/A	N/A

TR14	4	52	61	$36,127			5	N/A	N/A
FT9	2	53	61	$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.
"FR" site represents first row receiver; "SR" site represents second row receiver; "TR" site represents third row receiver
Reasonableness cost based on $140.00/ft²
N/A = Noise reduction not achieved by evaluated noise barrier
See Exhibit 3 for definitions of Activity Categories.

Exhibit 15: Reasonableness Evaluation for Cost—Noise Barrier NB2 – 10 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)
SR21	2	53	64	$36,127	$2,168,237	$1,188,062	7	N/A	N/A
SR22	4	55	67	$39,636			7	N/A	N/A
FR31	2	54	69	$46,655			9	N/A	N/A
SR23	4	52	68	$43,146			9	N/A	N/A
TR17	2	55	65	$36,127			5	N/A	N/A
TR19	4	51	66	$36,127			8	N/A	N/A
FR32	1	53	75	$67,712			11	N/A	N/A
SR24	1	53	72	$57,184			10	N/A	N/A
TR20	2	53	70	$50,165			9	N/A	N/A
FR33	3	54	74	$64,203			10	N/A	N/A
FR34	3	55	74	$64,203			8	N/A	N/A
FR35	3	56	74	$64,203			6	N/A	N/A
FR36	3	57	73	$60,693			5	N/A	N/A
FT12	2	52	63	$36,127			5	N/A	N/A
FT13	2	52	63	$36,127			5	N/A	N/A
FT16	2	51	63	$36,127			5	N/A	N/A
F3	4	50	62	$36,127			5	N/A	N/A
F4	3	49	63	$36,127			6	N/A	N/A
					Design Goal Achieved?	Yes		No	
					Cost Effective?	Yes		No	

Notes
Noise Abatement Criteria Impacts are noted by bolded values; Substantial Increase Impacts are noted by shaded values.
"FR" site represents first row receiver; "SR" site represents second row receiver; "TR" site represents third row receiver; "FT" site represents fourth row receiver; "F" site represents fifth row receiver;

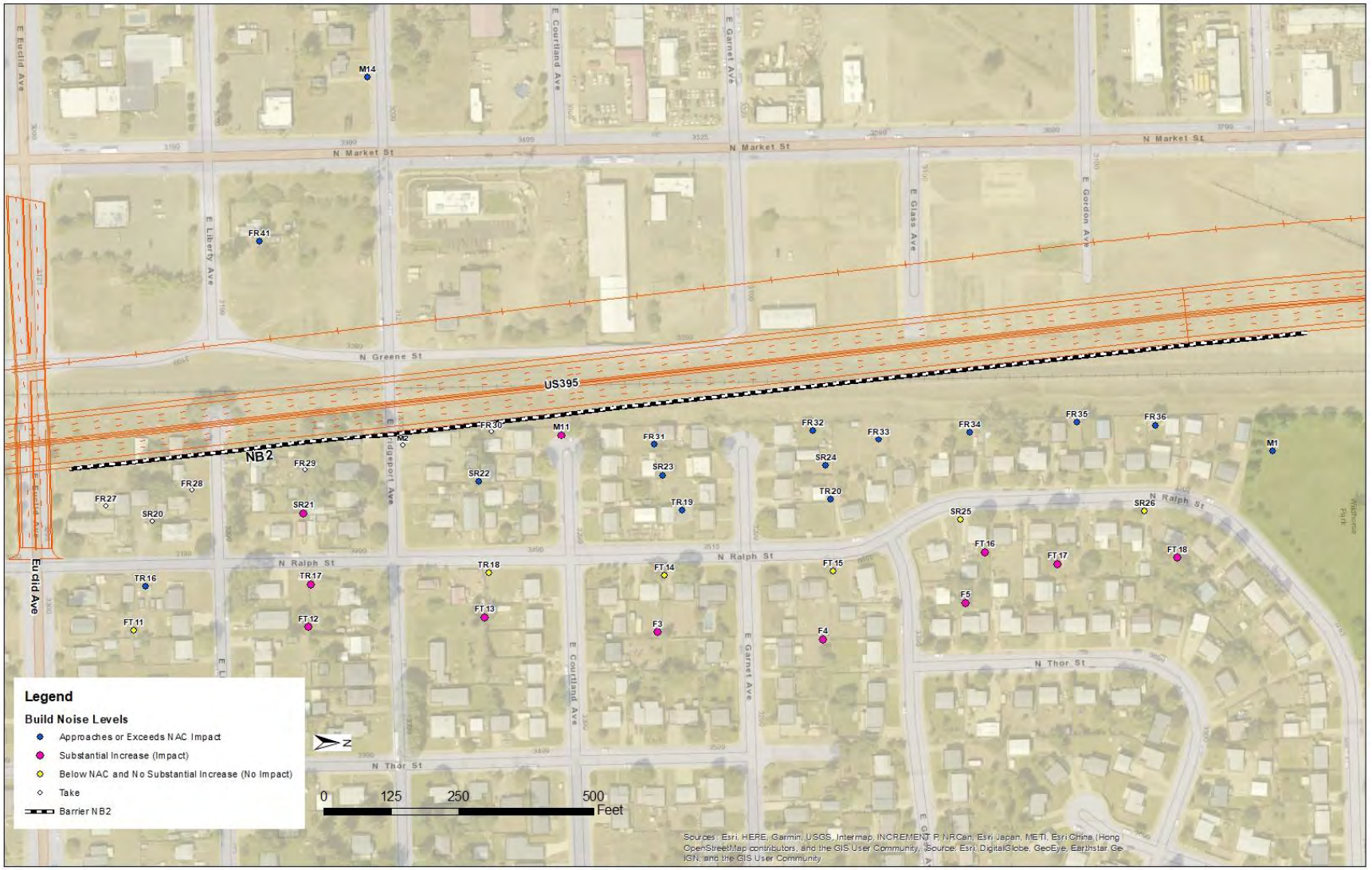
Reasonableness cost based on $51.61/ft²
N/A = Noise reduction not achieved by evaluated noise barrier
See Exhibit 3 for definitions of Activity Categories.

Exhibit 16: Reasonableness Evaluation for Cost—Noise Barrier NB3 – 18 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)
M7	2	53	65	$36,127	$144,508	$1,671,235	5	N/A	N/A
FR38	2	50	61	$36,127			7	N/A	N/A
					Design Goal Achieved?	Yes		No	
					Cost Effective?	No		No	

Notes
Substantial Increase Impacts are noted by shaded values.
"FR" site represents first row receiver; "M" site represents field measured and modeled receiver
Reasonableness cost based on $51.61/ft²
N/A = Noise reduction not achieved by evaluated noise barrier
See Exhibit 3 for definitions of Activity Categories.

Exhibit 17: Location of Noise Barrier NB2 – Meets WSDOT Feasible and Reasonable Criteria – 10 Feet Tall



US 395 North Spokane Corridor Project
Noise Discipline Report

WSP USA, 2018

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 evaluated at nine locations where traffic noise impacts were predicted. Noise barriers were evaluated at all nine locations with three noise barrier alignments found to meet WSDOT Criteria for the placement of a feasible noise barrier. However, only one location – Noise Barrier NB2 – met WSDOT Criteria for the placement of both a feasible and reasonable noise barrier.

Noise Barrier NB2 is located along the eastern edge of pavement of the proposed US 395 alignment from E. Euclid Avenue to north of Wild Horse Park. Noise Barrier NB2 was evaluated to reduce noise levels at residences and one park with noise criteria impacts and substantial increase impacts as high as 22 dBA over existing noise levels at residences located in this area east of the proposed US 395 alignment along N. Ralph Street. The location of the noise barrier is shown on Exhibit 11. At a height of 10 feet and 2,302 feet long, Noise Barrier NB2 would provide at least a 5-dBA noise reduction to 8 of the 10 first row receivers, which represent a total of 21 residential equivalent units, resulting in a reasonable allowance of $2,168,237. At 10 feet tall, Noise Barrier NB2 would also achieve over a 10-dBA reduction at three receivers representing five homes located behind the barrier. Additional noise barrier heights and lengths were evaluated for Noise Barrier NB2; however, at 10 feet tall, Noise Barrier NB2 provides reduction to lower noise levels below WSDOT NAC at all but four receiver locations, which represent ten residential equivalent units.

Because Noise Barrier NB2 meets WSDOT requirements for placement, Noise Barrier NB2 will be further evaluated in the final design of the US 395 NSC Project. To be included in the project, any barrier location must also be reviewed to ensure it meets sight distance safety requirements. 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, etc.) will be included in the final design stage evaluation of this barrier.

Construction Noise

Construction Noise Background

Construction creates temporary noise. Construction is usually carried out in reasonably discrete steps, each with its own mix of equipment and noise characteristics. For example, construction of this project requires asphalt removal, grading, paving, restriping, foundations for signage and ITS facilities, retaining walls, noise barriers, and drainage systems to name a few.

The most constant noise source at construction sites is usually engine noise. Mobile equipment generally operates intermittently or in cycles of operation, while stationary equipment, such as generators and compressors, generally operate at fairly constant sound levels. Trucks are present during most phases of construction and are not confined to the project site, so noise from trucks may affect more receivers than other construction noise. Other common noise sources include impact equipment, which could be pneumatic, hydraulic, or electric powered.

Noise levels during the construction period depend on the type, amount, and location of construction activities.

- The type of construction methods establish the maximum noise levels
- The amount of construction activity establishes how often certain construction noises occur throughout the day
- The location of construction equipment relative to adjacent properties determines the effect of distance in reducing construction noise levels.

Areas where structural supports and concrete and asphalt are planned for removal will typically generate the highest noise levels during project construction. Noise generated by construction equipment likely used for this project include trucks, forklifts, asphalt grinding machines, dozers, excavators, cranes, concrete mixers, drill rigs, vibratory rollers, backhoes, excavators, loaders, paving machines, pile drivers, and generators which can reach levels from 73 dBA to 105 dBA at 50 feet. As a point source, construction noise decreases by 6 dBA per doubling of distance moving away from the equipment source. The various pieces of equipment are almost never operating simultaneously at full-power and some will be turned off, idling, or operating at less than full power at any time. Therefore, the average L_{eq} noise levels will be less than the aggregate of the maximum noise levels.

Construction Noise Level Limits

Traffic noise and construction noise are exempt from the property line noise limits during daytime hours, but noise limits still apply to construction noise at night. Noise levels in Exhibit 18 apply only to construction noise at residential properties during nighttime hours, between 10 p.m. and 7 a.m. At night, construction noise must meet Washington State Department of Ecology property line regulations[5] that set limits based on the Environmental Designation for Noise Abatement (EDNA) of the land use: residential (Class A), commercial (Class B), and industrial (Class C).

Exhibit 18: Maximum Permissible Environmental Noise Levels

EDNA of Noise Source	EDNA of Receiving Property (dBA)		
	Class A	Class B	Class C
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Allowable nighttime (10:00 PM to 7:00 AM) noise levels at Class A receiving properties (residential) are reduced by 10 dBA.

Short-term exceedance of the sound levels in Exhibit 26 is allowed. During any one-hour period, the maximum level may be exceeded by:

- 5 dBA for a total of 15 minutes,
- 10 dBA for a total of 5 minutes, or
- 15 dBA for a total of 1.5 minutes[6].

The allowed exceptions are defined by the percentage of time a given level is exceeded. For example, L_{25} is the noise level exceeded 15 minutes during an hour. Therefore, the permissible L_{25} would be 5 dBA greater than the values in Exhibit 26, provided that the noise level is below the permissible level for the rest of the hour and never exceeds the permissible level by more than 5 dBA.

An hourly L_{eq} that is approximately 2 dBA higher than the values in Exhibit 26 is an equivalent sound level to the permissible levels, including the short term exceedances. A $L_{eq}(h)$ of 59 dBA corresponds approximately to a noise level of 57 dBA for 45 minutes and 62 dBA for 15 minutes, which are the maximum permissible noise levels created by a commercial source (Class B) and received by a residential property (Class A).

[5] WAC Chapter 173-40
[6] WAC 173-60-040

Construction Noise Assessment

Construction noise was not assessed quantitatively because the project is exempt from Department of Ecology property line noise level limits during daytime hours. The following sections discuss noise variances that would be required for nighttime work, typical construction equipment noise levels, and abatement measures.

Construction Noise Variance for Night Work

Construction noise is exempt from local property line regulations during daytime hours. If nighttime construction is required for this project, WSDOT (or the Design-Builder, dependent on specific contract requirements) will apply for variances or exemptions from local noise ordinances for the night work. Noise variances or exemptions require construction noise abatement measures that vary by jurisdiction. If night work is necessary for this project, noise variances may be required from the City of Spokane or Spokane County for construction work occurring weekdays between 10:00 p.m. to 7:00 a.m. with additional restricted times on weekends and holidays.

Construction Noise Abatement

Construction noise can be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing time of operation, and locating equipment farther away from noise sensitive receivers, e.g., homes. To reduce construction noise at nearby receptors, the following abatement measures can be incorporated into construction plans and contractor specifications:

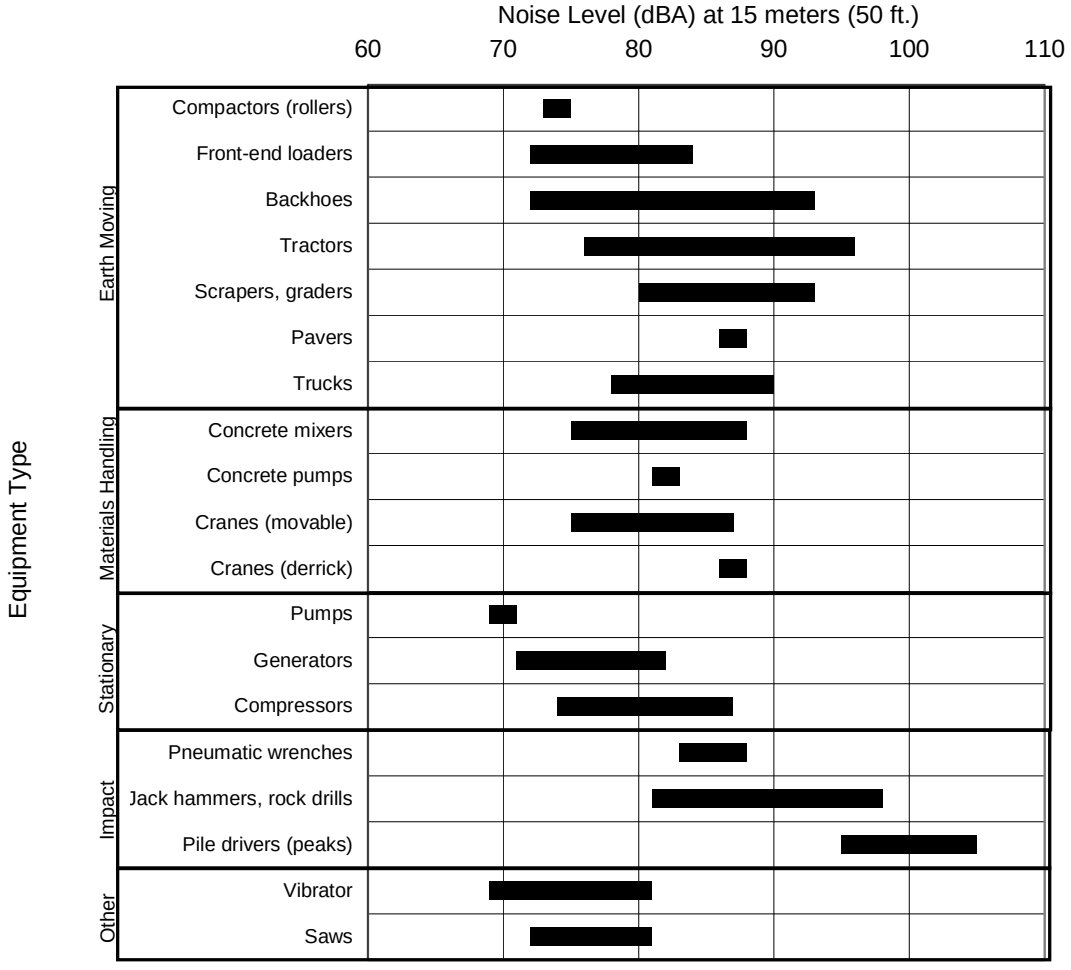
- Limiting construction activities to between 7 a.m. and 10 p.m. would reduce construction noise levels during sensitive nighttime hours
- Using haul vehicles with rubber bed-liners would reduce noise from loading trucks
- Equipping trucks with ambient backup alarms would reduce the noise for equipment backing
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures would reduce their noise by 5 to 10 dBA (U.S. EPA, 1971)
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences would decrease noise levels at nearby sensitive receptors

Noise generated by construction equipment likely used for this project include trucks, forklifts, asphalt grinding machines, dozers, excavators, cranes, concrete mixers, drill rigs, vibratory rollers, backhoes, excavators, loaders, paving machines, pile drivers, and generators which can reach levels from 73 dBA to 105 dBA at 50 feet as presented in Exhibit 19.

Additional methods for reducing construction noise levels that may be incorporated by the project engineering office or required by a jurisdiction include the following:

- Specifying the quietest equipment available would reduce noise by 5 to 10 dBA
- Turning off construction equipment during prolonged periods of non-use would eliminate noise from construction equipment during those periods
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase efficiency of operation
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance

Exhibit 19: Construction Equipment Noise Ranges



Source: EPA, 1971 and WSDOT, 1991.

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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 and County of Spokane. The information was researched from available online files on the City and County of Spokane's websites on October 24, 2018. The review did not identify permits that have been submitted to develop structures 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.

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. A review of the City and County of Spokane's land use and building permits identified no permits or approvals on file with the City or County.

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Appendix C—Traffic Data

Appendix C provides traffic data collected during field measurements on October 11 and 12, 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 US 395 North Spokane Corridor Project Team.

Exhibit C-1: Measured Traffic Volumes during Validation Measurement

Measurement #	Roadway	Autos	MT	HT	Speed (mph)
M1	Market NB	175	7	6	15-35
	Market SB	290	16	11	20-30
M2	Market NB	154	11	11	30
	Market SB	165	3	9	10-30
M3	Greene NB	236	25	7	30-40
	Greene SB	247	7	14	20-40 (35 avg)
M4	Greene NB	261	18	2	30-40 (avg 35-40)
	Greene SB	243	3	12	30-40 (avg 35-40)
M5	Greene NB	259	7	5	30-35 (uphill)
	Greene SB	213	20	11	30-40 (downhill)
M6	Market NB	235	7	7	30-35 (A,MT) 10-25 (HT)
	Market SB	247	16	17	35-40
M7	Wellesley EB	56	1	0	25-35
	Wellesley WB	42	0	0	25-35
	Freya NB	84	3	0	20-25
	Freya SB	55	3	0	20-25
M8	Market NB	281	14	8	30-40
	Market SB	278	9	4	30-40
M9	Market NB (one-way)	164	11	6	25-35 (A,MT) 20-30 (HT)
M10	Freya NB	171	5	0	25-30
	Freya SB	131	4	0	25-30
M11	Market NB	424	7	2	30-40
	Market SB	320	6	4	30-40
M12	Wellesley EB	54	6	0	10-20
	Wellesley WB	68	5	1	20-30
	Haven SB (one-way)	188	7	14	15-35
M13	Market NB (one-way)	151	9	6	10-35 (avg 30)
	Haven SB (one-way)	165	10	5	30-40 (avg 35)
M14	Market NB	228	4	7	30-35
	Market SB	183	11	9	30-40 (avg 35)
M15A	Market NB	145	4	10	35-40 (8-min)
	Market SB	144	6	7	20-40 (8-min)
	Ralph NB	25	0	0	20-30 (8-min)
	Ralph SB	6	0	0	20-30 (8-min)
M16	Greene NB	306	6	12	25-40 (avg 35)
	Greene SB	374	6	7	25-40 (avg 35)
	Upriver Dr EB	30	0	0	25-30
	Upriver Dr WB	38	0	0	25-30
M17	Greene NB	281	11	10	30-35
	Greene SB	285	19	14	35-50 (avg 45)
M18	Greene NB	305	10	7	30-40 (avg 35)
	Greene SB	300	9	5	30-40 (avg 30)

Source: WSP, 2018.

Exhibit C-2: Modeled Hourly Traffic Volumes for 2018 Existing Conditions

Roadway	Direction	From	To	Peak Hour	Autos	MT	HT
Market/Haven	SB	Columbia	Rowan	930	902	19	9
Market/Haven	SB	Rowan	Wellesley	1000	970	20	10
Market/Haven	SB	Wellesley	Garland	1320	1280	26	13
Market/Haven	SB	Garland	Euclid	1230	1193	25	12
Market/Haven	SB	Euclid	Greene	1287	1249	26	13
Green	SB	Market	Mission	1529	1483	31	15
Green	NB	Mission	Market	2201	2135	44	22
Market	NB	Greene	Euclid	1853	1797	37	19
Market	NB	Euclid	Garland	1770	1717	35	18
Market	NB	Garland	Wellesley	1300	1261	26	13
Market	NB	Wellesley	Rowan	850	825	17	9
Market	NB	Rowan	Columbia	790	766	16	8
Mission	EB		Greene	635	616	13	6
Mission	EB	Greene		890	863	18	9
Mission	WB		Greene	890	863	18	9
Mission	WB	Greene		635	616	13	6
Riverton	EB		Bridge	90	87	2	1
Riverton	EB	Bridge	Elima	180	175	4	2
Riverton	WB	Elima	Bridge	180	175	4	2
Riverton	WB	Bridge		90	87	2	1
Upriver	EB		Greene	290	281	6	3
Upriver	EB	Greene	Freya	350	340	7	4
Upriver	WB	Freya	Greene	350	340	7	4
Upriver	WB	Greene		290	281	6	3
Carlisle	EB	Upriver	Greene	130	126	3	1
Carlisle	EB	Greene	Ralph	115	112	2	1
Carlisle	WB	Ralph	Greene	115	112	2	1
Carlisle	WB	Greene	Upriver	130	126	3	1
Euclid	EB		Market	585	567	12	6
Euclid	EB	Market	Freya	550	534	11	6
Euclid	WB	Freya	Market	550	534	11	6
Euclid	WB	Market		585	567	12	6
Garland	EB		Market	450	437	9	5
Garland	EB	Market		450	437	9	5
Wellesley	EB		Haven	575	558	12	6
Wellesley	EB	Haven	Market	390	378	8	4
Wellesley	EB	Market	Freya	300	291	6	3
Wellesley	WB	Freya	Market	300	291	6	3
Wellesley	WB	Market	Haven	390	378	8	4
Wellesley	WB	Haven		575	558	12	6
Freya	NB	Wellesley		156	151	3	2
Freya	SB		Wellesley	220	214	4	2
Euclid	EB	Haven	Market	585	567	12	6
Euclid	EB	Market	Freya	550	534	11	6
Euclid	WB	Freya	Market	550	534	11	6
Euclid	WB	Market	Haven	585	567	12	6
Ralph	NB	Upriver	Euclid	156	153	3	0
Ralph	SB	Euclid	Upriver	26	25	1	0
Garland	EB		Market	900	873	18	9
Garland	WB	Market		900	873	18	9
Rowan	EB	Haven	Market	160	155	3	2
Rowan	WB	Market	Haven	160	155	3	2
Rowan	EB		Haven	360	349	7	4
Rowan	WB	Haven		360	349	7	4

Source: WSDOT, 2018.

Exhibit C-3: Modeled Hourly Traffic Volumes for 2040 No Build Conditions

Roadway	Direction	From	To	Peak Hour	Autos	MT	HT
Market/Haven	SB	Columbia	Rowan	1116	1083	22	11
Market/Haven	SB	Rowan	Wellesley	1200	1164	24	12
Market/Haven	SB	Wellesley	Garland	1584	1536	32	16
Market/Haven	SB	Garland	Euclid	1476	1432	30	15
Market/Haven	SB	Euclid	Greene	1545	1499	31	15
Green	SB	Market	Mission	1835	1780	37	18
Green	NB	Mission	Market	2597	2519	52	26
Market	NB	Greene	Euclid	2186	2120	44	22
Market	NB	Euclid	Garland	2089	2026	42	21
Market	NB	Garland	Wellesley	1534	1488	31	15
Market	NB	Wellesley	Rowan	1003	973	20	10
Market	NB	Rowan	Columbia	932	904	19	9
Mission	EB		Greene	851	825	17	9
Mission	EB	Greene		1193	1157	24	12
Mission	WB		Greene	1184	1148	24	12
Mission	WB	Greene		845	819	17	8
Riverton	EB		Bridge	121	117	2	1
Riverton	EB	Bridge	Elima	241	234	5	2
Riverton	WB	Elima	Bridge	239	232	5	2
Riverton	WB	Bridge		120	116	2	1
Upriver	EB		Greene	389	377	8	4
Upriver	EB	Greene	Freya	469	455	9	5
Upriver	WB	Freya	Greene	466	452	9	5
Upriver	WB	Greene		386	374	8	4
Carlisle	EB	Upriver	Greene	174	169	3	2
Carlisle	EB	Greene	Ralph	154	149	3	2
Carlisle	WB	Ralph	Greene	153	148	3	2
Carlisle	WB	Greene	Upriver	173	168	3	2
Euclid	EB		Market	784	760	16	8
Euclid	EB	Market	Freya	737	715	15	7
Euclid	WB	Freya	Market	732	710	15	7
Euclid	WB	Market		778	755	16	8
Garland	EB		Market	603	585	12	6
Garland	WB	Market		599	581	12	6
Wellesley	EB		Haven	771	747	15	8
Wellesley	EB	Haven	Market	523	507	10	5
Wellesley	EB	Market	Freya	402	390	8	4
Wellesley	WB	Freya	Market	399	387	8	4
Wellesley	WB	Market	Haven	519	503	10	5
Wellesley	WB	Haven		765	742	15	8
Freya	NB	Wellesley		448	439	9	0
Freya	SB		Wellesley	456	447	9	0
Euclid	EB	Haven	Market	784	760	16	8
Euclid	EB	Market	Freya	737	715	15	7
Euclid	WB	Freya	Market	732	710	15	7
Euclid	WB	Market	Haven	778	755	16	8
Ralph	NB	Upriver	Euclid	184	180	4	0
Ralph	SB	Euclid	Upriver	31	31	1	0
Garland	EB		Market	1206	1170	24	12
Garland	WB	Market		1197	1161	24	12
Rowan	EB	Haven	Market	214	208	4	2
Rowan	WB	Market	Haven	213	206	4	2
Rowan	EB		Haven	482	468	10	5
Rowan	WB	Haven		479	464	10	5

Source: WSDOT, 2018.

Exhibit C-3: Modeled Hourly Traffic Volumes for 2040 Build Conditions

Roadway	Direction	From	To	Peak Hour	Autos	MT	HT
Roadway	Dir	From	To	Peak Hour	Cars	MT	HT
Market/Haven	SB	Columbia	Rowan	642	623	13	6
Market/Haven	SB	Rowan	Wellesley	707	686	14	7
Market/Haven	SB	Wellesley	Garland	677	657	14	7
Market/Haven	SB	Garland	Euclid	872	846	17	9
Market/Haven	SB	Euclid	Greene	1125	1091	23	11
Green	SB	Market	Upriver	914	887	18	9
Green	SB	Upriver	Jackson	1073	1041	21	11
Green	SB	Jackson	Market	1036	1005	21	10
Green	NB	Market	Upriver	1294	1255	26	13
Green	NB	Upriver	Jackson	1464	1420	29	15
Green	NB	Jackson	Market	1153	1118	23	12
Market	NB	Greene	Euclid	1057	1025	21	11
Market	NB	Euclid	Garland	1079	1047	22	11
Market	NB	Garland	Wellesley	985	955	20	10
Market	NB	Wellesley	Rowan	682	662	14	7
Market	NB	Rowan	Columbia	616	598	12	6
Mission	EB		Greene	1108	1075	22	11
Mission	EB	Greene		1066	1034	21	11
Mission	WB		Greene	1081	1049	22	11
Mission	WB	Greene		1040	1009	21	10
Riverton	EB		Bridge	111	108	2	1
Riverton	EB	Bridge	Elima	111	108	2	1
Riverton	WB	Elima	Bridge	4	4	0	0
Riverton	WB	Bridge		4	4	0	0
Upriver	EB		Greene	497	482	10	5
Upriver	EB	Greene	Freya	497	482	10	5
Upriver	WB	Freya	Greene	300	291	6	3
Upriver	WB	Greene		300	291	6	3
Carlisle	EB	Upriver	Greene	87	84	2	1
Carlisle	EB	Greene	Ralph	190	184	4	2
Carlisle	WB	Ralph	Greene	42	41	1	0
Carlisle	WB	Greene	Upriver	50	49	1	1
Euclid	EB		Market	723	701	14	7
Euclid	EB	Market	Freya	559	542	11	6
Euclid	WB	Freya	Market	513	498	10	5

Source: WSDOT, 2018.

Exhibit C-4: Modeled Hourly Traffic Volumes for 2040 Build Conditions (Continued)

Roadway	Direction	From	To	Peak Hour	Autos	MT	HT
Euclid	WB	Market		445	432	9	4
Garland	EB		Market	255	247	5	3
Garland	WB	Market		177	172	4	2
Wellesley	EB		Haven	912	885	18	9
Wellesley	EB	Haven	Market	1066	1034	21	11
Wellesley	EB	Market	395	1466	1422	29	15
Wellesley	EB	395	Freya	691	670	14	7
Wellesley	WB	Freya	395	586	568	12	6
Wellesley	WB	395	Market	1013	983	20	10
Wellesley	WB	Market	Haven	921	893	18	9
Wellesley	WB	Haven		797	773	16	8
Freya	NB	Wellesley		124	122	2	0
Freya	SB		Wellesley	147	144	3	0
Euclid	EB	Haven	Market	723	701	14	7
Euclid	EB	Market	Freya	559	542	11	6
Euclid	WB	Freya	Market	513	498	10	5
Euclid	WB	Market	Haven	445	432	9	4
Ralph	NB	Upriver	Jackson	86	84	2	0
Ralph	NB	Jackson	Euclid	253	248	5	0
Ralph	SB	Euclid	Jackson	93	91	2	0
Ralph	SB	Jackson	Upriver	37	36	1	0
Garland	EB		Market	255	247	5	3
Garland	WB	Market		177	172	4	2
Rowan	EB	Haven	Market	104	101	2	1
Rowan	WB	Market	Haven	7	7	0	0
Rowan	EB		Haven	165	160	3	2
Rowan	WB	Haven		122	118	2	1
SR395	NB	Market	Wellesley (	4071	3664	326	81
SR395	SB	Wellesley (	Market	3210	2889	257	64
Wellesley Off	NB			1095	1062	22	11
Wellesley On	SB			1242	1205	25	12
SR395	NB	Off	On	2975	2678	238	60
SR395	SB	Off	On	1968	1771	157	39
Wellesley On	NB			501	486	10	5
Wellesley Off	SB			319	309	6	3
SR395	NB	On	End	3476	3128	278	70
SR395	SB	End	Off	2287	2058	183	46

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)[7]	Average Users at Site	Average Number of People Per Household[8]	Dwelling Units Residential Equivalency[9]
M1	Wild Horse Park	(10/24)*(7/7)*(5/12) = 0.17	10[10]	2.53	1
M9	Hillyard Museum Park	(10/24)*(7/7)*(5/12) = 0.17	5[11]	2.53	1
M16	Centennial Trail	(16/24)*(7/7)*(12/12) = 0.67	3[12]	2.53	1

Source: WSP USA, 2018

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

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 NB1

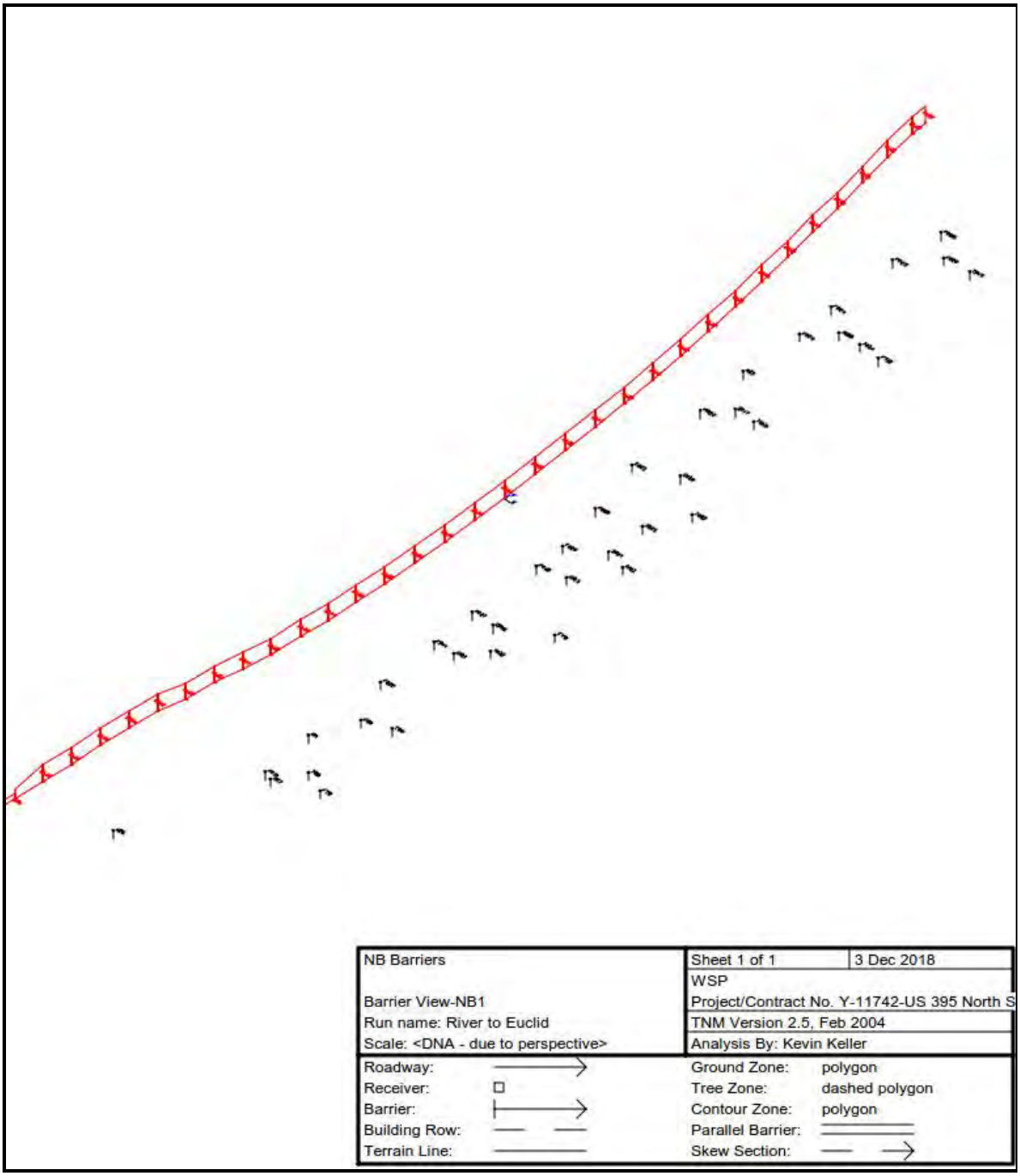


Exhibit E-2: TNM Noise Barrier Graphic—Noise Barrier NB2

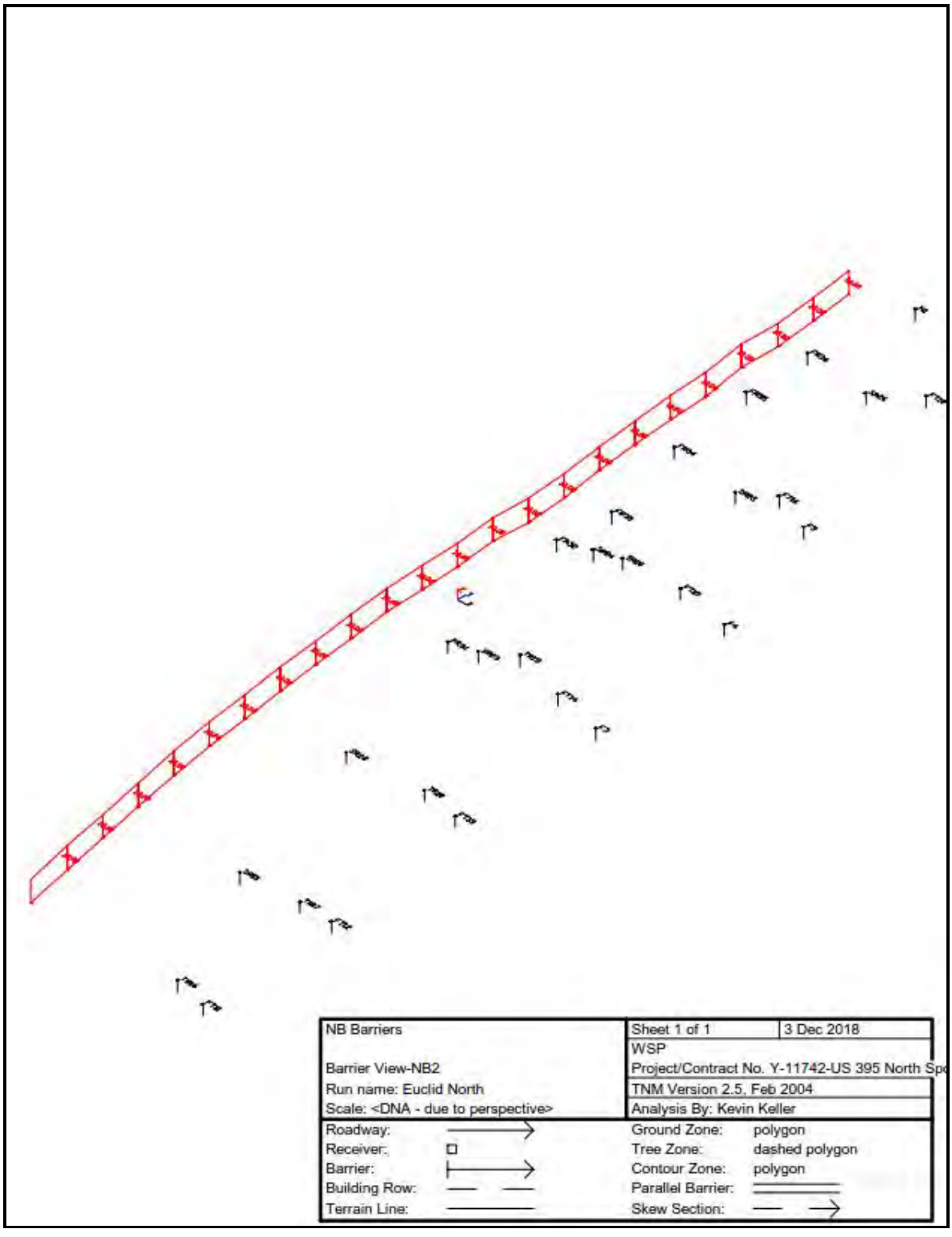
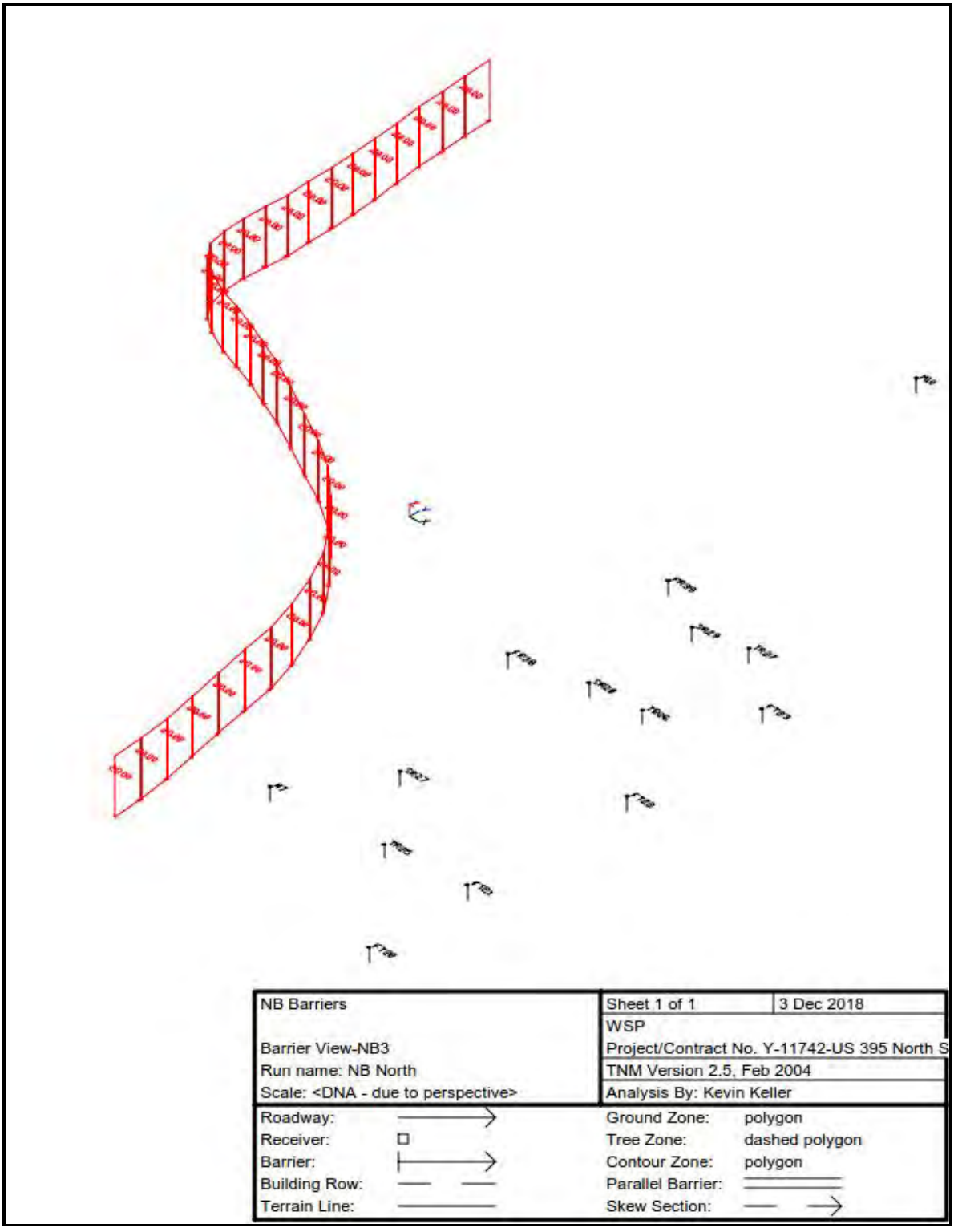


Exhibit E-3: TNM Noise Barrier Graphic—Noise Barrier NB3



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APPENDIX F—TNM Data

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

Validation Models:

- US395_Existing_Val_Site1
- US395_Existing_Val_Site2
- US395_Existing_Val_Site3
- US395_Existing_Val_Site4
- US395_Existing_Val_Site5
- US395_Existing_Val_Site6
- US395_Existing_Val_Site7
- US395_Existing_Val_Site8
- US395_Existing_Val_Site9
- US395_Existing_Val_Site10
- US395_Existing_Val_Site11
- US395_Existing_Val_Site12
- US395_Existing_Val_Site13
- US395_Existing_Val_Site14
- US395_Existing_Val_Site15
- US395_Existing_Val_Site16
- US395_Existing_Val_Site17
- US395_Existing_Val_Site18

Existing Conditions Model:

- US395_Existing

No Build Model:

- US395_NoBuild

Build Models:

- US395_Build Alt
- US395_NB Barriers_NB South_River to Euclid (Noise Barrier NB1)
- US395_NB Barriers_NB North (Noise Barriers NB2 and NB3)
- US395_SB Barriers (Noise Barriers SB1, SB2, SB3, SB4, SB5, and SB6)

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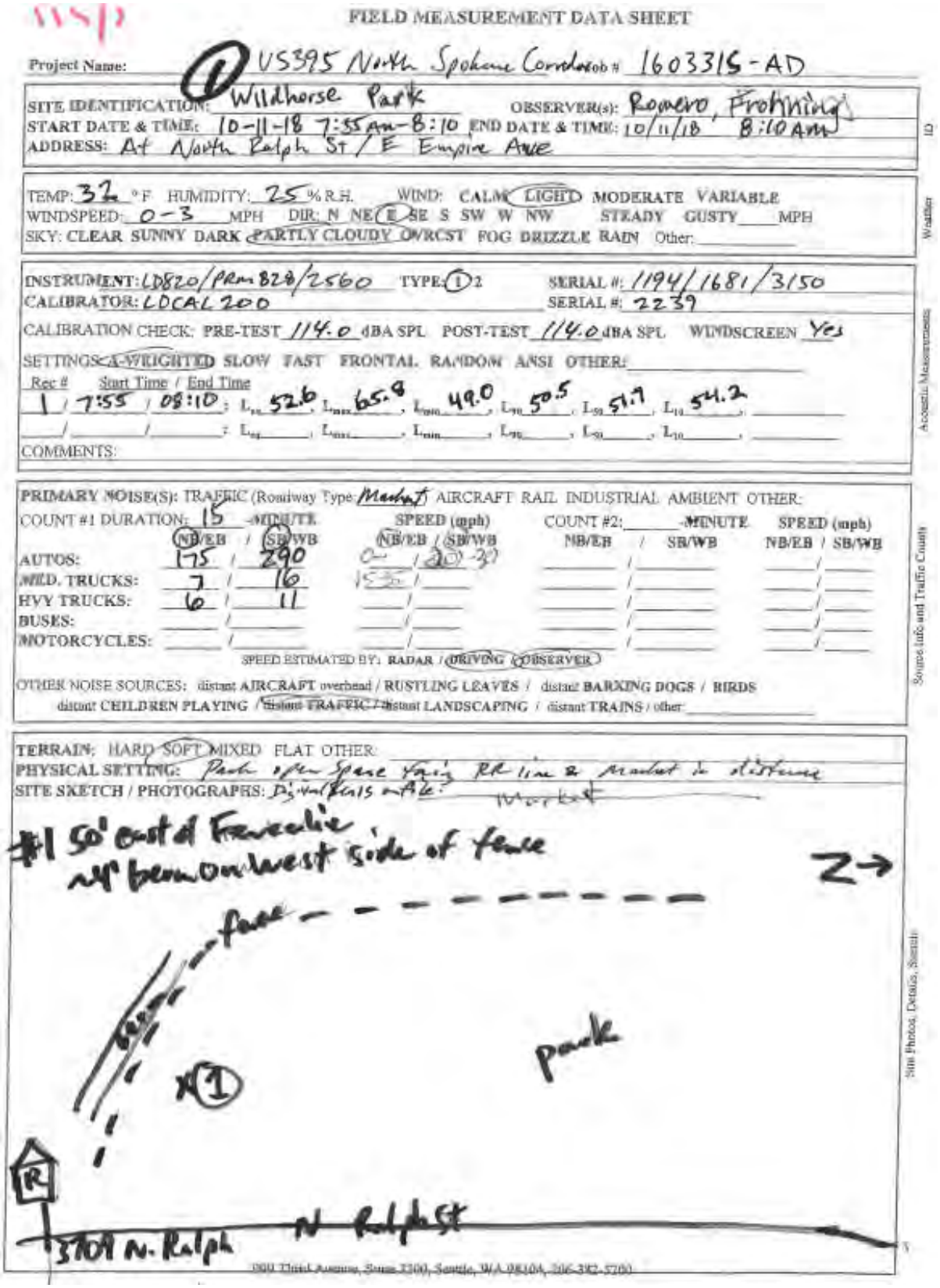
APPENDIX G—Field Data Sheets

Appendix G contains data sheets from the field that describe the locations where noise measurements were taken on October 11 and 12, 2018.

Exhibit G-1: 15-Minute Validation Measurement Site 1—Wildhorse Park—Field Data Sheet



FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160331S-AD

SITE IDENTIFICATION: Wildhorse Park OBSERVER(s): Romero, Frohming

START DATE & TIME: 10-11-18 7:55 am - 8:10 END DATE & TIME: 10/11/18 8:10 AM

ADDRESS: At North Ralph St / E Empire Ave

TEMP: 32 °F HUMIDITY: 25 % 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/PRM 828/2560 TYPE: 1 2 SERIAL #: 1194/1681/3150

CALIBRATOR: LOCAL 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	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	
1	7:55	08:10	52.6	65.8	49.0	50.5	51.7	54.2	

COMMENTS:

PRIMARY NOISE(S): TRAFFIC (Roadway Type: Market) AIRCRAFT RAIL INDUSTRIAL AMBIENT 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:	175	290	30	30-35				
MED. TRUCKS:	7	16	35					
HVY TRUCKS:	6	11						
BUSES:								
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: Park open space facing RR line & Market in distance

SITE SKETCH / PHOTOGRAPHS: Digital Photo #'s: ____

Exhibit G-2: 15-Minute Validation Measurement Site 2—3221 E Bridgeport Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 1603315-AD

SITE IDENTIFICATION: 2
START DATE & TIME: 10/11/18 9:00 Am
ADDRESS: 3221 E Bridgeport
OBSERVER(s): Romero, Krohning
END DATE & TIME: 10/11/18 09:15

TEMP: 38 °F HUMIDITY: 30 % 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: _____

INSTRUMENT: LD820/PRM828/2560 TYPE: (1) 2 SERIAL #: 1194/1681/3150
CALIBRATOR: CAL LD200 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_{50}	L_{90}	L_{10}	
2	9:00	9:15	53.3	66.6	48.0	49.6	51.7	54.7	

COMMENTS: primary noise source Maubert Ave.

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

	COUNT #1 DURATION: 15 MINUTE		SPEED (mph)		COUNT #2: ____ MINUTE		SPEED (mph)	
	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS:	154	165	30	10-30				
MED. TRUCKS:	11	3						
HVY TRUCKS:	11	9						
BUSES:								
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: Adj to Residence
PHYSICAL SETTING: Frontage along Bridgeport
SITE SKETCH / PHOTOGRAPHS: Ty.tel & GIS Coordinates on file.

3 distant planes, 1 power
2 distant trains
distant side street traffic

1809 Third Avenue, Suite 2200, Seattle, WA 98101 206.382.5700

Exhibit G-3: 15-Minute Validation Measurement Site 3—3221 E Indiana Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 3 OBSERVER(s): Romano Frohnmayer
START DATE & TIME: 10-11-18 09:41-0 END DATE & TIME: 10/11/18 09:56
ADDRESS: 3123 Indiana

TEMP: 42 °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: _____

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	09:41 / 09:56	L_{eq} 68.5	L_{max} 76.4	L_{min} 51.3	L_{90} 61.8	L_{50} 67.8	L_{10} 71.3	
___	___ / ___	L_{eq} ___	L_{max} ___	L_{min} ___	L_{90} ___	L_{50} ___	L_{10} ___	

COMMENTS:

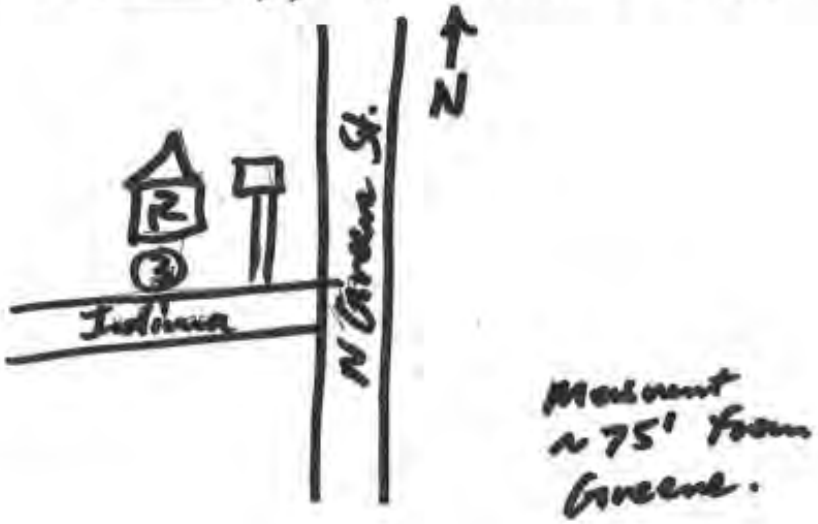
PRIMARY NOISE(S): TRAFFIC (Roadway Type: Market/Greene) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 15 MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: ___ MINUTE NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	236	247	30 29	20 40				
MED. TRUCKS:	25	7		avg 35				
HVY TRUCKS:	7	14						
BUSES:								
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: Residential Sidewalk
SITE SKETCH / (PHOTOGRAPHS): Digital w/ GIS Coordinates on file.



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

Exhibit G-4: 15-Minute Validation Measurement Site 4—3303 E Carlisle Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job #: 160331S-AD

SITE IDENTIFICATION: 4
START DATE & TIME: 10-11-18 10:21 END DATE & TIME: 10/11/18 10:38
ADDRESS: 3303 ~~Ralph~~ E. Carlisle
OBSERVER(s): Romero Frohning

TEMP: 45 °F HUMIDITY: 40 % 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: ____

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								
4	10:21	10:38	L_{eq} 57.5	L_{max} 63.5	L_{min} 51.3	L_{01} 54.5	L_{50} 57.0	L_{10} 59.8		
			L_{eq}	L_{max}	L_{min}	L_{01}	L_{50}	L_{10}		

COMMENTS:

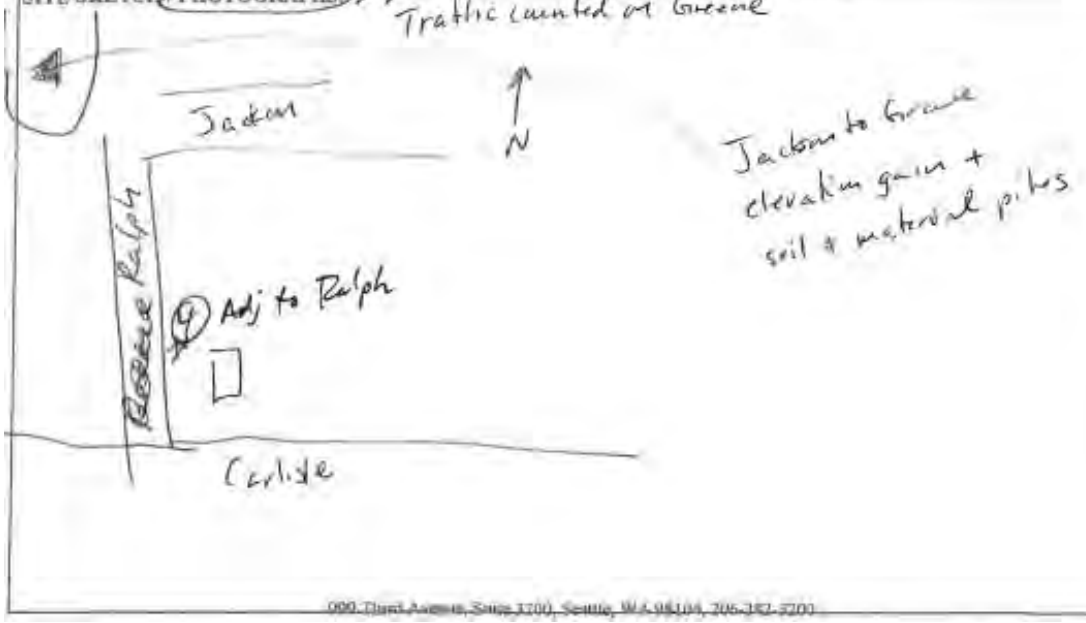
PRIMARY NOISE(S): TRAFFIC (Roadway Type: Greene) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: ____ -MINUTE NB/EB	COUNT #2: ____ -MINUTE SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	261	243	30-40	30-40				
MED. TRUCKS:	18	3	avg 40	avg 40				
HVY TRUCKS:	2	12						
BUSES:								
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:
SITE SKETCH / PHOTOGRAPHS: Digital w/ GIS Coordinates on file



999 Third Avenue, Suite 3700, Seattle, WA 98104, 206-382-5200

Exhibit G-5: 15-Minute Validation Measurement Site 5—3117 E Marietta Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor (Cedar Green) Job #: 160331S-AD

SITE IDENTIFICATION: 5 Apartments OBSERVER(s): Romero Frohning

START DATE & TIME: 10-11-18 10:54 END DATE & TIME: 11:09 10/11/18

ADDRESS: 3117 E. Marietta Ave (Cedar Green Apts.)

TEMP: 49 °F HUMIDITY: 30 % 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: ____

INSTRUMENT: LD820/PRM820/2560 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 Y

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

Rec #	Start Time	End Time	L_{eq}	L_{max}	L_{min}	L_{01}	L_{50}	L_{10}	
5	10:54	11:09	56.7	64.7	45.4	51.1	56.0	59.2	

COMMENTS:

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

COUNT #1 DURATION: 15 MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: ____ MINUTE NB/EB	COUNT #2: ____ MINUTE SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	259	213	30-35	30-40				
MED. TRUCKS:	7	20	↓	↓				
HVY TRUCKS:	5	11						
BUSES:	0	0	uphill	downhill				
MOTORCYCLES:	0	0						

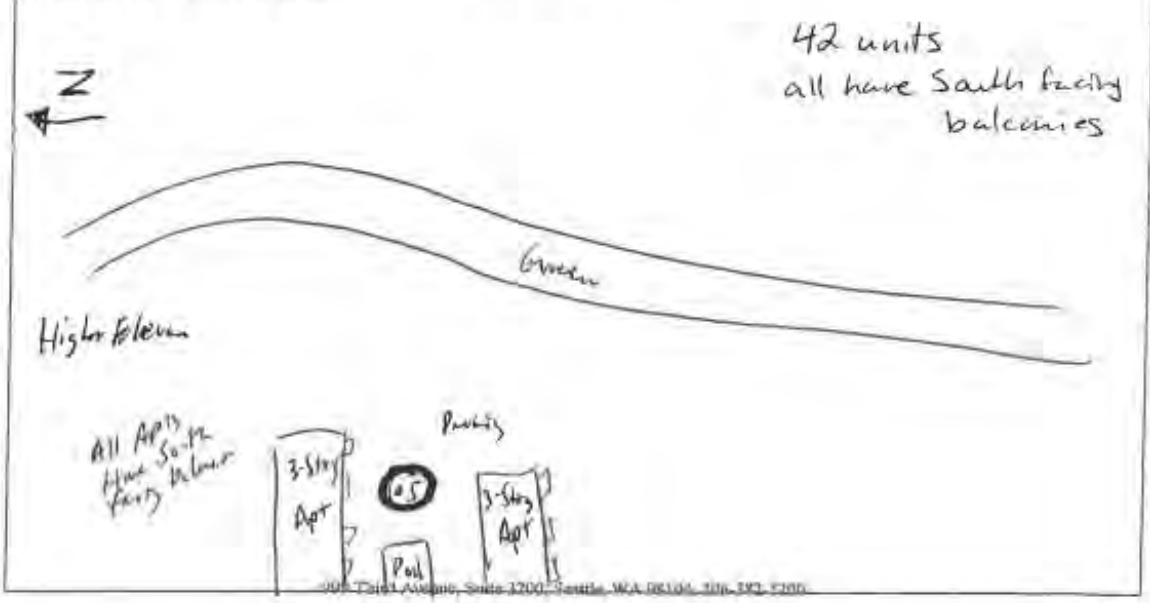
SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

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: Low Canopy at Cedar Green Apts

SITE SKETCH / PHOTOGRAPHS:



Weather

Acoustic Measurements

Source Info and Traffic Counts

Site Photos, Details, Sketch

Exhibit G-6: 15-Minute Validation Measurement Site 6—3124 E Fairview Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 6 OBSERVER(s): Romero, Frahmann
START DATE & TIME: 10-11-18 11:30 END DATE & TIME: 10-11-18 11:45
ADDRESS: 3124 Fairview Ave.

Weather

TEMP: 51 °F HUMIDITY: 20 % 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 ___
SETTINGS: (A-WEIGHTED) SLOW FAST FRONTAL RANDOM ANSI OTHER:

Rec #	Start Time	End Time								
(6)	11:30	11:45	L_{eq} 59.8	L_{max} 72.5	L_{min} 46.1	L_{01} 53.7	L_{50} 58.3	L_{10} 62.3		
			L_{eq}	L_{max}	L_{min}	L_{01}	L_{50}	L_{10}		

COMMENTS:

Source Info and Traffic Counts

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

COUNT #1 DURATION: 15 -MINUTE	SPEED (mph)		COUNT #2: ___ -MINUTE	SPEED (mph)	
	(NB/EB) / SB/WB	(NB/EB) / SB/WB	NB/EB / SB/WB	NB/EB / SB/WB	
AUTOS:	235 / 247	30-35 / 35-40	___ / ___	___ / ___	
MED. TRUCKS:	7 / 16	30-35 / 35-40	___ / ___	___ / ___	
HVY TRUCKS:	7 / 17	10-25 / 35-40	___ / ___	___ / ___	
BUSES:	___ / ___	___ / ___	___ / ___	___ / ___	
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:
PHYSICAL SETTING: Frontage to home 3124 Fairview
SITE SKETCH / PHOTOGRAPHS:

Exhibit G-7: 15-Minute Validation Measurement Site 7—3503 E Broad Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job #: 160331S-AD

SITE IDENTIFICATION: 7 OBSERVER(s): Romero Frohning
START DATE & TIME: 10-11-18 12:30 END DATE & TIME: 10-11-18 12:45
ADDRESS: E Broad St

Weather

TEMP: 57 °F HUMIDITY: 20 % 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 #: 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	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	
7	12:30	12:45	49.5	60.5	42.2	45.2	48.0	52.5	

COMMENTS:

Source Info and Traffic Counts

PRIMARY NOISE(S): TRAFFIC (Roadway Type: local road) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

	COUNT #1 DURATION: 15 MINUTE NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB	COUNT #2: 15 MINUTE NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB
AUTOS:	56 / 42	25+35 mph	139 / 20-25	/
MED. TRUCKS:	1 /	/	6 / mph	/
HVY TRUCKS:	/	/	/	/
BUSES:	/	/	/	/
MOTORCYCLES:	Wellesley	/	NFreya - both directions	/

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: Residences distant from Market
SITE SKETCH / (PHOTOGRAPHS): Digital w/ GPS Coordinates on file.

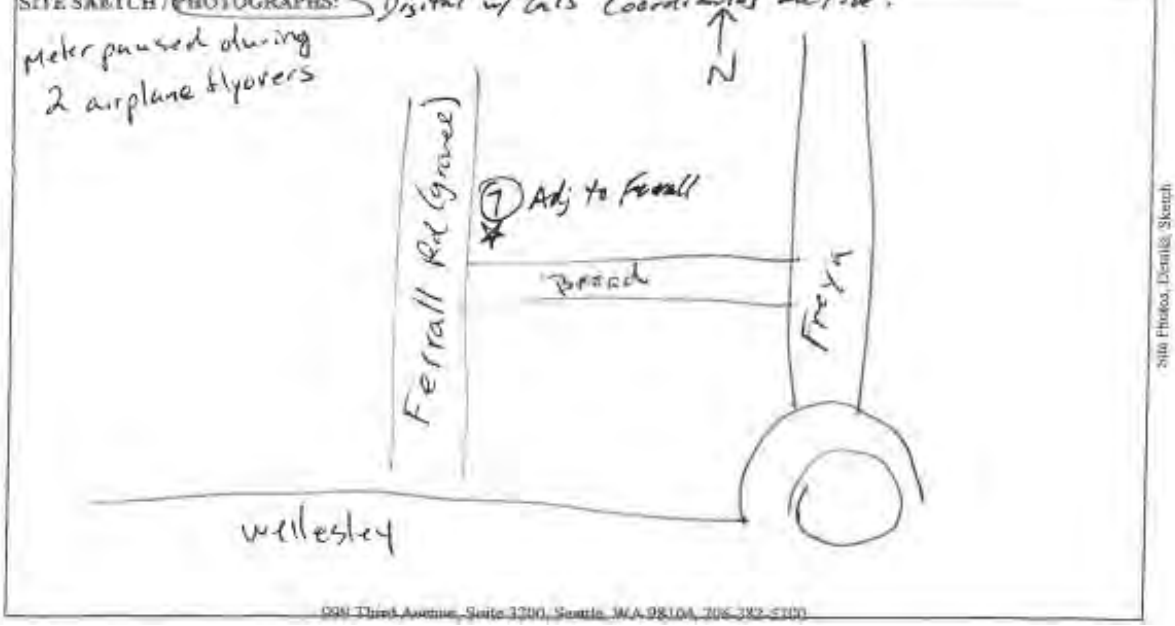


Exhibit G-8: 15-Minute Validation Measurement Site 8—N Market St./E Garland Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job #: 160315-AD

SITE IDENTIFICATION: (8) OBSERVER(s): Romero Frahmann
START DATE & TIME: 10-11-18 2:40 END DATE & TIME: 10-11-18 2:55 pm
ADDRESS: Market & Garland

TEMP: 60 °F HUMIDITY: ____% R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 2-6.6 max 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							
8	2:40 pm	2:55 pm	L_{eq} 67.0	L_{max} 76.3	L_{min} 54.9	L_{50} 60.1	L_{90} 66.0	L_{10} 70.0	
____	____	____	L_{eq} ____	L_{max} ____	L_{min} ____	L_{50} ____	L_{90} ____	L_{10} ____	

COMMENTS:

Acoustic Measurement

PRIMARY NOISE(S): TRAFFIC (Roadway Type: Market) AIRCRAFT RAIL INDUSTRIAL AMBIENT 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:	281	278	30-40 30-40	____	____	____ / ____
MED. TRUCKS:	14	9	____ / ____	____	____	____ / ____
HVY TRUCKS:	8	4	____ / ____	____	____	____ / ____
BUSES:	____	____	____ / ____	____	____	____ / ____
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:
SITE SKETCH / PHOTOGRAPHS:

Site Photos, Details, Sketch

Exhibit G-9: 15-Minute Validation Measurement Site 9—Hillyard Museum Park—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 9 Hillyard Museum Park OBSERVER(s): Romero Fahning
START DATE & TIME: 10-11-18 3:18 pm END DATE & TIME: 10-11-18 3:33
ADDRESS: Market / E. Queen Ave.

TEMP: 60 °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: _____

INSTRUMENT: LD820/PRM820/2560 TYPE: (1) 2 SERIAL #: 194 1681, 3150
CALIBRATOR: LDCAL200 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ___
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}	
9	3:18	3:33	61.1	72.9	42.9	48.0	57.8	65.0	
___	___	___	___	___	___	___	___	___	___

COMMENTS:

PRIMARY NOISE(S): TRAFFIC (Roadway Type: Market) AIRCRAFT RAIL INDUSTRIAL AMBIENT 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:	104 / ___	25-35 / ___	___ / ___	___ / ___
MED. TRUCKS:	11 / ___	25-35 / ___	___ / ___	___ / ___
HVY TRUCKS:	10 / ___	25-30 / ___	___ / ___	___ / ___
BUSES:	___ / ___	___ / ___	___ / ___	___ / ___
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: Open Space new "main street" (Market)
PHYSICAL SETTING: Central section of Hillyard outdoor Park
SITE SKETCH & (PHOTOGRAPHS): Digital on file w/ GIS coordinates.

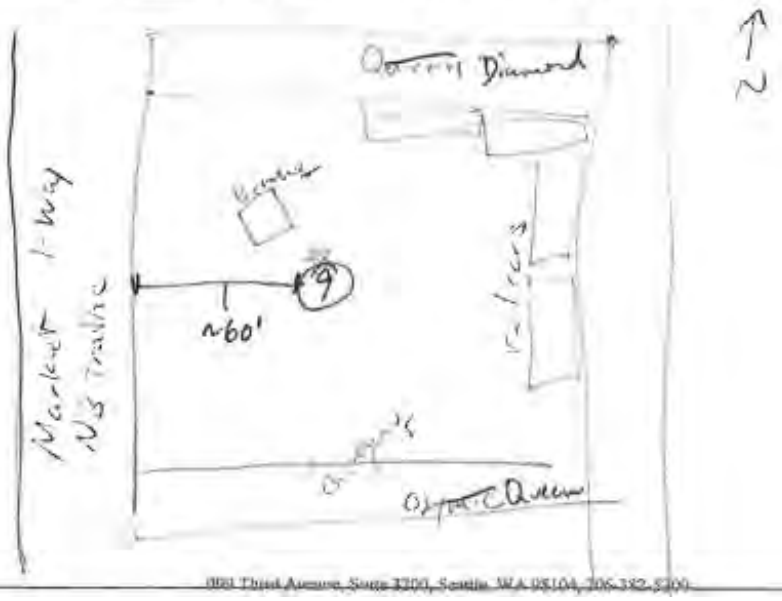


Exhibit G-10: 15-Minute Validation Measurement Site 10—N Ferrall St./E Crown Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US 395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 10 OBSERVER(s): Romero, Frohning
START DATE & TIME: 10/11/18 3:45 END DATE & TIME: 10/11/18 4:00
ADDRESS: Vacant lot at Ferrall St/E Crown

ID

TEMP: 60 °F HUMIDITY: 20 % R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 1 - 8 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								
10	3:45	4:00	L_{eq} 52.1	L_{max} 59.0	L_{min} 44.6	L_{90} 47.1	L_{50} 51.6	L_{10} 55.7		
___	___	___	L_{eq} ___	L_{max} ___	L_{min} ___	L_{90} ___	L_{50} ___	L_{10} ___		

COMMENTS:

Acoustic Measurements

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

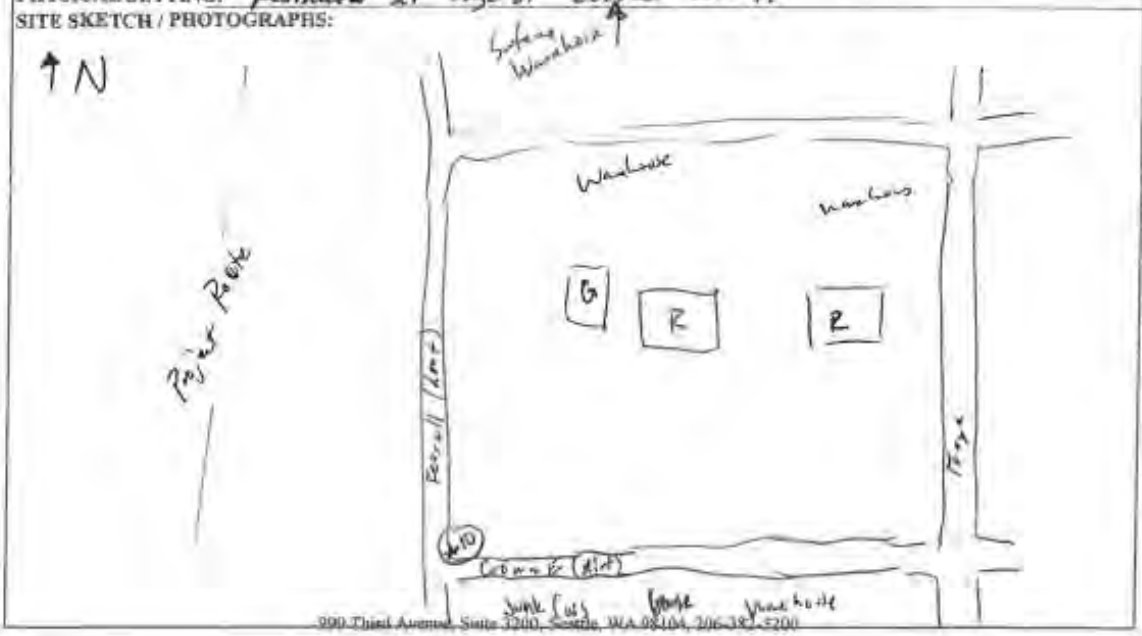
COUNT #1 DURATION: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: ___ -MINUTE NB/EB	COUNT #2: ___ -MINUTE SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	131	131	25-30	25-30				
MED. TRUCKS:	3	3	↓	↓				
HVY TRUCKS:	0	0						
BUSES:	0	0						
MOTORCYCLES:	0	0						

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: Dirt & Paved Roads in area.
PHYSICAL SETTING: Residence at edge of current dev't.
SITE SKETCH / PHOTOGRAPHS:



Site Photos/ Details /Sketch

Exhibit G-11: 15-Minute Validation Measurement Site 11—3218 E Courtland Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160331S-AD

SITE IDENTIFICATION: 11 OBSERVER(s): Rondeno, Frohnin

START DATE & TIME: 10-11-18 4:30 END DATE & TIME: 10-11-18 4:45

ADDRESS: 3218 Courtland (Adj to Residence)

TEMP: 60 °F HUMIDITY: 20 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE

WINDSPEED: 2-5 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____MPH

SKY: CLEAR SUNNY DARK (PARTLY CLOUDY) OVRCST FOG DRIZZLE RAIN Other: ____

Weather

INSTRUMENT: LD820/PAMB28/2560 TYPE: (1) 2 SERIAL #: 1194 168 / 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							
11	4:30 / 4:40	L_{eq} 55.8	L_{max} 71.1	L_{min} 47.8	L_{90} 51.8	L_{50} 54.4	L_{10} 57.5	
___	___ / ___	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	

COMMENTS: Could be 1.5 dBA low w/o dogs/kids in distance

Acoustic Measurements

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

COUNT #1 DURATION: 10 -MINUTE	NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB	COUNT #2: 15 -MINUTE NB/EB / SB/WB	SPEED (mph) NB/EB / SB/WB
AUTOS:	284 / 214	30-40 / 30-40	424 / 320	30-40 / 30-40
MED. TRUCKS:	5 / 4	___ / ___	7 / 6	___ / ___
HVY TRUCKS:	1 / 3	___ / ___	2 / 4	___ / ___
BUSES:	___ / ___	___ / ___	___ / ___	___ / ___
MOTORCYCLES:	___ / ___	___ / ___	___ / ___	___ / ___

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

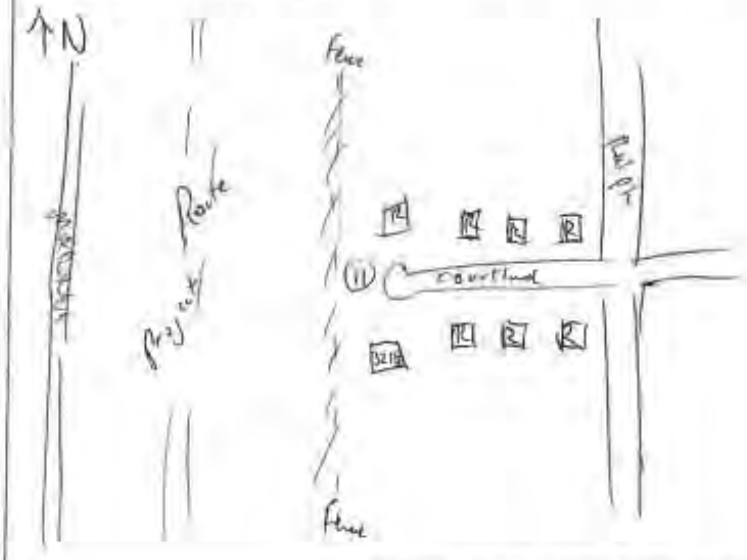
OTHER NOISE SOURCES: distant AIRCRAFT overhead / RUSTLING LEAVES / distant BARKING DOGS / BIRDS distant CHILDREN PLAYING / distant TRAFFIC / distant LANDSCAPING / distant TRAINS / other: ____

Source Info and Traffic Counts

TERRAIN: HARD SOFT (MIXED) FLAT OTHER: ____

PHYSICAL SETTING: End of Cul-de-Sac facing Project Rte & Market in distance

SITE SKETCH / PHOTOGRAPHS:



Site Photos, Details, Sketch

999 Third Avenue, Suite 1700, Seattle, WA 98104, 206-382-5210

Exhibit G-12: 15-Minute Validation Measurement Site 12—2924 E Wellesley Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: (12) OBSERVER(s): Romero, Frohning
START DATE & TIME: 10/12/18 8:45-9:00 END DATE & TIME: 10/12/18 9:00
ADDRESS: Adj to Community Bldg @ 2924 E. Wellesley Ave.

TEMP: 45 °F HUMIDITY: 30 % 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, 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								
12	8:45	9:00	L_{eq} 72.1	L_{max} 92.3	L_{min} 57.5	L_{90} 63.5	L_{50} 68.4	L_{10} 74.1		
___	___	___	L_{eq} ___	L_{max} ___	L_{min} ___	L_{90} ___	L_{50} ___	L_{10} ___		

COMMENTS:

Acoustic Measurements

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

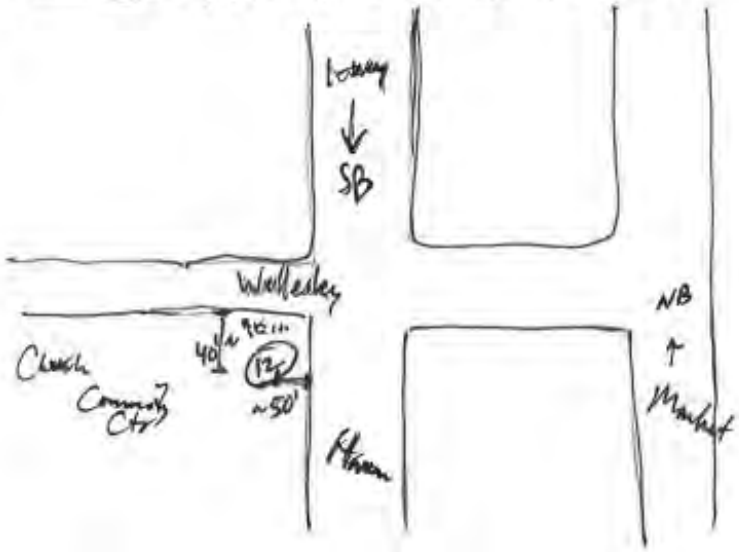
COUNT #1 DURATION: 15 -MINUTE	SPEED (mph)		COUNT #2: Haven 15 -MINUTE	SPEED (mph)	
	NB/EB / SB/WB	NB/EB / SB/WB	NB/EB / SB/WB	NB/EB / SB/WB	
AUTOS:	54 / 69	15-20 / 20-30	___ / 183	___ / 25-30	
MED. TRUCKS:	6 / 5	↓ / ↓	___ / 7	___ / ↓	
HVY TRUCKS:	0 / 1	↓ / ___	___ / 14	___ / 25-30	
BUSES:	___ / ___	___ / ___	___ / ___	___ / ___	
MOTORCYCLES:	___ / ___	recent/none	___ / none	___ / none/recent	

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 Lists and Traffic Counts

TERRAIN: HARD SOFT (MIXED) FLAT OTHER: ___
PHYSICAL SETTING: Paved area near bus stop @ Wellesley / Haven
SITE SKETCH / PHOTOGRAPHS: Digital w/ GPS coordinates on file.



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Site Photos, Details, Sketch

Exhibit G-13: 15-Minute Validation Measurement Site 13—3018 E Hoffman Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 1603315-AD

SITE IDENTIFICATION: 13 OBSERVER(s): Romero, Fahning
START DATE & TIME: 10-12-18 9:15 - 9:30 END DATE & TIME: 10-12-18 9:30
ADDRESS: Apts at Hoffman West of Market

TEMP: 46 °F HUMIDITY: 20 % 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	L_{eq}	L_{max}	L_{min}	L_{50}	L_{90}	L_{10}	
13	9:15	9:30	58.9	66.1	49.7	57.7	57.6	62.2	

COMMENTS:

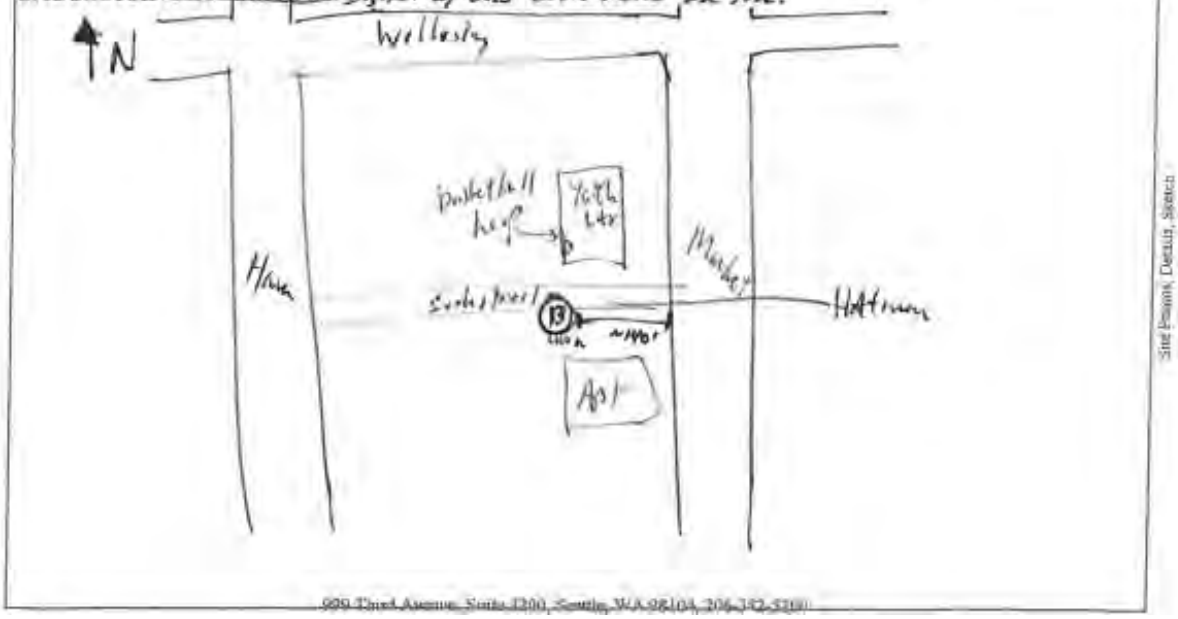
PRIMARY NOISE(S): TRAFFIC (Roadway Type: Hoffman & Market) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1: 10 MINUTE (MARKET)	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: 15 MINUTE (Market / Haven) NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	101	110	15-35	36-40	151	165	15-35	36-40
MED. TRUCKS:	6	6	↓	↓	9	10	↓	↓
HVY TRUCKS:	4	4	↓	↓	6	5	↓	↓
BUSES:			Avg 30	Avg 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:

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHYSICAL SETTING: Frontage / Sidewalk north of Apts @ Hoffman / Market.
SITE SKETCH / PHOTOGRAPHS: Digital w/ GPS coordinates on file.



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

Exhibit G-14: 15-Minute Validation Measurement Site 14—3018 E Bridgeport Ave.—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: (14) OBSERVER(s): Romero, Frohning
START DATE & TIME: 10:00 10/12/18 END DATE & TIME: 10/12/18 10:15
ADDRESS: Res @ 3018 Bridgeport

Weather

TEMP: 55 °F HUMIDITY: 20 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 2-6 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 #: 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_{01}	L_{50}	L_{10}	
14	10:00	10:15	63.6	73.6	52.5	56.4	62.4	68.5	

COMMENTS:

Source Info and Traffic Counts

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

COUNT #1 DURATION: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: ____ -MINUTE NB/EB	COUNT #2: ____ -MINUTE SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	125	183	30-35	30-40				
MED. TRUCKS:	4	11	5	6				
HVY TRUCKS:	7	9						
BUSES:				Avg 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: ____
PHYSICAL SETTING: Sidewalk outside Res @ 3018 Bridgeport
SITE SKETCH (PHOTOGRAPHS) Pictures taken w/ Field GIS coordinates.

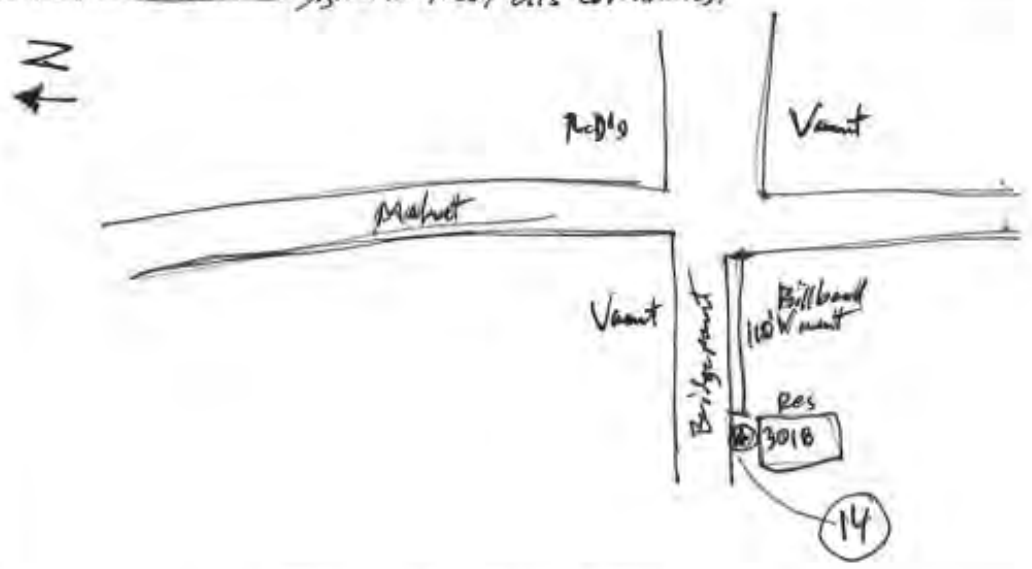

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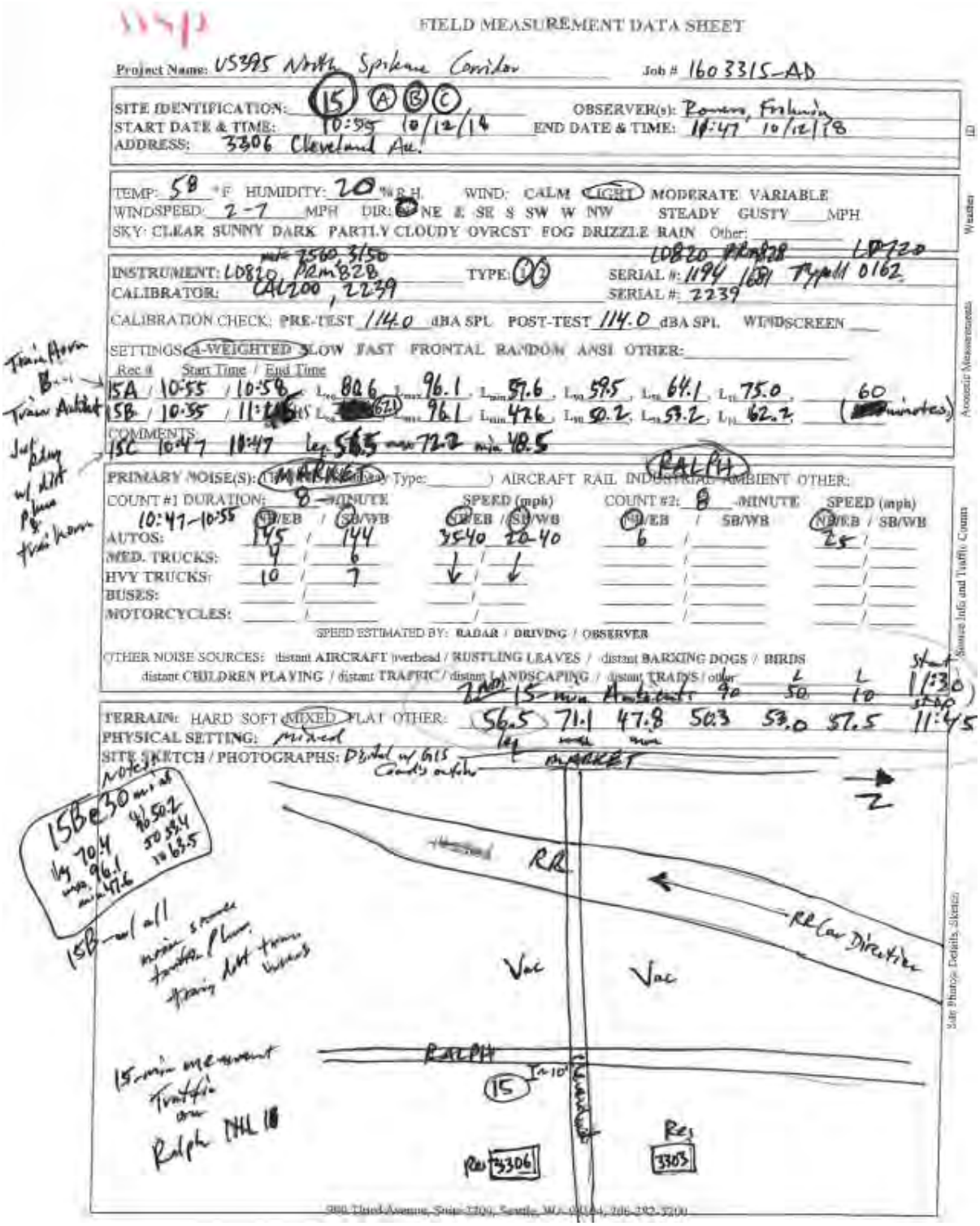
Exhibit G-15: 15-Minute Validation Measurement Site 15—3306 E Cleveland Ave.—Field Data Sheet



FIELD MEASUREMENT DATA SHEET

Project Name: US 395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 15 (A) (B) (C) OBSERVER(s): Romero, Frishwin
START DATE & TIME: 10:55 10/12/18 END DATE & TIME: 11:47 10/12/18
ADDRESS: 3306 Cleveland Ave.

TEMP: 58 °F HUMIDITY: 20 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-7 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, PCB828 TYPE: 2 SERIAL #: 1194 1681 Type II 0162
CALIBRATOR: CAL200, 2239 SERIAL #: 2239
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

Rec #	Start Time	End Time							
15A	10:55	10:58	L_{eq} 80.6	L_{max} 96.1	L_{min} 57.6	L_{90} 59.5	L_{50} 64.1	L_{10} 75.0	60 minutes
15B	10:55	11:46	L_{eq} [illegible]	L_{max} 96.1	L_{min} 47.6	L_{90} 50.2	L_{50} 53.2	L_{10} 62.2	

COMMENTS: 15C 10:47 10:47 leq 56.5 max 72.2 min 48.5

PRIMARY NOISE(S): (MARKET) Roadway Type: ( ) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: (RALPH)

COUNT #1 DURATION: 8 MINUTE	SPEED (mph)		COUNT #2: 8 MINUTE	SPEED (mph)	
10:47-10:55	NB/EB / SB/WB		NB/EB / SB/WB		NB/EB / SB/WB
AUTOS:	145 / 144	35-40 / 20-40	6 /		25 /
MED. TRUCKS:	4 / 6	↓ / ↓	/		/
HVY TRUCKS:	10 / 7		/		/
BUSES:	/		/		/
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

15-min Ambients	90	50	10	L	L	Start 11:30 stop 11:45
TERRAIN: HARD SOFT (MIXED) FLAT OTHER:	56.5 leq	71.1 max	47.8 min	50.3	53.0	57.5

PHYSICAL SETTING: mixed
SITE SKETCH / PHOTOGRAPHS: Digital w/ GIS Condo's onsite

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

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job #: 160331S-AD

SITE IDENTIFICATION: 16 OBSERVER(s): Romero, Krahning
START DATE & TIME: 10/12/18 12:05 END DATE & TIME: 10/12/18 12:20
ADDRESS: Centennial Trail (east of Greene)

TEMP: 60 °F HUMIDITY: 20 % R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-7 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 #: 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	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	
16	12:05	12:15	63.1	70.9	50.7	56.1	61.4	66.5	

COMMENTS:

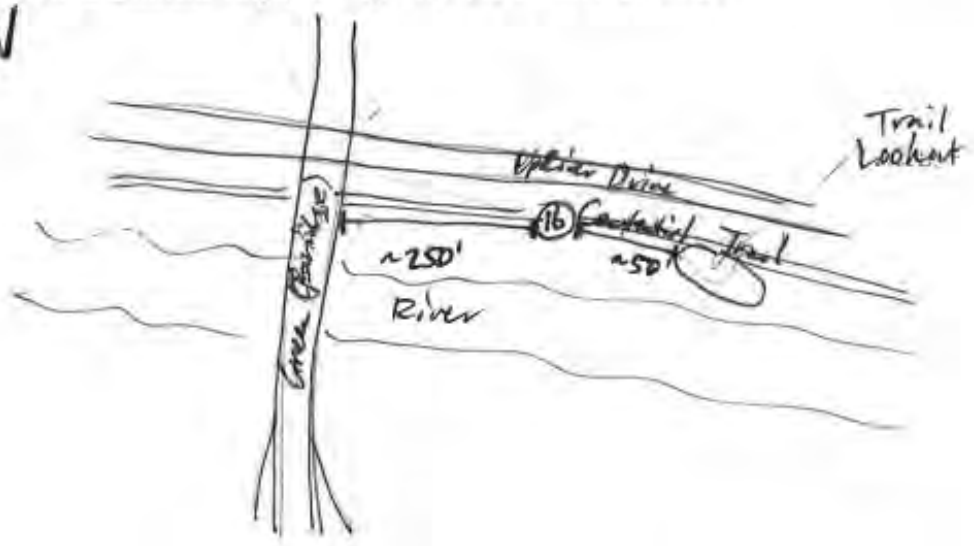
PRIMARY NOISE(S): TRAFFIC (Roadway Type: Uptiver Drive) AIRCRAFT RAIL INDUSTRIAL CONSTRUCTION OTHER:

COUNT #1 DURATION: 15 -MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SB/WB	COUNT #2: 15 -MINUTE NB/EB	SB/WB	SPEED (mph) NB/EB	SB/WB
AUTOS:	306	309	25-40	25-40	30	38	25-30	25-30
MED. TRUCKS:	6	6	↓	↓	0	0	↓	↓
HVY TRUCKS:	12	7	↓	↓	↓	↓	↓	↓
BUSES:			Avg 35	Avg 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: ___

TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHYSICAL SETTING: Paved trail between Uptiver Drive & River
SITE SKETCH / PHOTOGRAPHS: Digital w/ GIS coordinates on file.



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

Exhibit G-17: 15-Minute Validation Measurement Site 17—3126 E Jackson Ave.—Field Data Sheet

WSP

FIELD MEASUREMENT DATA SHEET

Project Name: US 395 North Spokane Corridor Job # 160315-AD

SITE IDENTIFICATION: 17 OBSERVER(s): Romero, Fishman
START DATE & TIME: 10/12/18 12:40 END DATE & TIME: 10-12-18 12:55
ADDRESS: 2nd Row Apts Jackson / Greene

TEMP: 61 °F HUMIDITY: 20 % R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other:

INSTRUMENT: LD820, PRM828, 2560 TYPE: 1 2 SERIAL #: 1194, 1681, 3150
CALIBRATOR: LOCAL200 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_{50}	L_{90}	L_{10}	
17	12:40	12:55	65.9	78.5	48.6	59.9	64.9	68.5	
/	/	/							

COMMENTS:

PRIMARY NOISE(S): TRAFFIC (Roadway Type: Arterial) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: Greene

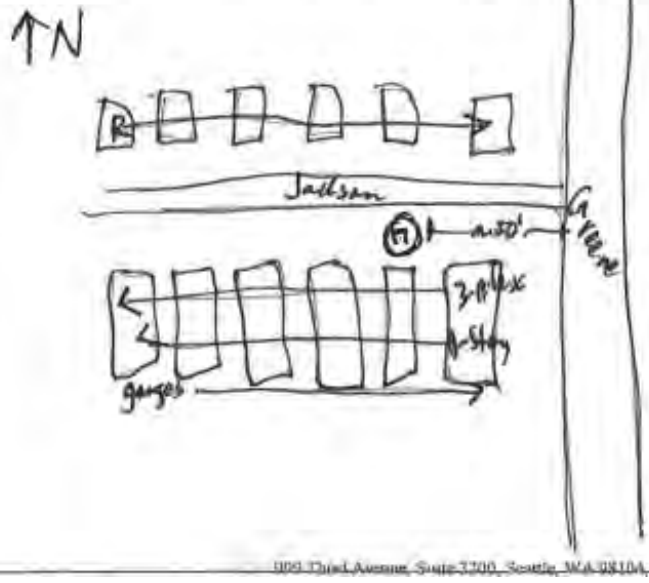
COUNT #1 DURATION: 10 -MINUTE COUNT #2: 15 -MINUTE

	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	191	195	30-35	35-45/50	281	285	30-35	35-50 mostly 45
MED. TRUCKS:	7	13	↓	↓	11	19	↓	↓
HVY TRUCKS:	7	9	↓	↓	10	14	↓	↓
BUSES:								
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: Sidewalk at north of multi-family units 50' from Greene
SITE SKETCH / PHOTOGRAPHS: digital w/ GIS coordinates on file.



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

Exhibit G-18: 15-Minute Validation Measurement Site 18—3111 E Marshall Ave—Field Data Sheet

FIELD MEASUREMENT DATA SHEET

Project Name: US395 North Spokane Corridor Job # 1603315-AD

SITE IDENTIFICATION: 18 OBSERVER(S): Romero, Frohning
START DATE & TIME: 10-12-18 1:10 END DATE & TIME: 10-12-18 1:25
ADDRESS: 3111 Marshall Ave.

TEMP: 63 °F HUMIDITY: 20 % R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 2-4 MPH DIR: N NE (E) SE S SW W NW STEADY GUSTY ____ MPH
SKY: CLEAR SUNNY DARK PARTLY CLOUDY OVRCST FOG DRIZZLE RAIN Other: ____

INSTRUMENT: LD820, PRMB2B, 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}
18	1:10	1:25	62.6	73.3	52.1	55.7	61.5	65.6
____	____	____	____	____	____	____	____	____

COMMENTS:

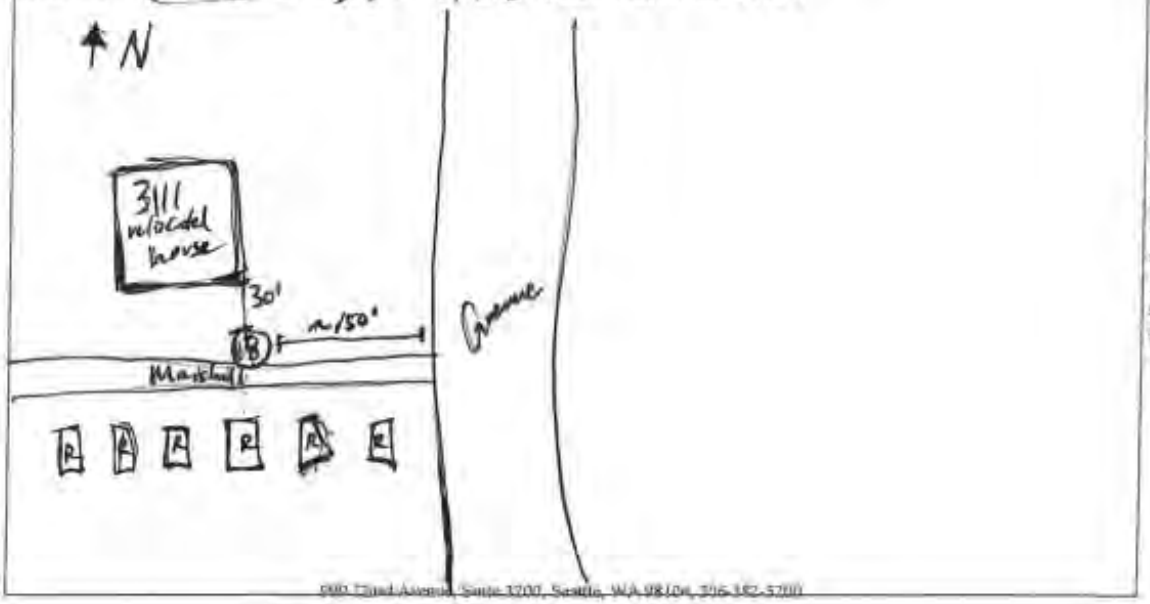
PRIMARY NOISE(S): TRAFFIC (Roadway Type: Arterial) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

COUNT #1 DURATION: 10 MINUTE	NB/EB	SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB	COUNT #2: 15 MINUTE NB/EB	COUNT #2: 15 MINUTE SB/WB	SPEED (mph) NB/EB	SPEED (mph) SB/WB
AUTOS:	205	200	30-40	30-40	305	300	30-40	30-40
MED. TRUCKS:	7	7	↓	↓	10	9	↓	↓
HVY TRUCKS:	5	3	↓	↓	7	5	↓	↓
BUSES:			Avg 35	Avg 30			(Avg 35)	(Avg 30)
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: Sidewalk in front of Relocated House
SITE SKETCH / PHOTOGRAPHS: Digitized w/ GIS coordinates on file.



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