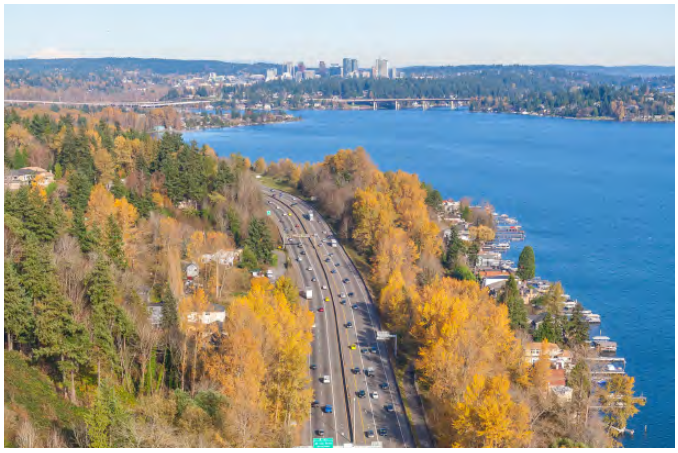
WSDOT

U. S. Department of Transportation
Federal Highway Administration

July 2018

I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project (MP 0.0 to 11.9)

Attachment C: Noise Discipline Report



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SUMMARY

What is the purpose of this discipline report?

The Noise Discipline Report was prepared in support of the *I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project (MP 0.0 to 11.9)* (the Project) *Environmental Assessment*. This report evaluates the environmental effects of proposed improvements on Interstate 405 (I-405) from milepost (MP) 0.0 to milepost 11.9 in support of the EA.

The Project proposes to make several roadway, structural, drainage, and transit and operational improvements to the I-405 corridor.

The Project is part of a comprehensive strategy identified in the 2002 *I-405 Corridor Program Final Environmental Impact Statement* (EIS) and subsequent *Record of Decision* (ROD) to reduce traffic congestion and improve mobility along the state's second-busiest highway. The Project is needed because travelers on I-405 face one of the most congested routes in the state, particularly during peak travel times.

Noise Environment

The study area for the Project is primarily residential, single family with pockets of multifamily and commercial developments.

The noise study area covers 400 feet from the pavement edge throughout the Project limits.

The Washington State Department of Transportation (WSDOT) compared the predicted peak-hour noise levels to the Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) to determine if there would be noise impacts with the Project. A substantial increase of 10 A-weighted decibels (dBA) or more in noise levels compared with the existing noise environment is considered a noise impact. Listed below are existing noise levels in 2016, 2045 noise levels without the Project, and predicted noise levels with the Project in 2045, the design year.

- Existing (2016) noise levels in the overall study area are between 50 and 78 dBA. Due to the traffic data availability, we selected 2016 for the existing year.

- In 2045, without the Project, noise levels are predicted to increase to between 51 and 79 dBA.
- In 2045, with the Project, noise levels are predicted to increase to between 50 and 79 dBA, which is the same as without the Project.

Noise Impacts of the Project

The analysis of noise impacts in the noise study area that would result from the Project is based on future sound levels compared to the existing levels and applicable criteria. Construction noise impacts are based on the maximum noise levels of construction equipment published by the Environmental Protection Agency (EPA) (EPA 1971) (Exhibit 6-1).

WSDOT used the FHWA NAC to evaluate traffic noise impacts. Traffic noise levels are predicted at sensitive receivers based on projected future traffic operations using the FHWA Traffic Noise Model (TNM) Version 2.5. Abatement measures that may be taken to avoid or reduce potential noise impacts are discussed where appropriate.

WSDOT evaluated the noise study area for the presence of receivers sensitive to traffic noise. We modeled 407 receivers to identify current and future noise impacts under the Project and No Build conditions, then compared the predicted peak-hour noise levels to FHWA's NAC to determine if the Project will result in traffic noise impacts.

This noise analysis revealed that 168 receivers (representing 365 residences, 5 parks, 2 churches, and 7 trails) currently approach or exceed the FHWA NAC of 66 dBA Leq (equivalent sound pressure level in A-weighted decibels). The analysis of future modeled No Build conditions predicts an increase to 203 receivers (representing 444 residences, 5 parks, 1 hospital, 3 churches, and 7 trails) without the Project due to a slight increase in traffic noise levels. With the Project, WSDOT expects to approach or exceed the NAC of 66 dBA at 193 receiver locations (representing 425 residences, 5 parks, 3 churches, and 7 trails), which is less than the No Build predicted condition by 2045 without noise abatement.

Considered Abatement

WSDOT evaluated 39 noise walls along the right of way for feasibility (a combination of acoustic and engineering considerations that evaluates if abatement can be constructed that achieves a meaningful reduction in noise levels) and reasonableness (assesses the practicality of the abatement measure based on a number of factors after abatement is found to be feasible) to protect potentially affected homes and other sensitive receivers such as parks and trails along the Project corridor.

We found five noise walls to be feasible and reasonable and recommended for construction. At an open house for the Project, some property owners and tenants brought to WSDOT's attention that some did not want a noise wall if it would affect their view. Based on that, WSDOT conducted a polling process of those owners and tenants to determine the majority opinion (Appendix D, Noise Wall Polling Results). As the result of the polling, the majority of the tenants and property owners rejected construction of Wall East 3. For the four remaining proposed noise walls, WSDOT expects that 28 receiver locations representing 191 homes and a trail would benefit from the proposed noise abatement.

Out of the 34 remaining walls evaluated, 22 were found to be not feasible and 12 were found to be feasible but not reasonable. These 34 walls were not recommended for construction. Exhibit 1 summarizes the existing and predicted noise conditions at the modeled locations.

Exhibit 1. Noise Impacts and Abatement at Modeled Locations

Condition	Construction Noise	Operational Impacts	Abatement Measures
Existing 2016 (pm peak)	None	Noise levels exceeded NAC at 168 locations.	None required.
2045 No Build (pm peak)	None	Noise levels exceeded NAC at 203 locations.	None required.
2045 with Project (pm peak)	Nearby receivers could experience temporary noise impacts during construction. Potential nighttime construction will require a noise variance from local jurisdictions.	Noise levels exceeded NAC at 193 locations.	Noise walls were considered at 39 locations within the project limits. Five of the 39 noise walls are recommended for construction because they meet WSDOT's feasibility and reasonableness criteria. One of 5 walls was rejected by the community.

SECTION 1 INTRODUCTION

This report was prepared in support of the Interstate 405 (*I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project* (milepost [MP] 0.0 to 11.9) *Environmental Assessment* (EA). The I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project (the Project) proposes to make several roadway, structural, drainage, and transit improvements to the I-405 corridor.

The Project is part of a comprehensive strategy identified in the 2002 *I-405 Corridor Program Final Environmental Impact Statement* (EIS) and subsequent *Record of Decision* (ROD) to reduce traffic congestion and improve mobility along the state's second-busiest highway. The Project is needed because travelers on I-405 face one of the most congested routes in the state, particularly during peak travel times.

SECTION 2 PROJECT DESCRIPTION

What improvements are proposed with the Project?

Exhibit 2-1 describes in detail the improvements proposed with the Project. Exhibit 2-2, sheets 1 through 8, show the proposed improvements on a series of maps. In general, the Project proposes to add one lane to I-405 in each direction for about 9 miles beginning on I-405 near SR 167 and continuing approximately 1 mile north of I-90. The Project would also add a general purpose (GP) (auxiliary) lane to southbound I-405 between MP 6.7 (north of N 30th Street) and 7.1 (south of NE 44th Street) and MP 9.4 (north of 112th Avenue SE) to 10.5 (north of Coal Creek Parkway). The existing high-occupancy vehicle (HOV) lane on I-405 and the additional lane would be operated as a two-lane express toll lane (ETL) system. Additional details describing the ETLs are provided in the next question, "How would the express toll lanes work?

Exhibit 2-1. Improvements Proposed with the I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Project Element	I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project
I-405/I-5 Interchange Exhibit 2-2, Sheet 1	– Extend the southbound left lane at the I-5 interchange west for approximately 500 feet to provide additional merge distance.
I-405 Lanes and Shoulders from SR 167 to north of I-90 Exhibit 2-2, Sheets 2 through 8	– Create a dual ETL system from MP 2.9 (northeast of the I-405/SR 167 interchange) and MP 11.9 (north of the I-405/I-90 interchange) by adding one new lane in each direction and converting the existing HOV lane to an ETL. – Convert the existing HOV lane to a single ETL from MP 2.4 (at the I-405/SR 167 interchange) to MP 2.9 on northbound I-405 and from MP 1.6 (in Renton over Springbrook Creek) to MP 2.9 on southbound I-405. – Add an additional GP (auxiliary) lane on southbound I-405 between MP 6.7 (north of 30th Street) and MP 7.1 (south of NE 44th Street) and MP 9.4 (north of 112th Avenue SE) to MP 10.5 (north of Coal Creek Parkway). – Bring I-405 up to current freeway standards where feasible.
I-405 Tolling from SR 167 to north of I-90 Exhibit 2-2, Sheets 2 through 8	– Construct tolling gantries to collect the tolls for the ETL system (see description in the row above).
Cedar Avenue Exhibit 2-2, Sheet 4	– Reconstruct the bridge over I-405 to widen southbound I-405.
Renton Avenue Exhibit 2-2, Sheet 4	– Reconstruct the bridge over I-405 to widen southbound I-405.
Cedar River Bridge Exhibit 2-2, Sheet 4	– Widen the southbound I-405 bridge over the Cedar River.
Sunset Boulevard N Interchange Area Exhibit 2-2, Sheet 4	– Widen the I-405 northbound and southbound bridges over Sunset Boulevard N.
NE Park Drive Interchange Area Exhibit 2-2, Sheet 5	– Widen the I-405 southbound bridge over NE Park Drive.
N 30th Street Interchange Area Exhibit 2-2, Sheet 5	– Replace the local road overpass abutment slopes with retaining walls on both sides of I-405 and lower the southbound I-405 roadway by approximately one foot.
NE 44th Street Interchange Area Exhibit 2-2, Sheet 6	– Replace the northbound and southbound I-405 bridges over May Creek with two new single span bridges and provide habitat improvements. – Replace the NE 44th Street bridge over I-405. Construct new direct access ramps and two inline transit stations (one in each direction) in the I-405 median. Transit stations would include station platforms, signage, artwork, lighting, fare machines (ORCA), and site furnishings such as shelters, lean rails, benches, bollards, bicycle parking, and trash receptacles. – Realign and reconstruct the northbound access to I-405 from a loop ramp to a new on-ramp from Lake Washington Boulevard NE. – Build four roundabouts along local arterials. – Construct an at-grade park-and-ride lot at Lake Washington Boulevard N and N 43rd Street with a minimum of 200 parking stalls and a roundabout (improvements would be built, but may be built by Sound Transit or others).

Exhibit 2-1. Improvements Proposed with the I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Project Element	I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project
112th Avenue SE Interchange Area Exhibit 2-2, Sheet 7	– Replace the 112th Avenue SE bridge over I-405. – Construct new direct access ramps, two inline transit stations (one in each direction) in the I-405 median. Transit stations would include station platforms, signage, artwork, lighting, fare machines (ORCA), and site furnishings such as shelters, lean rails, benches, bollards, bicycle parking, and trash receptacles. – Construct a roundabout on 112th Avenue SE. – Reconfigure the Newport Hills Park-and-Ride.
Coal Creek Parkway Interchange Area Exhibit 2-2, Sheet 7	– Construct a new southbound I-405 bridge on a new alignment. Convert the existing southbound I-405 bridge to northbound ETLs. – Convert the four local road intersections on Coal Creek Parkway SE to roundabouts.
I-405/I-90 Interchange Area Exhibit 2-2, Sheet 8	– Reconfigure the I-405 southbound to I-90 eastbound ramp from one to two lanes. – Realign the I-405 northbound to I-90 eastbound ramp. As part of this work, construct two new bridges over the eastbound I-90 ramp to Factoria Boulevard and over Factoria Boulevard.
Fish Passage Exhibit 2-2, Sheet 6	– Construct four fish passage crossings for unnamed tributary (UNT) 08.LW.0283 (formerly Gypsy Creek). – Construct a fish passage crossing under I-405 mainline for Stream UNT 08.LW.7.7A.[a] – Construct a fish passage crossing under I-405 mainline for Stream UNT 08.LW.7.8.[a]
Lake Washington Trail Exhibit 2-2, Sheets 6 and 7	– Realign and reconstruct the existing trail west of its current location to reside in the King County's Eastside Rail Corridor property between Ripley Lane in Renton (MP 7.7) and Coal Creek Parkway in Bellevue (MP 10.2). As part of this work, widen a portion of the King County's Eastside Rail Corridor Regional Trail.
Noise Walls Exhibit 2-2, Sheets 4, 6, 7 and 8	– Construct 4 new noise walls. – Relocate 2 existing noise walls.
Stormwater Management Exhibit 2-2, Sheets 1 through 8	– Add 46.92 acres of new PGIS and 5.7 acres of non-PGIS. – Provide enhanced treatment for 100% of new impervious surfaces. – Retrofit 51 percent (111.5 acres) of existing untreated PGIS and continue to treat stormwater from the 21.27 acres of PGIS that currently receives treatment. – Treat a total of 179.69 acres of PGIS.
Construction Duration	– 5 years of construction is expected from 2019 through 2024. – The direct access ramps and associated transit improvements at 112th Avenue SE, reconfiguring the Newport Hills Park-and-Ride lot, and building four roundabouts on Coal Creek Parkway SE may be constructed after 2024, depending on when allocated funds for these elements become available.

ETL = express toll lane GP = general purpose; HOV = high-occupancy vehicle; MP = milepost PGIS = pollutant generating impervious surfaces

a For these culverts, a restrictor plate will be put in place to prevent flooding until a downstream barrier is removed, at which time the restrictor plate will be removed.

How would the express toll lanes work?

At this time, the Washington State Transportation Commission (WSTC) has not established operational hours, user exemptions, occupancy requirements, and operating parameters for the ETLs proposed with the Project. The WSTC would set operational requirements for the ETLs prior to opening day. For this analysis, we assumed the requirements for the current I-405, Bellevue to Lynnwood ETL system would be used for this project. These assumptions, listed below, represent the most recent operating guidance from the WSTC for ETLs:

- **Limited Access** – The system would have designated entry and exit points, with a buffer between the ETLs and the GP lanes. These access points would vary in length, depending on the location.
- **Dynamic and Destination Pricing** – The I-405 ETL system would use both dynamic and destination pricing to determine a driver's toll at the time they enter the ETL. With *dynamic pricing*, toll rates vary based on congestion within the corridor to maintain performance. Electronic signs would be used to communicate the current toll rate for drivers. Toll rates are updated every few minutes, but the driver's price is set when they enter the system. With *destination pricing*, the toll is based on the driver's destination. Toll signs would show up to three toll rates for different toll zones, or destinations. Drivers would pay the rate they see upon entering the ETLs to reach their destination, even if they see a different toll rate for their destination further down the road. When both of these pricing approaches are used together, it means that the toll that drivers pay is based both on the congestion in the corridor and the distance they are traveling.
- **Operating Hours and *Good To Go!* Passes** – The ETL system is expected to operate from 5 a.m. to 7 p.m. on weekdays, with the system toll-free and open to all at other hours and on major holidays. Transit, HOVs, and motorcycles would need to have a *Good To Go!* pass to use the ETLs for free during operating hours. Eligible HOV users would be required to set the *Good To Go!* pass to the HOV mode to avoid charges.

How does dynamic pricing work?

Electronic monitors along the roadway measure real-time information on the speed, congestion, and number of vehicles in the ETLs. This information is used to determine whether tolls go up or down to optimize lane use.

As the ETLs become congested, toll rates increase, and as congestion decreases, toll rates decrease. The use of dynamic pricing allows the lanes to operate with high volumes but avoid becoming congested.

When would tolls be charged to use the ETLs?

It is assumed the ETLs would operate from 5 a.m. to 7 p.m. on weekdays. At all other times and major holidays, the lanes would be free and open to all without a *Good To Go!* pass.

During operating hours:

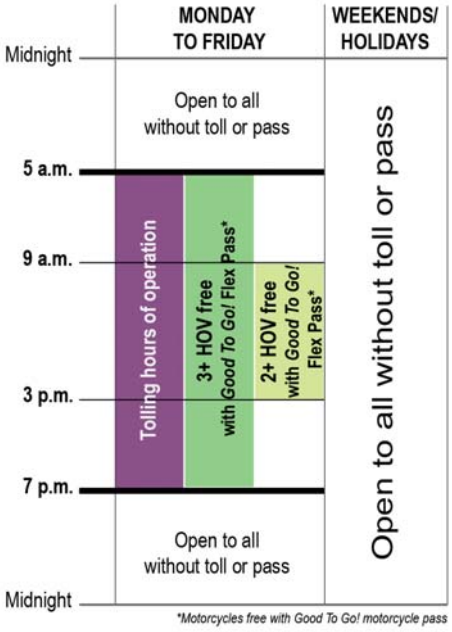
- **SOVs** would pay a toll to use the lanes.
- **Transit, HOV 3+, and Motorcycles** would travel for free with a *Good To Go!* pass.
- **HOV 2+** would travel for free from 9 a.m. to 3 p.m. with a *Good to Go!* pass. From 5 a.m. to 9 a.m. and 3 p.m. to 7 p.m. HOV2+ would pay a toll to use the ETLs with or without a *Good To Go!* pass.
- **Large vehicles** over 10,000 pounds gross vehicle weight would not be able to use the ETLs at any time.

Single-occupant vehicles (SOVs) could choose to pay a toll to use the ETLs during operating hours with or without a *Good To Go!* pass.

- **Occupancy Requirement**s – During the peak periods (weekdays from 5 a.m. to 9 a.m. and 3 p.m. to 7 p.m.), transit vehicles and carpools with three or more persons (HOV 3+) would be able to use the lanes for free with a *Good To Go!* pass. From 9 a.m. to 3 p.m., the system would be open toll-free to those with two or more passengers (HOV2+) with a *Good To Go!* pass. Motorcycles ride toll-free in the ETLs with a *Good To Go!* pass. During non-operating hours, SOVs will not be permitted to enter the ETLs from ramps where access is provided directly from local streets. SOV access would only be permitted from freeway GP entry and exit points.
- **Vehicle Weight** – Vehicles over 10,000 pounds gross vehicle weight will be prohibited, which is consistent with HOV lane restrictions throughout Washington.
- **Electronic Tolling** – Payments would be made via electronic tolling with a *Good To Go!* pass. For drivers who choose not to use a *Good To Go!* Pass, WSDOT offers optional photo billing (pay by mail) for an extra fee.

What is a *Good to Go!* Account?

A *Good To Go!* account is the cheapest and easiest way to pay tolls in Washington. With an account, your tolls will be paid automatically without having to stop at a toll booth or worry about bills in the mail. For more information please go to: http://www.wsdot.wa.gov/GoodToGo/default.htm



How would the Project be constructed?

WSDOT expects to construct the Project using a design-build contract. Design-build is a method of project delivery in which WSDOT executes a single contract with one entity for design and construction services to provide a finished product. With design-build projects, contractors have the flexibility to offer innovative and cost-effective alternatives to deliver the Project, improve project performance, and reduce project effects. Some design modifications that the contractor may propose could affect the Project footprint and design details described in this EA; however, if the contractor proposes modifications not covered by this EA, environmental review would be conducted as needed.

Construction work would include the removal of existing asphalt and concrete surfaces, clearing and grading adjacent areas, laying the aggregate roadway foundation, and placing

of asphalt and concrete surfaces. Changing the vertical and horizontal alignments of the I-405 mainline would require earthwork, with approximately 780,000 cubic yards of excavation and approximately 700,000 cubic yards of fill.

Construction equipment such as backhoes, excavators, front loaders, pavement grinders, jack hammers, pile drivers, trucks, as well as grading and paving equipment would be used. Equipment used for construction would include cranes, pile drivers, drilling rigs and augers, backhoes and excavators, jack hammers, concrete pumping equipment, and slurry processing equipment.

Staging areas in unused right of way would provide room for employee parking, large equipment storage, and material stockpiles. The contractor may also find other locations for construction staging.

Exhibit 2-2. I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project Improvements, Sheet 1 of 8

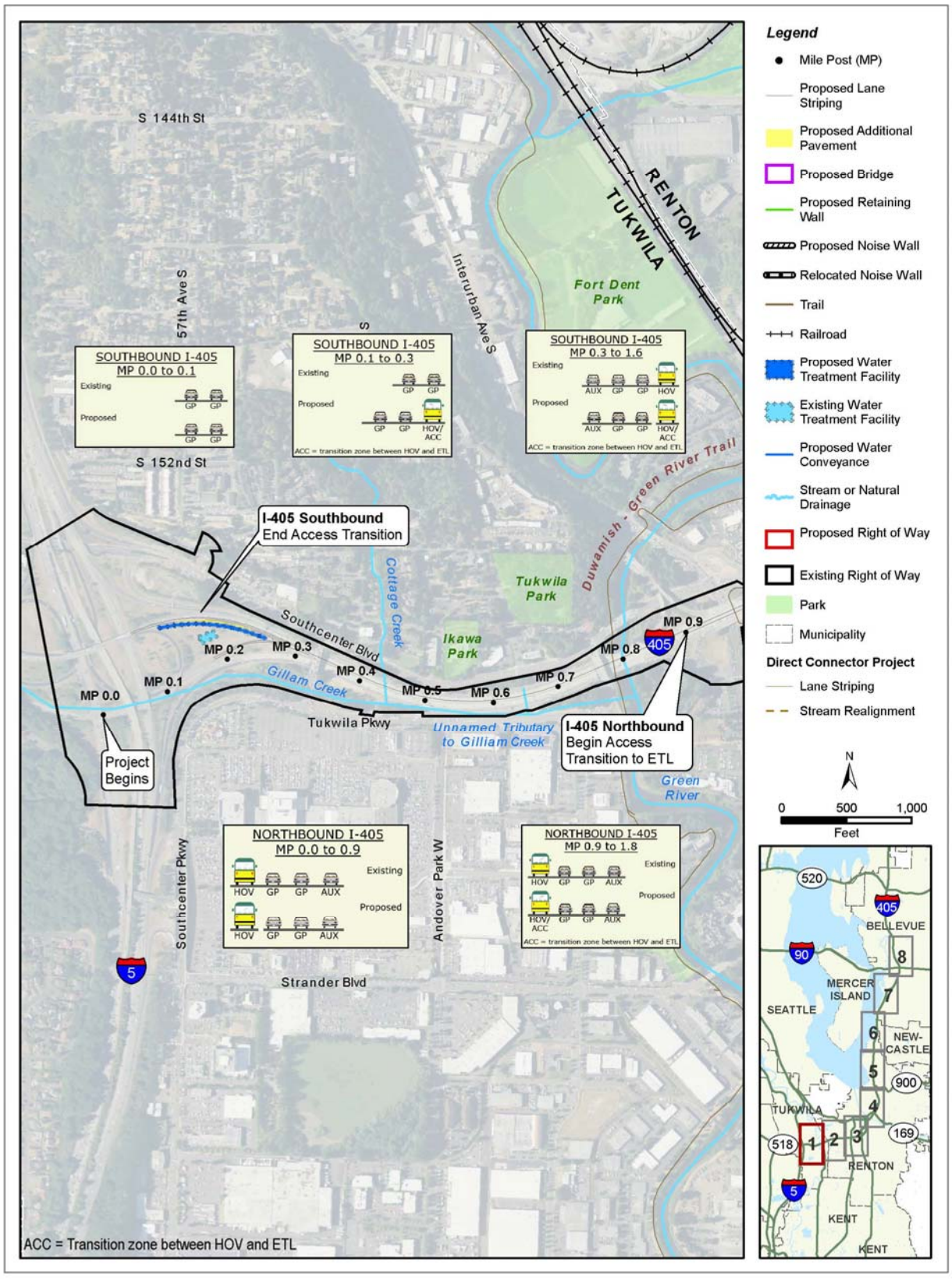
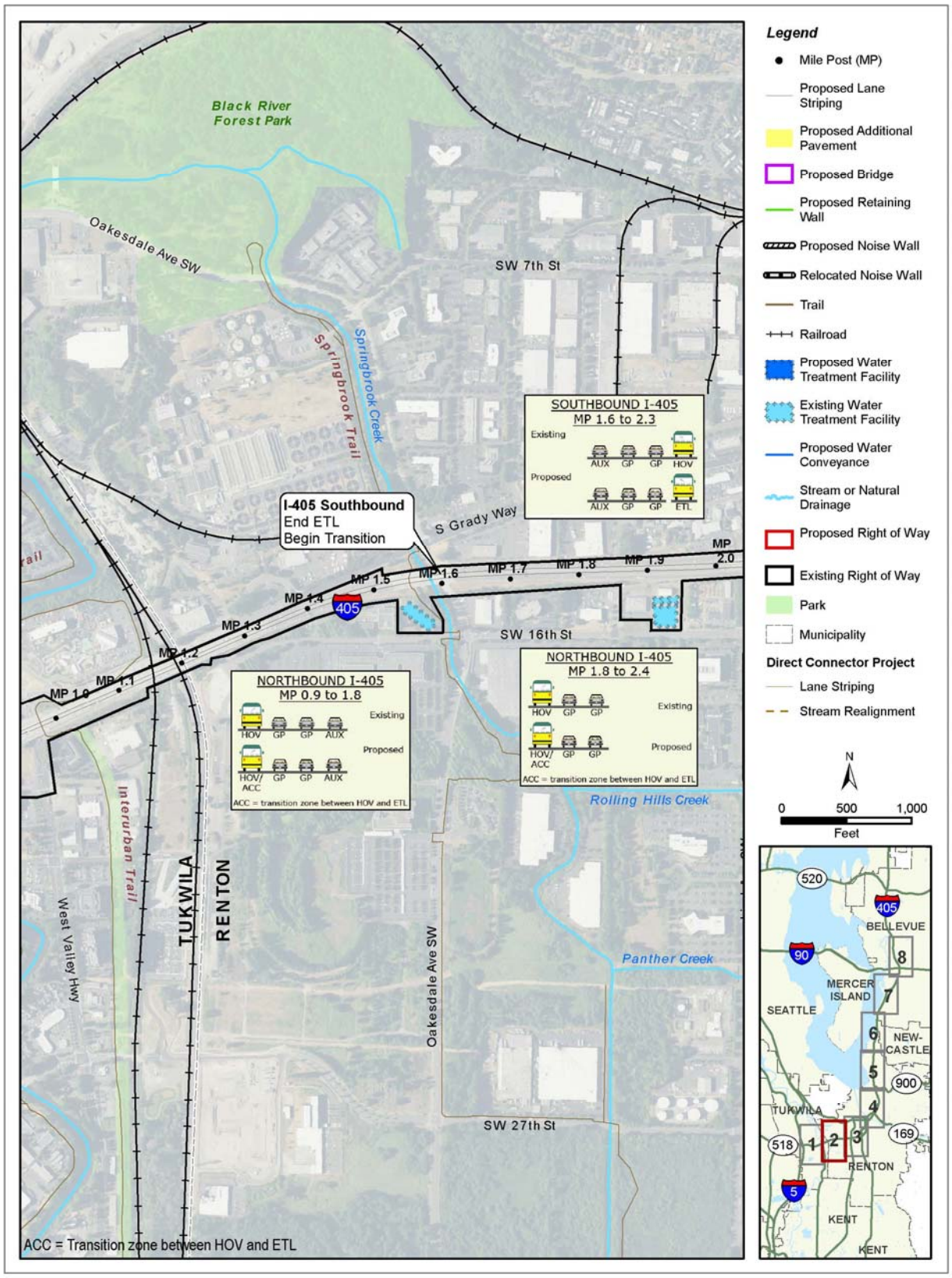


Exhibit 2-2. I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project Improvements, Sheet 2 of 8



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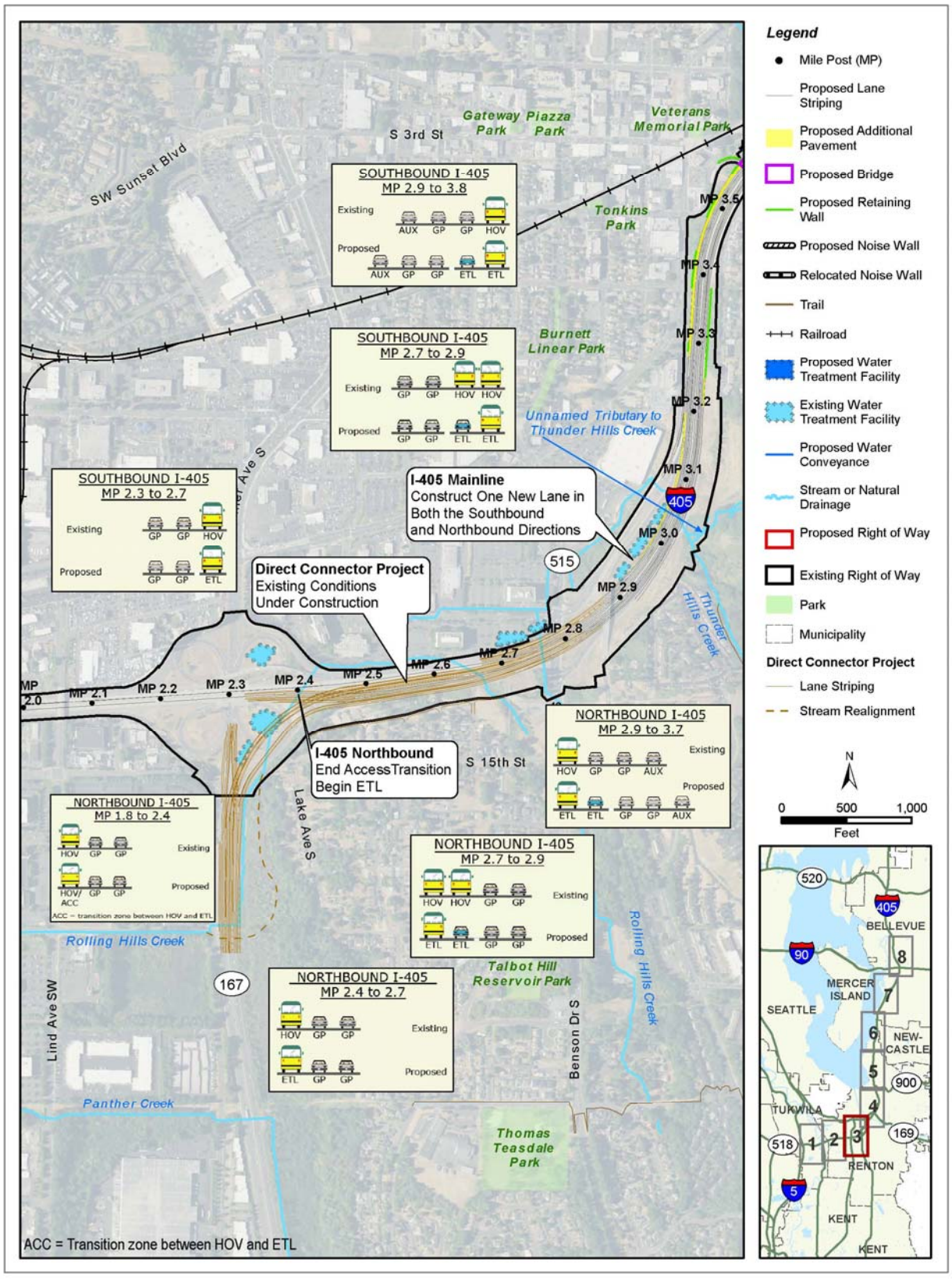

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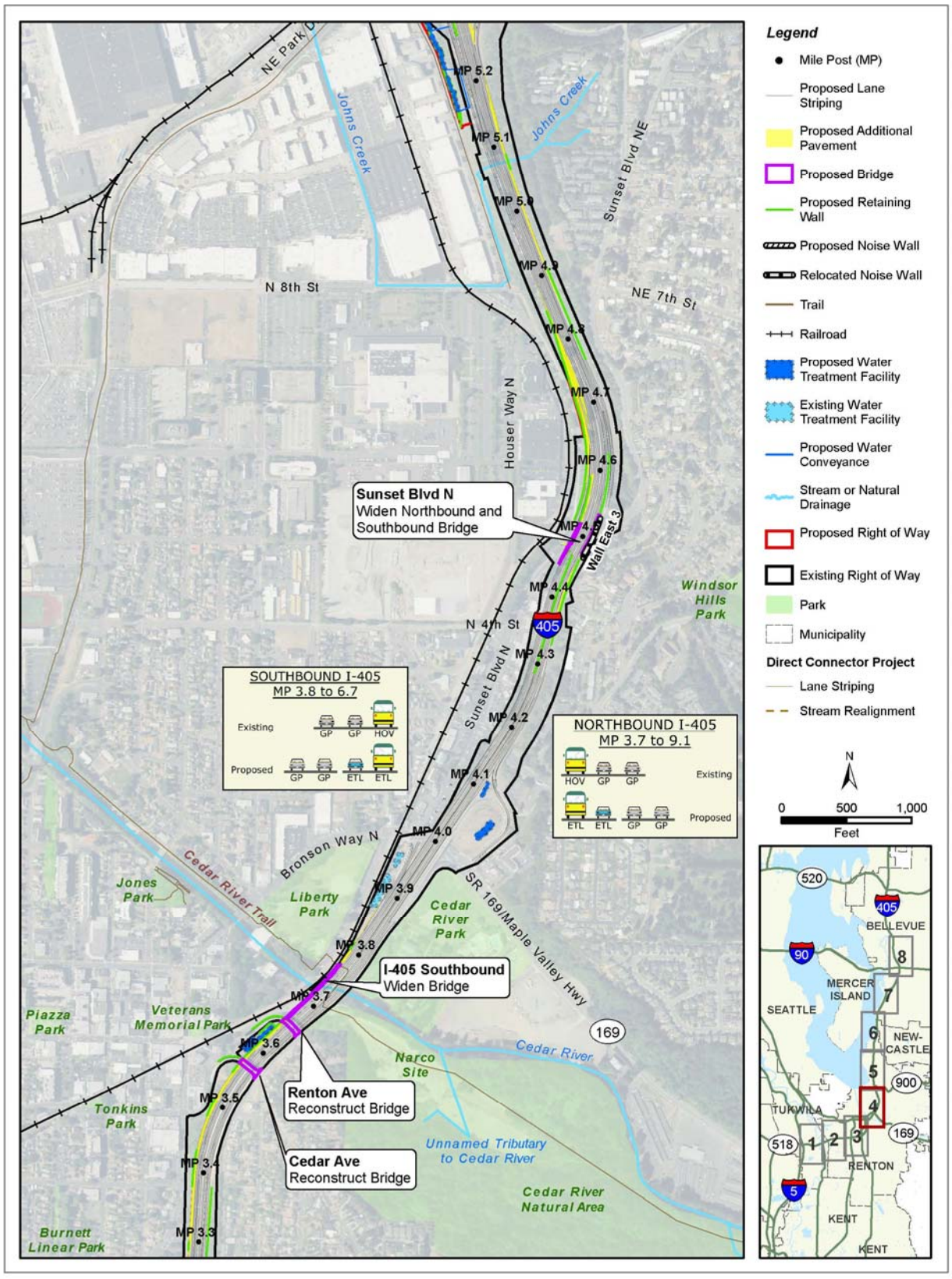

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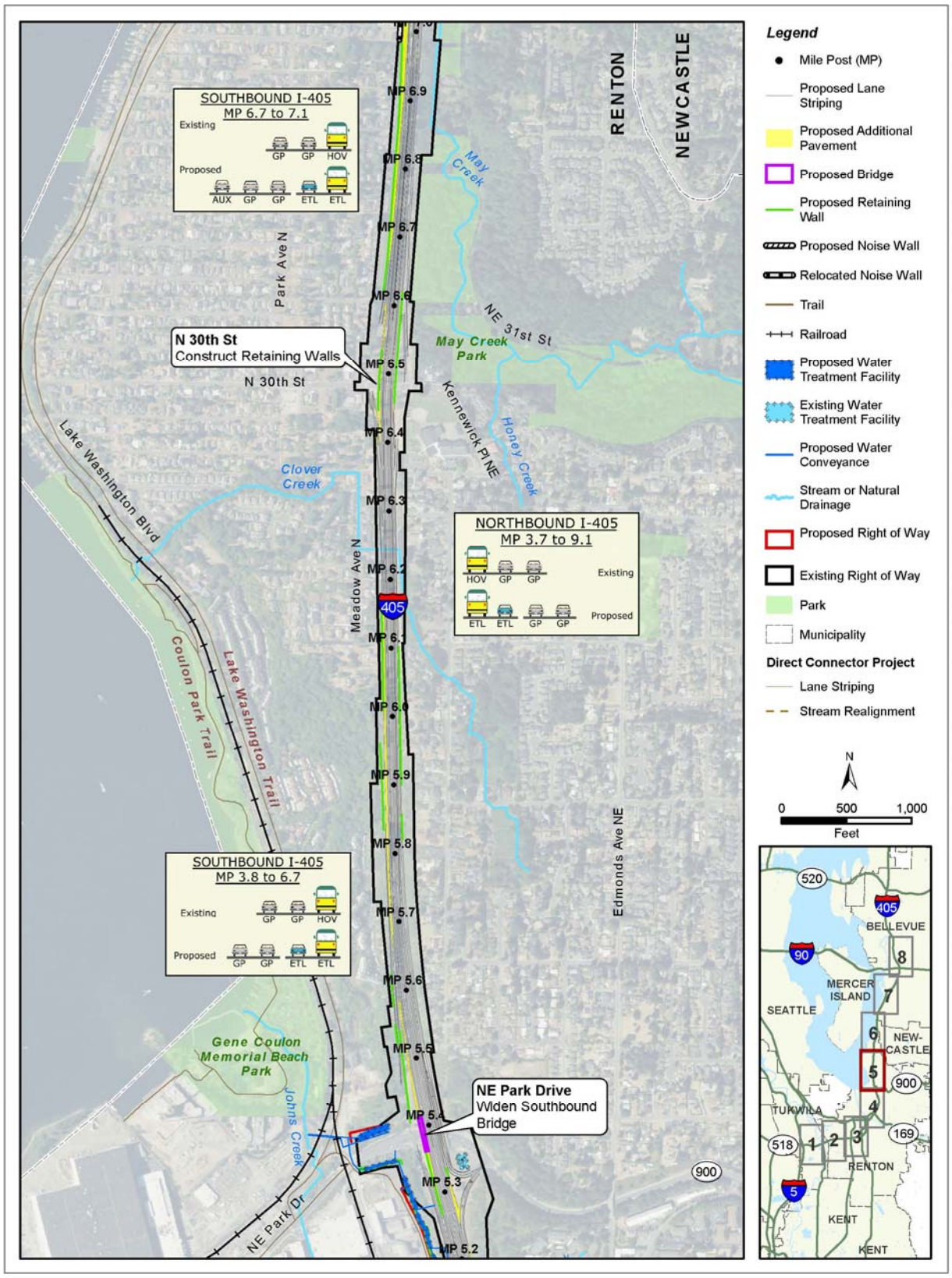

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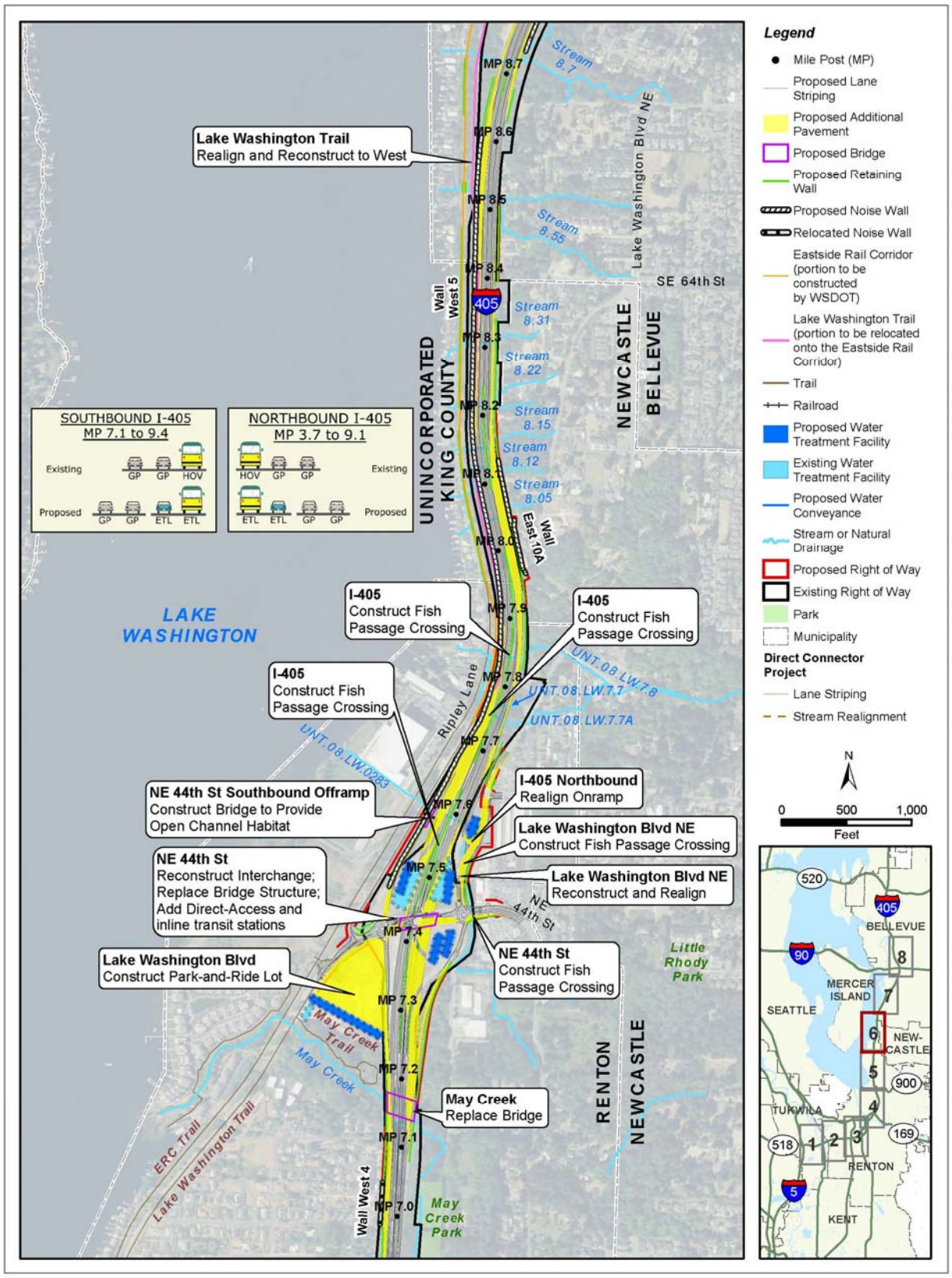
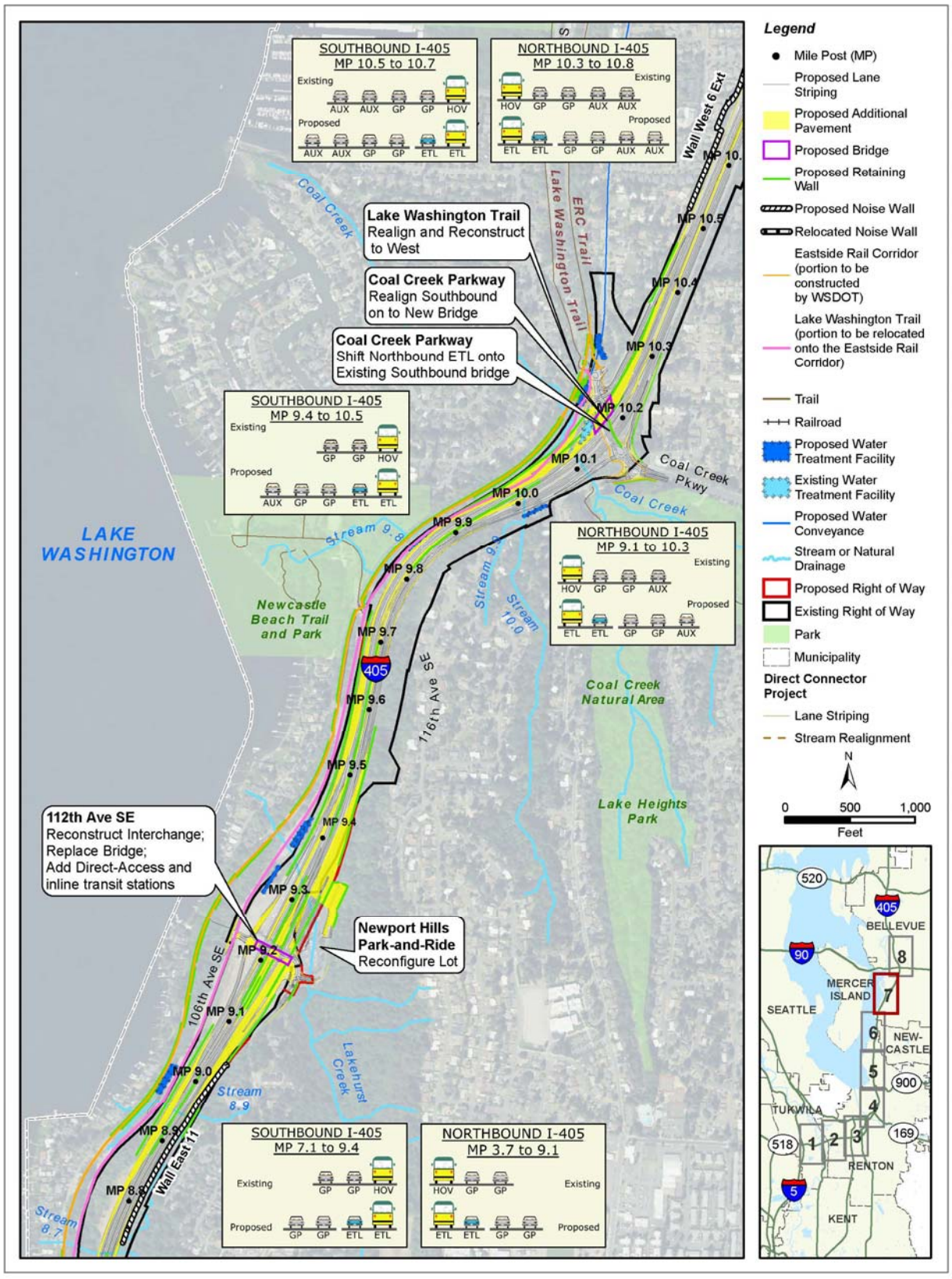


Exhibit 2-2. I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project Improvements, Sheet 7 of 8



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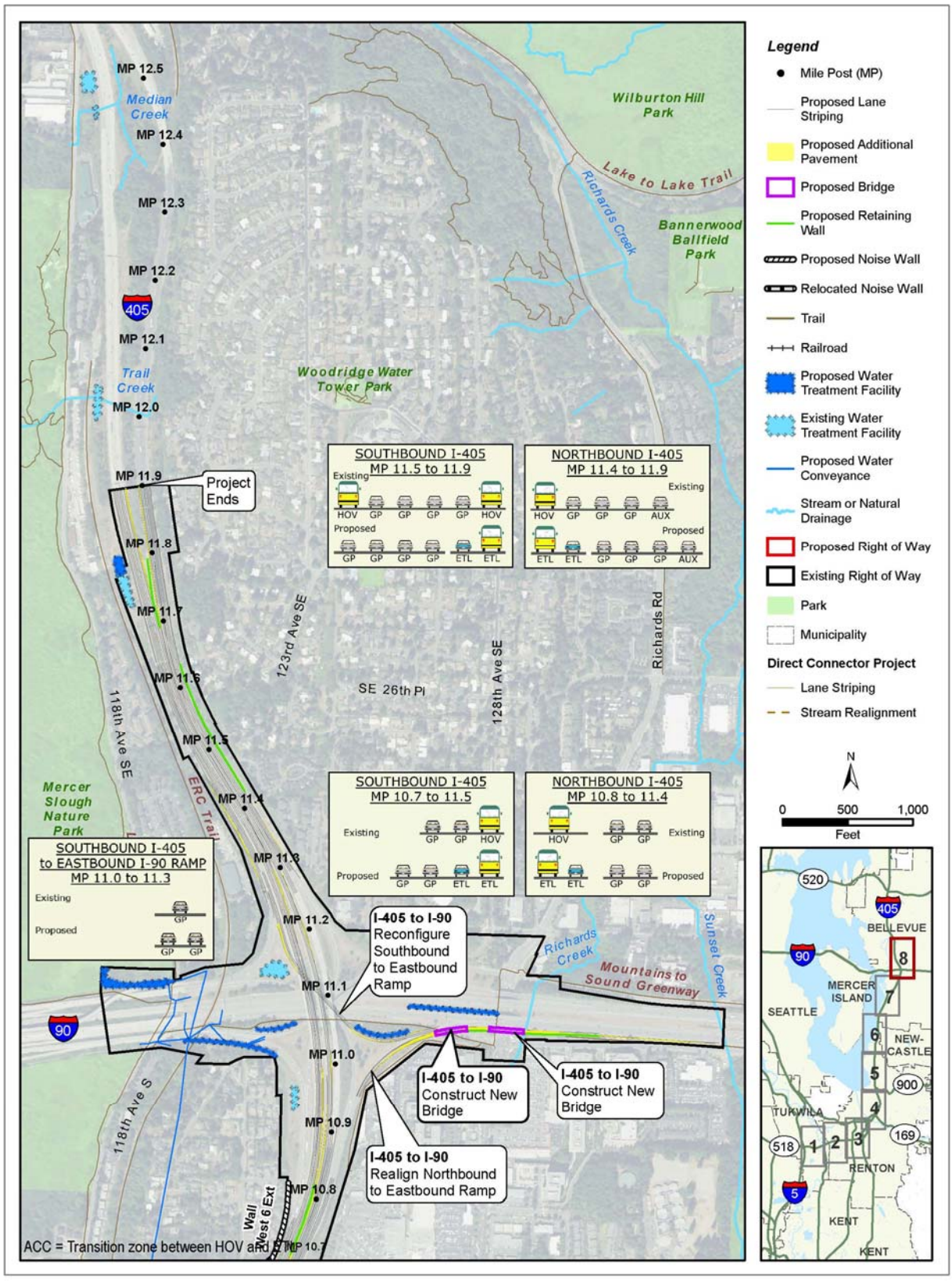


SECTION 3 METHODOLOGY

Background Information on Noise

Type 1 Trigger for Noise Analysis

A traffic noise analysis is required by law (23 Code of Federal Regulations [CFR] 772) for federally funded projects and required by WSDOT policy (WSDOT 2011) for other funded projects that meet the following criteria:

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

The Project proposes to increase the number of through-traffic lanes on an existing highway to address safety and improve mobility. Implementation of the Project to construct an additional lane in both directions is a Type 1 trigger for a traffic noise analysis.

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 how it varies between people.

Sound is measured using the logarithmic decibel scale, so that doubling the number of noise sources, such as the number of cars on a roadway, increases the sound level by three A-weighted decibels (dBA). Therefore, when you combine two sources emitting 60 dBA, the combined sound level is 63 dBA, not 120 dBA. The human ear can barely perceive a 3-dBA increase, while a 5-dBA increase is about 1.5 times as loud and

readily noticed. 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 hertz (Hz), with less efficiency outside this range. Environmental noise is composed of many frequencies. A-weighting (dBA) of sound levels is a filter applied electronically by a sound-level meter that combines the many frequencies into one sound level that simulates how an average person hears sounds.

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. Exhibit 3-1 presents the magnitudes of typical noise levels.

Exhibit 3-1. Typical Noise Levels

Transportation Noise Sources	Noise Level (dBA)	Other Sources	Description
-	130	50-horsepower siren (100 feet)	Painfully loud
Jet takeoff (200 feet)	120	Thunder	
Car horn (3 feet)	110	Rock band	
Jet takeoff (2,000 feet)	100	Shout (0.5 foot)	Very annoying
Heavy truck (50 feet)	90	Jack hammer (50 feet)	Hearing loss with prolonged exposure
Train on structure (50 feet)	85	Backhoe (50 feet)	
City bus passing (50 feet)	80	Bulldozer (50 feet)	Annoying
Train (50 feet)	75	Blender (3 feet)	
City bus at stop (50 feet)	70	Vacuum cleaner (3 feet)	
Freeway traffic (50 feet)		Lawn mower (50 feet)	
Train in station (50 feet)	65	Washing machine (3 feet)	Intrusive
Light traffic (50 feet)	60	TV (10 feet)	
-		Talking (3 feet)	
Light traffic (100 feet)	50	Flowing stream	Quiet

Source: FTA 1995

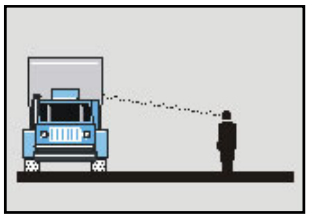
Traffic Noise Sources

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

Sound Propagation

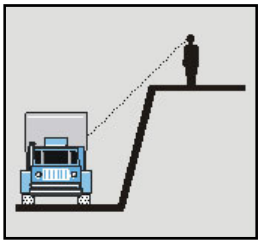
Sound propagation, or how far the sound travels, is affected by the terrain and the elevation of the receiver relative to the noise source. Breaking the line of sight between the receiver and the noise source can reduce noise levels. Listed below are examples of sound propagation pathways.

- Level ground – Noise travels in a straight path between the source and receiver.



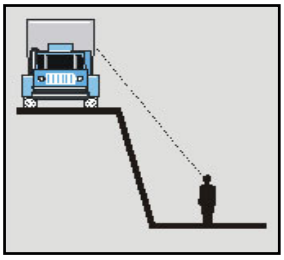
Level Ground

- 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 may act as a partial noise barrier. Even a short barrier, like a concrete safety barrier, can reduce the noise level.



Elevated Source/Depressed Receiver

Line and Point Sources

Noise levels decrease with distance from the source. For a line source, like a highway, noise levels decrease 3 dBA for every doubling of distance, e.g., from 66 dB at 50 feet to 63 dB at 100 feet, between the source and the receiver over hard ground (concrete, pavement), or 4.5 dBA over soft ground (grass). For point sources, like most construction noise, the levels decrease between 6 and 7.5 dBA for every doubling of distance, depending on ground hardness.

Effects of Noise

The FHWA noise abatement criteria (NAC) are based on speech interference, which is a well-documented impact 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 70 dBA equivalent sound level (L_{eq}) (24) for hearing loss (EPA 1974).

Noise Level Descriptors

The L_{eq} is a measure of the average noise level during a specified period of time. A 1-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 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 useful in determining 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.

The variation of sound levels recorded during a measurement period is represented by L_n, where "n" is the percent of time that a sound level is exceeded. 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.

Noise Regulations and Impact Criteria

Traffic noise impacts occur when predicted Leq (h) noise levels approach or exceed the NAC established by the FHWA, or substantially exceed existing noise levels (FHWA 1982). WSDOT considers a noise impact to occur if predicted Leq (h) noise levels approach within 1 dBA of the NAC. Exhibit 3-2 describes exterior Leq(h) noise levels for various land activity categories specified by the NAC. WSDOT also considers an increase of 10 dBA or more to be a substantial increase and constitute a traffic noise impact. See Appendix B, Traffic Noise Analysis and Abatement Process, for a detailed description of the noise analysis and abatement process.

Exhibit 3-2. FHWA Noise Abatement Criteria by Land Use

Activity Category	Leq(h)[a] 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. For example, Arlington National Cemetery.
B	67 (exterior)	Residential (single- and multi-family units).
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare 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, daycare 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.

[a] Leq(h) are A-weighted (dBA) hourly equivalent steady state sound levels used for impact determination and are not design standards for abatement.

Construction Noise Levels Limits

Traffic and construction noise are exempt from the Washington Administrative Code (WAC) property line noise limits during daytime hours, but noise limits still apply to construction noise at night. Noise levels shown in Exhibit 3-3 apply only to construction noise at residential properties between 10 p.m. and 7 a.m. At night, construction noise must meet Washington State Department of Ecology property line regulations (WAC 173-60-040) 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).

Allowable nighttime (10 p.m. to 7 a.m.) noise levels at Class A receiving properties (residential) are reduced by 10 dBA (WAC 173-60).

Exhibit 3-3. 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

Short-term exceedance of the sound levels in Exhibit 3-3 is allowed. During any 1-hour period, the maximum level may be exceeded by the following:

- 5 dBA for a total of 15 minutes
- 10 dBA for a total of 5 minutes
- 15 dBA for a total of 1.5 minutes (WAC 173-60-040)

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 3-3, 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.

Noise Study Area

Land use varies in the study area, which is primarily single-family residential with pockets of multifamily and commercial development at intersections.

From I-5 to the I-405/SR 167 interchange, the terrain north and south of I-405 is generally flat with the exception of the hillside overlooking the I-5/I-405 interchange from the north. Land use overlooking the I-5/I-405 interchange is primarily single- and multifamily residences with commercial businesses located near I-405 along Southcenter Boulevard, SW Grady Way, Tukwila Parkway, and SW 16th Street. A few residences and a church are also located northwest of the I-405/SR 167 interchange along SW 12th and 13th Streets. The Green River, Interurban Trail, and Springbrook Trail pass under I-405 in this area.

From the I-405/SR 167 interchange, commercial development north of I-405 changes to a mix of commercial, residential, and institutional land use north of S Grady Way. Renton Library, Renton History Museum, and the Local 907 Fire Department are located in this area north and west of I-405. Veterans Memorial Park and the Cedar River Trail are also located in this area. Residential land use is located south and east of I-405 from SR 167 to SR 169 with some multifamily apartments located east of Benson Road S and along Mill Avenue S.

From SR 169 to the I-405/NE Park Drive interchange, the terrain west of I-405 is generally lower than the highway. To the east, the terrain begins lower than the freeway and the primary land uses are parks and commercial, then terrain rises to a bluff above the freeway, with residential land use at the top.

From I-405/NE Park Drive interchange to the NE 44th Street interchange, the freeway is depressed, with a small area south of the NE 30th Street interchange nearly at grade with I-405. Northeast of NE 30th Street, the terrain drops to May Creek and then rises steeply to a bluff, where the primary land use is undeveloped natural buffer adjacent to the freeway and residential at the top of the rise. Northwest of NE 30th Street, the terrain is slightly elevated compared with I-405.

From the NE 44th Street interchange to SE Coal Creek Parkway, the terrain to the east steeply rises and land use at the top is residential. To the west the terrain drops from I-405 to Lake Washington Boulevard SE, and land use between the freeway and Lake Washington Boulevard SE is residential.

Between SE Coal Creek Parkway and I-90, the terrain is somewhat elevated above I-405 to the west. To the east, it begins slightly elevated, then drops below the I-90 interchange.

This noise study analyzes traffic noise effects up to 400 feet from the edge of the pavement on both sides of I-405 throughout the project corridor. A simple 'straight-line' noise model (FHWA-approved preliminary traffic noise screening analysis) was developed to predict the distance to where traffic noise levels drops below impact levels, and we determined that distance was 400 feet from the edge of pavement. The model used the existing measured noise and future projected traffic volumes to predict noise impacts

where a substantial noise level increase of 10 dBA or more would occur. The study area then extends to the limits of noise impacts, where there would be a future noise level of 66 dBA or less in 2045. See Appendix B, Traffic Noise Analysis and Abatement Process, for a detailed description of the noise analysis and abatement process.

Traffic Noise Measurement and Validation

Ambient sound levels were measured to describe the existing noise environment, identify major noise sources in the study area, and validate the noise model. Noise measurements were collected out to 400 feet from the roadway to confirm the straight-line model predictions and to validate the model out to just beyond the 66-dBA contour.

We collected 15-minute L_{eq} measurements at locations representative of sound-level environments in the study area during free-flowing traffic conditions. FHWA allows 15-minute L_{eq} measurements to represent the hourly L_{eq} (h). These traffic noise measurements are not a representation of average existing noise levels.

To ensure that the noise model used to predict traffic noise impacts accurately reflects the sound levels in the noise study area, we constructed the model 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 to validate the model.

The FHWA Traffic Noise Model (TNM) Version 2.5 (2004) was used for validation and to predict future L_{eq} (h) traffic noise levels. 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. When nontraffic noise is present, such as aircraft noise, TNM will under-predict the actual noise level. To ensure the model does not under-predict, noise measurements are paused to avoid interference of other noise sources. To create the model, design files outlining major roadways, topographical features, and sensitive receivers were imported into the TNM model as background features and the corresponding values were entered manually. We used aerial photographs and site visits to verify site conditions.

Exhibit 3-4 lists the validation locations and the comparison of measured to modeled values for the Project. The analysis included noise measurements taken at 71 sites chosen to represent noise-sensitive sites in the study area. The measured sites represent approximately 270 single-family residences and units in multifamily buildings, 4 parks, 1 hotel, 1 church, 4 trails, and 1 school. We took 15-minute noise measurements at each location and used the measured noise levels to validate the noise model as described earlier in this section. For noise model validation, we entered traffic volumes in the noise model to match field counts during the time of day of the noise measurement.

We added additional topographical and geometrical detail to the TNM model until the modeled noise levels at each of the 56 measurement sites were at 2 dBA or less of the measured level. The noise levels at all 71 measured sites were modeled using TNM. All of these sites were at 2 dBA or less of the measured values, which indicates that the model accurately represented site conditions.

Exhibits 3-5 through 3-18 show the measured receivers' locations. In these exhibits, measured receivers are denoted by the letter V followed by a number

Exhibit 3-4. Noise Model Validation – I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Validation Sites	Site #	Measured Receiver Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
1	V1	Liberty Park	4/7/2015	12:49 p.m.	65.1	63.8	1.3
2	V2	Liberty Park	4/7/2015	1:08 p.m.	69.3	67.3	2.0
3	V3	Cedar River Park	4/7/2015	2:33 p.m.	71.2	69.4	1.8
4	V4	Quality Inn	4/7/2015	3:48 p.m.	70.4	69.1	1.3
5	V5	1531 N 3rd Street	4/15/2015	11:57 a.m.	65.1	64.4	0.7
6	V6	407 Grandey Way NE	4/15/2015	1:10 p.m.	62.4	64.4	-2.0
7	V7	409 Grandey Way NE	4/15/2015	12:48 p.m.	64.2	63.9	0.3
8	V8	658 Sunset Blvd NE	4/15/2015	1:48 p.m.	70.8	70.9	-0.1
9	V9	821 Sunset Blvd NE	4/15/2015	2:30 p.m.	58.5	58.2	0.3
10	V10	901 Sunset Blvd NE	4/15/2015	2:55 p.m.	60.1	59.0	1.1
11	V11	975 Aberdeen Avenue NE	4/16/2015	11:14 a.m.	61.6	62.8	-1.2
12	V12	Lake WA Condo Bldg D	4/16/2015	1:03 p.m.	62.5	62.8	-0.3
13	V13	1917 Jones Avenue NE	4/16/2015	12:11 p.m.	68.9	67.1	1.8
14	V15	2053 N 20th Street	4/16/2015	1:44 p.m.	51.6	53.0	-1.4
15	V16	2132 High Avenue NE	4/16/2015	12:14 p.m.	68.4	66.6	1.8
16	V17	1408 N 20th Street	4/16/2015	3:11 p.m.	57.1	57.2	-0.1
17	V18	2615 Meadow Pl N	4/17/2015	11:28 a.m.	62.8	60.9	1.9
18	V20	Kennydale School	4/17/2015	12:08 p.m.	62.4	63.3	-0.9
19	V21	1411 N 32nd Street	4/17/2015	12:44 p.m.	62.9	61.0	1.9
20	V22	3221 Meadow Avenue N	4/17/2015	1:13 p.m.	60.6	59.1	1.5
21	V23	3804 Meadow Avenue N	4/17/2015	1:46 p.m.	61.4	62.2	-0.8
22	V25	3940 Meadow Avenue N	4/20/2015	11:29 a.m.	67.5	69.4	-1.9

Exhibit 3-4. Noise Model Validation – I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Validation Sites	Site #	Measured Receiver Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
23	V26	4242 Jones Rd (Church)	4/20/2015	12:16 p.m.	65.9	65.9	0.0
24	V27	7900 110th Avenue SE	4/20/2015	1:12 p.m.	59.7	61.6	-1.9
25	V28	1900 NE 48th St Bldg A	4/20/2015	1:43 p.m.	64.8	64.1	0.7
26	V29	1900 NE 48th St Bldg C	4/20/2015	2:15 p.m.	64.3	64.8	-0.5
27	V30	5021 Ripley Lane N	4/20/2015	2:51 p.m.	61.9	61.9	0.0
28	V30b	5021 Ripley Ln (Pool Area)	4/22/2015	11:01 a.m.	58.5	60.3	-1.8
29	V31	7023 Ripley Lane	4/21/2015	11:15 a.m.	66.2	64.4	1.8
30	V31b	5201 Ripley Lane	4/21/2015	11:25 a.m.	65.9	66.1	-0.2
31	V 31c	7029 Ripley Lane	4/22/2015	11:47 a.m.	67.3	65.3	2.0
32	V32	6603 Hazelwood Lane	4/21/2015	12:00 p.m.	63.0	62.6	0.4
33	V33	10923 SE 64th Street	4/21/2015	12:45 p.m.	66.7	67.6	-0.9
34	V34	11005 SE 64th Street	4/21/2015	1:19 p.m.	58.4	59.2	-0.8
35	V35	10803 SE 62nd St	4/21/2015	1:57 p.m.	74.0	76.0	-2.0
36	V36	5730 NE 110th Ave	4/21/2015	2:37 p.m.	62.5	63.2	-0.7
37	V37	Kimberlee Neighborhood Park	4/22/2015	1:10 p.m.	69.2	70.2	-1.0
38	V38	5443 Pleasure Point Ln SE	4/22/2015	1:51 p.m.	54.3	54.7	-0.4
39	V39	4945 116 Place SE	4/22/2015	2:34 p.m.	66.2	64.5	-0.5
40	V40	4605 SE 50th Street	4/27/2015	1:33 p.m.	61.9	62.4	2.0
41	V40R	4611 Bagley Lane	4/27/2015	12:52 p.m.	65.5	63.5	-1.6
42	V41	4605 SE 46th Street	4/27/2015	2:28 p.m.	66.7	64.7	1.7
43	V42	4436 NE 119th Street	4/27/2015	3:05 p.m.	70.6	72.2	2.0
44	V43	12109 SE 45th Place	4/29/2015	10:53 a.m.	65.8	65.2	-0.8

Exhibit 3-4. Noise Model Validation – I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Validation Sites	Site #	Measured Receiver Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
45	V44	12105 SE 44th Street	4/29/2015	11:34 a.m.	67.3	65.3	0.6
46	V45	2100 Cascade Key Way	4/29/2015	2:46 p.m.	62.2	63.0	2.0
47	V46	4201-122nd Avenue SE	4/30/2015	11:20 p.m.	60.4	60.6	-0.2
48	V47	12315 SE 41st Lane	4/29/2015	1:20 p.m.	61.2	62.9	-1.7
49	V48	12042 SE 42nd Court	4/30/2015	12:19 p.m.	61.5	59.8	1.7
50	V49	12020 SE 42nd Court	10/05/2015	1:12 p.m.	59.4	59.3	0.1
51	V50	12223 SE 39th Street	4/30/2015	1:22 p.m.	64.4	66.3	-1.9
52	V51	122140 SE 37th Street	5/01/2015	11:07 a.m.	63.4	65.3	-1.9
53	V52	12104 SE 31st Street	10/05/2015	12:22 p.m.	63.7	65.6	-1.9
54	V53	12108 SE 31st Street	5/01/2015	12:16 p.m.	63.8	64.2	-0.4
55	V54	3024 118th Avenue SE	8/13/2015	11:40 a.m.	57.9	59.1	-1.2
56	V55	2525 121st Avenue SE	8/12/2015	10:15 a.m.	64.0	65.2	-1.2
57	V56	2155 120th Place SE	8/12/2015	10:40 a.m.	59.9	58.1	1.8
58	V57	15419 62nd Avenue S	3/7/2018	10:40 a.m.	58.7	58.2	-0.5
59	V58	6532 154th St S	3/5/2018	1:32 p.m.	72.9	70.9	-2.0
60	V59	Green River Trail	3/5/2018	2:12 p.m.	64.7	65.4	0.7
61	V60	Interurban Trail	3/7/2018	9:55 a.m.	68.8	67.2	-1.6
62	V61	Springbrook Trail	3/7/2018	9:55 a.m.	69.5	68.5	-1.0
63	V62	600 SW 13th St	3/1/2018	12:00 p.m.	74.8	72.8	-2.0
64	V63	200 SW 13th St	3/1/2018	2:00 p.m.	63.4	63.1	-0.3
65	V64	1406 Shattuck Av S	2/21/2018	12:15 p.m.	63.6	63.4	-0.2
66	V65	1228 Benson Rd S	3/7/2018	12:00 p.m.	63.9	64.4	0.5

Exhibit 3-4. Noise Model Validation – I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project

Validation Sites	Site #	Measured Receiver Location	Date	Start Time	Measured L_{eq} (dBA)	Modeled L_{eq} (dBA)	Difference (dBA)
67	V66	606 Mill Ave	3/5/2018	11:07 a.m.	68.4	67.6	-0.8
68	V67	913 S 5th St	3/5/2018	11:30 a.m.	65.8	65.3	-0.5
69	V68	1203 S 3rd St	3/5/2018	10:45 a.m.	67.0	65.9	-1.1
70	V69	Renton Historical Museum	3/5/2018	10:45 a.m.	67.0	65.8	-1.2
71	V70	Cedar River Park Trail	3/5/2018	10:45 a.m.	68.8	67.0	-1.8

Exhibit 3-5. Traffic Noise Measurement Locations – Model 7 (I-5, Southern Project Limit to SR 181)

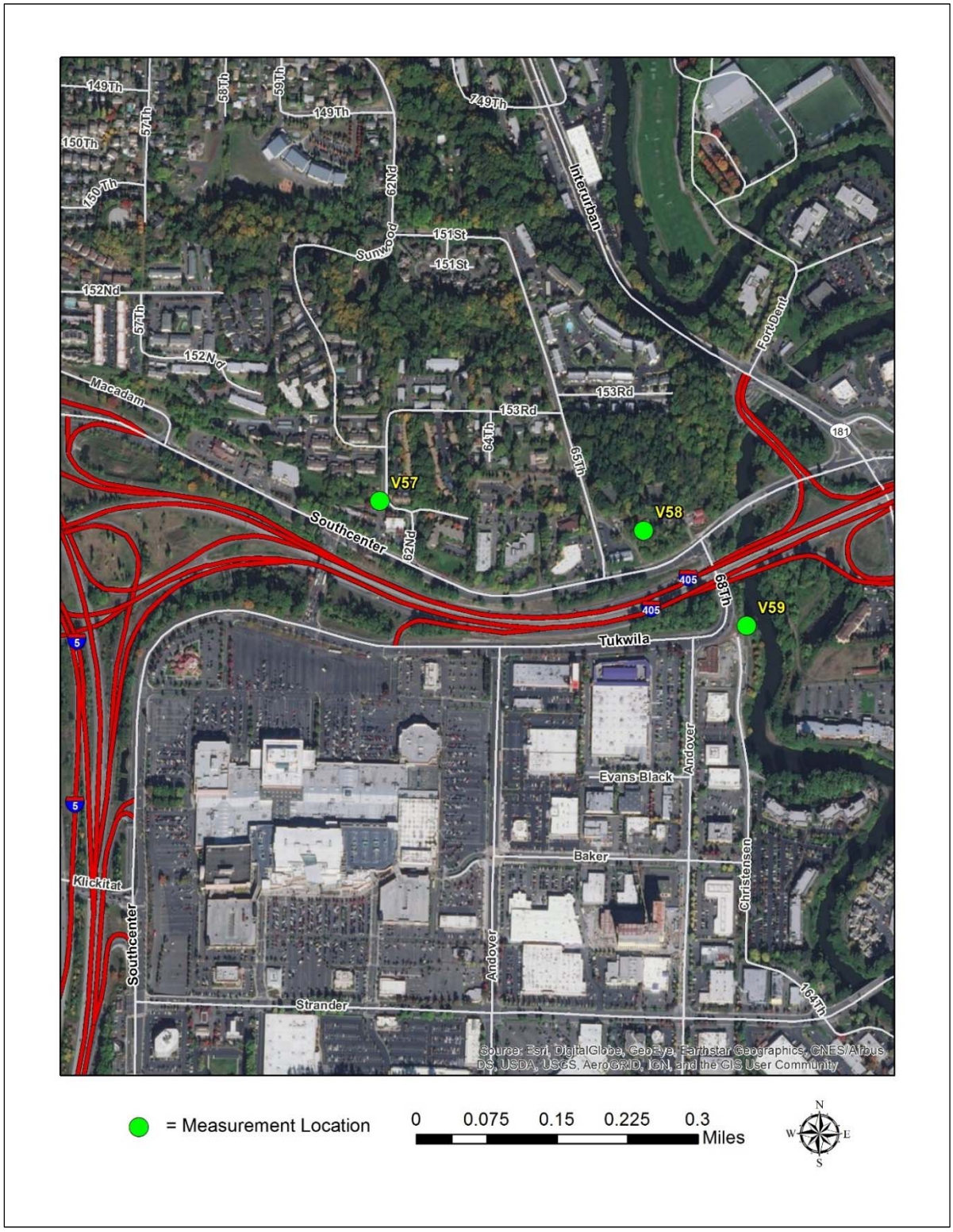


Exhibit 3-6. Traffic Noise Measurement Locations – Model 8 (SR 181 to Oakesdale Avenue SW)

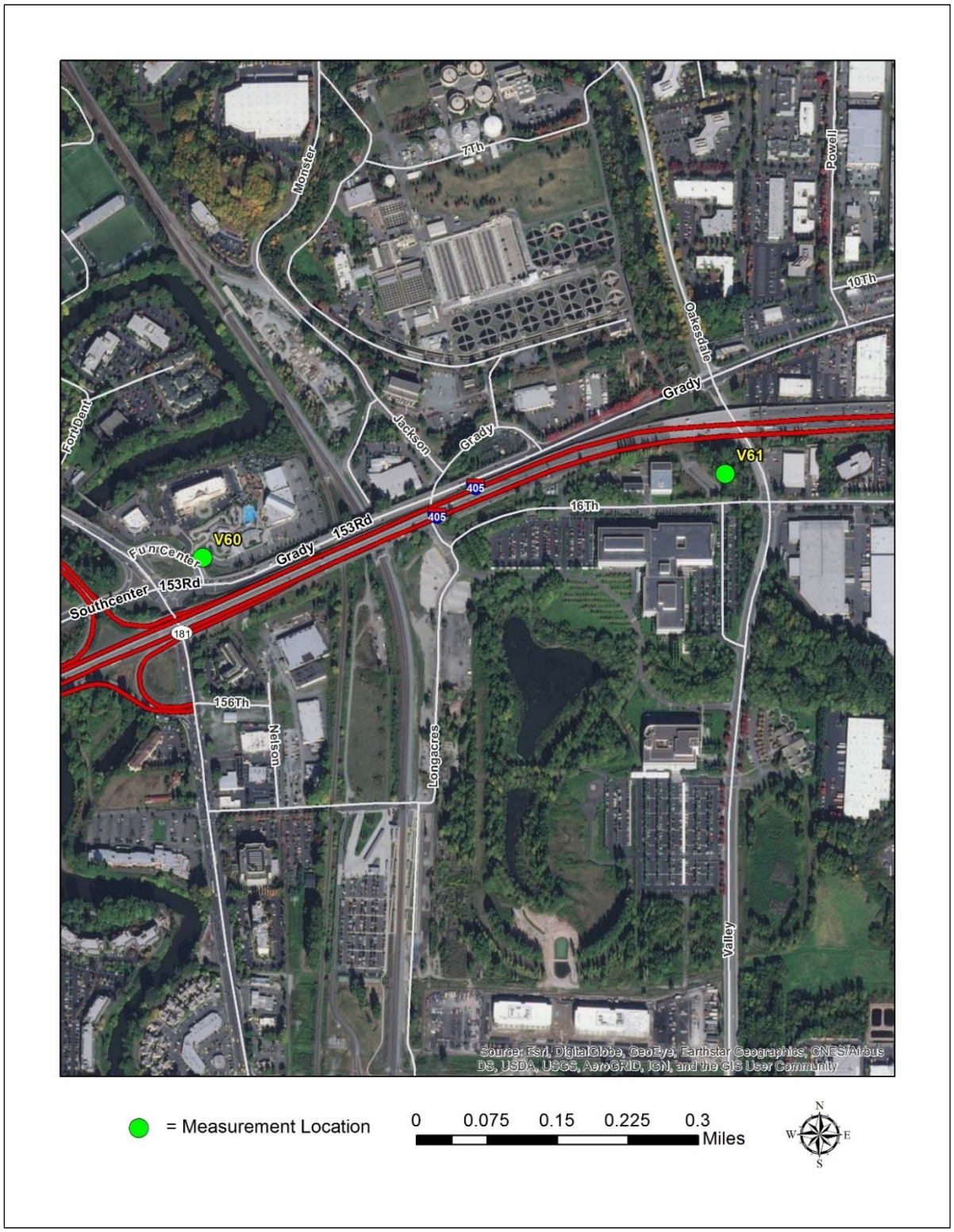


Exhibit 3-7. Traffic Noise Measurement Locations – Model 8 (Oakesdale Avenue SW to SR 167)

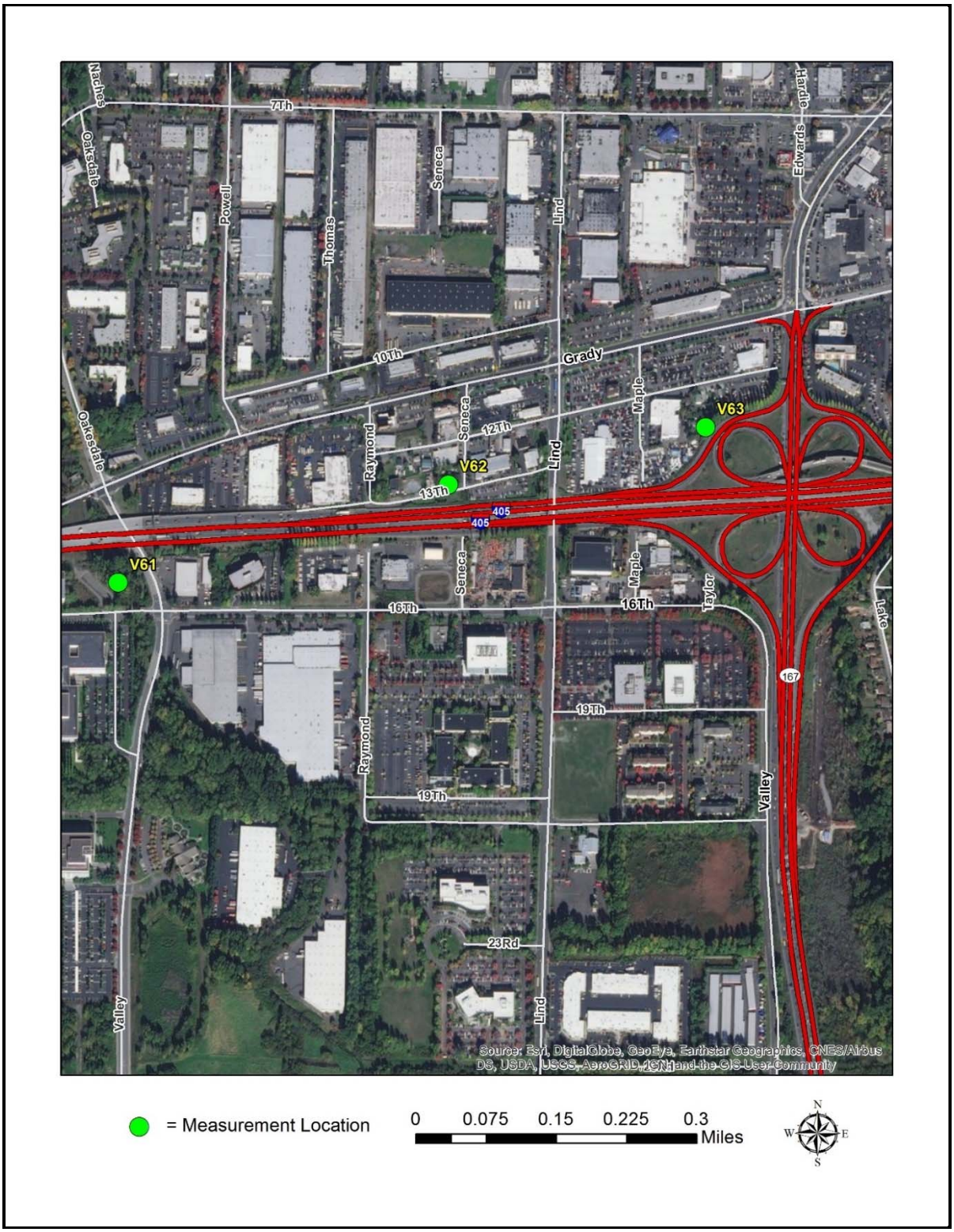


Exhibit 3-8. Traffic Noise Measurement Locations – Model 9 (SR 167 to SR 515)

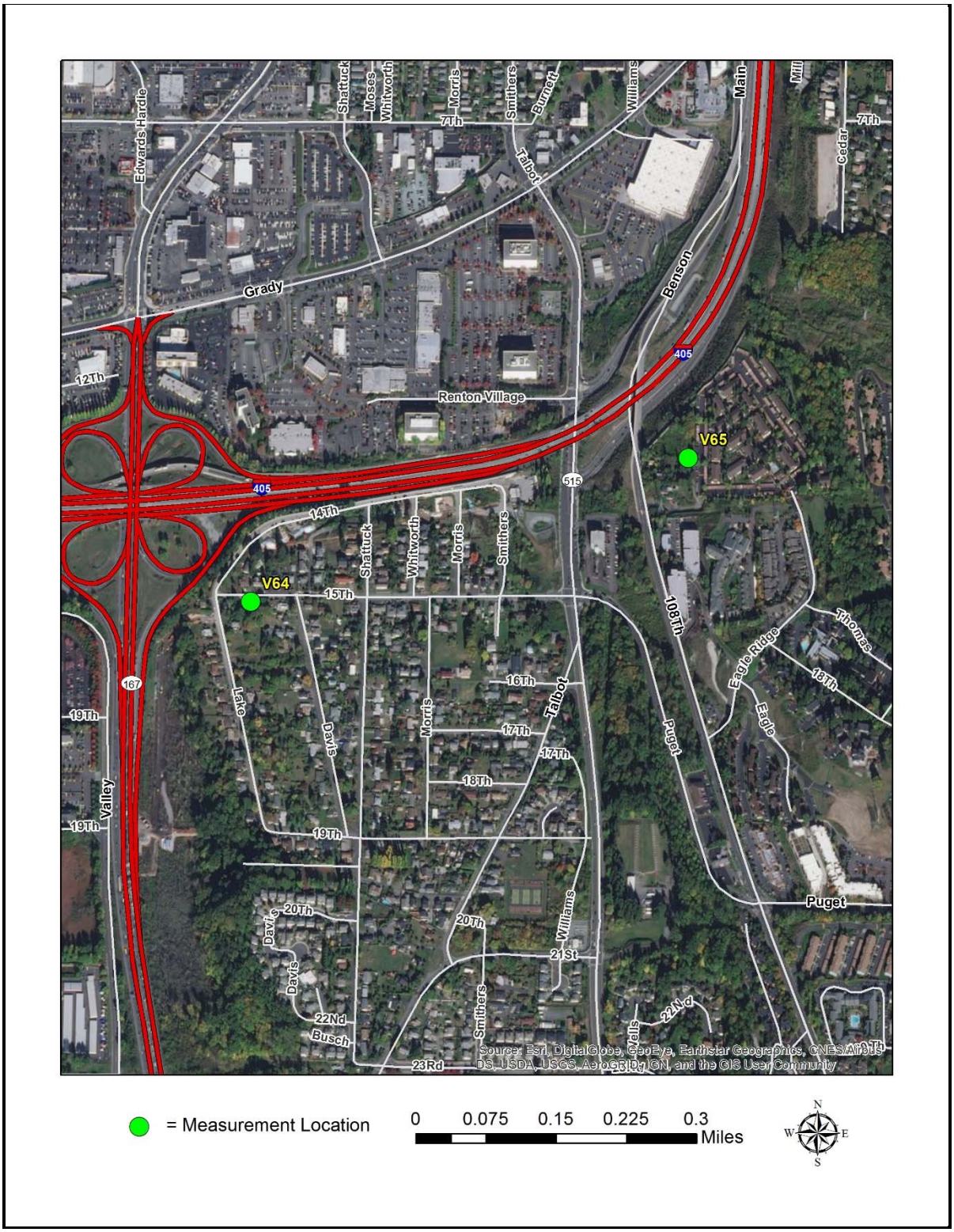


Exhibit 3-9. Traffic Noise Measurement Locations – Model 10 (SR 515 to SR 169)

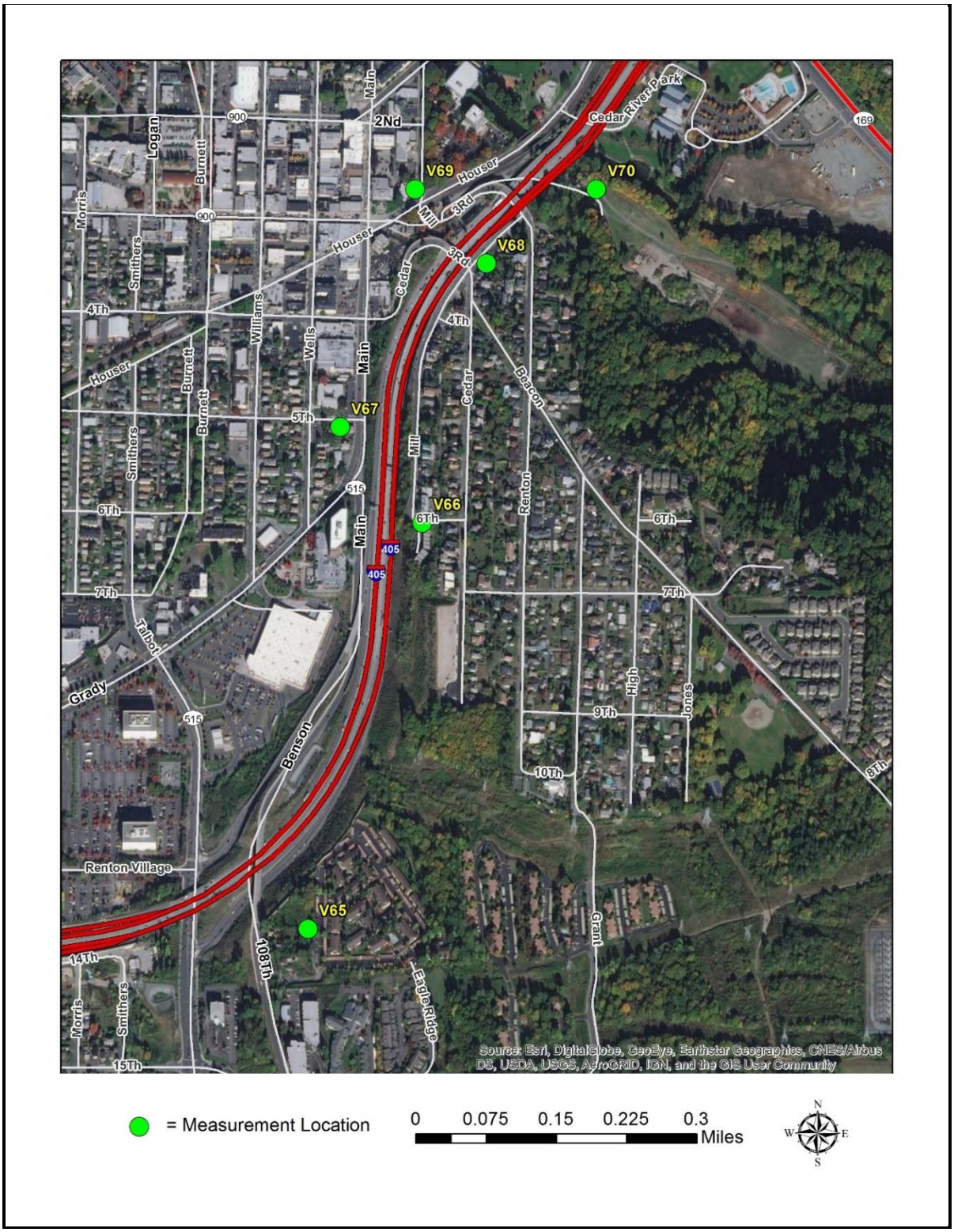


Exhibit 3-10. Traffic Noise Measurement Locations – Model 1 (SR 169 to Sunset Boulevard NE)

Exhibit 3-11. Traffic Noise Measurement Locations – Model 1 (Sunset Boulevard NE to SR 900)

Exhibit 3-12. Traffic Noise Measurement Locations – Model 2 (SR 900 to N 30th Street)

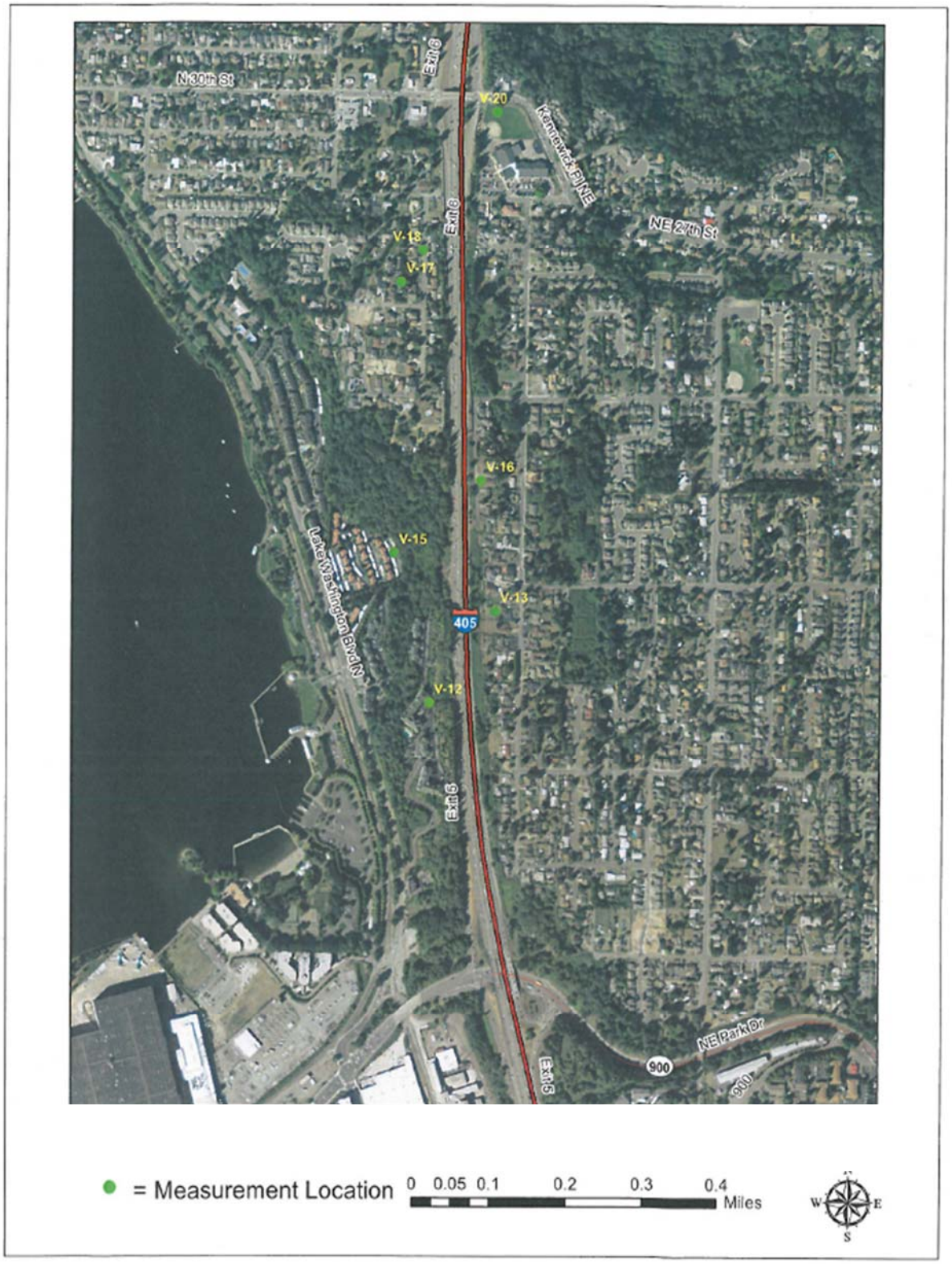


Exhibit 3-13. Traffic Noise Measurement Locations – Model 2 (N 30th Street to NE 44th Street)

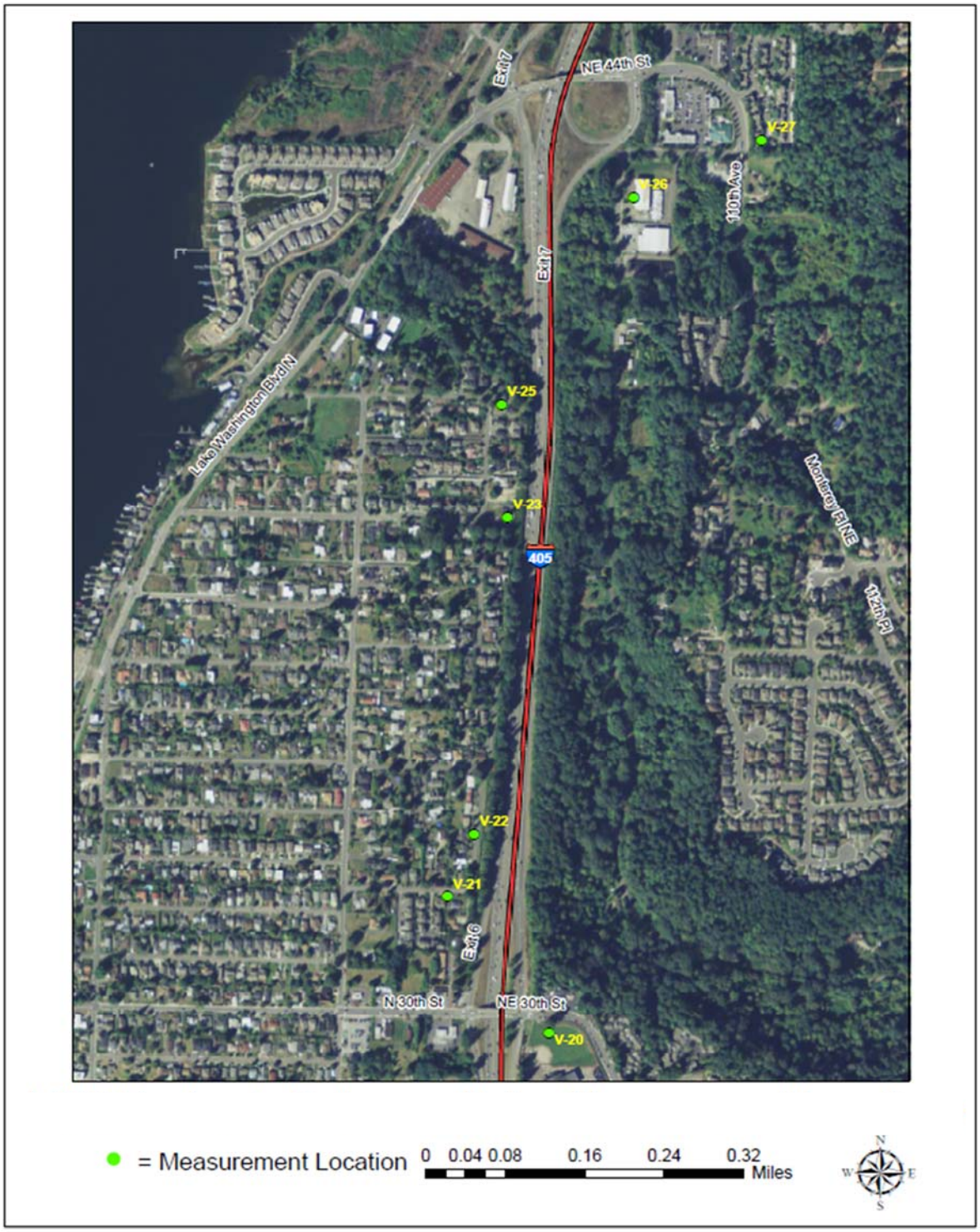


Exhibit 3-14. Traffic Noise Measurement Locations – Model 3 (NE 44th Street to SE 64th Street)

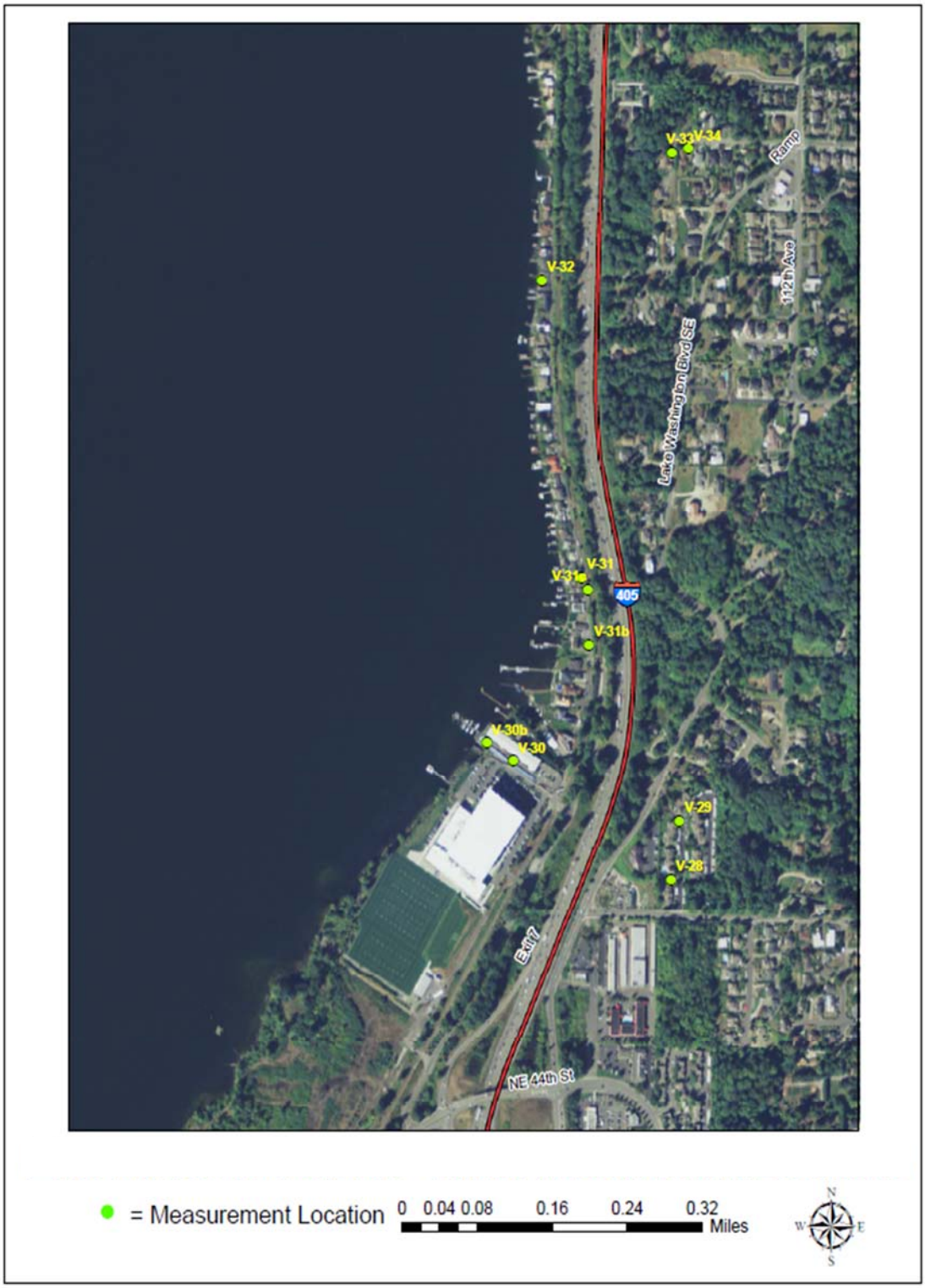
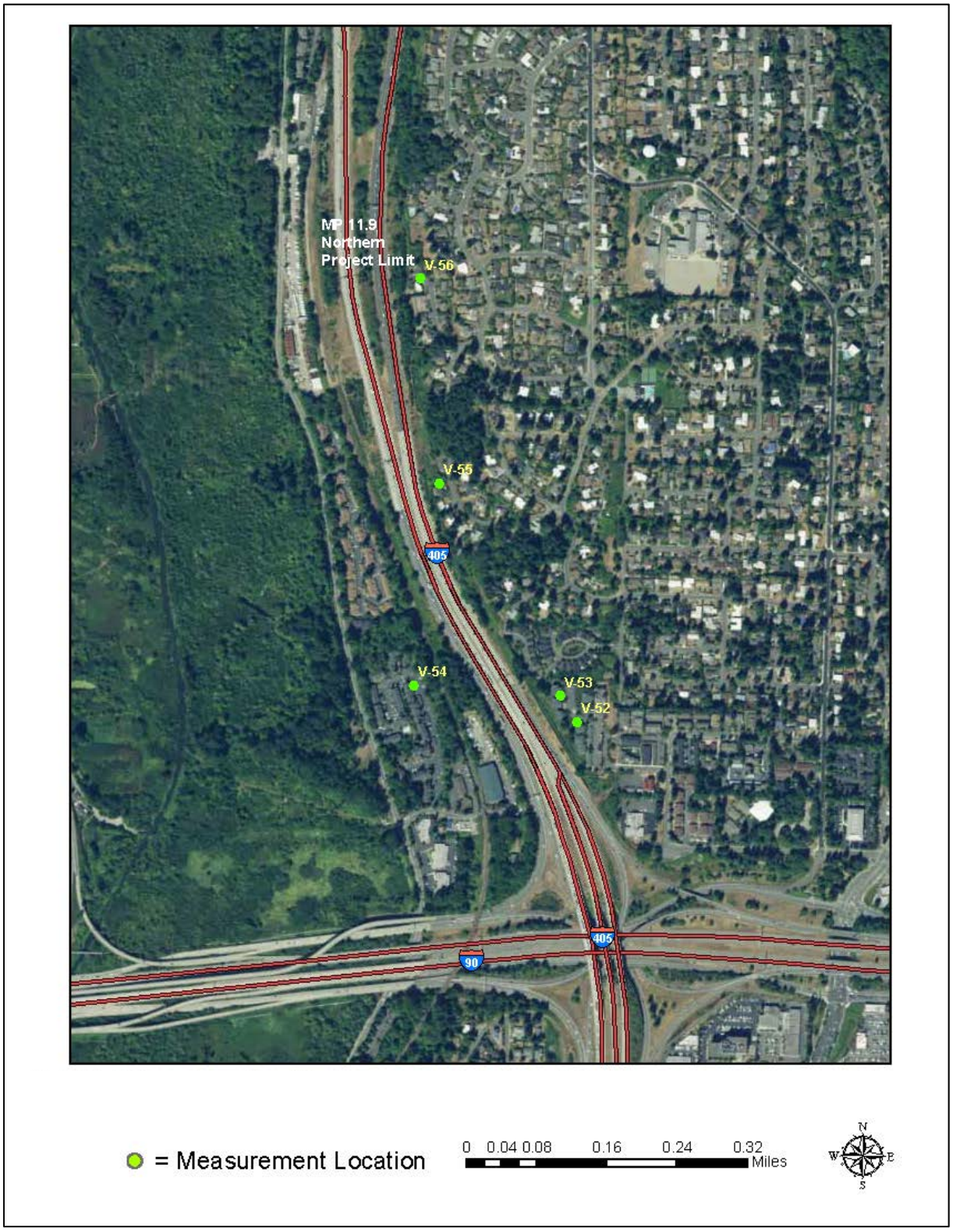


Exhibit 3-15. Traffic Noise Measurement Locations – Model 3 (SE 64th Street to Lake Washington Boulevard SE)

Exhibit 3-16. Traffic Noise Measurement Locations – Model 4 (Lake Washington Boulevard SE to SE Coal Creek Parkway)

Exhibit 3-17. Traffic Noise Measurement Locations – Model 5 (SE Coal Creek Parkway to I-90)

Exhibit 3-18. Traffic Noise Measurement Locations – Model 6 (I-90 to SE 21st Street, Northern Project Limit)



SECTION 4 PROJECT EFFECTS

FHWA requirements and WSDOT policy dictate that noise studies assess properties adjacent to highway projects that could be potentially affected by traffic noise. Primary consideration must be given to areas of frequent outdoor human use, such as residences with yards, decks, or patios. Parks and schools with outdoor play areas also warrant primary consideration of potential noise impacts. This section presents results of noise modeling for current and future traffic noise levels in the study area.

Operational Traffic Noise

We assessed the study area for the types of land uses noted above, at or above the traffic noise impact levels, in the following conditions. We evaluated 407 receivers representing 1,198 residences, 7 parks, 5 hotels, 3 commercial sites, 1 hospital, 1 school, 1 daycare, 3 churches, 9 trails, and 3 swimming pools. Of the 407 receivers evaluated, the following were determined to be at or above traffic noise impact levels:

- **Existing conditions (2016) traffic noise impacts.** 168 receivers representing 365 residences, 5 parks, 7 trails, and 2 churches.
- **No Build conditions (2045) traffic noise impacts.** 203 receivers representing 444 residences, 1 hospital, 5 parks, 7 trails, and 3 churches.
- **Build conditions (2045) traffic noise impacts.** 193 receivers representing 425 residences, 5 parks, 7 trails, and 3 churches.

Existing, No Build, and Build traffic noise levels for all modeled receivers in the study area are presented in Exhibits 4-1 through 4-9. Additional receivers were added to the TNM model to represent properties along the existing alignment. Each of these exhibits identifies the location of the modeled sites labeled with numbers preceded by the letter M. We input existing PM peak-hour traffic data into the TNM model and ran the model. The TNM noise model predicted loudest-hour noise levels using the loudest hourly traffic volumes for the future year conditions.

Existing Noise Level (Year 2016)

We modeled existing traffic volumes for 2016. The traffic volumes and vehicle mix for the Project are documented in Appendix B, Traffic Noise Analysis and Abatement Process. In addition to the measured sites, the noise model also included 336 additional receivers to provide additional information for areas not fully described by the measurement sites. The modeled sites represented similar receivers in the noise study area, although noise levels at adjacent receivers may vary because of terrain or distance. The receivers include both worst-case (closest to the I-405 alignment and other roads that would be substantially affected by the Project) and other local noise-sensitive receivers that could be affected by either increases or decreases in traffic noise.

Design Year Traffic Noise Level – No Build (Year 2045)

With No Build, noise levels are projected to increase by about 0 to 5 dBA over existing noise levels; however, the modeling shows an increase of 8 dBA at one modeled location. The modeling results show that 203 receivers are projected to be at or above the noise impact level under 2045 No Build. This change from existing conditions is a result of projected increases in traffic volumes in the design year of 2045. For No Build, we used the 2045 traffic volumes based on the existing I-405 configuration. The actual maximum noise-level increases may be less than the predicted increase because congestion may reduce traffic speed during peak traffic hours. Should this occur, peak-hour noise levels may be similar to existing noise levels but for a longer period each day.

Design Year Traffic Noise Level – Build (Year 2045)

With the Project, noise levels are projected to stay about the same as existing traffic noise levels or increase by 1 to 3 dBA by 2045 at most locations.; however, the modeling shows an increase of 8 dBA at one location. The modeling results show 193 receivers to be at or above the noise impact level under Build conditions. All properties projected to approach or exceed the impact level under Build conditions are analyzed for noise abatement in Section 5, Traffic Noise Abatement.

Exhibit 4-1. Modeled Noise Results for Model 7 – I-5 to SR 181

Site #'s	Receiver #	Receiver Type (see Exhibits 5-65 and 5-66)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V57	Residential property	1	59	60	59	0	-1
2	V58	Residential property	1	**72**	**73**	**73**	1	0
3	V59	Green River Trail	Trail	**66**	**67**	**67**	1	0
4	7M70	Multi-family 1 Floor	4	65	**66**	**66**	1	0
5	7M71	Multi-family 2 Floor	4	**66**	**67**	**67**	1	0
6	7M72	Multi-family 3 Floor	4	**67**	**68**	**68**	1	0
7	7M73	Multi-family 1 Floor	4	65	65	65	0	0
8	7M74	Multi-family 2 Floor	4	**66**	**67**	**67**	1	0
9	7M75	Multi-family 3 Floor	4	**67**	**68**	**68**	1	0
10	7M76	Multi-family 1 Floor	4	58	59	59	1	0
11	7M77	Multi-family 2 Floor	4	62	63	63	1	0
12	7M78	Multi-family 3 Floor	4	65	65	**66**	1	1
13	7M79	Multi-family 1 Floor	4	60	60	60	0	0
14	7M80	Multi-family 2 Floor	4	63	63	63	0	0
15	7M81	Multi-family 3 Floor	4	65	**66**	**66**	1	0
16	7M82	Residential property	1	**67**	**68**	**67**	0	-1
17	7M83	Residential property	1	**71**	**72**	**72**	1	0
18	7M84	Residential property	1	**71**	**72**	**72**	1	0
19	7M85	Residential property	1	**71**	**72**	**72**	1	0
20	7M86	Tukwila Park	Park	**69**	**70**	**70**	1	0
21	7M87	Green River Trail	Trail	64	65	65	1	0
22	7M88	Commercial property	Hotel	63	64	64	1	0
23	7M89	Commercial property	Hotel Pool	64	64	64	0	0

Exhibit 4-1. Modeled Noise Results for Model 7 – I-5 to SR 181

Site #'s	Receiver #	Receiver Type (see Exhibits 5-65 and 5-66)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
Total			54 residential units, 1 Trail, 1 Park, 2 Hotels	11 of 23 sites (representing 21 residences, 1 trail, and 1 park) are at or exceed the NAC	13 of 23 sites (representing 29 residences, 1 trail, and 1 park) are at or exceed the NAC	14 of 23 sites (representing 33 residences, 1 trail, and 1 park) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-2. Modeled Noise Results for Model 8 – SR 181 to Oakesdale Avenue SW

Site #	Receiver #	Receiver Type (see Exhibits 5-66 and 5-67)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V60	Trail/Recreation	Interurban Trail	67	67	67	0	0
2	V61	Springbrook Trail	Trail	69	70	70	1	0
3	V62	Residential property	1	73	74	75	2	1
4	V63	Residential property	1	66	67	67	1	0
5	8M81	Trail/Commercial	Interurban/Pool	66	66	66	0	0
6	8M82	Springbrook Trail	Trail	66	67	68	2	1
7	8M83	Church	Church	74	75	75	1	0
8	8M84	Residential property	1	66	67	66	0	-1
9	8M85	Residential property	1	65	66	66	1	0
10	8M86	Residential property	1	65	66	65	0	-1
11	8M87	Residential property	1	66	67	66	0	-1
Total			6 Residential Units, 2 Trails, 1 Church, 2 Commercial	9 of 11 sites (representing 4 residences, 1 trail, and 1 park) are at or exceed the NAC	11 of 11 sites (representing 6 residences, 1 trail, and 1 park) are at or exceed the NAC	10 of 11 sites (representing 5 residences, 1 trail, and 1 park) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-3. Modeled Noise Results for Model 9 – Oakesdale Avenue SW to SR 167

Site #	Receiver #	Receiver Type (see Exhibits 5-67 and 5-68)	Dwelling Units	Existing (2016) Leq (dBA)	No Build (2045) Leq (dBA)	Build (2045) Leq (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V64	Residential property	1	61	61	62	1	1
2	9M90	Hotel	Pool	63	64	64	1	0
3	9M91	Residential property	1	59	59	60	1	1
4	9M92	Residential property	1	61	61	62	1	1
5	9M93	Residential property	1	61	62	63	2	1
6	9M94	Residential property	1	62	63	63	1	1
7	9M95	Residential property	1	62	63	63	1	1
8	9M96	Residential property	1	59	60	61	2	1
9	9M97	Residential property	1	61	62	62	1	0
10	9M98	Residential property	1	63	64	64	1	0
11	9M99	Residential property	1	65	66	66	1	0
12	9M100	Residential property	1	60	61	61	1	0
13	9M101	Residential property	1	62	62	62	0	0
14	9M102	Residential property	1	64	64	65	1	1
Total			13 Residential Units, 1 Hotel	None of 14 are at or exceed the NAC	One of 14 sites (representing 1 residence) are at or exceed the NAC	One of 14 sites (representing 1 residence) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-4. Modeled Noise Results for Model 10 – SR 167 to SR 169

Site #	Receiver #	Receiver Type (see Exhibits 5-68 and 5-69)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V65	Residential property	1	63	64	65	2	1
2	V66	Residential property	1	**68**	**68**	**70**	2	2
3	V67	Residential property	1	**66**	**67**	**68**	2	1
4	V68	Residential property	1	65	**66**	**67**	2	1
5	V69	Museum Park	Park	65	65	65	0	0
6	V70	Cedar River Park	Trail	**68**	**69**	**68**	0	-1
7	10M100	Residential property	1	**68**	**69**	**70**	2	1
8	10M101	Residential property	1	**67**	**68**	**69**	2	1
9	10M102	Residential property	1	**66**	**67**	**68**	2	1
10	10M103	Residential property	1	54	54	55	1	1
11	10M104	Multi-family 1 Floor	8	56	57	58	2	1
12	10M105	Multi-family 2 Floor	8	56	57	58	2	1
13	10M106	Multi-family 3 Floor	8	56	57	58	2	1
14	10M107	Residential property	1	59	60	61	2	1
15	10M108	Residential property	1	59	60	60	1	0
16	10M109	Residential property	1	60	60	61	1	1
17	10M110	Residential property	1	61	61	62	1	1
18	10M111	Residential property	1	65	65	**66**	1	1
19	10M112	Multi-family 2 Floor	1	**72**	**73**	**73**	1	0
20	10M113	Multi-family 1 Floor	3	**66**	**67**	**68**	2	1
21	10M114	Multi-family 2 Floor	3	**73**	**74**	**74**	1	0
22	10M115	Multi-family 3 Floor	3	**76**	**76**	**77**	1	0
23	10M116	Multi-family 1 Floor	3	65	**66**	**66**	1	0

Exhibit 4-4. Modeled Noise Results for Model 10 – SR 167 to SR 169

Site #	Receiver #	Receiver Type (see Exhibits 5-68 and 5-69)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
24	10M117	Multi-family 2 Floor	3	**72**	**73**	**73**	1	0
25	10M118	Multi-family 3 Floor	3	**76**	**76**	**77**	1	1
26	10M119	Residential property	1	**67**	**68**	**69**	2	1
27	10M120	Residential property	1	**67**	**68**	**69**	2	1
28	10M121	Residential property	1	**66**	**67**	**67**	1	0
29	10M122	Multi-family 1 Floor	1	**66**	**67**	**67**	1	0
30	10M123	Multi-family 2 Floor	3	**73**	**73**	**74**	1	1
31	10M124	Multi-family 3 Floor	3	**76**	**76**	**77**	1	1
32	10M125	Residential property	1	**70**	**71**	**71**	1	0
33	10M126	Residential property	1	**69**	**69**	**70**	1	1
34	10M127	Residential property	1	**69**	**70**	**71**	2	1
35	10M128	Multi-family 1 Floor	2	**66**	**67**	**67**	1	0
36	10M129	Multi-family 2 Floor	2	**74**	**75**	**75**	1	0
37	10M130	Multi-family 1 Floor	3	65	**66**	**66**	1	0
38	10M131	Multi-family 2 Floor	3	**73**	**74**	**74**	1	0
39	10M132	Residential property	1	**68**	**68**	**69**	1	1
40	10M133	Multi-family 1 Floor	2	**67**	**67**	**67**	0	0
41	10M134	Multi-family 2 Floor	2	**73**	**74**	**74**	1	0
42	10M135	Residential property	1	**67**	**68**	**68**	1	0
43	10M136	Residential property	1	**68**	**68**	**68**	0	0
44	10M137	Residential property	1	64	65	65	1	0
45	10M138	Residential property	1	63	64	63	0	-1
46	10M139	Residential property	1	63	64	63	0	-1

Exhibit 4-4. Modeled Noise Results for Model 10 – SR 167 to SR 169

Site #	Receiver #	Receiver Type (see Exhibits 5-68 and 5-69)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
47	10M140	Residential property	1	64	65	64	0	-1
48	10M141	Residential property	1	64	65	65	1	0
49	10M142	Residential property	1	**67**	**68**	**70**	3	2
50	10M143	Residential property	1	**69**	**69**	**70**	1	1
51	10M144	Veterans Memorial	Park	50	51	50	0	-1
52	10M145	Residential property	1	**69**	**71**	**71**	2	0
53	10M146	Residential property	1	**69**	**71**	**72**	3	1
54	10M147	Multi-family 1 Floor	3	**67**	**69**	**70**	3	1
55	10M148	Residential property	1	**69**	**70**	**71**	2	1
56	10M149	Residential property	1	**67**	**68**	**68**	1	0
57	10M150	Residential property	1	**68**	**69**	**69**	1	0
58	10M151	Residential property	1	**67**	**68**	**69**	2	1
59	10M152	Residential property	1	**66**	**67**	**68**	2	1
60	10M153	Residential property	1	65	**66**	**67**	2	1
61	10M154	Residential property	1	65	65	**66**	1	1
62	10M155	Residential property	4	64	65	65	1	0
63	10M156	Residential property	4	64	65	65	1	0
64	10M157	Residential property	4	**66**	**67**	**68**	2	1
65	10M158	Residential property	4	62	62	63	1	1
66	10M159	Residential property	3	63	63	64	1	1

Exhibit 4-4. Modeled Noise Results for Model 10 – SR 167 to SR 169

Site #	Receiver #	Receiver Type (see Exhibits 5-68 and 5-69)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
Total			124 Residential Units, 2 Parks, 1 Trail	40 of 66 sites (representing 64 residences and 1 trail) are at or exceed the NAC	44 of 66 sites (representing 72 residences and 1 trail) are at or exceed the NAC	46 of 66 sites (representing 74 residences and 1 trail) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-5. Modeled Noise Results for Model 1 – SR 169 to SR 900

Site #	Receiver #	Receiver Type (see Exhibits 5-56 and 5-57)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V1	Park	Park	64	65	63	-1	-2
2	V2	Park	Park	**67**	**68**	**67**	0	-1
3	V3	Park	Park	**69**	**70**	**69**	0	-1
4	V4	Commercial property (hotel)	Hotel	**69**	**70**	**68**	-1	-2
5	V5	Residential property	5	64	65	64	0	-1
6	V6	Residential property	3	64	65	64	0	-1
7	V7	Residential property	2	64	65	64	0	-1
8	V8	Multi-family residential	6	**71**	**72**	**71**	0	-1
9	V9	Multi-family residential	6	58	59	59	1	0
10	V10	Multi-family residential	5	59	60	60	1	0
11	V11	Multi-family residential	8	63	64	63	0	-1
12	1M68	Multi-family residential	8	59	60	60	1	0
13	1M69	Commercial property	Restaurant	**68**	**69**	**67**	-1	-2
14	1M70	Commercial property (hotel)	Hotel	**68**	**69**	**67**	-1	-2
15	1M75	Hospital	Hospital	65	**66**	65	0	-1
16	1M77	Multi-family residential	15	**75**	**76**	**76**	1	0
17	1M78	Residential property	3	65	**66**	65	0	-1
18	1M79	Residential property	2	65	**66**	65	0	1
19	1M80	Residential property	3	**67**	**68**	**67**	0	-1
20	1M81	Residential property	5	**68**	**69**	**68**	0	-1
21	1M82	Residential property	6	**68**	**69**	**68**	0	-1
22	1M84	Residential property	4	**68**	**69**	**68**	0	-1
23	1M86	Residential property	1	**70**	**71**	**70**	0	-1
24	1M93	Residential property	4	**72**	**73**	**71**	-1	-2

Exhibit 4-5. Modeled Noise Results for Model 1 – SR 169 to SR 900

Site #	Receiver #	Receiver Type (see Exhibits 5-56 and 5-57)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
25	1M95	Residential property	1	**69**	**70**	**69**	0	-1
26	1M96	Residential property	1	**68**	**69**	**67**	-1	-2
27	1M97	Residential property	2	**68**	**69**	**68**	0	-1
28	1M99	Residential property	2	**68**	**70**	**69**	1	-1
29	1M101	Residential property	1	**68**	**69**	**68**	0	-1
30	1M102	Residential property	4	**67**	**68**	**67**	0	-1
31	1M103	Residential property	1	64	65	65	1	0
32	1M104	Residential property	1	63	64	64	1	0
33	1M105	Residential property	1	59	61	60	1	-1
34	1M107	Multi-family residential	6	57	59	58	1	-1
35	1M108	Multi-family residential	6	59	60	60	1	0
36	1M110	Multi-family residential	6	**68**	**69**	**68**	0	-1
37	1M111	Residential property	3	65	**66**	65	0	-1
38	1M112	Park	Park	**68**	**69**	**68**	0	-1
39	1M113	Multi-family 1 Floor	8	**75**	**76**	**76**	1	0
40	1M114	Multi-family 2 Floor	8	**75**	**76**	**76**	1	0
Total			137 Residential Units, 3 Park locations, 2 Hotels, 1 Commercial, 1 Hospital	20 of 40 sites (representing 77 residences and 3 parks) are at or exceed the NAC	24 of 40 sites (representing 85 residences, 3 parks, and 1 hospital) are at or exceed the NAC	20 of 40 sites (representing 77 residences and 3 parks) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-6. Modeled Noise Results for Model 2 – SR 900 to NE 44th Street

Site #	Receiver #	Receiver Type (see Exhibits 5-58 and 5-59)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V12	Multi-family residential	23	63	64	63	0	-1
2	V13	Residential property	3	**68**	**69**	**68**	0	-1
3	V15	Multi-family residential	12	53	54	56	3	2
4	V16	Residential Property	5	**67**	**68**	**68**	1	0
5	V17	Residential property	9	57	59	58	1	-1
6	V18	Residential property	8	61	62	62	1	0
7	V20	School	School	63	64	63	0	-1
8	V21	Residential property	3	61	63	62	1	-1
9	V22	Residential property	8	59	60	60	1	0
10	V23	Residential property	1	63	64	63	0	-1
11	V25	Residential property	1	**70**	**71**	**70**	0	-1
12	V26	Church	Church	**66**	**67**	**67**	1	0
13	V27	Multi-family residential	12	62	63	61	-1	-2
14	2M68	Residential property	3	59	**67**	**67**	8	0
15	2M69	Residential property	1	**66**	**74**	**73**	7	-1
16	2M70	Residential property	4	**71**	**74**	**74**	3	0
17	2M71	Residential property	3	**75**	**76**	**75**	0	-1
18	2M72	Residential property	8	54	64	63	9	-1
19	2M73	Residential property	1	**76**	**77**	**77**	1	0
20	2M74	Residential property	1	**67**	**68**	**69**	2	1
21	2M75	Residential property	7	61	63	63	2	0
22	2M76	Multi-family residential	27	56	60	59	3	-1
23	2M77	Multi-family residential	16	61	62	62	1	0
24	2M79	Residential property	4	54	58	57	3	-1

Exhibit 4-6. Modeled Noise Results for Model 2 – SR 900 to NE 44th Street

Site #	Receiver #	Receiver Type (see Exhibits 5-58 and 5-59)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
25	2M80	Residential property	3	**71**	**72**	**71**	0	-1
26	2M81	Residential property	5	53	55	55	2	0
27	2M83	Residential property	4	**68**	**70**	**70**	2	0
28	2M84	Residential property	9	58	60	59	1	-1
29	2M86	Residential property	1	62	63	62	0	-1
30	2M87	Residential property	1	61	62	61	0	-1
31	2M88	Residential property	1	59	60	59	0	-1
32	2M89	Residential property	1	61	62	62	1	0
33	2M90	Residential property	1	60	61	61	1	0
34	2M91	Residential property	1	60	61	60	0	-1
35	2M93	Residential property	2	60	61	61	1	0
36	2M94	Residential property	3	59	60	60	1	0
37	2M95	Residential property	4	60	61	61	1	0
38	2M96	Residential property	1	62	63	62	0	-1
39	2M97	Residential property	1	60	61	61	1	0
40	2M98	Residential property	1	61	62	61	0	-1
41	2M99	Residential property	8	58	59	58	0	-1
42	2M101	Residential property	6	59	60	59	0	-1
43	2M102	Residential property	2	64	65	64	0	-1
44	2M103	Residential property	2	60	61	60	0	-1
45	2M104	Residential property	1	62	63	63	1	0
46	2M105	Residential property	4	61	62	62	1	0
47	2M106	Multi-family residential	8	**69**	**71**	**70**	0	-2
48	2M107	Residential property	3	60	61	61	1	0
49	2M109	Residential property	8	56	57	57	1	0

Exhibit 4-6. Modeled Noise Results for Model 2 – SR 900 to NE 44th Street

Site #	Receiver #	Receiver Type (see Exhibits 5-58 and 5-59)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
50	2M110	Residential property	7	63	64	64	1	0
51	2M114	Residential property	2	63	64	64	1	0
52	2M116	Residential property	3	58	59	59	1	0
53	2M117	Residential property	4	58	59	59	1	0
54	2M122	Residential property	1	59	60	59	0	-1
55	2M124	Residential property	3	59	60	60	1	0
56	2M126	Residential property	4	61	62	62	1	0
57	2M127	Daycare center	Daycare	55	56	56	1	0
58	2M129	Residential property	1	**75**	**72**	**N/A**	N/A	N/A
59	2M130	Residential property	2	**66**	**67**	**66**	0	-1
60	2M132	Residential property	6	60	61	60	0	-1
61	2M133	Residential property	5	63	64	64	1	0
62	2M135	Residential property	6	61	62	60	0	-1
63	2M139	Residential property	1	61	64	63	2	-1
64	2M140	Residential property	1	63	65	64	1	-1
65	2M141(R))	Residential property	1	**68**	**69**	**68**	0	-1
66	2M142	Residential property	3	65	**66**	65	0	-1
67	2M4008	Residential property	1	**73**	**74**	**73**	0	-1
68	2M3932	Residential property	1	**72**	**73**	**71**	-1	-2
69	2M3922	Residential property	1	**68**	**73**	**N/A**	N/A	N/A
70	2M3908	Residential property	1	65	65	65	0	0
71	2M3904	Residential property	1	**68**	**69**	61	-7	-8
72	2M3820	Residential property	1	65	**66**	63	-2	-3
73	2M138	Residential property	1	65	**66**	63	-2	-3
74	2M143	May Creek Trail	Trail	64	65	63	-1	-2

Exhibit 4-6. Modeled Noise Results for Model 2 – SR 900 to NE 44th Street

Site #	Receiver #	Receiver Type (see Exhibits 5-58 and 5-59)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
Total			298 Residential Units, 1 School, 1 Daycare, 1 Church, 1 Trail	19 of 74 sites (representing 42 residences and 1 church) are at or exceed the NAC	23 of 74 sites (representing 43 residences and 1 church) are at or exceed the NAC	17 of 74 sites (representing 42 residences and 1 church) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels. N/A represents values that do not exist because the properties will be acquired.
The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-7. Modeled Noise Results for Model 3 – NE 44th Street to Lake Washington Boulevard SE

Site #	Receiver #	Receiver Type (see Exhibits 5-60 and 5-61)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing q(dB)	Build vs No Build (dB)
1	V28	Multi-family, Nautica condo	Pool	64	65	65	1	0
2	V29	Multi-family, Nautica	7	65	**66**	62	-3	-4
3	V30	Multi-family, Misty Cove	12	62	63	63	1	0
4	V30b	Multi-family (condo pool)	Pool	60	61	61	0	0
5	V31	Residential property	9	64	65	64	0	-1
6	V31b	Residential property	8	**66**	**67**	**67**	1	0
7	V31c	Residential property	5	65	**66**	65	0	-1
8	V32	Residential property	8	62	63	64	2	1
9	V33	Residential property	4	**68**	**69**	**69**	1	0
10	V34	Residential property	1	59	60	61	2	1
11	V35	Residential property	4	**76**	**77**	**77**	1	0
12	V36	Residential property	6	63	64	62	-1	-2

Exhibit 4-7. Modeled Noise Results for Model 3 – NE 44th Street to Lake Washington Boulevard SE

Site #	Receiver #	Receiver Type (see Exhibits 5-60 and 5-61)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing q(dB)	Build vs No Build (dB)
13	V37	Neighborhood park	Park	**71**	**72**	**71**	0	-1
14	V38	Residential property	5	51	51	51	0	0
15	3M68	Commercial property (lodge	Pool	**69**	**70**	**69**	0	-1
16	3M70	Residential property	6	62	63	63	1	0
17	3M71	Residential property	9	63	64	65	2	1
18	3M73	Residential property	6	**73**	**74**	**75**	2	1
19	3M74	Residential property	2	**75**	**79**	**76**	0	-3
20	3M75	Residential property	1	**78**	**79**	**79**	1	0
21	3M76	Residential property	4	**73**	**78**	**74**	1	-4
22	3M77	Residential property	2	**75**	**76**	**75**	0	-1
23	3M79	Residential property	4	**67**	**69**	**69**	2	0
24	3M81	Residential property	2	**75**	**76**	**76**	1	0
25	3M83	Residential property	7	58	59	62	4	3
26	3M84	Residential property	23	63	64	64	1	0
27	3M85	Residential property	5	**72**	**73**	**73**	1	1
28	3M87	Residential property	1	**69**	**74**	**70**	1	4
29	3M90	Residential property	2	**71**	**72**	**72**	1	0
30	3M92	Residential property	6	60	61	62	2	1
31	3M93	Residential property	5	61	62	62	1	0
32	3M94	Residential property	7	61	62	60	-1	-2
33	3M95	Residential property	7	53	54	52	-1	-2
34	3M99	Residential property	7	56	57	55	-1	-2
35	3M100	Residential property	3	**73**	**74**	**75**	2	1
36	3M102	Residential property	6	54	55	54	0	-1

Exhibit 4-7. Modeled Noise Results for Model 3 – NE 44th Street to Lake Washington Boulevard SE

Site #	Receiver #	Receiver Type (see Exhibits 5-60 and 5-61)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing q(dB)	Build vs No Build (dB)
37	3M104	Residential property	2	**70**	**71**	**71**	1	0
38	3M105	Residential property	6	**68**	**69**	**68**	0	-1
39	3M107	Residential property	1	**68**	**69**	**68**	0	-1
40	3M109	Multi-family (Misty Cove 2nd	6	**66**	**67**	**66**	0	-1
41	3M110	Multi-family (Misty Cove 3rd	6	**68**	**69**	**69**	1	0
42	3M112	Multi-family (Misty Cove ground floor)	6	63	64	64	1	0
43	3M114	Residential property	6	**76**	**77**	**77**	1	0
44	3M115	Residential property	2	62	63	63	1	0
45	3M119	Trail	10	**70**	**71**	**71**	1	0
46	3M121	Trail	10	**68**	**69**	**69**	1	0
47	3M122	Trail	10	**66**	**67**	**66**	0	-1
48	3M123	Trail	10	62	63	65	3	2
49	3M124	Trail	10	65	**66**	**67**	2	2
50	3M125	Trail	10	65	65	**66**	1	1
51	3M126	Trail	10	65	65	**66**	1	1
52	3M127	Trail	10	63	64	64	1	0
53	3M128	Trail	10	62	63	63	1	0
54	3M129	Trail	10	62	63	63	1	0
55	3M130	Trail	10	63	63	62	-1	-2
56	3M131	Trail	10	60	61	59	-1	-2
57	3M133	Trail	10	55	56	55	0	-1

Exhibit 4-7. Modeled Noise Results for Model 3 – NE 44th Street to Lake Washington Boulevard SE

Site #	Receiver #	Receiver Type (see Exhibits 5-60 and 5-61)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing q(dB)	Build vs No Build (dB)
58	3M158	Residential property	2	**69**	**70**	**71**	2	1
59	3M159	Residential property	2	**74**	**75**	**75**	1	0
60	3M160	Residential property	2	**73**	**74**	**74**	1	0
61	3M161	Residential property	2	**69**	**70**	**69**	0	-1
62	3M162	Residential property	3	**72**	**73**	**73**	1	0
63	3M163	Residential property	3	**68**	**69**	**70**	2	1
64	3M164	Residential property	3	**70**	**71**	**71**	1	0
65	3M168	Trail	10	**68**	**69**	**69**	1	0
66	3M169	Trail	10	**67**	**68**	**68**	1	0
67	3M170	Trail	10	61	62	63	2	1
Total			236 Residential Units, 3 Pools, 1 Park, 1 Trail	33 of 67 sites (representing 92 residences, 1 park, and 1 trail) are at or exceed the NAC	36 of 67 sites (representing 104 residences, 1 park and 1 trail) are at or exceed the NAC	36 of 67 sites (representing 92 residences, 1 park, and 1 trail) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels. The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-8. Modeled Noise Results for Model 4 – Lake Washington Boulevard SE to SE Coal Creek Parkway

Site #	Receiver #	Receiver Type (see Exhibit 5-62)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V39	Residential property	7	64	65	65	1	0
2	V40	Residential property	9	**62**	63	62	0	-1
3	V41	Residential property	6	65	**66**	**66**	1	0
4	V40R	Residential property	3	65	64	63	-2	-1
5	V42	Residential property	2	**73**	**73**	**73**	0	0
6	V45	Residential property	3	63	63	63	0	0
7	4M70	Residential property	9	56	56	55	-1	-1
8	4M71	Residential property	9	59	60	59	0	-1
9	4M72	Residential property	6	63	64	65	2	1
10	4M73	Residential property	6	62	62	62	0	0
11	4M74	Residential property	2	55	56	56	1	0
12	4M75	Residential property	2	**70**	**71**	**71**	1	0
13	4M76	Residential property	7	**71**	**72**	**72**	1	0
14	4M77	Residential property	7	59	60	60	1	0
15	4M78	Residential property	8	61	61	61	0	0
16	4M80	Residential property	2	**73**	**74**	**73**	0	-1
17	4M81	Residential property	2	65	66	65	-1	-2
18	4M82	Residential property	2	**72**	**72**	**71**	-1	-1
19	4M83	Residential property	2	**71**	**72**	**71**	0	-1
20	4M86	Residential property	3	63	64	63	-1	0
21	4M87	Residential property	12	58	59	59	1	0
22	4M88	Residential property	10	62	63	62	0	-1
23	4M93	Trail	10	60	61	59	-1	-2
24	4M94	Trail	10	**66**	**67**	**67**	1	0

Exhibit 4-8. Modeled Noise Results for Model 4 – Lake Washington Boulevard SE to SE Coal Creek Parkway

Site #	Receiver #	Receiver Type (see Exhibit 5-62)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
25	4M95	Trail	10	**66**	**66**	**67**	1	1
26	4M96	Trail	10	64	65	**66**	2	1
27	4M97	Trail	10	57	58	57	0	-1
28	4M98	Trail	10	**71**	**71**	**71**	0	0
29	4M99	Trail	10	**67**	**68**	**68**	0	0
30	4M100	Coal Creek Trail	1	63	64	64	1	0
31	4M101	Coal Creek Trail	1	61	62	62	1	0
Total			119 Residential Units, 2 Trails	10 of 31 sites (representing 17 residences and 1 trail) are at or exceed the NAC	12 of 31 sites (representing 25 residences and 1 trail) are at or exceed the NAC	12 of 31 sites (representing 23 residences and 1 trail) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels.

The letter "V" represents validation sites and the letter "M" represents modeled sites.

Exhibit 4-9. Modeled Noise Results for Model 5 and 6 – SE Coal Creek Parkway to SE 22nd Vicinity

Site #	Receiver #	Receiver Type (see Exhibits 5-63 and 5-64)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
1	V43	Residential property	1	65	**67**	**67**	2	0
2	V44	Residential property	1	65	**67**	**67**	2	0
3	V46	Residential property	2	61	62	62	2	0
4	V47	Multi-family residential property	9	63	65	65	2	0
5	V48	Residential property	1	60	62	62	2	0
6	V49	Residential property	1	59	61	61	2	0
7	V50	Residential property	2	**67**	**68**	**68**	1	0
8	V51	Residential property	1	**66**	**68**	**67**	1	-1
9	V52	Multi-family residential property	6	62	64	64	2	0
10	V53	Multi-family residential property	6	59	60	60	1	0
11	V54	Multi-family residential property	6	59	61	61	2	0
12	V55	Residential property	1	64	**66**	65	1	-1
13	V56	Residential property	5	59	60	60	1	0
14	5M70	Residential property	2	59	61	61	2	0
15	5M71	Residential property	2	62	64	64	2	0
16	5M72	Residential property	1	61	63	63	2	0
17	5M73	Residential property	2	61	63	62	1	-1
18	5M74	Residential property	1	62	64	64	2	0
19	5M75	Residential property	2	62	64	64	2	0
20	5M76	Residential property	2	59	61	61	2	0
21	5M77	Residential property	4	57	59	59	2	0
22	5M78	Residential property	2	60	61	61	2	0
23	5M79	Residential property	1	**66**	**68**	**68**	2	0
24	5M80	Residential property	3	62	64	64	2	0
25	5M81	Residential property	7	58	60	59	1	-1

Exhibit 4-9. Modeled Noise Results for Model 5 and 6 – SE Coal Creek Parkway to SE 22nd Vicinity

Site #	Receiver #	Receiver Type (see Exhibits 5-63 and 5-64)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
26	5M82	Residential property	2	61	63	62	1	-1
27	5M84	Residential property	1	57	59	59	2	0
28	5M85	Multi-family residential property	4	**70**	**72**	**71**	1	-1
29	5M86	Residential property	1	**70**	**71**	**71**	2	-1
30	5M87	Residential property	2	62	64	64	1	0
31	5M88	Residential property	1	62	64	63	1	-1
32	5M89	Residential property	2	60	61	61	2	0
33	5M90	Residential property	2	61	63	62	1	-1
34	5M91	Residential property	4	64	**66**	**66**	2	0
35	5M92	Residential property	2	60	62	61	1	-1
36	5M93	Residential property	2	59	61	61	2	0
37	5M94	Residential property	2	58	60	60	2	0
38	5M96	Residential property	2	61	63	63	2	0
39	5M98	Residential property	3	57	59	59	2	0
40	5M100	Residential property	4	**76**	**78**	**78**	2	0
41	5M102	Residential property	1	**69**	**71**	**70**	2	0
42	5M103	Residential property	1	**68**	**70**	**70**	2	0
43	5M104	Residential property	1	**67**	**69**	**68**	1	-1
44	5M105	Residential property	1	61	63	63	1	-1
45	5M106	Residential property	1	**70**	**72**	**71**	2	0
46	5M107	Residential property	2	**67**	**69**	**68**	1	-1
47	5M108	Residential property	1	65	**67**	**66**	1	-1
48	5M109	Residential property	1	**67**	**69**	**69**	2	0
49	5M111	Residential property	1	**66**	**68**	**67**	2	0

Exhibit 4-9. Modeled Noise Results for Model 5 and 6 – SE Coal Creek Parkway to SE 22nd Vicinity

Site #	Receiver #	Receiver Type (see Exhibits 5-63 and 5-64)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
50	5M112	Residential property	2	**66**	**68**	**67**	2	0
51	5M113	Residential property	2	**68**	**70**	**70**	2	0
52	5M114	Residential property	2	**68**	**69**	**69**	1	0
53	5M116	Residential property	3	**66**	**67**	**66**	0	-1
54	5M118	Residential property	2	**68**	**70**	**70**	2	0
55	5M120	Residential property	1	**67**	**69**	**69**	2	0
56	5M121	Residential property	2	**66**	**68**	**68**	2	0
57	5M122	Residential property	2	**67**	**69**	**69**	2	0
58	5M123	Residential property	1	**66**	**68**	**67**	1	-1
59	5M124	Residential property	1	65	**67**	**66**	1	-1
60	5M125	Residential property	2	65	**67**	**67**	2	0
61	5M126	Residential property	2	65	**67**	**66**	1	-1
62	5M128	Residential property	1	**69**	**70**	**70**	1	0
63	5M130	Church	Church	65	**67**	**66**	1	-1
64	5M132	Residential property	9	**66**	**67**	**67**	1	0
65	5M133	Residential property	2	65	**67**	**67**	2	0
66	5M134	Residential property	2	61	63	63	2	0
67	5M135	Residential property	6	65	**66**	**66**	2	0
68	5M136	Multi-family, Condo Pool Area	6	58	60	60	2	0
69	5M137	I-90 Trail	Trail	**78**	**79**	**79**	0	0
70	5M138	I-90 Trail	Trail	**78**	**79**	**79**	1	0
71	6M100	Residential property	1	63	64	64	1	0
72	6M101	Residential property	3	60	62	62	2	0
73	6M103	Residential property	2	59	60	60	1	0

Exhibit 4-9. Modeled Noise Results for Model 5 and 6 – SE Coal Creek Parkway to SE 22nd Vicinity

Site #	Receiver #	Receiver Type (see Exhibits 5-63 and 5-64)	Dwelling Units	Existing (2016) L_{eq} (dBA)	No Build (2045) L_{eq} (dBA)	Build (2045) L_{eq} (dBA)	Build vs Existing (dB)	Build vs No Build (dB)
74	6M106	Multi-family residential property	10	65	**66**	**66**	1	0
75	6M108	Multi-family residential property	12	63	64	63	0	-1
76	6M109	Multi-family residential property	10	60	61	60	0	-1
77	6M111	Residential property	4	57	58	58	1	0
78	6M128	Residential property	3	61	62	62	1	0
79	6M134	Residential property	1	65	**66**	65	0	-1
80	6M135	Residential property	1	63	64	64	1	0
81	6M136	Residential property	1	62	63	63	1	0
Total			211 Residential Units, 1 Trails, 1 Church	26 of 81 sites (representing 48 residences and 1 trail) are at or exceed the NAC	39 of 81 sites (representing 79 residences, 1 trail, and 1 church) are at or exceed the NAC	37 of 81 (representing 78 residences, 1 trail, and 1 church) are at or exceed the NAC		

Bold numbers represent noise levels at or above WSDOT impact levels

The letter "V" represents validation sites and the letter "M" represents modeled sites.

SECTION 5 TRAFFIC NOISE ABATEMENT

Background

Noise abatement is considered only where there is (1) an expected noise level of 66 dBA or higher in the design year Build condition, (2) an increase of 10 dBA over existing conditions for land use categories A, B, C, and D as defined in Exhibit 3-2, or (3) 71 dBA or higher for land use Category E. If such a situation exists, abatement is considered only where frequent human use occurs and where a lower noise level would have benefits (FHWA 1982). Noise levels can be reduced by the following types of abatement.

- Traffic management, such as restrictions on the types of vehicles and the time they may use a certain roadway.
- Change in vertical or horizontal alignment of the roadway.
- Acquisition of property.
- Construction of noise barriers, such as noise walls.

Abatement was considered for the traffic noise impacts related to the Project. Some of the modeled noise levels approach or exceed FHWA NAC levels. We modeled increases between the existing and Build conditions.

Abatement must be both feasible and reasonable for it to be recommended for construction.

Feasibility

Feasibility is a combination of acoustic and engineering considerations. WSDOT evaluates many factors to determine whether noise walls would be feasible. All of the following must occur for abatement (e.g., noise barrier) to be considered feasible:

- Abatement must be physically constructible.
- The majority first-row affected receivers (closest to the roadway) must obtain a minimum 5 dBA of noise reduction because of abatement (insertion loss), thus, ensuring that every reasonable effort will be made to assess outdoor use areas as appropriate.

Reasonableness

When noise abatement is determined feasible, we assess whether the abatement is reasonable. WSDOT would only construct noise walls, or other types of abatement, if the noise walls have been determined reasonable after thoroughly evaluating the criteria below.

The reasonableness criteria of a noise barrier depend on the noise level at the sensitive receivers that would benefit from the barrier. To be reasonable, the proposed wall must be cost-effective and it must also meet the design goal for noise reduction. The noise barrier area may not exceed the sum of the total allowed area per household, for all households that would benefit by at least 5 dBA, and 7 dBA at one location, as a result of the barrier. The allowed area per household is a function of the predicted future noise level during the loudest hour. For receivers other than single-family residences, WSDOT calculates a residential equivalency (RE).

Cost Effectiveness

The cost of noise abatement sufficient to provide at least the minimum feasible noise reductions must be equal to or less than the allowable cost of abatement for each noise wall location analyzed. Based on noise wall costs from 2007 to 2010, the current average cost in Washington is $51.61 per square foot. The cost is applied to the allowed wall surface area (square feet) to generate the allowable cost per qualified resident, as described in Exhibit 5-1.

Either wall square footage or cost can be used to evaluate cost effectiveness, unless costs for the wall will exceed the cost of a standard design noise wall; then cost must be used to compare the wall cost to the allowable cost.

For the Project, we evaluated a standard noise wall design, and the cost associated with the noise wall is used to describe the cost effectiveness. The allowable cost per receiver, based on Build conditions traffic noise levels, is presented in Exhibit 5-1.

Exhibit 5-1. Reasonableness Allowances for Noise Walls

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

[a] If the noise level increases 10 dBA or more as the result of a project (Column B), follow the allowed wall surface and cost for the level of increase in Columns C and D, respectively, 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 if the project results in an increase of 15 or more decibels, continue increasing the allowance at the rate provided herein unless circumstances determined on a case-by-case basis require a methodology for determining the allowance.

[b] Current costs are based on $51.61 per square foot constructed cost developed in 2011.

[c] Step 1 – when the noise levels are 10 to 14 dBA over future No Build conditions traffic noise as a result of a transportation project.

[d] Step 2 – when the noise levels are 15 or more dBA over existing traffic noise because 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.

Design Goal Achievement

The design goal for abatement on all transportation projects for reasonableness is at least 7 dBA of reduction for at least one first-row receiver. 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.

All the following reasonableness evaluation exhibits in this report describe the allowable cost per receiver and the cost of the minimum barrier size to achieve the design goal.

Residential Equivalency

WSDOT calculates reasonableness based on the number of residences that benefit from a noise wall. For noise-sensitive

uses other than residences, we calculate an RE of the users based on the usage factor and number of users, according to WSDOT's *Traffic Noise Policy and Procedures* (WSDOT 2011). Residences are assumed to be in use at all times, but many other facilities such as schools have specific hours of operation. The usage factor accounts for the times of operation (Appendix C, Residential Equivalency, shows typical usage factors). In Washington, the average household has three members, so for sites with other than residential uses, the number of users is multiplied by a usage factor and divided by three to convert to equivalent households. Appendix C, Residential Equivalency, presents the residential equivalency for receivers in the noise study area that include sensitive uses (other than single-family residences) that approached or exceeded the NAC.

Noise Wall Analysis—SR 169 to north of I-90

WSDOT evaluated noise barriers at 39 different locations between I-5 and north of I-90 to determine whether abatement could sufficiently reduce traffic noise levels. We found 5 of the 39 locations to be feasible and reasonable between I-5 and north of I-90. We evaluated a noise barrier at every location where noise levels were predicted to approach or to exceed the NAC. Each location is presented from south to north and is identified by which side of I-405 it is located. The following section summarizes noise wall feasibility, reasonableness, and the size of the recommended barrier.

1. Wall West 1 (Feasible, Not Reasonable)

We evaluated the Liberty Park area for a 28- to 30-foot-tall noise wall, which WSDOT has designated Wall West 1, along the I-405 southbound on-ramp between the I-405 Cedar River bridge and SR 169. Noise levels in this area would range between 63 and 68 dBA without a wall (Exhibit 5-2).

Exhibit 5-2. Feasibility Analysis for a 28- to 30-Foot-Tall Wall West 1

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
1M-112	**68**	64	Yes	5	100%
V-2	**67**	61	Yes	7	
V-1	63	61	No	3	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall West 1, as shown in Exhibit 5-56 later in this section, is feasible. At this location, a 28- to 30-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Noise Wall West 1 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall West 1 would have an area of 29,066 square feet. A wall height between 28 and 30 feet and a length of 982 feet would achieve a 7-dBA noise reduction, at least for one receiver behind the wall. A noise wall of this size would achieve WSDOT's design goal of reducing traffic noise levels by at least 7 dBA.

As shown in Exhibit 5-3, the allowable area of Wall West 1 is 5,444 square feet, which is less than the actual wall area of 29,066 square feet. Therefore, Wall West 1 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

Exhibit 5-3. Wall West 1 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area per Household (ft^2)	Area per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
1M-112	1	**68**	**68**	836	836	5,444	29,066	5
V-2	6	**67**	**67**	768	4,608			7
V-1	1	64	63	0	0			3
						Design Goal Achieved?	Yes	
						Cost Effective?	No	

Impacts are noted by bolded values.

2. Wall East 1 (Feasible, Not Reasonable)

We evaluated the Cedar River Park area for a 22- to 26-foot-tall Wall East 1 noise wall along the east edge of I-405 between I-405 Cedar River bridge and SR 169. Noise levels in this area would range between 65 and 69 dBA without a wall (Exhibit 5-4).

Exhibit 5-4. Feasibility Analysis for a 22- to 26-Foot-Tall Wall East 1

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V-3	**69**	63	Yes	7	67%
1M-111	65	65	Yes	0	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 1, as shown in Exhibit 5-56 later in this section, was found feasible. At this location, a 22- to 26-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall East 1 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 1 would have an area of 18,661 square feet. A wall height between 22 and 26 feet and a length of 759 feet would achieve a 7-dBA noise reduction at least for one receiver behind the wall. A noise wall of this size would achieve WSDOT's design goal of reducing traffic noise levels by at least 7 dBA.

The allowable area of Wall East 1 is 5,424 square feet, which is less than the actual wall area of 18,661 square feet (Exhibit 5-5). Therefore, Wall East 1 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

Exhibit 5-5. Wall East 1 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V-3	6	**69**	**69**	904	5,424	5,424	18,661	7
M-111	3	65	65	0	0			0
Design Goal Achieved?								Yes
Cost Effective?								No

Impacts are noted by bolded values.

3. Wall East 3 (Feasible, Reasonable)

We evaluated a noise wall along the east right of way of I-405 from north of NE 3rd Street extending to Sunset Boulevard NE, then connecting to the existing Wall East 3. The noise wall (the extension to the existing Wall East 3) would be 14 to 16 feet tall and approximately 1,380 feet long. Noise levels in the vicinity of Wall East 3 are predicted to be 65 to 76 dBA without a wall (Exhibit 5-6).

Exhibit 5-6. Feasibility Analysis for a 14- to 16-Foot-Tall Wall East 3 Extension

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First- Row Receiver?	Insertion Loss (dBA)	% First-Row ≥5 dBA
1M-78	65	62	Yes	3	83%
1M-77	**76**	65	Yes	11	
Feasible?					Yes

Impacts are noted by bolded values.

Noise Wall East 3, as shown in Exhibit 5-56 later in this section, was found feasible. At this location, modeling shows that a 14- to 16-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row receivers. Because Wall East 3 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 3 would be cost-effective, with an area of 20,700 square feet and a height between 14 and 16 feet, and would

achieve the design goal of providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 3 is 20,700 square feet, which is greater than the actual wall area of 9,957 square feet. This wall meets WSDOT's reasonableness requirement (Exhibit 5-7). We found Wall East 3 to be feasible and reasonable and recommend it for construction. The proposed Noise Wall East 3 would benefit one of two receivers located behind the wall. The one receiver represents 15 dwelling units located in the vicinity of the proposed wall. The wall would reduce noise levels to below the NAC for one of the two receivers, representing 15 dwelling units. In addition, Wall East 3 would reduce noise levels at one additional receiver, representing three dwelling units.

While this noise wall meets WSDOT's feasibility and reasonableness, the majority of the property owners and tenants behind the wall did not vote in favor of building this wall. Therefore, WSDOT would not build Wall East 3.

Exhibit 5-7. Wall East 3 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
1M-78	3	65	65	0	0	20,700	9,957	3
1M-77	15	**75**	**76**	1,380	20,700			11
						Design Goal Achieved?		Yes
						Cost Effective?		Yes

Note: Modeled Sites predicted to receive at least a 5 dBA reduction are considered benefitted by Wall East 3.
Impacts are noted by bolded values.
Wall will not be built following polling results. See Appendix D, Noise Wall Polling Results.

4. Wall East 4A (Not Feasible)

We evaluated a 14- to 28-foot-tall noise wall along the east right of way line of I-405 starting north of the bridge over Sunset Boulevard NE and extending north for about 1,740 feet. The modeled receivers located behind a Wall East 4A are elevated above I-405 and experience substantial noise from traffic on Sunset Boulevard NE as well. Noise levels in the

vicinity of Wall East 4A are predicted to be 64 to 71 dBA without a wall (Exhibit 5-8).

Exhibit 5-8. Feasibility Analysis for a 14- to 28-Foot-Tall Wall East 4A

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
1M-104	64	62	No	2	35%
1M-103	65	64	Yes	2	
1M-102	**67**	65	Yes	3	
1M-101	**68**	64	Yes	5	
V-8	**71**	64	Yes	7	
1M-99	**69**	65	No	4	
1M-97	**68**	**66**	No	2	
1M-93	**71**	**67**	Yes	4	
1M-96	**67**	**66**	No	2	
1M-95	**69**	**67**	No	2	
1M-86	**70**	**68**	Yes	3	
1M-84	**68**	**66**	Yes	1	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall East 4A, as shown in Exhibit 5-57 later in this section, was not found to be feasible because a wall up to 28 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers. Noise levels in the vicinity of Wall East 4A are predicted to be 64 to 71 dBA without a wall (Exhibit 5-8).

Receivers in the vicinity of site V-8 are on a hillside approximately 40 to 80 feet higher than the roadway and overlooking I-405. In this instance, a noise barrier along the I-405 right of way would provide little to no benefit for the homes on the hillside overlooking I-405. In addition, Sunset Boulevard NE is located between I-405 and the residences. Sunset Boulevard NE traffic also contributes substantially to the traffic noise in this area. Based on these factors, a noise wall is not feasible in the vicinity of Wall East 4A. Therefore, a reasonableness discussion is not necessary for this wall.

5. Wall East 4B (Feasible, Not Reasonable)

We evaluated an 18-foot-tall noise wall along the east right of way line of I-405 starting at NE 10th street and extending for

about 820 feet northward. Noise levels in the vicinity of a Wall East 4B are predicted to be 63 to 68 dBA without a wall (Exhibit 5-9).

Exhibit 5-9. Feasibility Analysis for an 18-Foot-Tall Wall East 4B

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
1M-110	**68**	60	Yes	5	100%
V-11	63	58	No	2	
				Feasible?	Yes

Impacts are noted by bolded values.

At this location, the modeling shows that an 18-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row receivers. Noise Wall East 4B, as shown in Exhibit 5-57, was found feasible. Because Wall East 4B appears to be feasible and physically constructible, the wall was also evaluated for reasonableness.

Wall East 4B would have an area of 14,773 square feet. A wall height of 18 feet and length of 820 feet would be the minimum feasible wall at this location. However, this wall would not achieve a 7-dBA noise reduction for at least one receiver behind the wall. A noise wall up to 30 feet tall would not achieve WSDOT's design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement. Therefore, no further reasonableness discussion is required for this wall.

6. Wall West 4 (Not Feasible)

We evaluated a 30-foot-tall noise wall along the west right of way line of I-405 starting in the May Creek vicinity and extending southward for about 592 feet to the relocated existing Wall West 4. Noise levels in the vicinity of a Wall West 4 are predicted to be 65 to 73 dBA without a wall (Exhibit 5-10).

Exhibit 5-10. Feasibility Analysis for a 30-Foot-Tall Wall West 4

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
2M-4008	**73**	**71**	Yes	2	20%
V25(3940)	**70**	**68**	Yes	2	
2M-3932	**71**	63	Yes	5	

Exhibit 5-10. Feasibility Analysis for a 30-Foot-Tall Wall West 4

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
2M-130	**66**	64	No	2	
2M-3908	65	61	Yes	3	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall West 4, as shown in Exhibit 5-59 later in this section, was not found to be feasible. A wall up to 30 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers. Therefore, a reasonableness discussion is not necessary for this wall.

7. Wall East 5 (Not Feasible)

We evaluated a 30-foot-tall noise wall along the east right of way of I-405 beginning just north of the NE Park Drive interchange and extending northward for approximately 511 feet to NE 14th Street. Noise levels in the area of a Wall East 5 are predicted to range between 65 and 72 dBA without a noise wall (Exhibit 5-11).

Exhibit 5-11. Feasibility Analysis for a 30-Foot-Tall Wall East 5

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
2M-68	65	62	Yes	4	25%
2M-69	**72**	**68**	Yes	5	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall East 5, as shown in Exhibit 5-58 later in this section, was not found to be feasible because a wall up to 30 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers.

Residences represented by these modeled sites are located between 200 and 400 feet from the I-405 right of way on a hillside, approximately 100 feet above and overlooking I-405. For that reason, the proposed wall would not protect the homes on the hillside from the I-405 traffic noise. Therefore, a reasonableness discussion is not necessary for this wall.

8. Wall East 6 (Feasible, Not Reasonable)

We evaluated a 10- to 20-foot-tall noise wall along the east I-405 right of way beginning at the end of the northbound on-ramp at NE Park Drive and extending approximately 2,713 feet northward. Noise levels in the vicinity of a Wall East 6 are predicted to range between 55 and 77 dBA without a wall (Exhibit 5-12).

Exhibit 5-12. Feasibility Analysis for a 10- to 20-Foot-Tall Wall East 6

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V-16	**68**	**66**	Yes	4	73%
2M-84	59	60	No	1	
2M-83	**70**	64	Yes	12	
V-13	**68**	64	Yes	8	
2M-81	55	54	No	3	
2M-80	**71**	61	Yes	11	
2M-79	57	56	No	2	
2M-75	63	59	Yes	6	
2M-74	**69**	61	No	10	
2M-73	**77**	61	Yes	14	
2M-71	**75**	64	Yes	11	
2M-72	63	60	No	4	
2M-70	**74**	65	Yes	12	
				Feasible?	Yes

Impacts are noted by bolded values.

This area is elevated above I-405, and the first row of residences are already shielded by a retaining wall. Noise Wall East 6, as shown in Exhibit 5-58 later in this section, is feasible. At this location, a 10- to 20-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Noise Wall East 6 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 6 would have an area of 43,796 square feet and a height between 10 and 20 feet; it would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement, as well as a substantial reduction in noise of 10 dBA and higher.

However, the allowable area of Wall East 6 is 25,680 square feet, which is less than the actual wall area of 43,796 square feet. Therefore, Wall East 6 does not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-13).

Exhibit 5-13. Wall East 6 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V-16	5	**67**	**68**	0	0			4
2M-84	9	58	59	0	0			1
2M-83	4	**68**	**70**	972	3,888			12
V-13	3	**68**	**68**	836	2,508			8
2M-81	5	53	55	0	0			3
2M-80	3	**71**	**71**	1,040	3,120			11
2M-79	4	54	57	0	0	25,680	43,796	2
2M-75	7	61	63	700	4,900			6
2M-74	1	**67**	**69**	904	904			10
2M-73	1	**76**	**77**	1,448	1,448			14
2M-71	3	**75**	**75**	1,312	3,936			11
2M-72	8	54	63	0	0			4
2M-70	4	**71**	**74**	1,244	4,976			12
						Design Goal Achieved?		Yes
						Cost Effective?		No

Impacts are noted by bolded values.

9. Wall West 6 Extension (Feasible, Reasonable)

We evaluated an 8- to 12-foot-tall noise wall at MP 10, along the west right of way of I-405 between the SE Coal Creek Parkway and I-90 interchange. A Wall West 6 extension would begin adjacent to the existing noise wall (existing Wall West 6) in the vicinity of SE 41st Street and extend for approximately 934 feet northward to SE 38th Street. Noise levels in the vicinity of Wall West 6 are predicted to range between 61 and 78 dBA without a wall, as shown in Exhibit 5-14.

Exhibit 5-14. Feasibility Analysis for an 8- to 12-Foot-Tall Wall West 6

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	1st Row Receiver?	Insertion Loss (dBA)	% 1st Row Receiver ≥ 5 dBA
5M-126	**66**	65	No	1	60%
5M-107	**68**	**66**	No	1	
5M-116	**66**	65	No	1	
V-50	**68**	65	Yes	3	
5M-111	**67**	**66**	No	3	
5M-106	**71**	**67**	Yes	6	
5M-104	**68**	**66**	No	3	
5M-103	**70**	**66**	Yes	3	
5M-102	70	65	Yes	5	
5M-130	66	64	No	4	
5M-100	**78**	**68**	Yes	9	
5M-125	**67**	65	No	2	
5M-124	**66**	64	No	2	
5M-108	**66**	63	Yes	3	
				Feasible?	Yes

Impacts are noted by bolded values.

An 8- to 12-foot-tall Noise Wall West 6, as shown in Exhibit 5-63 later in this section, was found to be feasible. At this location, an 8- to 12-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall West 6 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall West 6 would have an area of 8,551 square feet and require a height between 8 and 12 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement, as well as substantial reduction in noise of 10 dBA and higher.

The allowable area of Wall West 6 is 8,552 square feet, which is more than the actual wall area of 8,551 square feet. Therefore, Wall West 6 would meet WSDOT's reasonableness requirement and is recommended for construction (Exhibit 5-15).

Exhibit 5-15. Wall West 6 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
5M-126	2	65	**66**	0	0	8,552	8,551	1
5M-107	2	**67**	**68**	0	0			1
5M-116	3	**66**	**66**	0	0			3
V-50	2	**67**	**68**	0	0			3
5M-111	1	**66**	**67**	0	0			2
5M-106	1	**70**	**71**	1,040	1,040			6
5M-104	1	**67**	**68**	0	0			3
5M-103	1	**68**	**70**	0	0			3
5M-102	1	**69**	**70**	972	972			5
5M-130	1	65	**66**	0	0			4
5M-100	4	**76**	**78**	1,516	6,064			9
5M-125	2	65	**67**	0	0			2
5M-124	1	65	**68**	0	0			2
5M-108	1	65	**66**	0	0			3
Design Goal Achieved?								Yes
Cost Effective?								Yes

Note: Modeled Sites predicted to receive at least a 5 dBA reduction are considered benefitted by Wall West 6.
Impacts are noted by bolded values.

The proposed Noise Wall West 6 would benefit three of 14 receivers located behind the wall. The three receivers represent six dwelling units located in the vicinity of the proposed wall. The wall would reduce noise levels to below the NAC for 8 of the 14 receivers, representing 15 dwelling units. In addition, Wall West 6 would reduce noise levels at an additional four receivers, representing 8 dwelling units.

10. Wall West 7 (Feasible, Not Reasonable)

We evaluated a 10- to 20-foot-tall noise wall along the west right of way of I-90 and I-405 beginning along the eastbound to southbound ramp of I-90 and extending 1,184 feet southward along I-405 to the end of proposed Wall West 6.

Noise levels in the vicinity of a Wall West 7 are predicted to range between 66 and 70 dBA without a wall (Exhibit 5-16).

Exhibit 5-16. Feasibility Analysis for a 10- to 20-Foot-Tall Wall West 7

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	1st Row Receiver?	Insertion Loss (dBA)	% 1st Row Receiver ≥ 5 dBA
5M-121	**68**	**66**	No	2	
5M-114	**69**	62	Yes	8	
5M-120	**69**	**66**	Yes	3	
5M-122	**69**	**67**	Yes	2	
5M-118	**70**	63	No	6	
5M-113	**70**	60	Yes	10	83%
5M-128	**70**	**68**	No	2	
V-51	**67**	60	No	7	
5M-123	**67**	63	Yes	4	
5M-109	**69**	64	Yes	5	
5M-112	**67**	64	No	3	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall West 7, as shown in Exhibit 5-63 later in this section, was found to be feasible. The 10- to 20-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall West 7 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall West 7 would have an area of 25,525 square feet and a height between 10 and 20 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable wall area of Wall West 7 is 7,368 square feet, which is less than the actual wall area of 25,525 square feet. Therefore, Wall West 7 would not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-17).

Exhibit 5-17. Wall West 7 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
5M-121	2	**66**	**68**	0	0			2
5M-114	2	**68**	**69**	904	1,808			8
5M-120	1	**67**	**69**	0	0			3
5M-122	2	**67**	**69**	0	0			2
5M-118	2	**68**	**70**	972	1,944			6
5M-113	2	**68**	**70**	972	1,944	7,368	25,525	10
5M-128	1	**69**	**70**	0	0			2
V-51	1	**66**	**67**	768	768			7
5M-123	1	**66**	**67**	0	0			4
5M-109	1	**67**	**69**	904	904			5
5M-112	2	**66**	**67**	0	0			3
Design Goal Achieved?								Yes
Cost Effective?								No

Impacts are noted by bolded values.

11. Wall East 8A (Not Feasible)

We evaluated a 30-foot-tall noise wall on the east side of I-405 starting at N 33rd Street, in the May Creek vicinity, extending about 1,100 feet northward on the edge of roadway to N 39th Street. Noise levels in the vicinity of a Wall East 8A are predicted to be 63 to 68 dBA without a wall (Exhibit 5-18).

Exhibit 5-18. Feasibility Analysis for a 30-Foot-Tall Wall East 8A

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
2M-141(R)	**68**	59	Yes	5	
2M-140	64	55	Yes	4	0%
2M-139	63	56	No	4	
Feasible?					No

Impacts are noted by bolded values.

Noise Wall East 8A, as shown in Exhibit 5-59 later in this section, was not found to be feasible. A wall up to 30 feet tall

would not provide a 5-dBA reduction for the majority of the first row of receivers. Therefore, a reasonableness discussion is not necessary for this wall.

12. Wall East 8B (Feasible, Not Reasonable)

We evaluated an 18-foot-tall noise wall on the east side of I-405, along the northbound off-ramp to N 44th Street, beginning at the proposed off-ramp and extending approximately 575 feet to protect the Presbyterian church. Noise levels in the vicinity of a Wall East 8B were predicted to be 67 dBA without a wall (Exhibit 5-19).

Exhibit 5-19. Feasibility Analysis for an 18-Foot-Tall Wall East 8B

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V-26	**67**	60	Yes	7	100%
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 8B, as shown in Exhibit 5-59 later in this section, is feasible. At this location, an 18-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the first-row receiver. Since Wall East 8B appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 8B would have an area of 10,347 square feet and require a height of 18 feet. This would achieve the design goal by providing at least 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 8B is 768 square feet, which is less than the actual wall area of 10,347 square feet. Therefore, Wall East 8B would not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-20).

Exhibit 5-20. Wall East 8B Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V-26	1	**66**	**67**	768	768	768	10,347	7
						Design Goal Achieved?	Yes	
						Cost Effective?	No	

Impacts are noted by bolded values.

13. Wall West 9 (Not Feasible)

We evaluated a 30-foot-tall noise wall along the west edge of the I-405 right of way, approximately 1,000 feet north of the I-90 interchange. The noise wall would extend about 1,278 feet northward. Noise levels in the vicinity of a Wall West 9 are predicted to range between 60 and 66 dBA without a wall (Exhibit 5-21).

Exhibit 5-21. Feasibility Analysis for a 30-Foot-Tall Wall West 9

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
6M-108	63	58	No	4	50%
6M-109	60	56	Yes	4	
6M-106	**66**	60	Yes	6	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall West 9, as shown in Exhibit 5-64 later in this section, was not found to be feasible. At this location, a 30-foot-tall wall would not achieve a 5-dBA noise reduction for the majority of the first-row receivers. Therefore, a reasonableness discussion is not necessary for this wall.

14. Wall East 10A (Feasible, Reasonable)

We evaluated a noise wall along the right of way of the east side of I-405 beginning at SE 72nd Street. A two-wall concept was evaluated with a front wall of approximately 537 feet long and a back wall of approximately 380 feet long, with

approximately 70 feet of overlap between the two walls. A two-wall concept was evaluated to avoid conflicts with existing utilities and to allow space for utility maintenance. Noise levels in the vicinity of a 6- to 14-foot-tall Wall East 10A are predicted to range between 63 and 74 dBA without a wall (Exhibit 5-22).

Exhibit 5-22. Feasibility Analysis for a 6- to 14-Foot-Tall Wall East 10A

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
3M-87	**70**	**68**	No	1	100%
3M-74	**76**	**70**	Yes	5	
3M-76	**74**	**67**	Yes	7	
3M-115	63	62	No	1	
				Feasible?	Yes

Impacts are noted by bolded values.

Wall East 10A was found to be feasible. At this location, a 6- to 14-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents, as shown in Exhibit 5-60 later in this section. Because Wall East 10A appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 10A would have an area of 7,725 square feet and require a height between 6 and 14 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 10A is 7,736 square feet, which is greater than the actual wall area of 7,713 square feet. This would meet WSDOT's reasonableness requirement and is, therefore, recommended for construction (Exhibit 5-23). While this noise wall would meet WSDOT's feasibility and reasonableness, it should be further refined in the final design stage as design progresses.

Exhibit 5-23. Wall East 10A Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
3M-74	2	**75**	**76**	1,380	2,760	7,736	7,725	5
3M-76	4	**73**	**74**	1,244	4,976			7
3M-87	1	**69**	**70**	0	0			1
3M-115	2	62	63	0	0			1
Design Goal Achieved?								Yes
Cost Effective?								Yes

Note: Modeled Sites predicted to receive at least a 5 dBA reduction are considered benefitted by Wall East 10A.
Impacts are noted by bolded values.

The proposed Noise Wall East 10A would benefit two of the four receivers located behind the wall. The two receivers represent six dwelling units located in the vicinity of the proposed wall. The wall would not reduce noise levels below the NAC for any of the receivers located behind the wall. In addition, Wall East 10A would reduce noise levels at two additional receivers, representing three dwelling units.

15. Wall East 10B (Feasible, Not Reasonable)

We evaluated a 16- to 26-foot-tall noise wall along the east right of way of I-405 beginning approximately 1,600 feet north of SE 73rd Street and extending 2,781 feet northward to approximately 400 feet north of the SE 60th Street vicinity. Noise levels in the vicinity of a Wall East 10B are predicted to be 61 to 79 dBA without a wall (Exhibit 5-24).

Exhibit 5-24. Feasibility Analysis for a 16- to 26-Foot-Tall Wall East 10B

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
3M-104	**71**	**66**	Yes	5	
3M-85	**73**	**71**	No	2	
V-35	**77**	62	Yes	15	
3M-81	**76**	65	Yes	12	
V-34	61	59	No	2	
V-33	**69**	**66**	Yes	3	
3M-77	**75**	62	Yes	13	74%
3M-90	**72**	**67**	Yes	5	
3M-79	**69**	64	No	5	
3M-73	**75**	63	Yes	10	
3M-75	**79**	**68**	Yes	11	
3M-161	**69**	61	Yes	8	
3M-162	**73**	64	Yes	9	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 10B, as shown in Exhibits 5-60 and 5-61 later in this section, is feasible. At this location, a 16- to 26-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall East 10B appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 10B would have an area of 64,895 square feet and require a height between 16 and 26 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 10B is 33,744 square feet, which is less than the actual wall area of 64,895 square feet. Therefore, Wall East 10B would not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-25).

Exhibit 5-25. Wall East 10B Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
3M-104	2	**70**	**71**	972	1,944			5
3M-85	5	**72**	**73**	0	0			2
V-35	4	**76**	**77**	1,448	5,792			15
3M-81	2	**75**	**76**	1,380	2,760			13
V-34	1	59	61	0	0			2
V-33	4	**68**	**69**	0	0			3
3M-77	2	**75**	**75**	1,312	2,624	33,744	64,895	13
3M-90	2	**71**	**72**	1,108	2,216			5
3M-79	4	**68**	**69**	904	3,616			5
3M-73	6	**73**	**75**	1,312	7,872			10
3M-75	1	**78**	**79**	1,584	1,584			11
3M-161	2	**69**	**69**	904	1,808			8
3M-162	3	**72**	**73**	1,176	3,528			9
						Design Goal Achieved?		Yes
						Cost Effective?		No

Impacts are noted by bolded values.

16. Wall East 11 (Feasible, Reasonable)

We evaluated a 10- to 16-foot-tall noise wall along the east right of way of I-405 beginning approximately 400 feet north of SE 60th Street and extending to approximately 1,000 feet south of the Lake Washington Boulevard SE interchange. This noise wall would be approximately 1,566 feet long. Noise levels in the vicinity of a Wall East 11 are predicted to range between 62 and 77 dBA without a wall (Exhibit 5-26).

Exhibit 5-26. Feasibility Analysis for a 10- to 16-Foot-Tall Wall East 11

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
3M-107	**66**	64	No	2	
V-36	62	62	No	0	
3M-100	**75**	**70**	Yes	5	
V-37	**71**	64	Yes	7	
3M-114	**77**	72	Yes	5	
3M-105	**68**	**68**	No	0	100%
3M-158	**71**	64	Yes	6	
3M-159	**75**	**66**	Yes	9	
3M-160	**74**	**67**	Yes	7	
3M-163	**70**	**66**	No	4	
3M-164	**71**	**70**	No	7	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 11, as shown in Exhibit 5-61, is feasible. At this location, a 10- to 16-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall East 11 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 11 would have an area of 20,060 square feet and require a height between 10 and 16 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 11 is 22,936 square feet, which is greater than the actual wall area of 20,060 square feet that meets WSDOT's reasonableness requirement. Wall East 11 was found to be feasible and reasonable and is recommended for construction (Exhibit 5-27). While this noise wall meets WSDOT's feasibility and reasonableness, it should be further refined in the final design stage as design progresses.

Exhibit 5-27. Wall East 11 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
3M-107	1	**68**	**66**	0	0			2
V-36	6	63	62	0	0			0
3M-100	3	**73**	**75**	1,312	3,936			5
V-37	3	**71**	**71**	1,040	3,120			7
3M-114	6	**76**	**77**	1,448	8,688			5
3M-105	6	**68**	**68**	0	0	22,936	20,060	0
3M-158	2	**69**	**71**	1,040	2,080			6
3M-159	2	**75**	**75**	1,312	2,624			9
3M-160	2	**73**	**74**	1,244	2,488			7
3M-163	3	**69**	**70**	0	0			4
3M-164	3	**70**	**71**	0	0			3
						Design Goal Achieved?		Yes
						Cost Effective?		Yes

Note: Modeled Sites predicted to receive at least a 5 dBA reduction are considered benefitted by Wall East 11.
Impacts are noted by bolded values.

The proposed Noise Wall East 11 would benefit six of 11 receivers located behind the wall. The six receivers represent 18 dwelling units located in the vicinity of the proposed wall. The wall would reduce noise levels to below the NAC for three of the 11 receivers, representing six dwelling units. In addition, Wall East 11 would reduce noise levels at an additional six receivers, representing 19 dwelling units.

17. Wall East 12 (Not Feasible)

We evaluated a 20- to 24-foot-tall noise wall along the east right of way of I-405 beginning in the vicinity of 116th Place SE and SE 49th Street and extending approximately 976 feet northward. Noise levels in the vicinity of Wall East 12 are predicted to range between 71 and 72 dBA without a wall (Exhibit 5-28).

Exhibit 5-28. Feasibility Analysis for a 20- to 24-Foot-Tall Wall East 12

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
4M-76	**72**	**71**	Yes	2	0%
4M-75	**71**	**68**	Yes	3	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall East 12, as shown in Exhibit 5-62 later in this section, was not found to be feasible. At this location, a 30-foot-tall wall was not able to achieve a 5-dBA noise reduction for the majority of the first-row receivers. Therefore, a reasonableness discussion is not necessary for this wall.

18. Wall East 13 (Feasible, Not Reasonable)

We evaluated a 20- to 24-foot-tall noise wall along the east right of way of I-405 beginning at SE Coal Creek Parkway and extending approximately 2,055 feet southward to the vicinity of 116th Place SE and SE 49th Street. Noise levels in the vicinity of a Wall East 13 are predicted to range between 61 and 73 dBA without a wall (Exhibit 5-29).

Exhibit 5-29. Feasibility Analysis for a 20- to 24-Foot-Tall Wall East 13

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V-42	**73**	65	Yes	8	100%
4M-83	**71**	65	No	6	
4M-82	**71**	59	Yes	13	
4M-81	65	61	No	3	
4M-80	**73**	59	Yes	13	
V-41	**66**	59	Yes	5	
4M-78	61	59	No	2	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 13, as shown in Exhibit 5-62 later in this section, was found to be feasible. At this location, a 20- to 24-foot-tall wall would reduce traffic noise levels by at least 5

dBA for the majority of the first-row residents. We also evaluated Wall East 13 for a reasonableness determination because it appears to be feasible and physically constructible.

Wall East 13 would have an area of 75,296 square feet and require a height between 20 and 24 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement. The allowable area of Wall East 13 is 13,064 square feet, which is less than the actual wall area of 75,296 square feet. Therefore, Wall East 13 would not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-30).

Exhibit 5-30. Wall East 13 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V-42	2	**73**	**73**	1,176	2,352	13,064	75,296	8
4M-83	2	**72**	**71**	1,040	2,080			6
4M-82	2	**71**	**71**	1,040	2,080			13
4M-81	2	65	65	0	0			3
4M-80	2	**73**	**73**	1,176	2,352			13
V-41	6	65	**66**	700	4,200			5
4M-78	8	61	61	0	0			2
Design Goal Achieved?								Yes
Cost Effective?								No

Impacts are noted by bolded values.

19. Wall East 14 (Feasible, Not Reasonable)

We evaluated an 8- to 10-foot-tall noise wall along the north side of Coal Creek Parkway, extending from the existing wall (existing Wall 15) along I-405 to the southeast for 300 feet. Noise levels in the vicinity would range between 67 and 68 dBA without the wall (Exhibit 5-31).

Exhibit 5-31. Feasibility Analysis for an 8- to 10-Foot-Tall Wall East 14

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
5M-79	**68**	61	Yes	7	100%
V-43	**67**	62	Yes	5	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 14, as shown in Exhibit 5-63 later in this section, was found to be feasible. At this location, a minimum height of 8 to 10 feet would reduce traffic noise levels by at least 5 dBA for all of the first-row residents. Because Wall East 14 appears to be feasible and physically constructible, we also evaluated it for a reasonableness determination.

Wall East 14 would have an area of 2,374 square feet and require a height between 8 and 10 feet to achieve the design goal of providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 14 is 1,604 square feet, which is less than the actual wall area of 2,374 square feet. Therefore, Wall East 14 does not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-32).

Exhibit 5-32. Wall East 14 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area(ft^2)	Insertion Loss (dBA)
5M-79	1	**66**	**68**	836	836	1,604	2,374	7
V-43	1	65	**67**	768	768			5
						Design Goal Achieved?	Yes	
						Cost Effective?	No	

Impacts are noted by bolded values.

20. Wall East 15 (Feasible, Not Reasonable)

We evaluated a 14- to 20-foot-tall noise wall along the north side of Coal Creek Parkway, extending from the existing wall

(existing Wall 15) along I-405 to the north 749 feet. Noise levels in the vicinity would range between 58 and 71 dBA without the wall (Exhibit 5-33).

Exhibit 5-33. Feasibility Analysis for a 14- to 20-Foot-Tall Wall East 15

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
5M86	**71**	**69**	No	1	100%
5M-85	**71**	65	Yes	7	
V-47	64	60	Yes	5	
5M-84	58	58	No	1	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall East 15, as shown in Exhibit 5-63 later in this section, was found to be feasible. At this location, a 14- to 20-foot-tall wall would reduce traffic noise levels by at least 5 dBA for all of the first-row residents. Because Wall East 15 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall East 15 would have an area of 11,759 square feet and require a height between 14 and 20 feet to achieve the design goal of providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall East 15 is 10,460 square feet, which is less than the actual wall area of 11,759 square feet. Therefore, Wall East 15 would not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-34).

Exhibit 5-34. Wall East 15 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
5M-86	1	**70**	**71**	0	0	10,460	11,759	1
5M-85	4	**70**	**71**	1,040	4,160			7
V-47	9	63	64	700	6,300			5
5M-84	1	57	58	0	0			1
Design Goal Achieved?								Yes
Cost Effective?								No

Impacts are noted by bolded values.

21. Wall East 17 (Not Feasible)

We evaluated a 30-foot-tall noise wall north of the I-90 interchange, along the east edge of the I-405 right of way, extending from the existing wall (existing Wall 16) approximately 736 feet north. Noise levels in the vicinity of a Wall East 17 are predicted to range between 63 and 67 dBA without a wall (Exhibit 5-35).

Exhibit 5-35. Feasibility Analysis for a 30-Foot-Tall Wall East 17

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
5M-134	63	62	No	1	18%
5M-133	**67**	61	Yes	6	
5M-135	**66**	65	No	2	
5M-132	**67**	65	Yes	2	
Feasible?					No

Impacts are noted by bolded values.

Noise Wall East 17, as shown in Exhibit 5-64 later in this section, was not found to be feasible. At this location, a 30-foot-tall wall would not achieve a 5-dBA noise reduction for the majority of the first- row receivers. Therefore, a reasonableness discussion is not necessary for this wall.

22. Wall West 5-Wall ERC Trail 1 (Feasible, Reasonable)

We evaluated a 12- to 14-foot-tall noise wall along the west right of way of I-405 beginning approximately 300 feet north of the NE 44th Street interchange and extending approximately 5,991 feet northward, ending approximately near the junction of Hazelwood Lane SE and 106th Avenue SE. Noise levels in the vicinity of a Wall West 5-Wall ERC Trail 1 are predicted to be between 61 and 71 dBA without a wall (Exhibit 5-36).

Exhibit 5-36. Feasibility Analysis for a 12- to 14-Foot-Tall Wall West 5-Wall ERC Trail 1

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	1st Row Receiver?	Insertion Loss (dBA)	% 1st Row Receiver ≥ 5 dBA
3M-168	**69**	63	Yes	7	100%
3M-169	**68**	65	Yes	7	
V-31	64	58	No	4	
V-31c	65	59	No	6	
V-31b	**67**	59	No	5	
3M-121	**69**	60	Yes	7	
V-30b	61	57	No	3	
V-30	63	57	No	3	
3M-119	**71**	62	Yes	7	
3M-112	64	59	No	4	
3M-109	**66**	60	No	5	
3M-110	**69**	62	No	7	
3M-84	64	59	No	3	
3M-126	**66**	58	Yes	5	
3M-83	62	56	No	5	
3M-125	**66**	58	Yes	6	
3M124	**67**	58	Yes	5	
V-32	64	56	No	6	
3M-123	65	58	Yes	7	
3M-71	65	57	No	7	
3M-122	**66**	58	Yes	6	
3M-70	63	57	No	5	
				Feasible?	Yes

Impacts are noted by bolded values.

At this location, a 12- to 14-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents, as shown in Exhibits 5-60 and 5-61. Because Wall West 5-Wall ERC Trail 1 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall West 5-Wall ERC Trail 1 would have an area of 81,875 square feet and require a height of 12 to 18 feet to achieve the design goal of providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall West 5-Wall ERC Trail 1 is 104,916 square feet, which is greater than the actual wall area of 81,875 square feet. Therefore, Wall West 5-Wall ERC Trail 1 meets WSDOT's reasonableness requirement and is recommended for construction (Exhibit 5-37). While this noise wall meets WSDOT's feasibility and reasonableness, it should be further refined in the final design stage as design progresses.

Exhibit 5-37. Wall ERC Trail 1 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
3M-168	10	**68**	**69**	904	9,040	104,916	81,875	7
3M-169	10	**67**	**68**	0	0			7
V-31	9	64	64	700	6300			4
V-31c	5	65	59	700	3,500			6
3M-121	10	**68**	**69**	904	9,040			7
V-31b	8	**66**	**67**	768	6,144			5
V-30b	1	60	61	0	0			3
V30	12	62	63	0	0			3
3M-119	10	**69**	**71**	1,040	10,400			7
3M-112	6	63	64	0	0			4
3M-109	6	**66**	**66**	700	4,200			5
3M-110	6	**68**	**69**	904	5,424			7
3M-84	23	63	64	700	16,100			3
3M-126	10	65	**66**	700	7,000			5

Exhibit 5-37. Wall ERC Trail 1 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
3M-83	7	58	62	700	4,900			5
3M-125	10	65	**66**	700	7,000			6
3M124	10	65	**67**	836	8,360			5
V-32	8	62	64	700	5,600			6
3M-123	10	62	65	700	7,000			7
3M-71	9	63	65	700	6,300			7
3M-122	10	**66**	**66**	700	7,000			6
3M-70	6	62	63	0	0			5
Design Goal Achieved?								Yes
Cost Effective?								Yes

Note: Modeled Sites predicted to receive at least a 5 dBA reduction are considered benefitted by Wall ERC Trail 1.
Impacts are noted by bolded values.

The proposed Noise Wall ERC Trail 1 would benefit 17 of 22 receivers located behind the wall. The 17 receivers represent 161 dwelling units located in the vicinity of the proposed wall. The wall would reduce noise levels to below the NAC for 11 of the 22 receivers, representing 100 dwelling units. In addition, Wall ERC Trail 1 would reduce noise levels at an additional 11 receivers, representing 96 dwelling units.

23. Wall ERC Trail 2 (Not Feasible)

We evaluated a 30-foot-tall noise wall along the west right of way line of I-405 starting at the Coal Creek Parkway SE interchange and extending for about 4,246 feet south to the junction of Lake Washington Boulevard SE and SE 50th Place. Noise levels in the vicinity of Wall ERC Trail 2 are predicted to be 59 to 71 dBA without a wall (Exhibit 5-38).

Exhibit 5-38. Feasibility Analysis for a 30-Foot-Tall Wall ERC Trail 2

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	1st Row Receiver?	Insertion Loss (dBA)	% 1st Row Receiver ≥ 5 dBA
V-40	62	60	Yes	2	
V-45	63	62	No	0	
4M-72	65	63	Yes	3	
4M-73	62	61	Yes	2	
4M-86	63	59	Yes	4	
4M-87	63	59	Yes	0	
4M-88	63	59	No	1	9%
4M-94	**68**	65	Yes	4	
4M-95	**67**	65	Yes	2	
4M-96	**66**	61	Yes	6	
4M-97	61	56	Yes	4	
4M-98	**68**	65	Yes	3	
4M-99	**67**	63	Yes	1	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall ERC Trail 2, as shown in Exhibit 5-62 later in this section, was not found to be feasible. A wall up to 30 feet tall would not provide a 5-dBA reduction for the majority of the first-row receivers. Therefore, a reasonableness discussion is not necessary for this wall.

24. Wall I-90 Trail (Not Feasible)

We evaluated a 10-foot noise wall along the I-90 trail within 400 feet east and west of I-405 and south of I-90, and extending approximately 2,050 feet. The modeled receivers on the I-90 trail are roughly at grade with I-90 in this area. Noise levels in the vicinity of the I-90 Trail Wall are predicted to be 79 dBA without a wall. Because of the complex interchange roadway geometry, the model would not allow the receivers on the trail to be modeled; therefore, the future sound levels were estimated using a conservative 'straight line' noise model of traffic on I-90. Feasibility of the noise wall along I-90 was qualitatively assessed. Due to the receivers on this trail behind the wall also experiencing substantial noise from I-405 above, and the various on- and off-ramps from I-90 to I-405 and I-405

to I-90 behind the wall, it would not be possible to achieve a 5-dB reduction in noise levels. Therefore, this wall was determined not feasible and a reasonableness discussion is not necessary.

Noise Wall Analysis I-5 to SR 169

25. Wall 24 (Not Feasible)

We evaluated wall heights up to 20-foot-tall noise wall along the north right of way line of I-405 starting east of the I-405 southbound off-ramp to I-5 northbound extending east for about 1,400 feet. The modeled receivers located behind Wall 24 are elevated above I-405 and experience noise from traffic on I-405, I-5, and Southcenter Boulevard. Noise levels in the vicinity of Wall 24 are predicted to be 59 to 68 dBA without a wall (Exhibit 5-39).

Exhibit 5-39. Feasibility Analysis for a 20-Foot-Tall Wall 24

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V57	59	58	Yes	1	
7M70	**66**	61	No	5	
7M71	**67**	63	No	4	
7M72	**68**	64	Yes	4	
7M73	65	61	No	4	
7M74	**67**	63	No	4	
7M75	**68**	64	Yes	4	0%
7M76	59	57	No	2	
7M77	63	60	No	3	
7M78	**66**	62	Yes	4	
7M79	60	59	No	1	
7M80	63	60	No	3	
7M81	**66**	62	Yes	4	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 24, as shown in Exhibit 5-65 later in this section, was not found to be feasible because a wall up to 20 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers.

Receivers in this area are located on a hillside overlooking I-405 and other nearby roadways. In this instance, a noise barrier along the I-405 right of way would provide little to no benefit for the homes on the hillside overlooking I-405. In addition, Southcenter Boulevard is located between I-405 and the residences. Southcenter Boulevard traffic also contributes to the traffic noise in this area. Based on these factors, a noise wall is not feasible in the vicinity of Wall 24. Therefore, a reasonableness discussion is not necessary for this wall.

26. Wall 25 and Wall 26 (Not Feasible)

We evaluated wall heights up to a 20-foot-tall noise wall along the north right of way line of I-405 east and west of 66th Avenue South to shield I-405 traffic noise from homes and Tukwila Park located on the hillside north of I-405. Walls 25 and 26 would extend 995 feet with a break between the walls at 66th Avenue South. The modeled receivers located behind Wall 24 would be elevated above I-405 and experience noise from traffic on I-405 and Southcenter Boulevard. Noise levels in the vicinity of Walls 25 and 26 are predicted to be 67 to 72 dBA without a wall (Exhibit 5-40).

Exhibit 5-40. Feasibility Analysis for a 20-Foot-Tall Wall 25 and 26

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V58	**72**	**69**	Yes	3	0%
7M82	**67**	63	Yes	4	
7M83	**72**	**69**	Yes	3	
7M84	**72**	**69**	Yes	3	
7M85	**72**	**70**	Yes	2	
7M86	**70**	**68**	No	2	
				Feasible?	No

Impacts are noted by bolded values.

Noise Walls 25 and 26, as shown in Exhibit 5-65 later in this section, were not found to be feasible because a wall up to 20 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers.

Receivers in this area are located on a hillside overlooking I-405 and other nearby roadways. In this instance, a noise barrier along the I-405 right of way would provide little to no benefit for the homes on the hillside overlooking I-405. In

addition, Southcenter Boulevard is located between I-405 and the residences. Southcenter Boulevard traffic also contributes to the traffic noise in this area. Based on these factors, a noise wall is not feasible in the vicinity of Walls 25 and 26. Therefore, a reasonableness discussion is not necessary for this wall.

27. Wall 27 (Feasible, Not Reasonable)

We evaluated a noise wall at heights from 6 to 20 feet tall along the south side of I-405 as I-405 crosses over the Green River for 359 feet. Noise levels at the Green River Trail, the one receiver that is shielded by Wall 27, are 67 dBA without the wall (Exhibit 5-41).

Exhibit 5-41. Feasibility Analysis for a 14-Foot-Tall Wall 27

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V59	**67**	62	Yes	5	100%
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 27, as shown in Exhibit 5-65 later in this section, was found to be feasible. At this location, a 14-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the one first-row receiver. Because Wall 27 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall heights were evaluated up to 20 feet in an attempt to achieve at least a 7-dBA noise reduction design goal; however, no more than a 5-dBA noise reduction was achieved with a 20-foot-tall wall; therefore, Wall 27 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

28. Wall 28 (Not Feasible)

We evaluated a noise wall at heights of 6 to 20 feet tall along the I-405 southbound edge-of-pavement to shield noise from users of the Interurban Trail north of I-405. Wall 28 was evaluated at approximately 1,605 feet in length. The Interurban Trail is mostly lower than I-405 in this area. Noise levels in the vicinity of the Interurban Trail and Wall 28 are predicted to be 67 dBA without a wall (Exhibit 5-42).

Exhibit 5-42. Feasibility Analysis for a 20-Foot-Tall Wall 28

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V60	**67**	64	Yes	3	0%
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 28, as shown in Exhibit 5-66 later in this section, was not found to be feasible because a wall up to 20 feet tall would not provide a 5-dBA noise reduction for the majority of first-row receivers.

The area of Noise Wall 28 includes several other traffic noise sources and a noise wall located along I-405 would provide little benefit to users on the trail. Therefore, a noise wall is not feasible in the vicinity of Wall 28.

29. Wall 29 (Not Feasible)

We evaluated a noise wall at heights of 6 to 20 feet tall along the I-405 northbound edge-of-pavement to shield noise from users of the Interurban Trail and a hotel pool located south of I-405. Wall 29 was evaluated at approximately 685 feet in length. The Interurban Trail and hotel pool are located lower than I-405 in this area. Noise levels in the area of Wall 29 are predicted to be 66 dBA without a wall (Exhibit 5-43).

Exhibit 5-43. Feasibility Analysis for a 20-Foot-Tall Wall 29

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
8M81	**66**	64	Yes	2	0%
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 29, as shown in Exhibit 5-66 later in this section, was not found to be feasible because a wall up to 20 feet tall would not provide a 5-dBA reduction for the majority of first-row receivers.

The area of Noise Wall 29 includes several other traffic noise sources and a noise wall located along I-405 would provide little benefit to users on the trail or at the hotel pool. Therefore, a noise wall is not feasible in the vicinity of Wall 29.

30. Wall 30 (Feasible, Not Reasonable)

We evaluated a noise wall at heights from 6 to 20 feet tall along the edge-of-pavement of I-405 southbound as I-405 crosses over Oakesdale Avenue SW for a length of approximately 807 feet. Noise levels at the Springbrook Trail north of I-405, the one receiver that is shielded by Wall 30, are predicted to be 68 dBA without the wall (Exhibit 5-44).

Exhibit 5-44. Feasibility Analysis for a 14-Foot-Tall Wall 30

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
8M82	**68**	63	Yes	5	100%
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 30, as shown in Exhibit 5-66, was found to be feasible. At this location, a 14-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the one first-row receiver. Because Wall 30 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall heights were evaluated up to 20 feet in an attempt to achieve at least a 7-dBA noise reduction design goal; however, no more than a 5-dBA noise reduction was achieved with a 20-foot-tall wall; therefore, Wall 30 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

31. Wall 31 (Feasible, Not Reasonable)

We evaluated a noise wall at heights from 6 to 20 feet tall along the edge-of-pavement of I-405 northbound as I-405 crosses over Oakesdale Avenue SW for a length of approximately 725 feet. Noise levels at the Springbrook Trail south of I-405, the one receiver that is shielded by Wall 31, are predicted to be 70 dBA without the wall (Exhibit 5-45).

Exhibit 5-45. Feasibility Analysis for a 14-Foot-Tall Wall 31

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V61	**70**	65	Yes	5	100%
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 31, as shown in Exhibit 5-66 later in this section, was found to be feasible. At this location, a 14-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the one first-row receiver. Because Wall 31 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall heights were evaluated up to 20 feet in an attempt to achieve at least a 7-dBA noise reduction design goal; however, no more than a 6-dBA noise reduction was achieved with a 20-foot-tall wall; therefore, Wall 31 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

32. Wall 32 (Feasible, Not Reasonable)

We evaluated an 8- to 20-foot-tall noise wall along I-405 southbound, extending approximately 1,047 feet to shield traffic noise from a single-family residence and church located on SW 13th Street. Noise levels in the vicinity are predicted to be 75 dBA without the wall (Exhibit 5-46).

Exhibit 5-46. Feasibility Analysis for a 6-Foot-Tall Wall 32

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-ow Receiver ≥5 dBA
V62	**75**	**68**	Yes	7	100%
8M83	**75**	**69**	Yes	6	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 32, as shown in Exhibit 5-67, was found to be feasible. At this location, a minimum height of 6 feet would reduce traffic noise levels by at least 5 dBA for all of the first-row residents. Because Wall 32 appears to be feasible and physically constructible, we also evaluated it for a reasonableness determination.

Wall 32 would have an area of 8,376 square feet and require a height of 8 feet to achieve the design goal of providing at least a 7-dBA noise reduction for the reasonableness requirement.

The allowable area of Wall 32 is 2,624 square feet, which is less than the actual wall area of 8,376 square feet. Therefore, Wall 32 does not meet WSDOT's reasonableness requirement and is not recommended for construction (Exhibit 5-47).

Exhibit 5-47. Wall 32 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V62	1	**73**	**75**	1,312	1,312	2,624	8,376	7
8M83	1	**74**	**75**	1,312	1,312			6
Design Goal Achieved?								Yes
Cost Effective?								No

Impacts are noted by bolded values.

33. Wall 33 (Feasible, Not Reasonable)

We evaluated an 8- to 20-foot-tall noise wall along I-405 southbound on-ramp from Rainier Avenue South, extending approximately 809 feet to shield traffic noise from five nearby residences on SW 12th Street. Noise levels in the vicinity are predicted to range from 65 to 67 dBA without the wall (Exhibit 5-48).

Exhibit 5-48. Feasibility Analysis for an 18-Foot-Tall Wall 33

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V63	**67**	62	Yes	5	66%
8M84	**66**	63	Yes	3	
8M85	**66**	63	No	3	
8M86	65	61	No	4	
8M87	**66**	61	Yes	5	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 33, as shown in Exhibit 5-67 later in this section, was found to be feasible. At this location, a minimum height of 18 feet would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall 33 appears to be feasible and physically constructible, we also evaluated it for a reasonableness determination.

Wall heights were evaluated up to 20 feet in an attempt to achieve at least a 7-dBA noise reduction design goal; however, no more than a 5-dBA noise reduction was achieved with a 20-foot-tall wall; therefore, Wall 33 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

34. Wall 34 (Not Feasible)

We evaluated an 8- to 24-foot-tall noise wall along the hillside above I-405 northbound east of the I-405/SR 167 Interchange. Residences in this area experience noise from I-405 and SR 167 and a noise wall was recently constructed to shield traffic noise from these homes. Noise Wall 34 was evaluated to replace the existing noise wall along the top-of-slope south of I-405, extending approximately 1,988 feet. Noise levels in the vicinity are predicted to range from 60 to 66 dBA without the wall (Exhibit 5-49).

Exhibit 5-49. Feasibility Analysis for a 24-Foot-Tall Wall 34

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V64	62	60	No	2	
9M91	60	57	Yes	3	
9M92	62	58	Yes	4	
9M93	63	58	Yes	5	
9M94	64	58	Yes	6	
9M95	63	58	Yes	5	
9M96	61	57	Yes	4	23%
9M97	62	58	Yes	4	
9M98	64	61	Yes	3	
9M99	**66**	62	Yes	4	
9M100	61	58	Yes	3	
9M101	62	59	Yes	3	
9M102	64	60	Yes	4	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 34, as shown in Exhibit 5-68 later in this section, was not found to be feasible because a wall up to 24 feet tall would not provide a 5-dBA reduction at the majority of the first-row of receivers.

The area of Noise Wall 34 includes an existing noise wall that currently shields traffic noise from residences in this area; therefore, a replacement wall would provide little additional benefit to homes in the area. Noise Wall 34 is not feasible in this area and is not recommended for construction.

35. Wall 35 (Not Feasible)

We evaluated an 8- to 24-foot-tall noise wall along the hillside above I-405 northbound east of State Route 515 (SR 515). Residences in this area include single-family homes located above 108th Avenue and the Berkshire Apartment complex. Residences in this area experience noise primarily from I-405. A noise wall was recently constructed to shield these homes from traffic noise. Noise Wall 35 was evaluated to replace the existing noise wall along the top-of-slope southeast of I-405, extending approximately 423 feet. Noise levels in the vicinity

are predicted to range from 55 to 70 dBA without the wall (Exhibit 5-50).

Exhibit 5-50. Feasibility Analysis for a 24-Foot-Tall Wall 35

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V65	65	62	Yes	3	0%
10M100	**70**	**66**	No	4	
10M101	**69**	**68**	Yes	1	
10M102	**68**	**68**	No	0	
10M103	55	54	Yes	1	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 35, as shown in Exhibit 5-68 later in this section, was not found to be feasible because a wall up to 24 feet tall would not provide a 5-dBA reduction for the majority of the first row of receivers.

The area of Noise Wall 35 includes an existing noise wall that currently shields traffic noise from residences in this area, therefore a replacement wall would provide little additional benefit to homes in the area. Noise Wall 35 is not feasible in this area and is not recommended for construction.

36. Wall 36 (Feasible, Not Reasonable)

We evaluated an 8- to 20-foot-tall noise wall along the top-of-slope above I-405 northbound to shield single-family and multifamily residences located on Cedar Avenue South and Mill Avenue South from traffic noise. The predominant noise source in this area is traffic noise from I-405. A large retaining wall is located between homes and as I-405 is depressed in this area. Noise Wall 36 was evaluated along the top-of-slope above the retaining wall, extending approximately 1,930 feet. Noise levels in the vicinity are predicted to range from 60 to 77 dBA without the wall (Exhibit 5-51).

Exhibit 5-51. Feasibility Analysis for a 16-Foot-Tall Wall 36

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V66	**70**	**61**	Yes	9	
10M107	61	60	Yes	1	
10M108	61	60	Yes	0	
10M109	61	61	Yes	0	
10M110	62	61	Yes	1	
10M111	**66**	61	Yes	5	
10M112	**73**	60	Yes	13	
10M113	**68**	62	Yes	6	
10M114	**74**	**66**	Yes	8	
10M115	**77**	**72**	Yes	5	
10M116	**66**	62	Yes	4	
10M117	**73**	65	Yes	8	
10M118	**77**	**72**	No	5	
10M119	*69*	63	No	6	
10M120	**69**	63	Yes	6	
10M121	**67**	62	No	5	98%
10M122	**67**	62	No	5	
10M123	**74**	65	Yes	9	
10M124	**77**	**71**	Yes	6	
10M125	**71**	63	Yes	8	
10M126	**70**	62	Yes	8	
10M127	**71**	62	No	9	
10M128	**67**	61	No	6	
10M129	**75**	63	Yes	12	
10M130	**66**	61	Yes	5	
10M131	**74**	63	Yes	11	
10M132	**69**	62	Yes	7	
10M133	**67**	61	No	6	
10M134	**74**	63	Yes	11	
10M135	**68**	61	No	7	
10M136	**68**	62	Yes	6	

Exhibit 5-51. Feasibility Analysis for a 16-Foot-Tall Wall 36

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
10M137	65	60	Yes	5	
10M157	**68**	62	No	6	
10M158	63	58	No	5	
10M159	64	60	No	4	
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 36, as shown later in this section Exhibit 5-69, is feasible. At this location, a 16-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the majority of the first-row residents. Because Wall 36 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall 36 would have an area of 30,880 square feet and require a height of 16 feet. This would achieve the design goal by providing at least a 7-dBA noise reduction for the reasonableness requirement and providing at least 10-dBA reduction for eight residences. Without considering any additional non-typical construction costs, the cost of Wall 36 is $1,593,717. Constructing Wall 36 along the WDOT ROW line atop the steep slope above I-405 in this area would require a variety of additional design and construction elements totaling approximately $2,675,000 Adding the typical wall cost of $1,593,717 to all non-typical construction costs of $2,675,000 to build Wall 36 totals $4,268,717.

The allowable area of Wall 36 is 61,312 square feet, which relates to a total wall cost allowance of $3,163,299. Because the overall cost to construction Wall 36 is higher than the total wall cost allowance, Wall 36 does not meet WSDOT's reasonableness requirement (Exhibit 5-52) and is not recommended for construction.

Exhibit 5-52. Wall 36 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
V66	1	**68**	**70**	972	972			9
10M107	1	59	61	0	0			0
10M108	1	59	60	0	0			0
10M109	1	60	61	0	0			0
10M110	1	61	62	0	0			1
10M111	1	65	**66**	700	700			5
10M112	1	**72**	**73**	1176	1176			13
10M113	3	**66**	**68**	836	2508			6
10M114	3	**73**	**74**	1244	3732			8
10M115	3	**76**	**77**	1448	43440			5
10M116	3	65	**66**	700	2100			5
10M117	3	**72**	**73**	1176	3528			8
10M118	3	**76**	**77**	1448	4344			5
10M119	1	**67**	**69**	904	904			6
10M120	1	**67**	**69**	904	904	61,312	30,880	6
10M121	1	**66**	**67**	768	768			5
10M122	1	**66**	**67**	768	768			5
10M123	3	**73**	**74**	1244	3732			9
10M124	3	**76**	**77**	1448	4344			6
10M125	1	**70**	**71**	1040	1040			8
10M126	1	**69**	**70**	972	972			7
10M127	1	**69**	**71**	1040	1040			9
10M128	2	**66**	**67**	768	1536			6
10M129	2	**74**	**75**	1312	2624			12
10M130	3	65	**66**	700	2100			5
10M131	3	**73**	**74**	1244	3732			11
10M132	1	**68**	**69**	904	904			7
10M133	2	**67**	**67**	768	1536			6
10M134	2	**73**	**74**	1244	2488			11

Exhibit 5-52. Wall 36 Reasonableness Evaluation

Site	Dwelling Units	2016 Existing (L_{eq}) (dBA)	2045 Build (L_{eq}) (dBA)	Reasonableness Allowance			Minimum Design Goal Noise Wall	
				Area Per Household (ft^2)	Area Per Modeled Receiver (ft^2)	Total Allowable Wall Area (ft^2)	Total Wall Area (ft^2)	Insertion Loss (dBA)
10M135	1	**67**	**68**	836	836			7
10M136	1	**68**	**68**	836	836			6
10M137	1	64	65	700	700	61,312	30,880	5
10M157	4	**66**	**68**	836	3344			5
10M158	4	62	63	700	2800			5
10M159	3	63	64	0	0			4
							Design Goal Achieved?	Yes
							Cost Effective?	No

Impacts are noted by bolded values

37. Wall 37 (Not Feasible)

We evaluated noise wall heights from 6 to 20 feet tall along South 3rd Street above I-405 northbound between the overcrossings at Cedar Avenue South and South 3rd Street. The primary noise source in this area is from I-405 traffic. Noise Wall 37 was evaluated to adjacent to the retaining wall between homes in this area this depresses section of I-405, extending approximately 385 feet. Noise levels in the vicinity are predicted to range from 65 to 70 dBA without the wall (Exhibit 5-53).

Exhibit 5-53. Feasibility Analysis for a 20-Foot-Tall Wall 37

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V68	**67**	63	Yes	4	50%
10M141	65	63	Yes	2	
10M142	**70**	64	Yes	6	
10M143	**70**	65	Yes	5	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 37, as shown in Exhibit 5-69 later in this section, was not found to be feasible because a wall up to 20 feet tall will not provide a 5-dBA reduction for the majority of the first row of receivers.

The area of Noise Wall 37 includes a large retaining wall that currently breaks the line-of-sight between the first-row homes in this area to traffic on I-405. With the area including breaks for roads overcrossing I-405 longer walls without breaks are not possible to evaluation here, therefore placement of a noise wall in this area provides only marginal benefit to homes in the area. Noise Wall 37 is not feasible in this area and is not recommended for construction.

38. Wall 38 (Feasible, Not Reasonable)

We evaluated a noise wall at heights from 6- to 20-foot-tall along the edge of the bridge structure of I-405 northbound as it crosses over the Cedar River for a length of approximately 385 feet. Noise levels at the Cedar River Trail along I-405, the one receiver that is shielded by Wall 38, are predicted to be 68 dBA without the wall (Exhibit 5-54).

Exhibit 5-54. Feasibility Analysis for a 20-Foot-Tall Wall 38

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V70	**68**	62	Yes	6	100%
				Feasible?	Yes

Impacts are noted by bolded values.

Noise Wall 38, as shown in Exhibit 5-69, was found to be feasible. At this location, a 20-foot-tall wall would reduce traffic noise levels by at least 5 dBA for the one first-row receiver. Because Wall 38 appears to be feasible and physically constructible, we also evaluated the wall for a reasonableness determination.

Wall heights were evaluated up to 20 feet in an attempt to achieve at least a 7-dBA noise reduction design goal; however, no more than a 6-dBA noise reduction was achieved with a 20-foot-tall wall; therefore, Wall 38 does not meet WSDOT's reasonableness requirement and is not recommended for construction.

39. Wall 39 (Not Feasible)

We evaluated an 8- to 20-foot-tall noise wall along the shoulder of I-405 southbound to shield traffic noise from single-family residences located on Main Avenue South and Wells Avenue South. Homes in this area are located well below the elevation of I-405; however, the dominant noise source in this area is traffic noise from I-405. Noise Wall 39 was evaluated along the southbound shoulder, extending approximately 1,079 feet. Noise levels in the vicinity are predicted to range from 65 to 72 dBA without the wall (Exhibit 5-55).

Exhibit 5-55. Feasibility Analysis for a 20-Foot-Tall Wall 39

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
V67	**68**	64	No	4	0%
10M145	**71**	**70**	No	1	
10M146	**72**	**70**	Yes	2	

Exhibit 5-55. Feasibility Analysis for a 20-Foot-Tall Wall 39

Site	2045 Build w/o Wall (L_{eq}) (dBA)	2045 Build with Wall (L_{eq}) (dBA)	First-Row Receiver?	Insertion Loss (dBA)	% First-Row Receiver ≥5 dBA
10M147	**70**	**68**	Yes	2	
10M148	**71**	**70**	Yes	1	
10M149	**68**	65	Yes	3	
10M150	**69**	**67**	Yes	2	
10M151	**69**	**68**	Yes	1	
10M152	**68**	**67**	No	1	
10M153	**67**	64	No	3	
10M154	**66**	63	No	3	
10M155	65	61	Yes	4	
10M156	65	60	No	5	
				Feasible?	No

Impacts are noted by bolded values.

Noise Wall 39, as shown later in this section Exhibit 5-69, is not feasible. At this location, a noise wall up to 20-foot-tall would reduce traffic noise levels by at least 5 dBA at any of the first-row residents; therefore, Wall 39 does not meet WSDOT's feasibility requirement and is not recommended for construction.

Exhibit 5-56. Evaluated Noise Wall Alignments – SR 169 to Sunset Boulevard NE Vicinity

Exhibit 5-57. Evaluated Noise Wall Alignments – Sunset Boulevard NE to SR 900

Exhibit 5-58. Evaluated Noise Wall Alignments – SR 900 to N 30th Street

Exhibit 5-59. Evaluated Noise Wall Alignments – N 30th Street to NE 44th Street

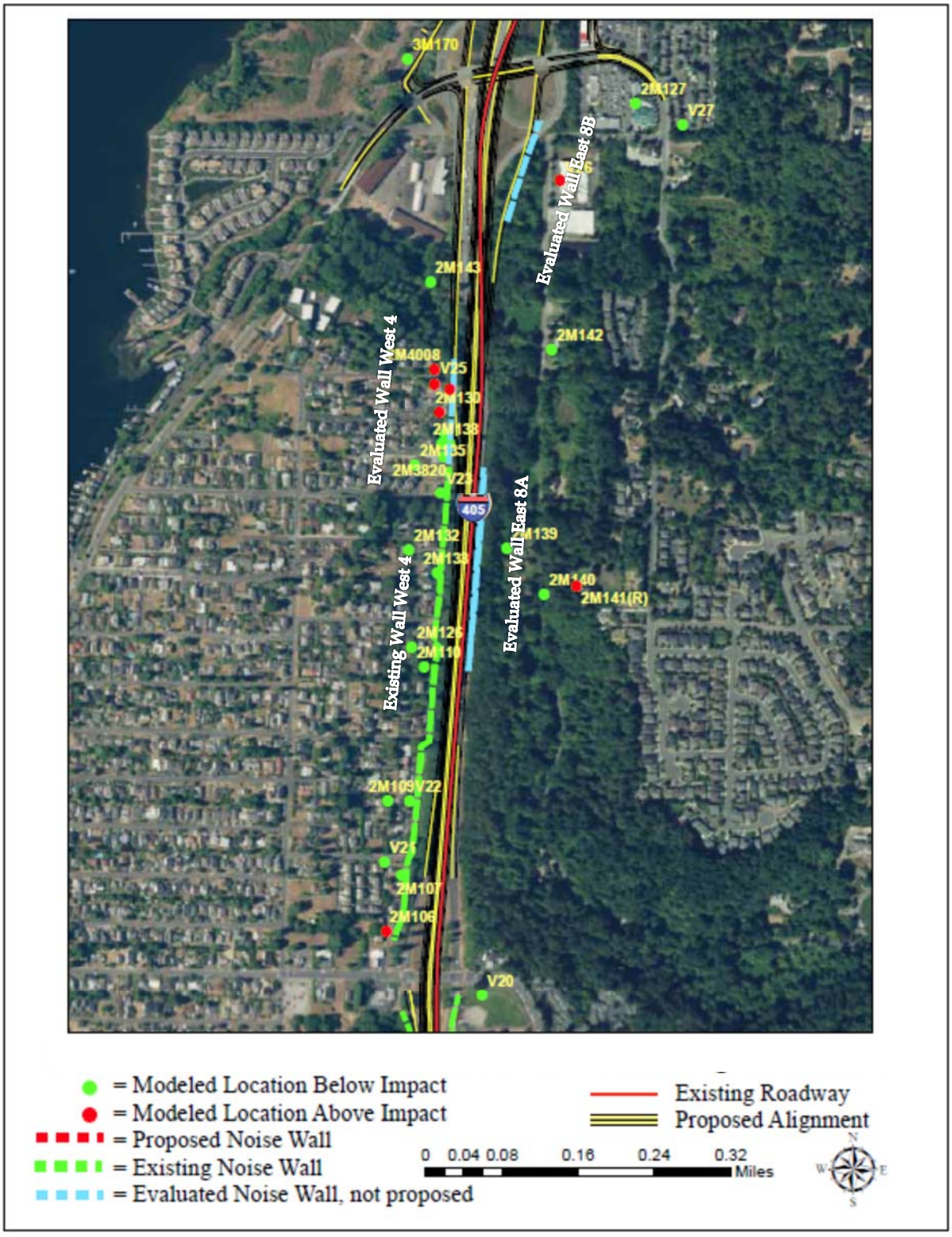


Exhibit 5-60. Evaluated Noise Wall Alignments – NE 44th Street to SE 64th Street Vicinity

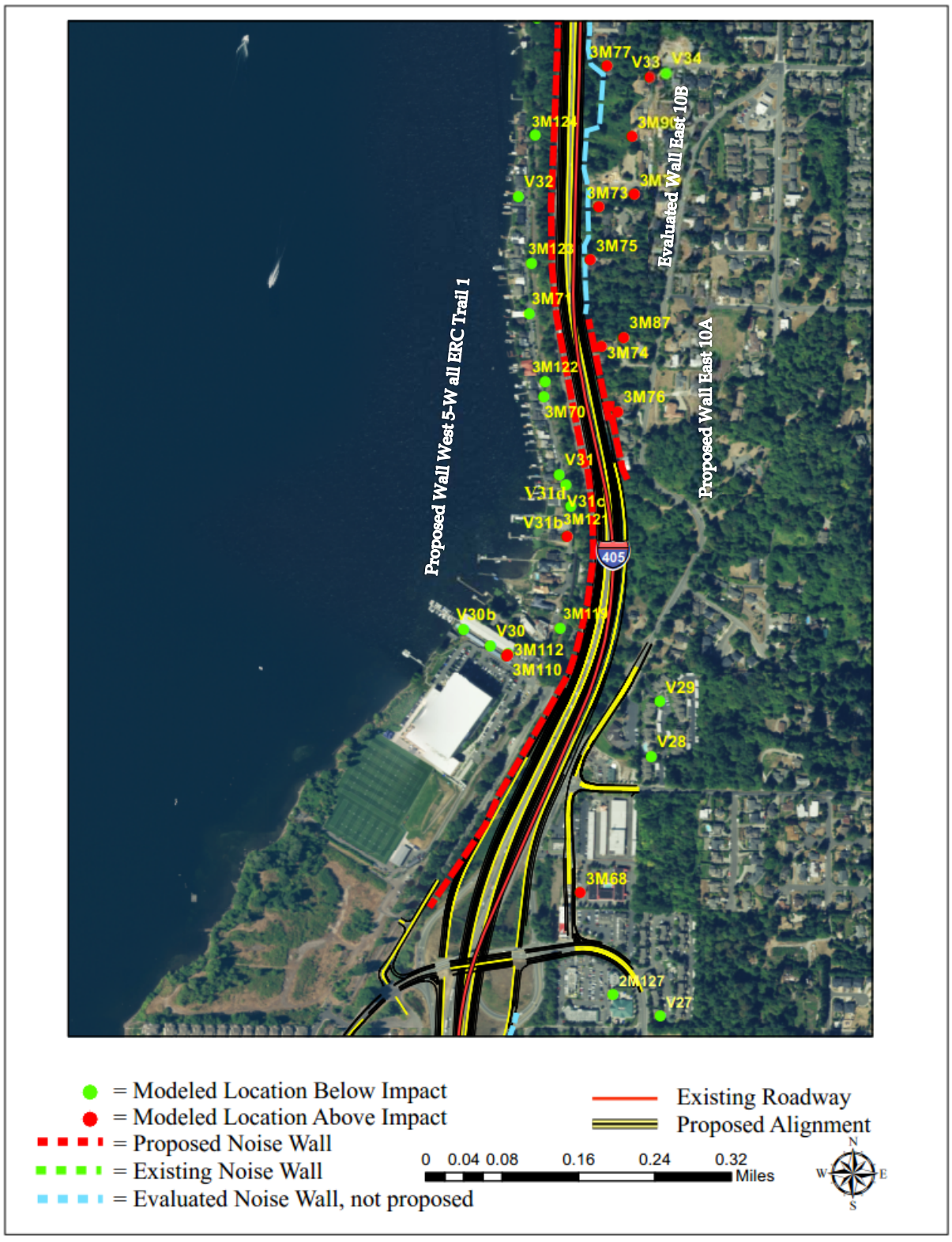


Exhibit 5-61. Evaluated Noise Wall Alignments – SE 64th Street Vicinity to Lake Washington Boulevard SE

Exhibit 5-62. Evaluated Noise Wall Alignments – Lake Washington Boulevard SE to SE Coal Creek Parkway

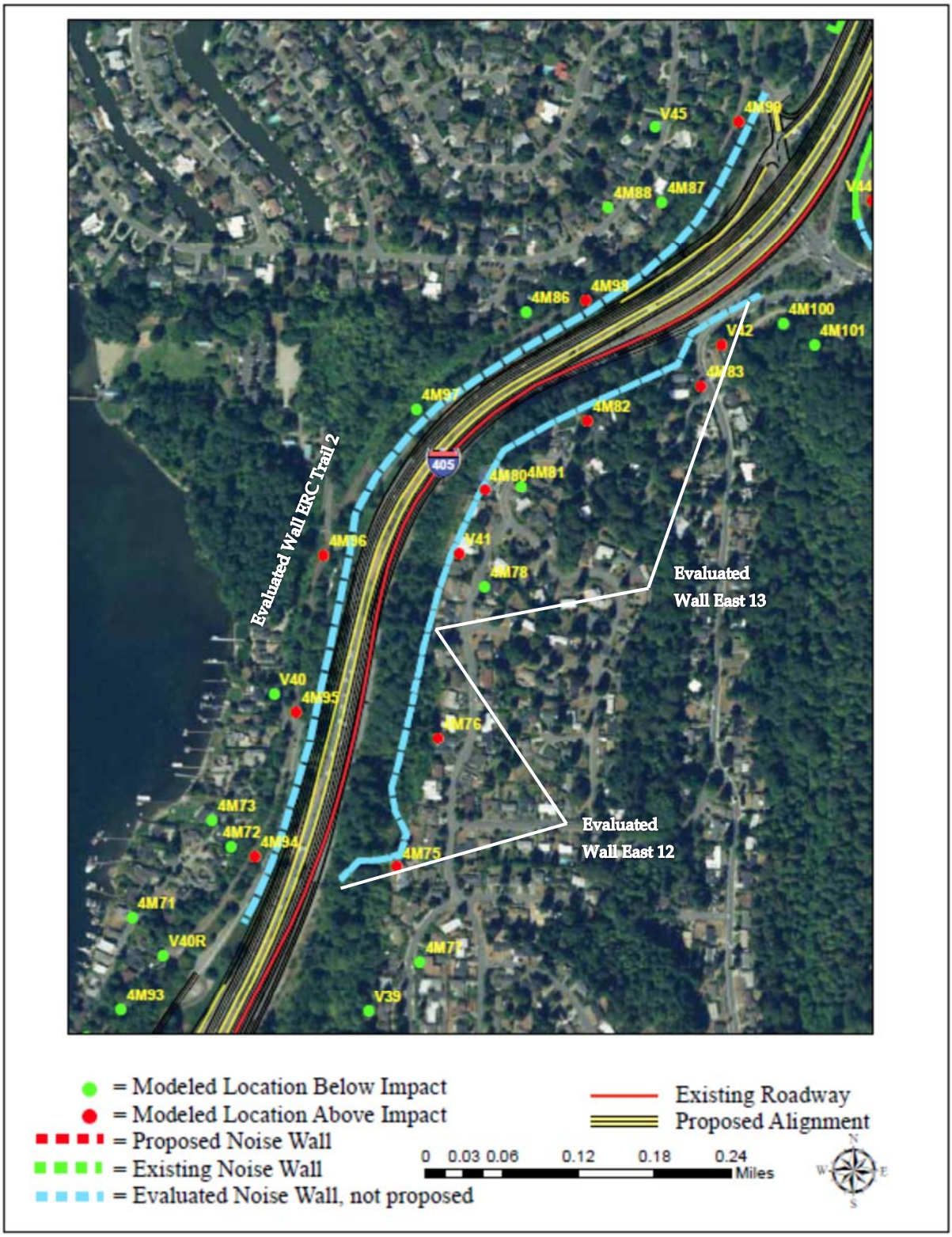


Exhibit 5-63. Evaluated Noise Wall Alignments – SE Coal Creek Parkway to I-90

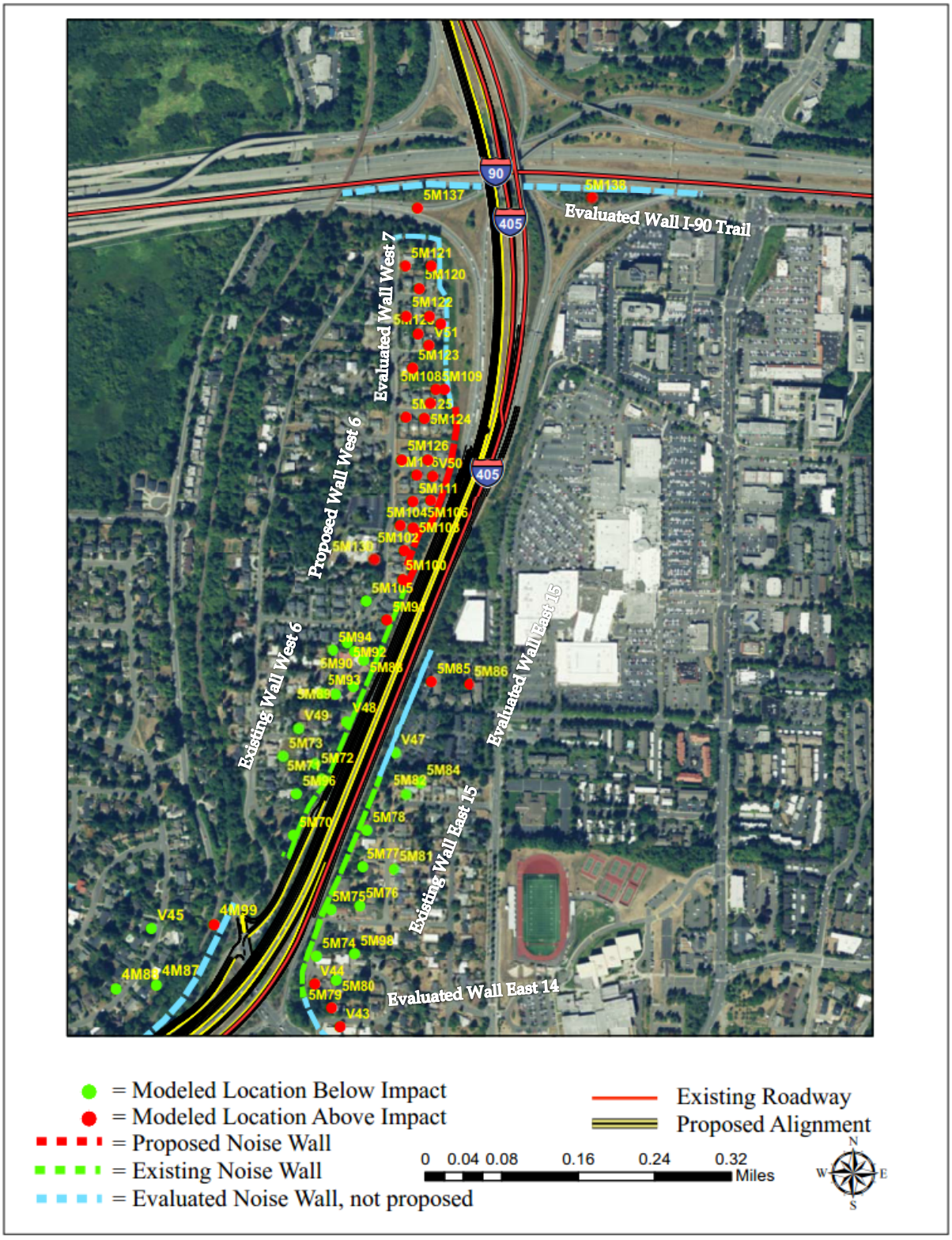


Exhibit 5-64. Evaluated Noise Wall Alignments – I-90 to SE 22nd Street Vicinity

Exhibit 5-65. Evaluated Noise Wall Alignments – I-5 to SR 181

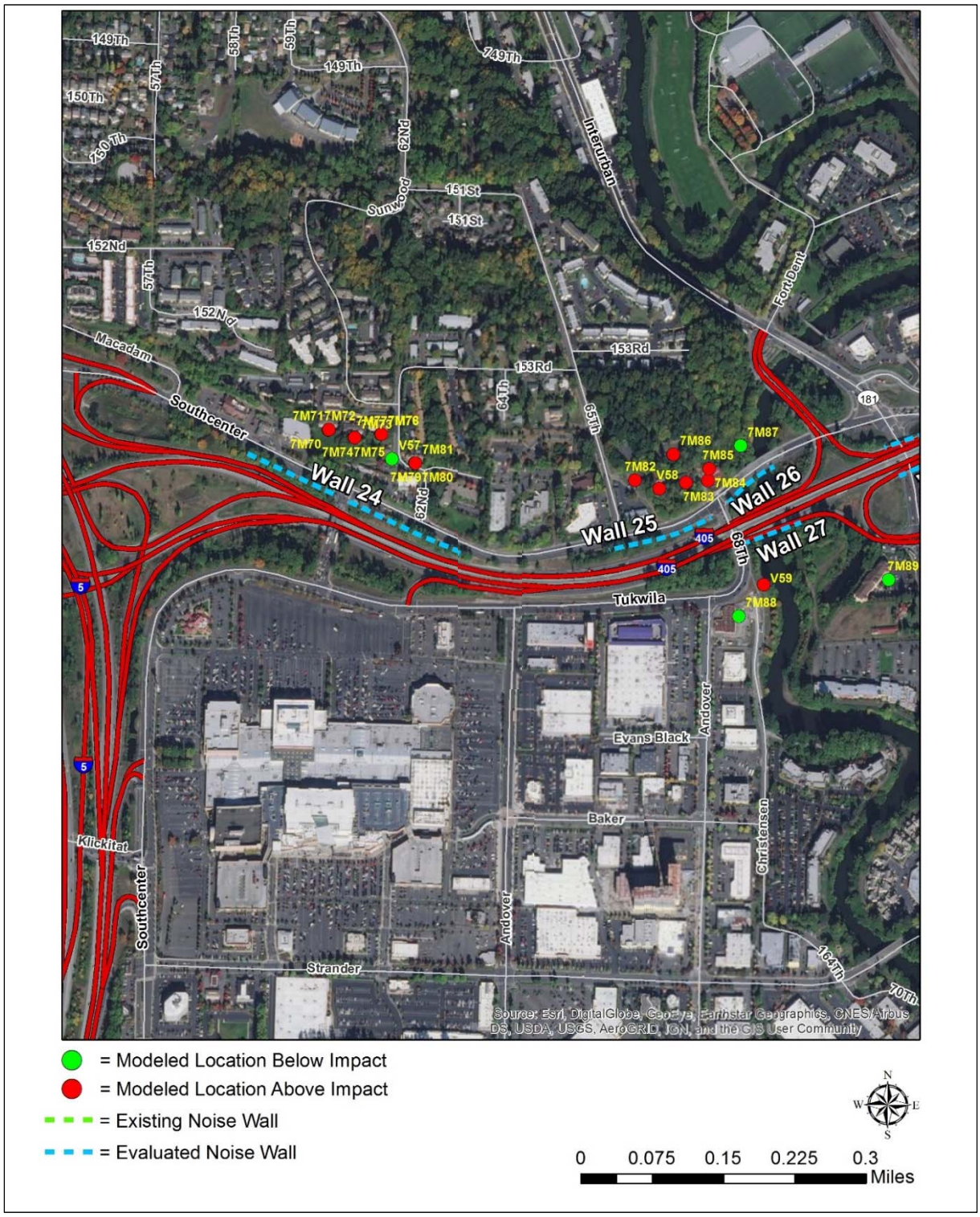


Exhibit 5-66. Evaluated Noise Wall Alignments – SR 181 to Oakesdale Avenue SW

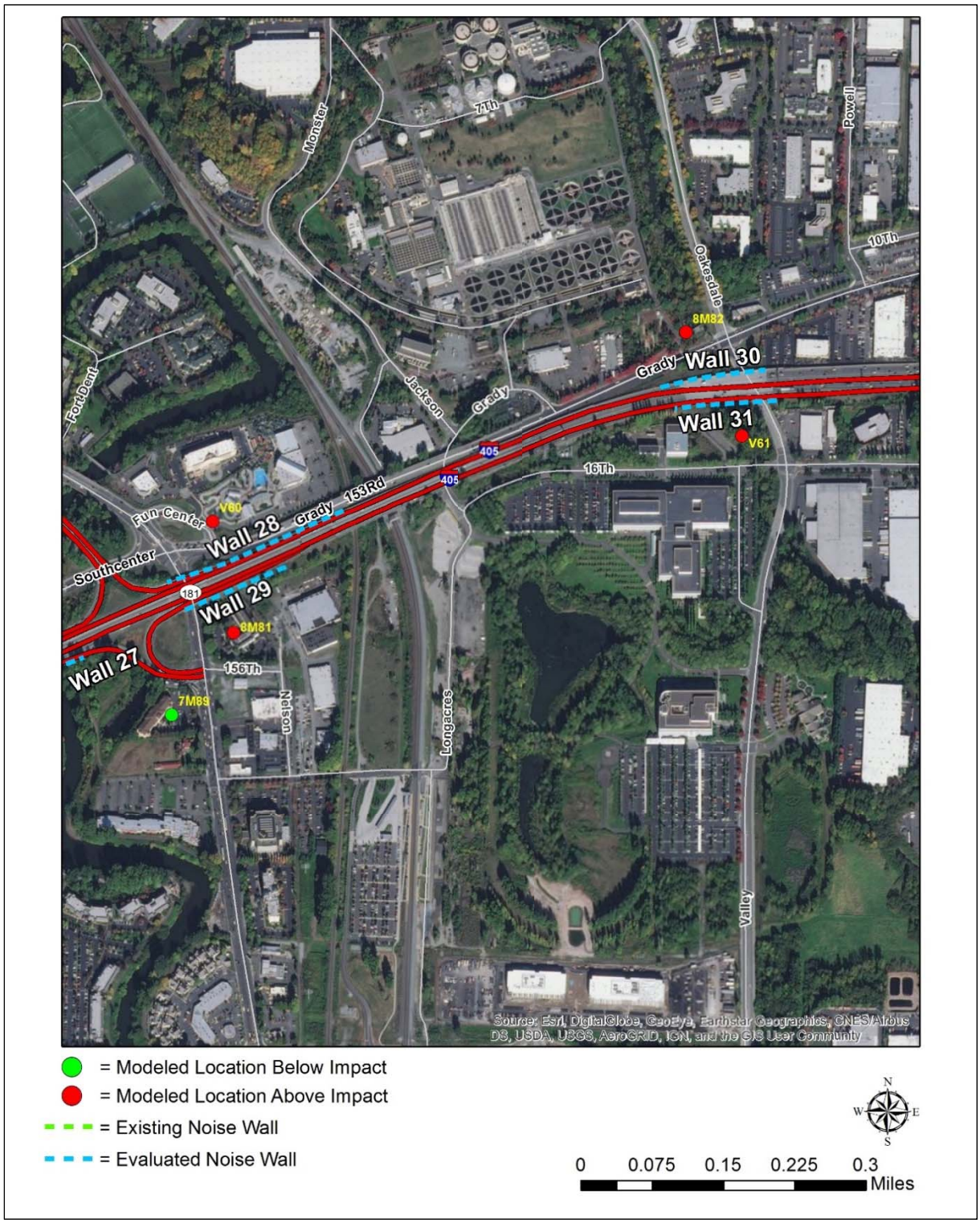


Exhibit 5-67. Evaluated Noise Wall Alignments – Oakesdale Avenue SW to SR 167

Exhibit 5-68. Evaluated Noise Wall Alignments – SR 167 to SR 515

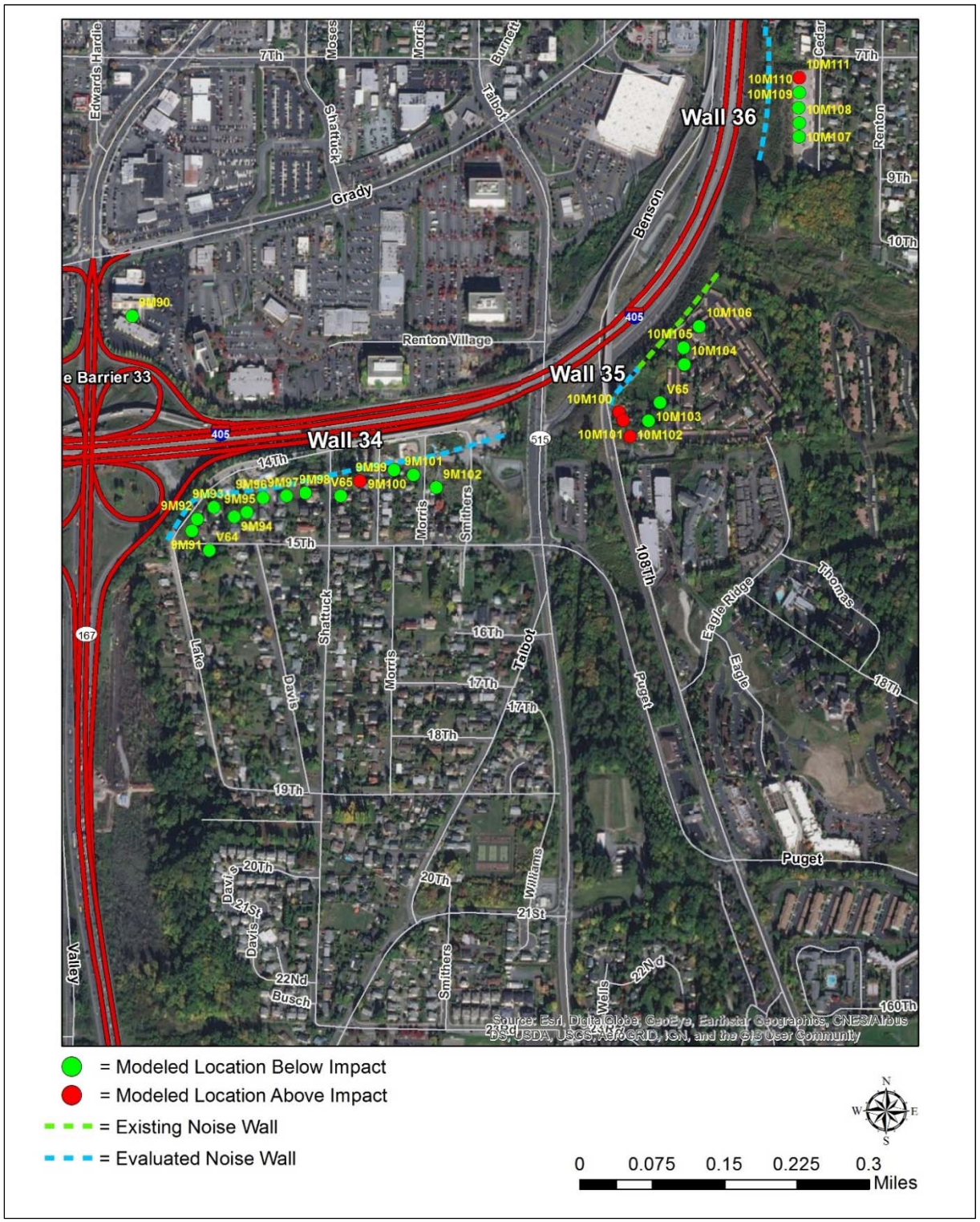
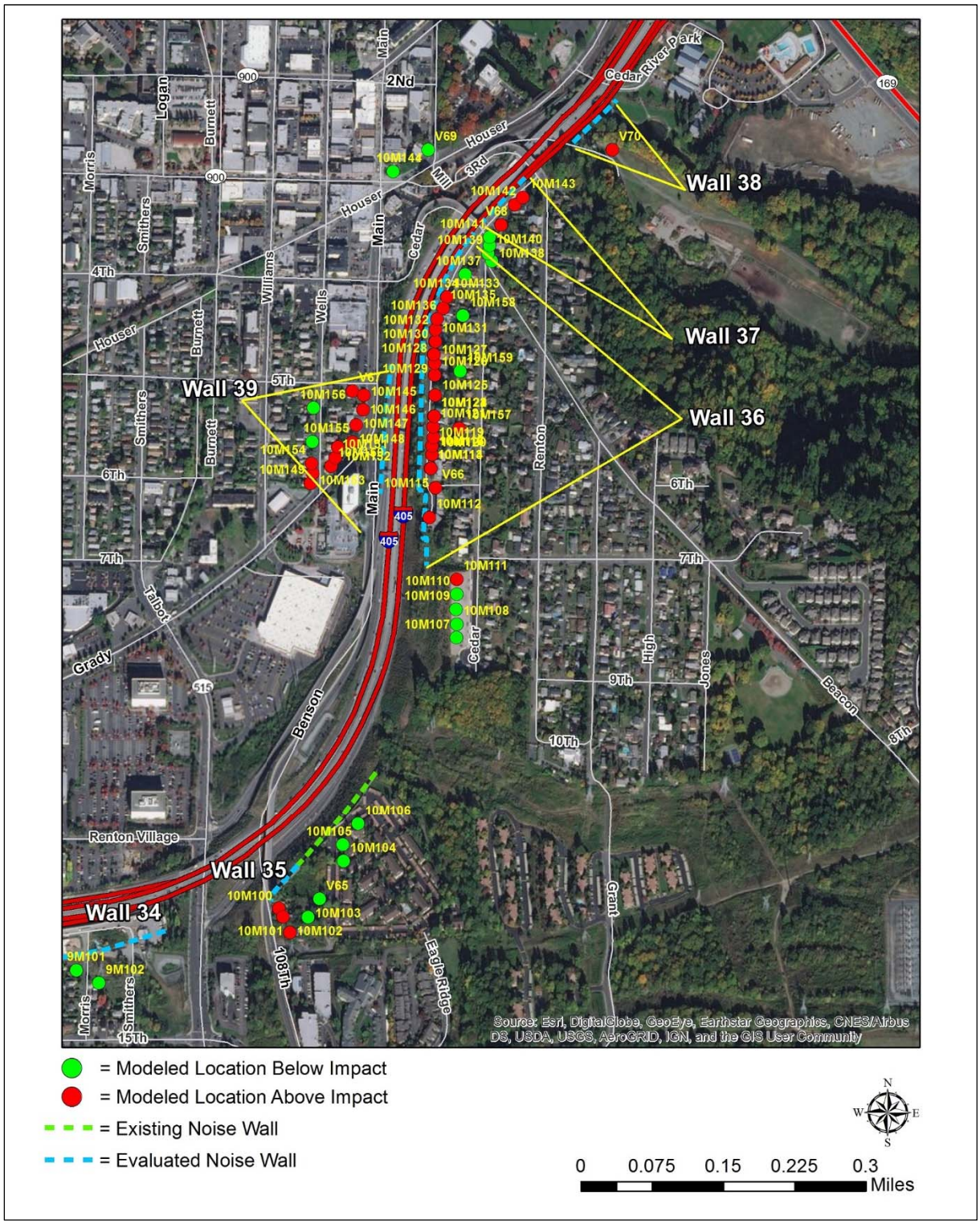


Exhibit 5-69. Evaluated Noise Wall Alignments – SR 515 to SR 169



Existing Walls

We performed noise evaluations for the existing noise walls within the project corridor to determine if the receivers behind the walls would maintain future noise levels below the 66-dBA NAC with the Project. There are 11 existing noise walls in the noise study area. Out of these existing noise walls, only one wall, Wall East 3, would not maintain the noise level below the NAC of 66 dBA.

The northern section of existing Wall East 3 on the bridge over Sunset Boulevard would move 9 feet to the east as the bridge is widened. Five receivers located behind the existing wall representing 18 homes would experience noise levels above 66 dBA. Raising the existing wall height up to 30 feet would not reduce the noise level of the affected receivers to below the NAC. Therefore, upgrading existing Wall East 3 is not cost-effective and the height of this wall would remain unchanged.

WSDOT would shift the northern end of Wall West 4 (approximately 400 feet) to the west, to the new right of way line. The height would remain unchanged, and all eight receivers (representing 54 dwelling units) would maintain noise levels below the NAC.

Recommendation for Traffic Noise Abatement

Traffic noise walls were evaluated at 39 locations for feasibility and reasonableness along the project corridor. The following five noise walls were found to be reasonable and feasible using WSDOT noise abatement criteria, these walls include:

- Wall East 3
- Wall East 10A
- Wall West 6 extension
- Wall East 11
- Wall West 5-ERC Trail 1

We recommend building these five noise walls. However, due to the property owners and tenants behind Wall East 3 expressing their desire not to have a noise wall as documented in polling results, WSDOT will not build Wall East 3. The remaining four walls, are recommended. These four walls would reduce traffic noise levels at 28 modeled receivers representing 191 residences and a trail. In addition, the

northern sections of Wall East 3 and Wall West 4 would be relocated.

In addition, WSDOT would build concrete protective fence and roadside barrier in some locations. The concrete protective fence would be built on the top of retaining walls adjacent to homes, and the roadside barrier would be built at the edge of pavement when required by safety standards to protect vehicles from steep slopes or other roadside hazards. Although these design elements are not considered noise abatement, modeling has shown that they may provide up to 3 dBA of noise reduction for adjacent residences.

SECTION 6 CONSTRUCTION NOISE

Construction Noise Background

Construction creates temporary noise and is usually carried out in reasonably discrete steps, each with its own mix of equipment and noise characteristics. For example, roadway construction typically involves demolition, construction, and paving.

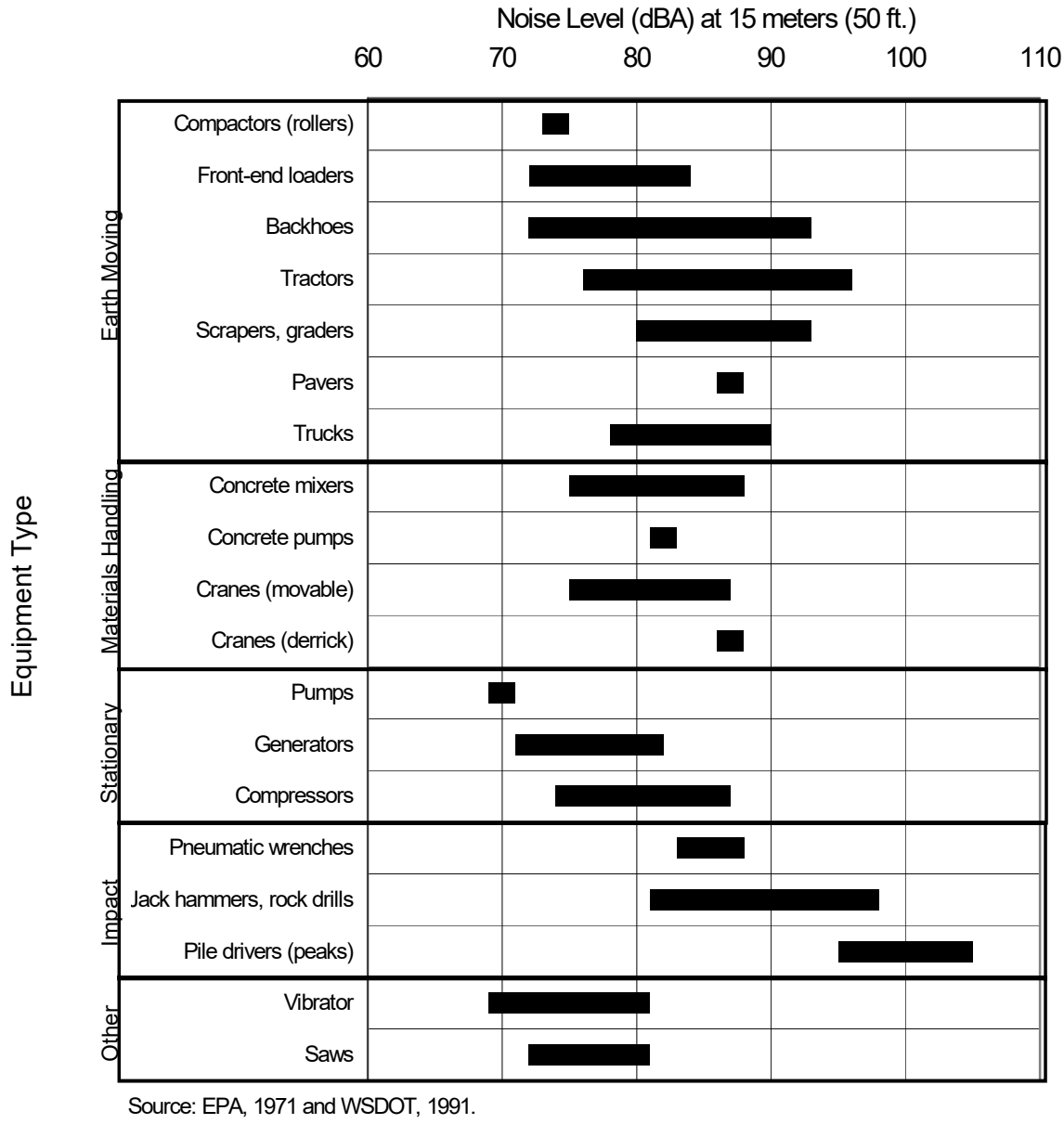
The most constant noise source at construction sites is usually engine noise. Mobile equipment generally operates intermittently or in cycles of operation, while stationary equipment, such as generators and compressors, generally operates at fairly constant sound levels. Trucks are present during most 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 typically include impact equipment, which could be pneumatic, hydraulic, or electric-powered.

As noted in the list below, noise levels during the construction period depend on the type, amount, and location of construction activities.

- The type of construction methods establishes 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.

The maximum noise levels of construction equipment are expected to be similar to the maximum construction equipment noise levels presented in Exhibit 6-1 and typically range from 69 to 106 dBA at 50 feet. As a point source, construction noise decreases by 6 dBA per doubling of distance from the source moving away from the equipment. The various pieces of equipment are almost never operating simultaneously at full power, and some would be powered off, idling, or operating at less than full power at any time. Therefore, the average L_{eq} noise levels would be less than aggregate of the maximum noise levels in Exhibit 6-1.

Exhibit 6-1. Construction Equipment Noise Ranges



Source: EPA, 1971 and WSDOT, 1991.

Construction Noise Variance for Night Work

Construction noise is exempt from state and local property line regulations during daytime hours. If nighttime construction is required for the Project, WSDOT would apply for variances or exemptions from local noise ordinances for the night work. Such noise variances or exemptions require construction noise abatement measures that vary by jurisdiction. If night work is mandated for the Project, WSDOT would obtain noise variances from the local jurisdictions.

Construction Noise Abatement

To reduce construction noise at nearby receptors, the following measures will be incorporated, where practicable, into construction plans and specifications:

- As construction is taking place in a specific area, if possible, WSDOT will construct proposed noise walls before other construction activities.
- WSDOT will equip construction equipment engines with mufflers, intake silencers, and engine enclosures, as appropriate.
- WSDOT will turn off construction equipment during prolonged periods of nonuse to reduce noise.
- WSDOT will locate stationary equipment away from receiving properties to decrease noise.
- WSDOT will maintain all equipment and train their equipment operators in good practices to reduce noise levels.
- WSDOT will use Occupational Safety and Health Act-approved ambient sound-sensing backup alarms that could reduce disturbances from backup alarms during quieter periods.

SECTION 7 REFERENCES

Environmental Protection Agency (EPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, D.C. NTID 300.1. December 31, 1971. Revised WSDOT District 1, February 1991.

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Federal Transit Administration (FTA), U.S. Department of Transportation. 1995. *Transit Noise and Vibration Impact Assessment*. Washington D.C.

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APPENDIX A ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
ADA	Americans with Disabilities Act
ANE	Air, Noise, and Energy (Program)
CFR	Code of Federal Regulations
dB	decibels
dBA	A-weighted decibel
DOT	Department of Transportation
EA	Environmental Assessment
EDNA	environmental designation for noise abatement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ETL	express toll lane
FHWA	Federal Highway Administration
ft^2	square foot
GP	general purpose
Hz	hertz
HOV	high-occupancy vehicle
I-405	Interstate 405
L_{eq}	sound level measure of the average noise level during a specified period of time
$L_{eq}(h)$	sound level measure of the average noise level for an hourly period
L_{max}	maximum sound level during a period of time
L_{min}	minimum sound level during a period of time
L_n	n representing the percentage of time the sound level exceeded
MP	milepost
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
OEO	Office of Equal Opportunity
RE	residential equivalency

Acronym	Meaning
ROD	Record of Decision
SOV	single-occupant vehicle
SR	State Route
TNM	traffic noise model
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

APPENDIX B TRAFFIC NOISE ANALYSIS AND ABATEMENT PROCESS

When are noise reports and/or recommendations final?

The noise abatement process, from 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.

After completion of the above, the traffic noise discipline report can be finalized.

Design Phase

The Design Phase steps described below and the Public Involvement steps described in the following section may be incorporated before the discipline 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 when the discipline report was prepared.

If conflicts from utilities, steep slopes, etc. are present, the project team provides the details and costs of the conflicts to the noise analyst. 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 noise 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 impacts of the noise wall (or other abatement) on their community.

The final determination whether to construct a noise wall or other abatement that traffic noise analysis recommends 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 offices discretion. An 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.

Modeled Traffic Volumes

Exhibit B-1 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

I-405 between:		2045 Build AM - 5:30 AM to 6:30 AM			2045 Build PM - 2PM to 3PM			Existing AM - 5:30 AM to 6:30 AM			Existing PM - 2PM to 3PM		
South	**North**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**
I-5	**SR 181**	5898	5596	11494	6137	5986	12123	4256	4541	8797	5437	4793	10230
SR 181	**SR 167**	5233	5941	11174	6500	6191	12691	3740	4903	8643	5677	4869	10546
SR 167	**SR 515**	4822	5368	10190	6370	5538	11908	3981	3968	7949	5169	4579	9748
SR 515	**SR 169**	5474	5763	11237	6844	6188	13032	4595	4377	8972	5622	5377	10999
SR 169	**SR 900**	5534	4368	9902	5516	5311	10827	4309	2998	7307	4446	4107	8553
SR 900	**N 8th St**	5870	4722	10592	5885	5881	11766	4505	3219	7724	4675	4706	9381
N 8th St	**Park Dr**	6425	5034	11459	5985	6519	12504						
Park Dr	**30th St**	6577	5202	11779	6168	6338	12506	4592	4052	8644	4639	5152	9791
30th St	**44th St**	6987	5124	12111	6244	6515	12759	4887	3384	8271	4783	4795	9578
44th St	**112th St**	7243	4926	12169	6138	6605	12743	4800	3209	8009	4643	4649	9292
112th St	**Coal Creek**	7522	4945	12467	6352	6820	13172	5003	3326	8329	4875	4918	9793
Coal Creek	**I-90**	8363	4988	13351	7254	8122	15376	5563	3297	8860	5449	5464	10913

Exhibit B-2 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

I-5 between:		2045 Build AM - 5:30 AM to 6:30 AM			2045 Build PM - 2PM to 3PM			Existing AM - 5:30 AM to 6:30 AM			Existing PM - 2PM to 3PM		
South	**North**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**
I-405	**SR 518**	7605	2630	10235	3983	6407	10390	6286	3222	9508	3579	8431	12010

Exhibit B-3 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

SR 167 between:		2045 Build AM - 5:30 AM to 6:30 AM			2045 Build PM - 2PM to 3PM			Existing AM - 5:30 AM to 6:30 AM			Existing PM - 2PM to 3PM		
South	**North**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**
S 180th St	**S Grady Way**	4730	3832	8562	4626	5430	10056	4222	2455	6677	3445	4304	7749

Exhibit B-4 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

I-405 between:	2045 Build AM - 5:30 AM to 6:30 AM	2045 Build PM - 2PM to 3PM	Existing AM - 5:30 AM to 6:30 AM	Existing PM - 2PM to 3PM
North	**Northbound**	**Southbound**	**Total**	**Northbound**
NB NE 44th Off	171	350	130	274
NB NE 44th On	427	244	204	207
SB NE 44th Off	124	465	71	246
SB NE 44th On	322	375	202	249
NB 112th Off	45	98	29	47
NB 112th On	324	312	269	281
SB 112th Off	88	424	46	226
SB 112th On	69	209	34	42
NB CC Off	234	405	221	337
NB CC On	1075	1307	772	883
SB CC Off	276	2043	173	966
SB CC On	233	741	145	571
I-5 NB to I 405 NB	2408	1352	1674	1310
I-5 NB to I 405 SB	705	746	512	725
I-5 SB to I 405 NB	1820	2844	1211	2281
I-5 SB to I 405 SB	736	697	817	821
I-405 NB to I-5 NB	646	902	644	943
I-405 NB to I-5 SB	589	1043	485	943
I-405 SB to I-5 NB	2526	1318	2708	2028
I-405 SB to I-5 SB	771	1473	453	1315

Exhibit B-4 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

I-405 between:	2045 Build AM - 5:30 AM to 6:30 AM	2045 Build PM - 2PM to 3PM	Existing AM - 5:30 AM to 6:30 AM	Existing PM - 2PM to 3PM
North	**Northbound**	**Southbound**	**Total**	**Northbound**
I-405 NB to SR 181	918	852	642	771
I-405 SB to SR 181	469	531	374	484
SR 181 to I-405 NB	167	601	142	521
SR 181 to I-405 SB	176	663	123	587
I-405 NB to SR 167 NB	755	752	361	596
I-405 NB to SR 167 SB	1599	1821	950	1651
I-405 SB to SR 167 NB	268	180	107	112
I-405 SB to SR 167 SB	1770	1939	1192	1533
SR 167 NB to I-405 NB	1835	1954	1517	1445
SR 167 NB to I-405 SB	1852	1547	1764	1175
SR 167 SB to I-405 NB	108	489	72	344
SR 167 SB to I-405 SB	759	1225	536	865

Notes:

The hours used in this table represent the projected highest volume that could use the corridor when closest to free-flow conditions.
Higher volumes are projected in hours closer to the peak period of the two analysis periods; however, congestion within the corridor limits the actual volume that can get through.
AM: These volumes are in the beginning of the 6-hour analysis period, as most of the congestion had not build up yet along the corridor. Also, according to existing counts, the highest volumes were observed in the NB direction in the early hours of the peak period.
PM: These volumes are the first hour of the 6-hour analysis period, as the highest congestion has not started at this time to limit the through volume.

Exhibit B-5 Modeled Hourly Traffic Volumes for Existing and Future No Build and Build Conditions

I-405 between:		2045 Build AM - Truck %			2045 Build PM - Truck %			Existing AM - Truck %			Existing PM - Truck %		
South	North	Northbound	Southbound	Total	Northbound	Southbound	Total	Northbound	Southbound	Total	Northbound	Southbound	Total
I-5	SR 181	11%	14%	13%	7%	6%	6%	8%	10%	9%	7%	6%	6%
SR 181	SR 167	11%	14%	13%	8%	6%	7%	8%	10%	9%	9%	6%	7%
SR 167	SR 515	9%	11%	10%	8%	4%	5%	10%	8%	9%	9%	5%	6%
SR 515	SR 169	9%	11%	10%	7%	4%	6%	10%	8%	9%	8%	5%	7%
SR 169	SR 900	9%	9%	9%	6%	4%	5%	10%	7%	8%	7%	5%	6%
SR 900	N 8th St	9%	9%	9%	6%	4%	5%	10%	7%	8%	7%	5%	6%
N 8th St	Park Dr	8%	9%	9%	5%	4%	5%						
Park Dry	30th St	8%	8%	8%	5%	4%	4%	9%	7%	8%	7%	5%	6%
30th St	44th St	9%	8%	8%	5%	4%	4%	9%	7%	8%	6%	5%	6%
44th St	112th St	9%	7%	8%	4%	4%	4%	9%	6%	8%	6%	6%	6%
112th St	Coal Creek	9%	7%	8%	4%	4%	4%	9%	6%	8%	5%	6%	5%
Coal Creek	I-90	9%	7%	8%	4%	5%	4%	9%	6%	8%	5%	6%	5%

Notes:

Truck Percentages reported are the 6-Hour average percentage.

APPENDIX C RESIDENTIAL EQUIVALENCY

WSDOT calculates reasonableness based on the number of residences that benefit from a noise wall. For noise-sensitive uses other than residences, a residential equivalency (RE) of the users is calculated, based on the usage factor and number of users (WSDOT 1987). Residences may be in use at all times, but many other facilities such as schools have specific hours of operation. The usage factor accounts for the times of operation. Exhibit C-1 shows typical usage factors. In Washington, the average household has three members, so for sites use other than residential, the usage factor is multiplied by the number of users and then divided by three to convert to an equivalent number of households. Exhibit C-2 presents the residential equivalencies calculated for this report.

Exhibit C-1 WSDOT Established Usage Factors

Site	Hours/Day	Days/Week	Months/Year	Usage Factor
Homes	24	7	12	1
Apartments	24	7	12	1
Hospitals	24	7	12	1
Churches	6	3	12	0.11
Schools	10	5	9	0.22
Parks	10	5	5	0.17
Trails	9	7	12	0.375

Exhibit C-2 Residential Equivalency

Noise Receivers	Activity Description	Number of Users	Usage Factor	Users to Households Factor	Residential Equivalency (RE)
V1	Liberty Park – baseball field and tennis court	10[1]	0.17	0.33	1
V2	Liberty Park – baseball field, stands, and basketball court	108[1]	0.17	0.33	6
V3	Cedar River Park – Soccer field and baseball field	108[1]	0.17	0.33	6
V20	Kennydale School	211[1]	0.22	0.33	15
V37	Neighborhood Park – picnic tables	40[2]	0.17	0.33	3
1M-112	Liberty Park Skateboard facility	20[1]	0.17	0.33	1
V4	Outdoor bench at motel	50[2]	0.17	0.33	3
V26	Church	30[2]	0.11	0.33	2
V30b	Condo outdoor pool	12[2]	0.17	0.33	1
V59 and 7M86	Green River Trail (north and south of I-405)	35[1]	0.375	0.33	4
V60 and 8M81	Interurban Trail (north and south of I-405)	10[1]	0.375	0.33	1
V61 and 8M82	Springbrook Trail (north and south of I-405)	10[1]	0.375	0.33	1
V69 and 10M144	Renton Historical Museum Park and Veterans Memorial Park	10[1]	0.375	0.33	1
V70	Cedar River Trail (south of Cedar River)	10[1]	0.375	0.33	1
1M-111	Cedar River Park – trail, picnic, and recreational area	50[2]	0.17	0.33	3

Exhibit C-2 Residential Equivalency

Noise Receivers	Activity Description	Number of Users	Usage Factor	Users to Households Factor	Residential Equivalency (RE)
3M-119 to 3M-170 & 4M-93 to 4M-99	ERC Trail (Ripley Lane to Newcastle Beach)	2000[3]	0.375	0.33	10
5M-137 and 5M-138	I-90 Trail (at the I-405 and I-90 Interchange)	10[1]	0.375	0.33	1
7M86	Tukwila Park	35[1]	0.17	0.33	2
7M88, 7M89 and 9M90	Hotels and Hotel Pools	20[2]	0.17	0.33	1
8M83	Church	20[2]	0.11	0.33	1

1 Number of users was estimated because user data were not available from Renton Parks Department.
2 Estimated average number of users at any one time while facility is open.
3 Estimated number of users per day from King County, Eastside Rail Corridor Regional Trail Plan.

APPENDIX D NOISE WALL POLLING RESULTS

I-405 Renton to Bellevue Widening and Express Toll Lanes Project - Renton Noise

Noise Wall Polling Process

WSDOT polls neighborhoods when information gathered during the public involvement process indicates a potential objection to noise wall construction. In this case, people who own or rent an impacted or benefited unit in the first and second rows behind the proposed noise wall were invited to participate in the poll. Each qualifying unit had one vote. For rented units, votes were split between the property owner and tenants.

Proposed Noise Wall Information

WSDOT proposed building a new noise wall on the east side of I-405 on state property, starting near Northeast Third Street and running approximately 1,400 feet north to connect to the existing noise wall. The proposed wall ranged from 14 to 16 feet in height. Although the wall was projected to help reduce I-405 traffic noise, it could also obstruct scenic views.

Property owners and tenants behind Wall East 3 expressed their desire not to have the wall. Based on that, WSDOT conducted a polling process with the community to determine the majority's opinion and the polling resulted the wall will not be built with this project.

Noise Wall Decision

As shown in Exhibit D-1, based on a tally of ballots received by the required postmark date, about 96 percent of the impacted or benefited units opposed building the proposed new noise wall. As a result of this feedback, WSDOT has modified the project design to remove this new noise wall from the scope of the project.

Exhibit D-1 Noise Wall Polling Results

								Vote							
Name	Owner/ Tenant	Address	City	State	Zip	Tracking #	Ballot Received?	Yes	No	Weighting	Yes	No		Yes%	No%
Shari Fisher	owner	118 Monterey Dr NE	Renton	WA	98056-4035	7004 2890 0001 9662 9171	Yes		No	1.5		1.5		4.0%	96.0%
Sherry Xiao	owner	12819 SE 38th St #282	Bellevue	WA	98006	7004 2890 0001 9662 9188	Yes		No	1.5		1.5			
Sylvester Cugini	owner	353 Vuemont Pl NE	Renton	WA	98056	7004 2890 0001 9662 9195	Yes		No	1.5		1.5			
Michael Proulx	owner	407 Grandey Way NE	Renton	WA	98056	7004 2890 0001 9662 9201	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #101	Renton	WA	98056-3604	7004 2890 0001 9662 9218	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #102	Renton	WA	98056-3604	7004 2890 0001 9662 9225	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #103	Renton	WA	98056-3604	7004 2890 0001 9662 9232	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #104	Renton	WA	98056-3604	7004 2890 0001 9662 9249	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #105	Renton	WA	98056-3604	7004 2890 0001 9662 9256	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #106	Renton	WA	98056-3604	7004 2890 0001 9662 9263	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #107	Renton	WA	98056-3604	7004 2890 0001 9662 9270	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #108	Renton	WA	98056-3604	7004 2890 0001 9662 9287	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #201	Renton	WA	98056-3604	7004 2890 0001 9662 9317	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #202	Renton	WA	98056-3604	7004 2890 0001 9662 9324	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #203	Renton	WA	98056-3604	7004 2890 0001 9662 9331	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #204	Renton	WA	98056-3604	7004 2890 0001 9662 9133	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #205	Renton	WA	98056-3604	7004 2890 0001 9662 9140	Yes		No	1.5		1.5			
Current Resident	tenant	351 Vuemont Pl NE, #206	Renton	WA	98056-3604	7004 1350 0001 2194 6533	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #207	Renton	WA	98056-3604	7004 1350 0001 2194 6731	Yes			1.5					
Current Resident	tenant	351 Vuemont Pl NE, #208	Renton	WA	98056-3604	7007 1490 0000 1968 4725	Yes		No	1.5		1.5			
Current Resident	tenant	333 Vuemont Pl NE, #101	Renton	WA	98056-3604	7004 1350 0001 2194 6571	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #102	Renton	WA	98056-3604	7004 1350 0001 2194 6588	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #103	Renton	WA	98056-3604	7004 1350 0001 2194 6595	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #104	Renton	WA	98056-3604	7004 1350 0001 2194 6601	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #105	Renton	WA	98056-3604	7004 1350 0001 2194 6618	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #106	Renton	WA	98056-3604	7004 1350 0001 2194 6625	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #107	Renton	WA	98056-3604	7004 1350 0001 2194 6632	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #108	Renton	WA	98056-3604	7004 1350 0001 2194 6649	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #109	Renton	WA	98056-3604	7006 2150 0003 6193 8579	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #110	Renton	WA	98056-3604	7006 2150 0003 6193 8586	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #201	Renton	WA	98056-3604	7004 1350 0001 2194 6656	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #202	Renton	WA	98056-3604	7004 1350 0001 2194 6663	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #203	Renton	WA	98056-3604	7004 1350 0001 2194 6670	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #204	Renton	WA	98056-3604	7004 1350 0001 2194 6687	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #205	Renton	WA	98056-3604	7004 1350 0001 2194 6700	Yes	Yes		0.75	0.75				
Current Resident	tenant	333 Vuemont Pl NE, #206	Renton	WA	98056-3604	7004 1350 0001 2194 6694	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #207	Renton	WA	98056-3604	7004 1350 0001 2194 6717	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #208	Renton	WA	98056-3604	7004 1350 0001 2194 6724	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #209	Renton	WA	98056-3604	7006 2150 0003 6193 8593	Yes			1.5					
Current Resident	tenant	333 Vuemont Pl NE, #210	Renton	WA	98056-3604	7006 2150 0003 6193 8609	Yes			1.5					
										Total Yes:	**0.75**				
										Total No:	**18.0**				

I-405 Renton to Bellevue Widening and Express Toll Lanes Project - Renton Noise Wall Follow-up

August 2017

In May 2017, the Washington State Department of Transportation invited you by postal mail to participate in a poll to help determine whether to build a proposed noise wall as part of the I-405 Renton to Bellevue Widening and Express Toll Lanes project.

The purpose of this memorandum is to provide an update on the outcome of the poll. In short, a large majority of residents and property owners who responded to the poll reported that they opposed the wall. Based on this feedback, WSDOT no longer plans to build this new noise wall.

Proposed noise wall information
WSDOT proposed building a new noise wall on the east side of I-405 on state property, starting near Northeast Third Street and running approximately 1,400 feet north to connect to the existing noise wall. The proposed wall ranged from 14 to 16 feet in height. WSDOT's modeling indicated that this wall would help reduce I-405 traffic noise near your home.

Noise wall polling process
WSDOT polls neighborhoods when information gathered during the public involvement process indicates a potential objection to noise wall construction. In this case, WSDOT received feedback that some property owners were concerned with potential obstruction of views. WSDOT then invited people who own or rent an impact or benefited unit in the first and second rows behind the proposed noise wall to participate in a poll. Each qualifying unit had one vote. For rented units, votes were split between the property owner and the tenant.

Final noise wall decision
Based on a tally of ballots received by the required postmark date, about 96 percent of the impacted or benefited units opposed building the proposed new noise wall.

As a result of this feedback, WSDOT has modified the project design to remove this new noise wall from the scope of the project.

WSDOT's decision is final. The agency will not consider future noise walls or other noise abatement until there is another construction project in the area that requires noise analysis.