Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

Revised City of Seattle Major Public Project Construction Noise Variance Application

Prepared for

Washington State Department of Transportation

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March 6, 2017
Revised July 6, 2017

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Exhibits

Attachments

Acronyms and Abbreviations

ANSI	American National Standards Institute
dB	Decibels
dBA	A-weighted decibels
HOV	High-occupancy vehicle
Hz	Hertz
INM	Independent Noise Monitor
L_1	Sound level exceeded for 1 percent of the measurement duration (i.e., 36 seconds per hour)
L_{eq}	Equivalent sound level
L_{max}	Maximum noise level
MPPCNV	Major Public Project Construction Noise Variance
NMMP	Noise Management and Mitigation Plan
RCW	Revised Code of Washington
SDCI	Seattle Department of Construction and Inspections
SMC	Seattle Municipal Code
SR	State Route
WABS	West Approach Bridge South
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Introduction

Key Takeaway
This revised noise variance application is informed by SDCI and public comments.

The Washington State Department of Transportation (WSDOT) is submitting this revised application to the Seattle Department of Construction and Inspections (SDCI) to request a Major Public Project Construction Noise Variance (MPPCNV) for the Montlake Phase of the State Route (SR) 520 Bridge Replacement and High-Occupancy Vehicle (HOV) Program per the Noise Control Ordinance (Seattle Municipal Code, Chapter 25.08 [SMC 25.08]) and City of Seattle's Director's Rule 3-2009. This noise variance will cover activities occurring as part of the SR 520 Montlake Phase.

The next SR 520 project phase, known as the Montlake Phase, includes construction of the West Approach Bridge South, Montlake lid and interchange, and a bicycle/pedestrian land bridge over the highway. Construction of this first phase of the I-5 to Lake Washington Project (also known as the "Rest of the West") is scheduled to begin in 2018. WSDOT and SDCI began noise variance coordination efforts in fall 2016 to prepare for Montlake Phase construction.

Key Takeaway
The revised noise variance application reduced the total length of the requested variance from seven to five years to clarify the anticipated duration of substantial construction activities.

WSDOT requests a five year nighttime noise variance for the proposed Montlake Phase to allow necessary construction work activities to occur during nighttime hours (between 10 p.m. and 7 a.m. on weekdays and between 10 p.m. and. 9 a.m. on weekends and legal holidays). As part of the MPPCNV for the Montlake Phase, this application proposes nighttime construction noise limits for noise-sensitive receivers near construction sites.

Key Takeaway
The revised noise variance application removes the request to allow impact work to occur beyond what is permitted by city code.

WSDOT requests an MPPCNV pursuant to SMC 25.08.590 (Granting of Variance) and SMC 25.08.655 (MPPCNV) to allow construction noise generated on site to exceed the sound level limit as specified in SMC 25.08.410 and as modified by 25.08.420 and 25.08.425.

Completion of all construction activities during only daytime hours would be unreasonable in light of public and worker safety. It would require multiple periods of closure of SR 520, Montlake Boulevard, and Lake Washington Boulevard during peak traffic periods, which would result in:

- Extensive delays to the traveling public.
- Increased traffic volumes on city streets and nearby highways.
- A potential increase in the number of accidents in the project work zone.

Key Takeaway
Limiting construction activities to daytime only hours would result in:
- $39 to $140 million in increased project costs
- Over half a billion dollars in regional economic impact

Completion of all construction activities during only daytime hours would substantially extend the construction period and increase the economic cost to taxpayers. Increased direct project costs are estimated to be between $39 and $140 million. Added indirect costs (associated with daytime traffic impacts) to the delivery of people, goods and services in the region are estimated to result in an economic impact to the region at well over half a billion dollars.

Examples of Montlake Phase nighttime construction work activities needing a variance that would be unreasonable to limit to daytime construction in light of public and worker safety include, but are not limited to:

- Demolishing structures next to or over the highway.
- Conducting work that is immediately adjacent to or over live traffic such as constructing of lid walls, placing concrete girders for the Montlake lid and the land bridge, installing large overhead sign structures, or installing formwork and concrete placement for walls and bridges along SR 520.
- Constructing bridge foundations which involves both spread footing and drilled shaft construction.
- Delivering large equipment or materials, such as lengthy bridge girders or concrete for the new bridges and retaining walls adjacent to and over SR 520.
- Relocating utilities located within the roadway on SR 520, Montlake Boulevard and Lake Washington Boulevard.
- Managing major traffic shifts and new ramp/roadway connections along SR 520.
- Paving City streets such as Montlake Boulevard and Lake Washington Boulevard.

WSDOT has developed expected construction activities and an estimated schedule for the Montlake Phase. The analysis demonstrates that means and methods are available to meet the noise limits requested in this noise variance application. The contractor will propose their own construction activities and schedule, and create a detailed noise management and mitigation plan to meet the commitments WSDOT has made in this MPPCNV application and the noise variance issued by SDCI. Construction activities and equipment used may not be specifically identical but are likely to be similar to those identified by WSDOT in the Proposed Construction Activities section.

This revised noise variance application includes the following:

- A Noise Management and Mitigation Plan to demonstrate that means and methods are available to meet the proposed noise limits.
- A description of the proposed construction activities including a description of the noisiest proposed activities.
- Existing baseline sound levels at noise-sensitive land uses within the project areas.
- Proposed sound-level limits for nighttime construction activities that would be unreasonable to limit to daytime construction in light of public and worker safety or render the project economically or functionally unreasonable.
- Calculated sound levels that may be expected at noise-sensitive land uses during the noisiest nighttime construction activities.
- Proposed noise-mitigation measures.
- Provisions for compliance tracking and actions taken to resolve public complaints.

WSDOT is working with SDCI to meet the 90-day permit processing timeline for WSDOT projects on a state highway as outlined in Revised Code of Washington (RCW) 47.01.485. The legislative intent behind this law is to expand the opportunities for streamlining the delivery of essential transportation projects while maintaining natural resource protection. This requirement became effective when Governor Inslee signed 2ESSB 5994 into law on July 6, 2015. The following section was been added to RCW 47.01.485:

> *(1) To the greatest extent practicable, a city, town, code city, or county must make a final determination on all permits required for a project on a state highway as defined in RCW 46.04.560 no later than 90 days after the department (WSDOT) submits a complete permit application for a project with an estimated cost of less than $500 million.*

Project Descriptions and Proposed Construction Activities

Montlake Phase Overview and Project Site Description

Key Takeaway
The existing SR 520 West Approach Bridge is vulnerable to a catastrophic failure during a large earthquake.

The next SR 520 project phase, known as the Montlake Phase (Exhibit 1), includes construction of the West Approach Bridge South, Montlake lid and interchange, and a bicycle/pedestrian land bridge over the highway. Construction of this first phase of the I-5 to Lake Washington Project (also known as the "Rest of the West") is scheduled to begin in 2018.

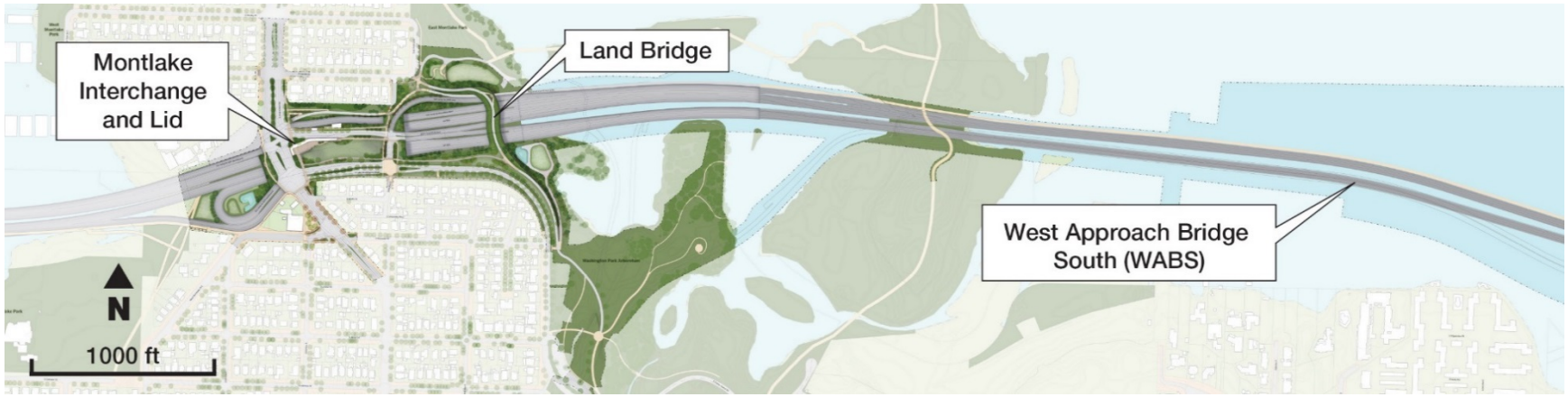
The existing SR 520 west approach bridge is built on hollow columns, which are vulnerable to a catastrophic failure during a large earthquake, and the roadway has narrow shoulders and lacks transit/HOV lanes. The West Approach Bridge South is a companion to the nearly completed West Approach Bridge North and will connect eastbound traffic from Montlake to the new floating bridge. It will also feature a dedicated transit/HOV lane that will provide improved mobility for buses and carpools as they access the new floating bridge and continue to the Eastside.

Key Takeaway
The Montlake Phase project is located in a mostly residential area. The SR 520 program is enhancing safety by replacing the highway's aging bridges and keeping the region moving with vital highway and transit facility improvements throughout the corridor.

The new Montlake interchange and lid will include direct-access connections for transit and HOV in addition to new bicycle and pedestrian connections to existing regional and local trails and routes. The Montlake lid will be a hub for local and regional transportation connectivity, and will include multifunctional open spaces, urban trails, undercrossings, a segment of the regional shared-use path adjacent to SR 520, and transit connections. The land bridge will be a bicycle/pedestrian path over SR 520 that provides a north-south local trail connection across the highway between the Washington Park Arboretum and points north. The Montlake Phase also features construction of stormwater treatment sites that will capture and naturally filter highway runoff to help protect the local environment.

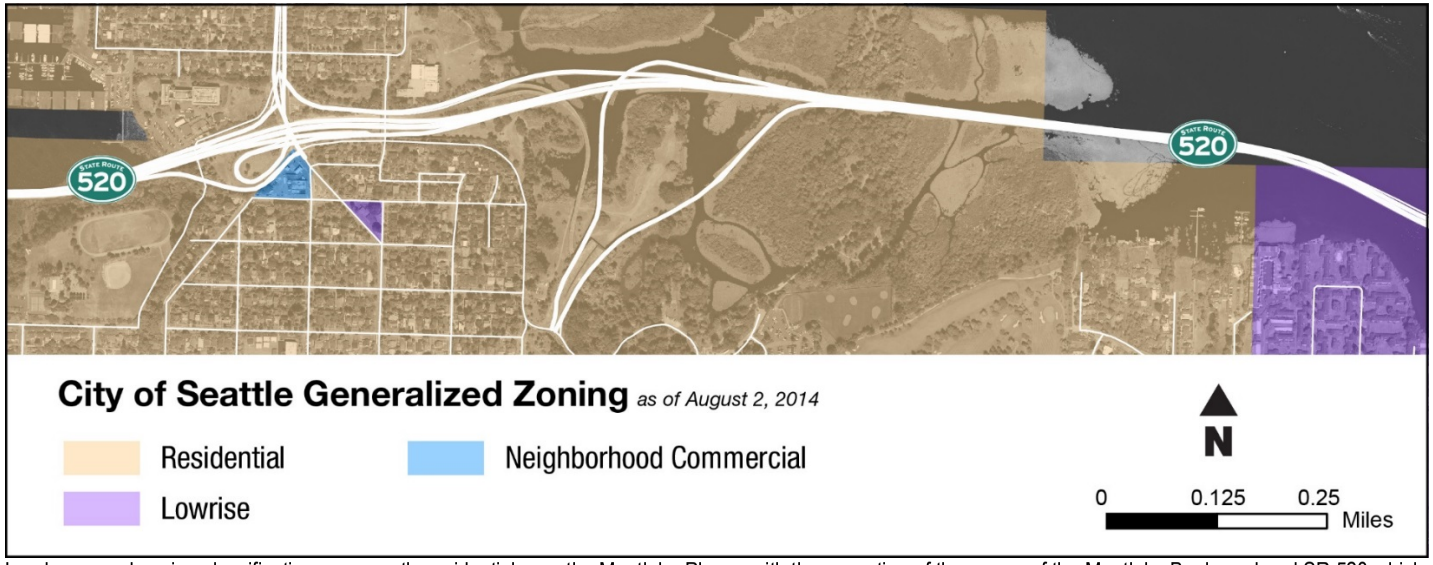
Land uses and zoning classifications are mostly residential near the project area, with the exception of the corner of Montlake Boulevard and SR 520, which is zoned as neighborhood commercial (Exhibit 2).

EXHIBIT 1. MONTLAKE PHASE PROJECT AREA



The Montlake Phase includes the construction of the West Approach Bridge South, Montlake interchange and lid, and the bicycle/pedestrian land bridge.

EXHIBIT 2. ZONING



Land uses and zoning classifications are mostly residential near the Montlake Phase, with the exception of the corner of the Montlake Boulevard and SR 520 which is zoned as neighborhood commercial.

Expected Construction Activities

The Montlake Phase will be a design-build contract. WSDOT has carefully reviewed the work to be built as part of this contract and has developed an expected list of construction activities and an estimated schedule for this work. A request for proposals is planned to be issued by WSDOT in 2017. WSDOT will evaluate the proposals received based on cost and technical credits. WSDOT expects to award the contract to the selected contractor in 2018. The contractor will develop their own approach and plan for the construction activities and schedule for this work, and update the Noise Management and Mitigation Plan (NMMP) accordingly. While the order and timing of activities may differ, the construction activities and equipment used are likely to be similar to those identified by WSDOT. The proposed Montlake Phase major construction phases and durations are as follows:

- Waterline installation, estimated 5 to 7 months
- Demolition of existing Montlake Boulevard bridge, estimated 1 month
- Demolition of existing 24th Avenue Bridge, estimated 1 month
- Demolition of existing West Approach Bridge, estimated 4 to 6 months
- Temporary work bridge construction, estimated 5 to 7 months
- Drilled shafts for WABS, estimated 12 to 16 months
- Bridge substructure and superstructure construction for WABS, estimated 14 to 20 months
- Construction of Montlake lid, estimated 48 to 60 months
- Traffic shifts, estimated 48 to 60 months
- Utility relocation, estimated 48 to 60 months
- Temporary shoring wall construction, estimated 48 to 60 months
- West Approach Bridge North widening, estimated 48 to 60 months

Expected nighttime construction activities, that require a noise variance, are part of some or all of the phases described above. WSDOT has developed an expected schedule and list of equipment to be used during nighttime hours by the contractor as noted in Exhibit 3 and Exhibit 4. The contractor will update the list of equipment and the order and timing of activities in the updated NMMP. All construction activities noted in Exhibit 3 are not expected to occur continuously on all nights for consecutive weeks and it is likely that there will be breaks in the activities.

EXHIBIT 3. ESTIMATED SCHEDULE OF MONTLAKE PHASE NIGHTTIME CONSTRUCTION ACTIVITIES

All construction activities noted in Exhibit 3 are not expected to occur continuously on all nights for consecutive weeks and it is likely that there will be breaks in the activities. The Montlake Phase contractor will update the nighttime activities schedule in the updated Nighttime Management and Mitigation Plan.

EXHIBIT 4. EXPECTED NIGHTTIME CONSTRUCTION EQUIPMENT

	NMMP Modeled Construction Activities				Other Nighttime Activities		
Equipment Type	Demolition of structures	Construction of lid walls (Work adjacent to or over live traffic)	Shaft Installation for WABS	Delivery of large equipment or materials	Relocation of utilities	Making traffic shifts and new ramp/roadway connections	Paving operations on City streets
Asphalt roller						✓	✓
Bulldozer					✓	✓	
Compressor	✓	✓		✓	✓	✓	✓
Concrete pump		✓	✓		✓		✓
Concrete truck		✓	✓		✓		✓
Crawler crane	✓	✓	✓	✓			
Delivery truck	✓	✓	✓	✓	✓	✓	✓
Diesel generator			✓		✓	✓	✓
Drill rig			✓				
Dump or Debris truck	✓	✓	✓	✓	✓		✓
Excavator with crusher	✓						
Excavator with thumb	✓				✓		
Forklift	✓	✓		✓	✓		
Grader					✓	✓	
Hydraulic crane	✓	✓		✓			
Loader	✓	✓		✓	✓		✓
Street sweeper						✓	✓
Vibratory roller						✓	✓
Vibratory pile installer			✓				
Welder			✓		✓		

Montlake Phase contractor to update above list as part of updates to the Noise Management and Mitigation Plan.
Typical noise levels of each piece of nighttime construction equipment noise are listed in Exhibit 11.

WSDOT Compliance with City of Seattle Criteria for a Major Public Project Construction Noise Variance

Definition of Major Public Project

SMC 25.08.168: The Definition of a Major Public Project

SMC 25.08.168 defines "major public project" as follows:

> *"Major public project" means a project for a public facility as defined in SMC Title 23, the construction of which the Administrator determines is likely to be of at least six months duration, and is likely to have a substantial impact on the public safety, health and welfare and the provision of public services, including transportation services. In making this determination the Administrator shall consider factors such as the expected size, complexity or cost of the proposed construction or reconstruction; the expected duration of the proposed construction or reconstruction; the magnitude of the expected impacts on traffic and transportation; and/or the degree of impact on the provision of public services during the proposed construction or reconstruction.*

The Montlake Phase includes the construction of the West Approach Bridge South, Montlake lid and interchange, and a bicycle/pedestrian land bridge over the highway and requires a five-year duration of substantial construction work. This section contains a detailed description of how this application meets the criteria for granting a MPPCNV.

SMC 23.84A.030 "P": The Definition of Public Facility

SMC 23.84A.030 "P" defines "public facility" as follows:

> *"Public facility" means a public project or city facility.*

The proposed Montlake Phase of the SR 520 Bridge Replacement and HOV Program is a "major public project" as defined in SMC 25.08.168 and is a "public facility" as defined in SMC 23.84.030. SR 520 plays a major role in sustaining the region's economy and maintaining the ability to travel between Seattle and the Eastside. The SR 520 Bridge Replacement and HOV Program is making major enhancements to this vital urban highway. The program is improving traffic safety by replacing SR 520's aging and vulnerable bridges, while making other key highway improvements to enhance public mobility and transportation options throughout the corridor.

Key Takeaway

The revised noise variance application reduced the total duration of the requested variance from seven to five years to clarify the anticipated duration of substantial construction activities.

Work on the Montlake Phase is scheduled to commence in 2018 with work substantially complete in 2023. The length of the variance requested is 5 years to complete substantial construction activities.

Criteria for Granting a Noise Variance

SMC 25.08.590.C: The Criteria for Granting a Noise Variance

SMC 25.08.590.C states:

> *A. The Administrator may grant a variance if the Administrator finds that:*
>
> *1. The noise occurring or proposed to occur does not endanger public health or safety; and*
>
> *2. The applicant demonstrates that the criteria required for the variance are met.*

This noise variance application proposes nighttime construction noise limits for noise-sensitive receivers in proximity to construction areas. The proposed noise limits include a 6 dBA (A-weighted decibels) increase over existing hourly noise levels measured between the quietest nighttime hours of 12 a.m. to 5 a.m., at periods when no substantial nearby nighttime construction activities were underway. The proposed descriptors and noise limits for the Montlake Phase are based on WSDOT and SDCI noise variance coordination efforts which started in fall 2016 and a review of other SDCI decisions on MPPCNV applications for agencies such as WSDOT, Sound Transit and the Seattle Department of Transportation. These other variances were granted an increase of hourly average noise level limits ranging from 6 dBA up to 15 dBA over measured existing baseline noise levels.

Key Takeaway

WSDOT proposes a 6 dBA increase over existing hourly averaged noise levels measured between the quietest nighttime hours of 12 a.m. to 5 a.m.

SDCI decisions on prior noise variances range from granting an increase of 6 dBA up to 15 dBA over existing baseline noise levels (measured 12 a.m. to 5 a.m.).

Criteria for a Major Public Project Construction Noise Variance

SMC 25.08.655.A: The Criteria for an MPPCNV

The criteria for an MPPCNV are stated in SMC 25.08.655.A as follows:

> *A. The Administrator may grant a major public project construction variance to provide relief from the exterior sound level limits established by this chapter during the construction periods of major public projects. A major public project construction variance shall provide relief from the exterior sound level limits during the construction or reconstruction of a major public project only to the extent the applicant demonstrates that compliance with the levels would:*
>
> *1. Be unreasonable in light of public or worker safety or cause the applicant to violate other applicable regulations, including but not limited to regulations that reduce impacts on transportation infrastructure or natural resources; or*
>
> *2. Render the project economically or functionally unreasonable due to factors such as the financial cost of compliance or the impact of complying for the duration of the construction or reconstruction of the major public project.*

How Does This Project Meet the Criteria for an MPPCNV?

Limiting Montlake Phase construction to daytime hours would be unreasonable in light of public and worker safety and would render the project economically and functionally unreasonable. Many work activities for this project cannot be completed over or adjacent to active traffic because they are too risky or dangerous to perform adjacent to traffic. Some examples of these activities include:

- Placing bridge and lid girders over SR 520.
- Demolishing old concrete structures.
- Installing falsework and formwork.
- Conducting major traffic shifts, bridge and wall foundation construction.

These activities require construction work zones to be closed off from traffic. Work zones requiring closure to live traffic will need either closures of all lanes, directional closures, or single lane closures of SR 520 and ramps, Montlake Boulevard, and Lake Washington Boulevard during work hours to safely complete the work. These closures cannot occur during daytime due to high-traffic volumes.

Anticipated impacts of limiting construction to daytime hours

Key Takeaway

The highest numbers of work zone accidents occur on urban freeways and during daytime hours, when traffic volumes are greater.

In preparation for submitting a noise variance application for the Montlake Phase, WSDOT analyzed the feasibility of conducting the construction work activities during daytime-hours only. The analysis indicated that a restriction of construction activities to daytime hours only would result in several key factors which would render the project unreasonable in light of public and worker safety, and economically and functionally unreasonable. Below is a summary of the anticipated impacts of daytime-only construction for the Montlake Phase.

Work zone safety

WSDOT evaluated the impact of daytime and nighttime hours on public and worker safety in construction work zones. A 2010 Federal Highway Administration evaluation of work zone safety reports that the highest numbers of work zone accidents occur on urban freeways and during daytime hours, when traffic volumes are greater (*What We Know about Work Zone Fatalities*, FHWA, 2010).

Additionally, this study found an increase in collisions considered to be more dangerous within work zones, than outside of work zones. Examples include:

- An increase in rear-end collisions associated with congestion and traffic queues within work zones.
- Work zone collisions involving larger vehicles occur at about twice the rate as in general highway collisions due to the greater number of construction vehicles present.

WSDOT reviewed the 2008 National Cooperative Highway Research Program's evaluation of nighttime and daytime work zone safety. Limited data from the report indicates that the collision rate in work zones (number of collisions per million miles traveled) is over 60 percent greater than outside of work zones (page 30, NCHRP Report 627, 2008).

Restricting Montlake Phase work to daytime hours is anticipated to result in a significant increase in the expected number of collisions in and around the work zones.

Emergency services

Many Montlake Phase construction activities require lane closures of segments of SR 520 and city of Seattle streets in the vicinity of SR 520 to protect the safety of the public and workers. WSDOT anticipates that restricting these necessary lane closures to daytime hours would cause significantly increased traffic congestion on SR 520 and nearby city of Seattle streets due to the higher traffic volumes

experienced during daytime hours compared to nighttime. As a result, WSDOT also anticipates that the increase in traffic congestion incurred with daytime-only lane closures would result in severe impacts to emergency service response time.

Traffic operations

Historically, WSDOT has restricted lane and/or ramp closures on high-traffic volume highways to nighttime hours to avoid impacts to the traveling public, therefore requiring some construction activities to occur at night. In coordination with local agency partners, most lane closures on high-traffic volume city or county streets, that are part of WSDOT projects, are also limited to nighttime hours to limit impacts to the traveling public. WSDOT evaluated the impact of daytime lane closures on traffic operations on and around SR 520 as noted below:

SR 520

SR 520 carries approximately 77,000 vehicles per weekday over Lake Washington with most of this volume occurring between 7 a.m. and 7 p.m. Daytime closures of SR 520 for construction work would require this volume of crosslake traffic to use other routes, adding to congestion on the alternative facilities. I-5, I-90, I-405 and SR 522 would carry this additional traffic on routes that are already heavily congested during the AM and PM peak travel times, resulting in greater overall impacts to more of the transportation network. SR 520 is also a critical route for transit throughout the area; an estimated 16,000 transit riders would need to take other routes that are currently filled during peak hour travel. Additional buses would need to be added to these alternate routes to handle the additional demand.

Montlake Boulevard

Daytime closures on Montlake Boulevard would result in approximately 57,000 vehicles per day north of SR 520 and 22,000 vehicles per day south of SR 520 having to find alternate routes to reach their destinations. With limited alternative routes, many motorists would take city streets to take other city arterials such as Boyer, Furman, and Eastlake avenues to travel north and south. Motorists taking longer trips may use other arterials to get to I-5 to travel north and south between local destinations. Again, transit routes would also be affected with users needing to travel to take alternative bus routes or transfer to light rail to get between UW and Capitol Hill link stations.

Lake Washington Boulevard East

Lake Washington Boulevard East closures would result in 10,200 vehicles per day having to find alternative routes to travel between Montlake Boulevard and SR 520. In many cases, these vehicles would likely divert to the city street network along Roanoke, Louisa, Miller, and Lynn streets, and Boyer, 25th, and 26th avenues, to access Montlake Boulevard and SR 520 from Lake Washington Boulevard.

Economic considerations

WSDOT evaluated the economic effects of requiring all construction activities on the Montlake Phase to daytime hours that would otherwise exceed nighttime property-line noise limits. This restriction would affect the schedule and cost of constructing the project and have a substantial economic impact on the traveling public because of the significance of SR 520 on the regional transportation network and local economy.

Expected Montlake Phase construction schedule and costs

WSDOT completed a schedule analysis on the effect of shifting all activities that will require total lane or directional closures from nighttime to daytime hours. This includes work ranging from roadway, wall and

bridge construction, to demolition operations. The following key schedule impacts which would result from restricting construction work to daytime hours only were identified:

- With an approved nighttime noise variance, WSDOT anticipates a limited number of total highway closures for demolition work to occur on weekends (late Friday evening through 5 a.m. Monday morning). Completing the same level of work during daytime hours only would extend each closure period until Thursday of the following week. In other words, an additional four days of total SR 520 closure would be added to each of the currently planned weekend closures.
- Environmental permit conditions for work activities, such as in-water work, restrict some construction activities to limited timeframes during the year. With construction work restricted to daytime hours only, these work activities would have a longer duration. As a result, activities such as in-water work, that are not completed within the limited timeframe could be significantly delayed, ultimately delaying the entire project's completion.
- Secondary effects, such as having to deliver materials during congested daytime hours, delays the deliveries, adds more traffic congestion into the roadway system, and again delays the completion of the project.

Overall, limiting construction to daytime hours would have an estimated delay to project completion of at least three years. WSDOT's analysis estimated the increased direct contract cost, as a result of limiting construction to daytime only, to WSDOT and Washington taxpayers between $39 and $140 million. This estimated increase in direct project costs accounts for the anticipated three-year extension of construction that would result in restricting construction to daytime hours.

Key Takeaway

Limiting construction activities to daytime-only hours would result in:

- At least a three-year delay to project completion.
- $39 to $140 million dollars in increased project costs. Over half a billion dollars in regional economic impacts.

Regional costs

The societal economic impacts to the region result in a greater financial impact than the estimated direct, project costs. Daytime closure of lanes and ramps on SR 520, Montlake Boulevard, and other city streets will cause delays to the traveling public, the delivery of goods and services, and hinder access by emergency vehicles. Additionally, lane closures result in a direct loss of toll revenue, which WSDOT uses to fund the SR 520 program.

In total, the economic cost to the region of completing all project work during daytime hours only is estimated to exceed $540 million dollars assuming the Liquidated Damages (LD) values used for the SR 520 program. The actual economic cost to the region of completing all project work during daytime hours is likely to be greater.

WSDOT has experience with an extended 24/7 single lane closure on SR 520. In 2000, a barge struck and damaged one of the hollow columns on the west approach structure to the floating bridge. Due to the expected traffic (and economic) impact to the area, the Governor declared an emergency to allow for an expedited contracting approach to speed the repair of this damage and reopen all of the eastbound lanes. Even with the expedited process, motorist complaints were significant. Bridge repairs required an approximately one-month closure of the right eastbound lane in the vicinity of the damaged column. This resulted in severe traffic congestion to eastbound traffic on SR 520 and heavy diversion to other routes, including I-90, I-5 and city streets.

WSDOT estimates and uses the societal economic impact of lane closures for construction projects and captures them as Liquidated Damages (LD) in a contract to encourage contractors to maintain lane and ramp availability during peak travel periods. WSDOT may assess LDs for failure to have a lane, ramp, or roadway open to traffic, or an Intelligent Transportation System (ITS) fully operational by the specified time. The LD assessments are based on, and cannot exceed, the estimated cost to the traveling public incurred by the disruption.

WSDOT's Transportation Data, GIS, and Modeling Office (TDGMO) uses standardized methodology for calculating costs, based on roadway characteristics, hourly traffic data, and the specifics of the planned roadway or ITS disruption. In order to ensure uniformity, all LDs of this type for WSDOT projects statewide are calculated by engineers in the TDGMO. The methodology includes a software program called QUEWZ-98 for freeway lane closures, and specialized spreadsheet templates for various other work zone strategies. WSDOT's Budget & Financial Analysis Office is consulted annually for changes to the appropriate consumer index and their input is used to periodically update costs within the LDs templates and QUEWZ-98 program. For the SR 520 program, LDs used range between $1,200 per lane per hour for Lake Washington Boulevard East to $18,000 per lane per hour for SR 520 eastbound lanes.

WSDOT Term of Proposed Variance

SMC 25.08.655.B: The Term of the Proposed Variance

SMC 25.08.655.B states:

> *B. A major public project construction variance shall set forth the period or periods during which the variance is effective, which period or periods shall be the minimum reasonably necessary in light of the standard set forth in subsection A, and the exterior sound level limits that will be in effect during the period of the variance.*

Requested Period the Variance is Effective

WSDOT requests that construction noise generated on the site be allowed to exceed the noise level limits set by Seattle Noise Control Ordinance, SMC 25.08.410, during nighttime hours (between 10 p.m. and 7 a.m. on weekdays and between 10 p.m. and. 9 a.m. on weekends and legal holidays).

The variance is requested for the length of time that is needed to complete substantial construction of the Montlake Phase. Nighttime construction activities requiring a noise variance are expected to occur at various times throughout the project duration. Major construction is scheduled to begin in 2018, with an estimated completion date in 2023. The length of the requested variance is 5 years which is the anticipated duration necessary to complete the major construction activities

The contractor would be able to perform nighttime construction work if the work is performed within the Montlake Phase construction area as described below and covered by this MPPCNV or any temporary noise variances granted by SDCI. The MPPCNV is subject to review by SDCI after the first year of construction, as provided in SMC 25.08.655.D. Additional coordination with SDCI would continue throughout construction.

Construction Area and Exterior Nighttime Construction Noise-Level Limits

This noise variance application proposes nighttime construction noise limits for nighttime noise-sensitive receivers in proximity to the Montlake Phase construction area. Nighttime noise-sensitive receivers are

generally properties where people are sleeping, such as a residence. The next section contains information on the characteristics of noise and sound.

The proposed descriptors and noise limits for the Montlake Phase are based on WSDOT and SDCI noise variance coordination efforts, which began in fall 2016, and a review of prior SDCI decisions on MPPCNV applications from agencies such as WSDOT, Sound Transit and the Seattle Department of Transportation. In each of these cases, SDCI granted variances with an increase of average hourly noise level limits ranging from 6 dBA up to 15 dBA over measured existing baseline noise levels.

The Montlake Phase noise variance application proposes a 6 dBA increase over existing hourly average noise levels (L_{eq}) measured during the quietest part of the nighttime hours (the five hour period from 12 a.m. to 5 a.m.). Although these proposed noise level limits are based on measurements during only the quietest nighttime hours, the proposed limits would apply to the operation of construction equipment during all nighttime hours, from 10 p.m. to 7 a.m. on weekdays and 10 p.m. and 9 a.m. on weekends and legal holidays. This revised noise variance application assumes that all equipment used for the project would meet the daytime noise level limits as described in Section 25.08.425 of the Seattle Municipal Code.

Key Takeaway

WSDOT measured **existing** sound levels near the project area, during the quietest hours (12 a.m. – 5 a.m.), and found that the:

- **Hourly average (L_{eq})** nighttime noise levels range from 56 dBA at Site 3 to 72 dBA at Site 2. City of Seattle code identifies 45 dBA as the nighttime hourly average limit.
- **Hourly maximum (L_{max})** nighttime noise levels measured at each site peaked from 78 dBA at Site 3 to 94 dBA at Site 4. City of Seattle code identifies 60 dBA as the nighttime hourly maximum noise limit.

Continuous monitoring and recording of A-weighted sound levels ranging in duration from 11 days to two weeks was conducted at seven sites (Exhibit 5). Measurements were taken at Sites 1 through 6 during October and November 2016, and then at Site 7 in January 2017 with calibrated Larson Davis Model 720 (Type 2) and 820 (Type 1) noise meters, which comply with American National Standards Institute S1.4 for instrument accuracy. All sound level monitoring equipment was calibrated before and after each measurement. In addition, the noise meters are calibrated annually by an accredited laboratory. Sound levels measured during the late night hours (12 a.m. to 5 a.m.) provide the most conservative representation of the existing baseline condition. Noise measurement sites were selected based on their proximity to construction activities.

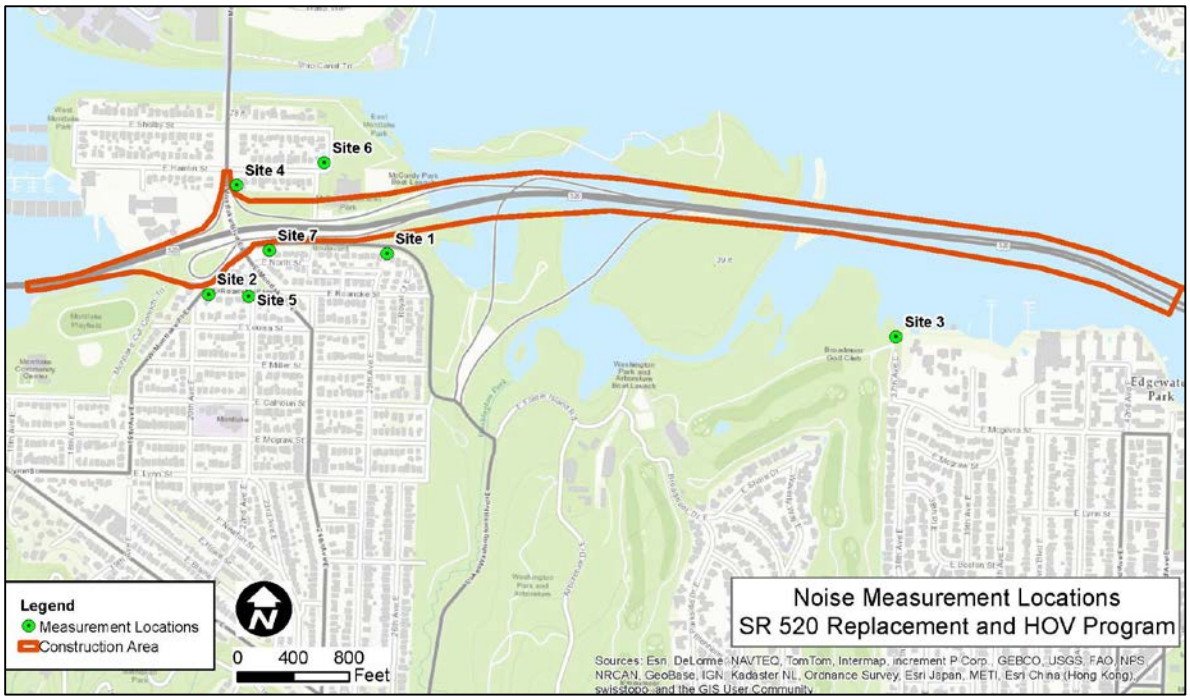
The measured existing nighttime sound levels exceed the City of Seattle nighttime noise control ordinance limits of 45 dBA (L_{eq}) at all monitoring locations. The existing sound levels, which are produced primarily by traffic on public roads, are not subject to the limits of the ordinance (SMC 25.08.410-425). The comparison is presented in Exhibit 6 as a baseline for evaluating potential noise impacts from proposed construction activities.

The noise variance application also proposes a highest 1 percent maximum noise level limit above the nighttime L_{eq} to monitor potential short-term noises. Hourly percentile sound levels, Ln, are the sound levels exceeded for "n" percent of an hour. The measured L_1 is the sound level exceeded for 1 percent of the measurement duration (i.e., 36 seconds per hour). The proposed L_1 limits are 10 dBA above the L_{eq} noise level limit with a maximum upper limit of 80 dBA, which is the City's daytime construction hourly L_{eq} noise level limit at residentially zoned receivers. The proposed L_1 limits would be in the range of existing L_{max} sound levels measured during the late-night hours of 12 a.m. to 5 a.m. in the Montlake lid construction area, see Exhibit 7.

In addition to the L_{eq}, this noise variance application proposes to track compliance with the terms set by the MPPCNV by monitoring the measured hourly L_1 sound level. The L_1 has been found to be more reliable than the L_{max}, as stated in the Denny Substation Program Noise Monitoring and Mitigation Plan, revised February 11, 2015:

> *For the purpose of monitoring construction sound levels, the hourly L_1 has been found to be more reliable than the hourly L_{max} in tracking compliance with MPPCNV limits. As with the L_{max}, the hourly L_1 provides a representative measure of the worst-case sound levels produced by a construction activity; unlike the L_{max}, the L_1 is not susceptible to distortion by one-time, atypical events such as a tool or load being dropped, and it is more representative of sound levels produced during higher-intensity construction activities each hour.*

EXHIBIT 5. CONSTRUCTION AREA AND NOISE MEASUREMENT LOCATIONS



The seven sites listed below were identified as representing nighttime noise-sensitive receivers near each construction area:

- Site 1 – 2449 E. Lake Washington Boulevard
- Site 2 – City of Seattle property near Montlake Boulevard Market
- Site 3 – Beaver Lodge Sanctuary
- Site 4 – 2740 Montlake Boulevard E.
- Site 5 – 2015 E. Roanoke St.
- Site 6 – 2800 block E. Park Drive East and WABN construction site (former MOHAI site)
- Site 7 – 2209 E. Lake Washington Boulevard

EXHIBIT 6. MEASURED HOURLY AVERAGE BASELINE NOISE LEVELS AND PROPOSED EXTERIOR NIGHTTIME NOISE LEVEL LIMITS

Site	City of Seattle nighttime noise control ordinance limit Hourly Average L_{eq} (dBA)	Measured 12 to 5 AM Log Hourly Average L_{eq} (dBA)	Proposed Nighttime Noise Level Hourly Average Limit L_{eq} (dBA)
1	45	61	67
2	45	72	78
3	45	56	62
4	45	60	66
5	45	59	65
6	45	57	63
7	45	60	66

Measured hourly average L_{eq} noise levels between 12 a.m. and 5 a.m. exceed the City of Seattle Noise Control Ordinance limits by up to 27 dBA. This variance application requests a 6 dBA increase over the baseline noise levels measured between 12 a.m. and 5 a.m. The proposed L_{eq} limits are based on WSDOT and SDCI coordination efforts which started in fall 2016 and a review of prior SDCI decisions on MPPCNV applications from agencies such as WSDOT, Sound Transit and the Seattle Department of Transportation. In each of these cases, SDCI granted variances with an increase of hourly average L_{eq} noise level limits ranging from 6 dBA up to 15 dBA over measured existing baseline nighttime noise levels.

EXHIBIT 7. MEASURED L_{MAX} NOISE LEVELS AND PROPOSED L_1 EXTERIOR NIGHTTIME NOISE LEVEL LIMITS

Site	City of Seattle nighttime noise control ordinance limits Hourly Average L_{max} (dBA)	Measured 12 to 5 AM L_{max} range (dBA)	Proposed Nighttime Noise Level Hourly Limit L_1 (dBA)
1	60	71 to 83	77
2	60	72 to 89	80
3	60	55 to 78	72
4	60	75 to 94	76
5	60	45 to 90	75
6	60	53 to 92	73
7	60	70 to 92	76

Measured L_{max} noise levels between 12 a.m. and 5 a.m. exceed the City of Seattle Noise Control Ordinance limits by up to 34 dBA. The variance application proposed L_1 limits of 10 dBA increase over the proposed L_{eq} limits. These proposed L_1 limits are based on a review of prior SDCI decisions on other MPPCNV applications. The proposed L_1 limits would be up to 19 dBA lower than the measured L_{max} levels.

Public health and safety

SDCI's decision on the Sound Transit project at 6600 Roosevelt Way NE includes the following assessment of noise levels related to public health and safety:

> *It is generally accepted that very high levels of noise have adverse physical impacts on humans including, but not limited to, hearing damage. Many standards apply to occupational exposures at high levels for prolonged periods of time. For example, the Occupational Safety and Health Act mandates a hearing conservation program by employers if sound levels exceed 85 dBA continuously over an 8-hour workday. If sound levels exceed 90 dBA continuously over an 8-hour workday, hearing protection is required.*

The proposed nighttime noise level limits anticipated by this MPPCNV application would maintain sound levels below these identified levels, as shown in Exhibit 6 and Exhibit 7. The highest 1 percent maximum L_1 variance limit would be no greater than 80 dBA for sensitive receptors. SDCI's 6600 Roosevelt Way NE decision also references U.S. DOT Guidance:

> *Federal Transit [Administration] (FTA) guidelines recommend that a nighttime 8-hour L_{eq} of 70 dBA not be exceeded. Because this federal guideline is stated in terms of 8-hour L_{eq}, it would allow the sounds in any given hour to be louder than 70 dBA so long as the sound during other hours were quieter, to bring the 8-hour average down to 70 dBA.*

This variance application is proposing an hourly (or 1-hour) L_{eq} variance limit below the 70 dBA 8-hour L_{eq}, as referenced in SDCI's decisions on previous noise variances, at all but one baseline noise monitoring location. This location, Site 2, represents one residence currently experiencing a nighttime L_{eq} of 72 dBA and therefore has a proposed variance limit above 70 dBA (Exhibit 6). The proposed variance limit would be stricter than the U.S. DOT FTA guideline, as it would not allow louder hours to be averaged down by quieter hours. The 6 dBA increases from on-site nighttime project noise levels that are requested and the resulting noise levels will likely be noticed by some residents, but would not cause a danger to public health or safety.

Characteristics of Sound and Noise

Definition of Sound

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

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

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

The smallest "just noticeable" increase in sound is about 3 dBA. A 6 dBA increase is clearly noticeable, and a 10 dBA increase causes a doubling of judged loudness. For example, 80 dBA is judged to be twice as loud as 70 dBA and four times as loud as 60 dBA. Exhibit 8 summarizes how increases in perceived loudness correlate with sound level increases.

EXHIBIT 8. PERCEIVED LOUDNESS INCREASES

Sound Level Increase (dBA)	Perceived Loudness Increase
0 to 2	Not noticeable
3	Just noticeable
6	Noticeable
10	Twice as loud
20	Four times as loud

Definition of Noise

Noise is unwanted or unpleasant sound. Noise is a subjective term because, as described above, sound levels are perceived differently by different people. Magnitudes of typical noise levels are presented in Exhibit 9.

EXHIBIT 9. TYPICAL NOISE LEVELS

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

Noise Level Descriptors

Because sound levels fluctuate over time, several A-weighted sound level descriptors are used to characterize the sound.

The L_{eq} is a measure of the average noise level during a specified period of time. A one-hour period, or hourly L_{eq}, is used to measure construction 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. L_{max} is the maximum sound level that occurs during a single event and is related to impacts on speech interference and sleep disruption.

With Ln, "n" is the percent of time that a sound level is exceeded and is used to describe the range and pattern of sound levels experienced during the measurement period. For example, the L_1 level is the noise level that is exceeded 1 percent of the time. Sound varies in the environment and people will generally find a higher, but constant, sound level more tolerable than a quiet background level interrupted by higher sound level events. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in an otherwise quiet area if both environments have the same L_{eq}.

City of Seattle Noise Control Ordinance

The City of Seattle limits noise levels at property lines of neighboring properties (Seattle Noise Control Ordinance, SMC 25.08.410). The sound level limit depends on the land uses of both the noise source and the receiving property (Exhibit 10). The Montlake Phase project area and the surrounding properties are zoned residential, with the exception of a small area immediately south of the eastbound SR 520 off-ramp Montlake Boulevard, which is zoned as neighborhood commercial (Exhibit 2). The City's sound level limits apply to construction activities occurring between 10 p.m. and 7 a.m. on weekdays or 10 p.m. and 9 a.m. on weekends and legal holidays. Legal holidays are defined in SMC 25.08.155 as New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the day after, and Christmas Day. Construction activities during nighttime hours that would exceed these levels require a noise variance from the City.

EXHIBIT 10. SEATTLE NOISE CONTROL ORDINANCE – EXTERIOR SOUND LEVEL LIMITS

District of Sound Source	District of Receiving Property			
	Residential Daytime L_{eq} (dBA)	Residential Nighttime L_{eq} (dBA)	Commercial L_{eq} (dBA)	Industrial L_{eq} (dBA)
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

Nighttime hours are 10 p.m. to 7 a.m. during weekdays and 10 p.m. to 9 a.m. during weekends and legal holidays
dBA = A-weighted decibels
L_{eq} = equivalent sound level
During a measurement interval, L_{max} may exceed the exterior sound level limits shown by no more than 15 dBA.

Exceptions to the Seattle Noise Control Ordinance

Daytime noise

Noise levels shown in Exhibit 10 may be exceeded by construction equipment between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends and legal holidays. Threshold levels for equipment are listed below:

> *25 A-weighted decibels (dBA) for equipment on construction sites, including but not limited to, crawlers, tractors, dozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors, derrick barges, tug boats, and pneumatic-powered equipment*

Daytime construction activities are allowed to exceed the noise-level limits in the Seattle Noise Control Ordinance (SMC 25.08.425) by 25 dBA (Exhibit 10). These levels should be measured from the real property of another person or at a distance of 50 feet from the equipment, whichever is greater. Construction activities for the Montlake Phase would mostly occur in a residential district. The daytime construction activity associated with the Montlake Phase would be limited to 80 dBA (55 dBA + 25 dBA) for residential districts.

Impact type noise

In addition, the Seattle Noise Control Ordinance (SMC 25.08.425) regulates sound created by impact types of construction equipment (e.g., pavement breakers, pile drivers, jackhammers, and sandblasting tools) or those that otherwise create impulse or impact noise (as measured at the property line or 50 feet from the equipment, whichever is greater). The equipment may exceed the sound level limits (equivalent sound level [L_{eq}] described in Exhibit 10) in any 1-hour period between 8 a.m. and 5 p.m. on weekdays and 9 a.m. and 5 p.m. on weekends and legal holidays. The sound level is in no event to exceed the following:

- L_{eq} = 90 dBA continuously
- L_{eq} = 93 dBA for 30 minutes
- L_{eq} = 96 dBA for 15 minutes
- L_{eq} = 99 dBA for 7.5 minutes

Sound levels in excess of L_{eq} = 99 dBA are prohibited unless authorized by variance. The standard of measurement is a 1-hour L_{eq} measured for time periods not less than 1 minute in order to project an hourly L_{eq}.

Proposed Nighttime Noise Level Limits

Noise level limits (Exhibit 7) were established in the previous section, WSDOT Compliance with City of Seattle Criteria for a Major Public Project Construction Noise Variance. The Montlake Phase noise variance application proposes a 6 dBA increase over existing hourly average noise levels (L_{eq}) measured during the quietest part of the nighttime hours (the five hour period from 12 a.m. to 5 a.m.). The proposed L_1 limits are 10 dBA above the L_{eq} noise level limit with a maximum upper limit of 80 dBA, which is the City's daytime construction hourly L_{eq} noise level limit at residentially zoned receivers.

Noise Management and Mitigation Plan

This section provides a summary of the Noise Management and Mitigation Plan (NMMP) in Attachment 1 and summarizes a noise analysis for the expected construction activities of the Montlake Phase of the SR 520 Bridge Replacement and HOV Program. This section was prepared according to the requirements of Section 25.08.655 of the Seattle Municipal Code and Director's Rule DR3-2009, both pertaining to Major Public Project Construction Noise Variances from the City of Seattle Noise Code.

Key Takeaway

WSDOT analyzed construction noise to demonstrate that the means and methods are available to complete the Montlake Phase project within the proposed limits of the noise variance.

Once selected, the Montlake Phase contractor will update the NMMP with the refined construction means and methods to complete the project within the limits of the noise variance.

WSDOT has developed expected construction activities and a schedule for the Montlake Phase. The analysis in this NMMP section demonstrates that means and methods are available to meet the noise limits requested in this MPPCNV. The contractor will propose their own construction activities and schedule, and create a detailed NMMP to meet the commitments WSDOT has made in this noise variance application and the MPPCNV issued by SDCI. Construction activities and equipment used may not be specifically identical but are likely to be similar to those identified by WSDOT.

Expected Noisiest Nighttime Construction Periods

Projected nighttime major construction L_{eq} and L_1 noise levels were modeled for selected noise-sensitive receivers using SoundPLAN Version 7.4, a three-dimensional graphics-oriented program for outdoor noise propagation. SoundPLAN calculates the L_{eq} by averaging the use of each individual piece of equipment and evenly distributes the activity over an hour. SoundPLAN calculates the L_1 using the loudest 1 percent same hour as used to calculate the L_{eq}. The L_1 results from SoundPLAN are an additional 10 dBA over the L_{eq}, this is a conservative high level estimate for the L_1. For nighttime construction noise estimates, the noisiest nighttime construction activity that would occur at the surface of each construction site and the noisiest equipment during this activity was assumed.

The noisiest major construction activities were modeled to provide a conservative estimate of noise levels. A variety of construction activities are anticipated to occur within the footprint of the Montlake Phase, potentially using the equipment outlined in Exhibit 11. Since impact work would be prohibited during nighttime hours (10 p.m. and 8 a.m. on weekdays or 10 p.m. and 9 a.m. on weekends and legal holidays), that type of equipment was not included in the noise modeling. Construction noise includes truck operations within the construction site and not on haul routes. Haul routes are not regulated under the Seattle Noise Control Ordinance and therefore are not included in this application.

Key Takeaway

WSDOT conducted noise modeling of the loudest expected construction activities to provide a conservative estimate of nighttime noise levels.

As a result, the modeled levels represent the loudest nights that are anticipated over the construction period.

Construction may not occur on all nights, and construction during some phases of work would generate less noise than those selected for noise modeling.

Major construction activities that are expected to be the loudest during the project were modeled for four construction periods to estimate the anticipated highest nighttime construction noise levels.

Construction may not occur on all nights, and construction during other phases of work would generate less noise than those selected for noise modeling. The modeled levels represent the loudest nighttime construction activities that are anticipated over the construction period.

EXHIBIT 11. NIGHTTIME CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment Type	Typical Noise Level (dBA) at 50 Feet
Asphalt roller	80
Bulldozer	82
Compressor without mitigation	81
Compressor with mitigation	71
Concrete pump	82
Concrete truck	88
Crawler crane	83
Delivery truck	88
Diesel generator	81
Drill rig	83
Dump or Debris truck	88
Excavator with crusher	96
Excavator with thumb	96
Forklift	80
Grader	85
Hydraulic crane	88
Loader	85
Street sweeper	80
Vibratory roller	80
Vibratory pile installer	96
Welder	82

Source: August 2006 FHWA Construction Noise Handbook, Section 9: https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/

The construction equipment listed in Exhibit 11 is not expected to be used all together at the same time, or on all nights. The noise levels for the four expected loudest construction periods are described in the following subsections. Each subsection lists the number and type of construction equipment modeled to estimate the expected highest nighttime construction noise levels. Construction during other phases of work would generate less noise than those selected for noise modeling.

WSDOT Noise Modeling Summary

Montlake Phase – North Lid Wall and Center Lid Wall

Modeled nighttime exterior noise levels for the construction of the Montlake lid structure are shown in Exhibit 12. The model included the construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A). These two activities are currently estimated by WSDOT to occur at the same time for a period of three to four months. Equipment used for each activity was estimated to include a hydraulic crane, crawler crane, concrete pump, two compressors, and five concrete trucks. Without mitigation, modeled noise levels would exceed the proposed L_{eq} noise level limit for a few residences near Site 1, and Site 4. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedances. Mitigation was evaluated for residences near Site 1, and Site 4.

EXHIBIT 12. EXTERIOR NIGHTTIME NORTH LID WALL AND CENTER LID NOISE LEVELS WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	62	67	72	77
2	62	78	72	80
3	-	62		72
4	66	66	76	76
5	62	65	72	75
6	63	63	73	73
7	65	66	75	76
Max Locations without mitigation	68 near Site 1	67	78	77
	68 near Site 4	66	78	76

Note: Noise levels are hourly averages.

Noise levels were also modeled using compressors with mitigation, to confirm that the contractor can reduce noise levels below the proposed nighttime noise level limit for all residences near Site 1 and Site 4, Exhibit 13. Mitigation requirements for the compressors are discussed in the minimum mitigation section. Exhibit 14 shows the noise level contours and the areas of construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A). The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will update the construction methods, schedule, and mitigation measures in their NMMP. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

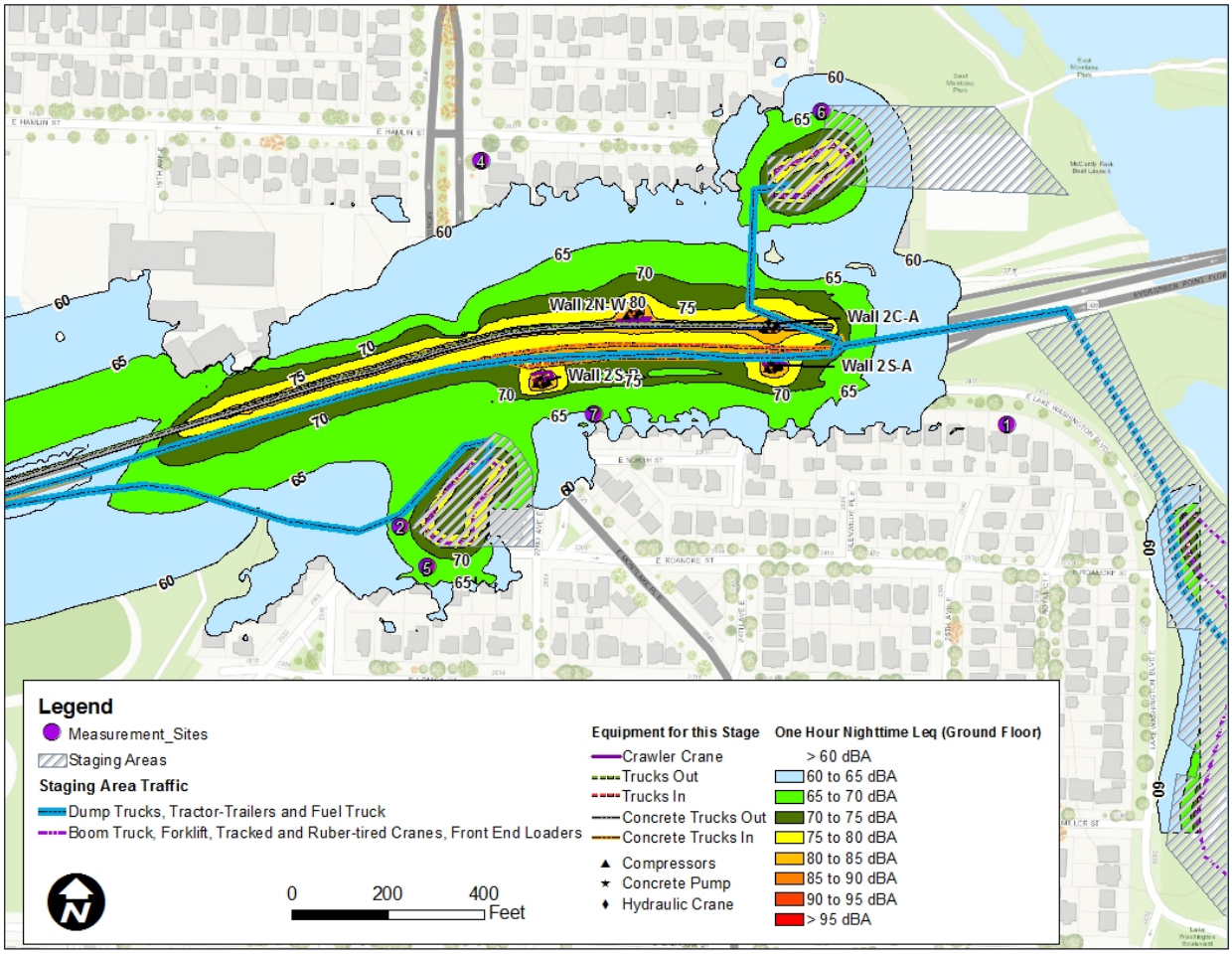
EXHIBIT 13. EXTERIOR NIGHTTIME NORTH LID WALL AND CENTER LID NOISE LEVELS WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
Max Locations without mitigation	62 near Site 1	67	72	77
	62 near Site 4	66	72	76

Note: Noise levels are hourly averages.

Exhibit 13 shows that areas that are expected to exceed the noise level limits, without mitigation, would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 14. NORTH LID WALL AND CENTER LID CONSTRUCTION NOISE LEVELS WITH MITIGATION



Nighttime modeled noise levels during construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A) using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase – North, South, and Center Lid Walls

Modeled exterior nighttime noise levels for the construction of the Montlake structure are shown in Exhibit 15. The model included the construction activities for the North Lid Wall (identified as 5N-A), the South Lid Wall (identified as 5S-A), the Center Lid Wall (identified as Wall 5C-A), and construction of the Montlake lid adjacent to Montlake Boulevard E. Although each activity would occur over a period of three to four months, they would have different start dates, and are currently estimated by WSDOT to all overlap for approximately one month. Equipment used for each activity was estimated to include a hydraulic crane, crawler crane, concrete pump, two compressors, and five concrete trucks. Without mitigation, modeled noise levels would exceed the proposed L_{eq} noise level limit at Site 7, and for a few residences near Site 4 and Site 7. The loudest constructed noise level is identified in Exhibit 16. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedances. Mitigation was evaluated for residences near Site 4 and Site 7.

EXHIBIT 15. EXTERIOR NIGHTTIME NORTH, SOUTH AND CENTER LID WALLS MODELED NOISE LEVELS WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	61	67	71	77
2	59	78	69	80
3		62		72
4	65	66	75	76
5	63	65	73	75
6	57	63	67	73
7	67	66	77	76
Max Unmitigated Location	69 near Site 4	66 (same as Site 4)	79	76

Note: Noise levels are hourly averages.

Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers. Noise levels were also modeled using compressors with mitigation (Exhibit 16) to confirm that the contractor can reduce noise levels below the nighttime noise level limit for all residences. Exhibit 16 shows that areas that are expected to exceed the noise level limits, without mitigation, would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Exhibit 17 shows the construction activities for the North Lid Wall (identified as 5N-A), the South Lid Wall (identified as 5S-A), the Center Lid Wall (identified as Wall 5C-A), and construction of the Montlake lid adjacent to Montlake Boulevard E. The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will detail construction methods, schedule, and mitigation measures in their NMMP. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

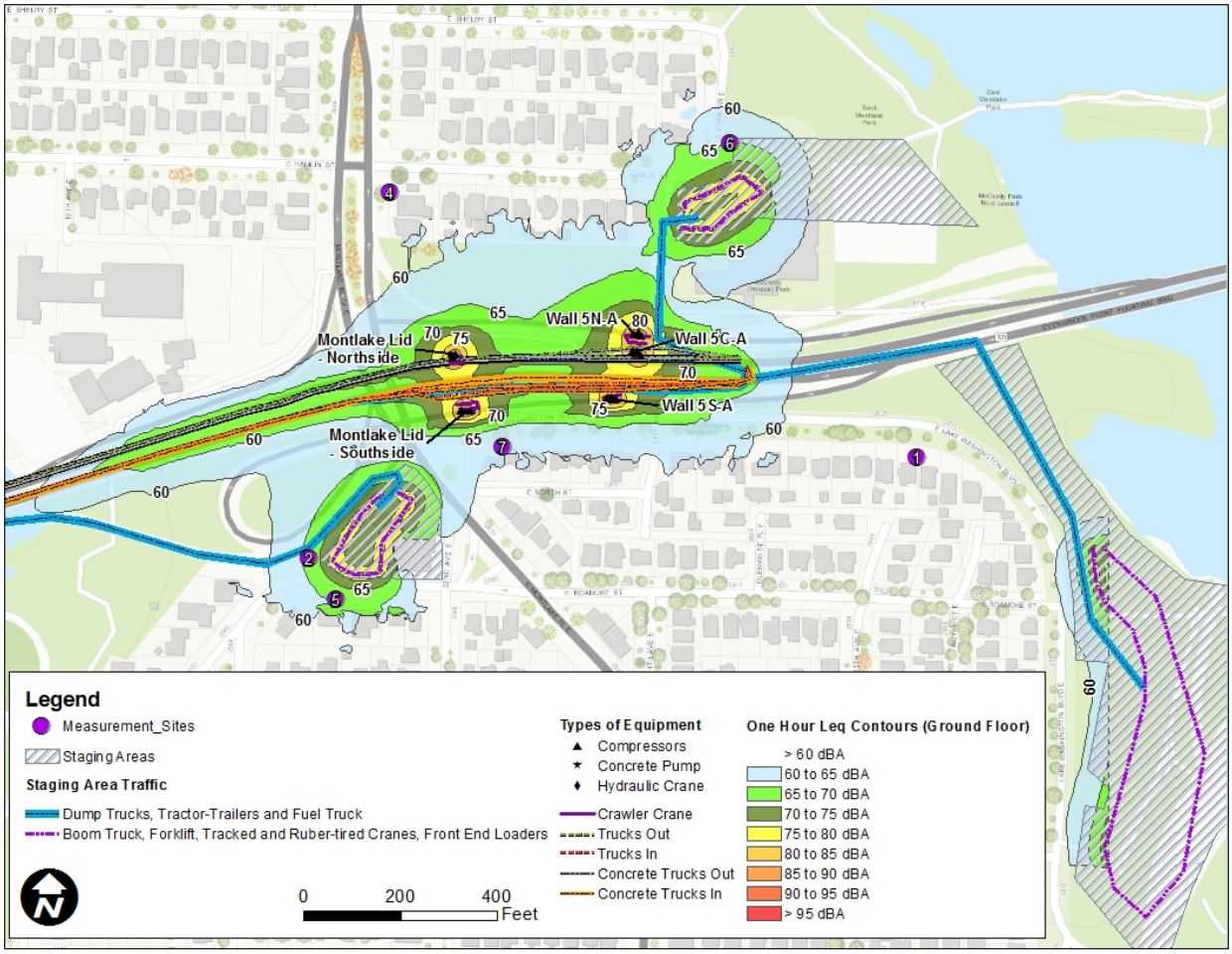
EXHIBIT 16. EXTERIOR NIGHTTIME NORTH, SOUTH AND CENTER LID WALLS MODELED NOISE LEVELS WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
7	62	66	72	76
Max Unmitigated Locations	60 near Site 4	66 (same as Site 4)	70	76

Note: Noise levels are hourly averages.

Exhibit 16 shows that areas that are expected to exceed the noise level limits, without mitigation, would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 17. NORTH, SOUTH, AND CENTER LID WALLS CONSTRUCTION NOISE LEVELS WITH MITIGATION



Nighttime modeled noise levels during construction of the North Lid Wall (identified as wall section 5N-A), the Center Lid Wall (identified as wall section 5C-A), and the South Lid Wall (identified as wall section 5S-A) using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase 3B – Demolition of Existing Montlake Blvd. E. Structure

Demolition of the existing Montlake Boulevard E. structure is estimated to take one month. Equipment modeled during nighttime hours was estimated to include two excavators with crushers, three compressors, five dump trucks, one loader, fifteen debris trucks, and one excavator with thumb. Excavators with impact hammers would be used during daytime hours, but impact work is not allowed during nighttime hours; therefore, impact hammers have not been modeled during the nighttime. Modeled noise levels are shown in Exhibit 18. Without mitigation, modeled noise levels would exceed the L_{eq} noise level limit at Site 7, the loudest constructed noise level is near Site 7. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedance. Mitigation was evaluated for residences near Site 7.

EXHIBIT 18. EXTERIOR NIGHTTIME DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE NOISE LEVELS WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	54	67	64	77
2	61	78	71	80
3	-	62		72
4	66	66	76	76
5	63	65	73	75
6	62	63	72	73
7	69	66	79	76

Note: Noise levels are hourly averages.

Noise levels were also modeled using compressors with mitigation, (Exhibit 19), to confirm that the contractor can reduce noise levels below the nighttime noise level limit for all residences near Site 7. Exhibit 20 shows the noise level contours and construction activities locations for demolition of the existing Montlake Boulevard E. structure with mitigation. Mitigation requirements for the compressors are discussed in the minimum mitigation section. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers. The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will detail construction methods, schedule, and mitigation measures in their NMMP.

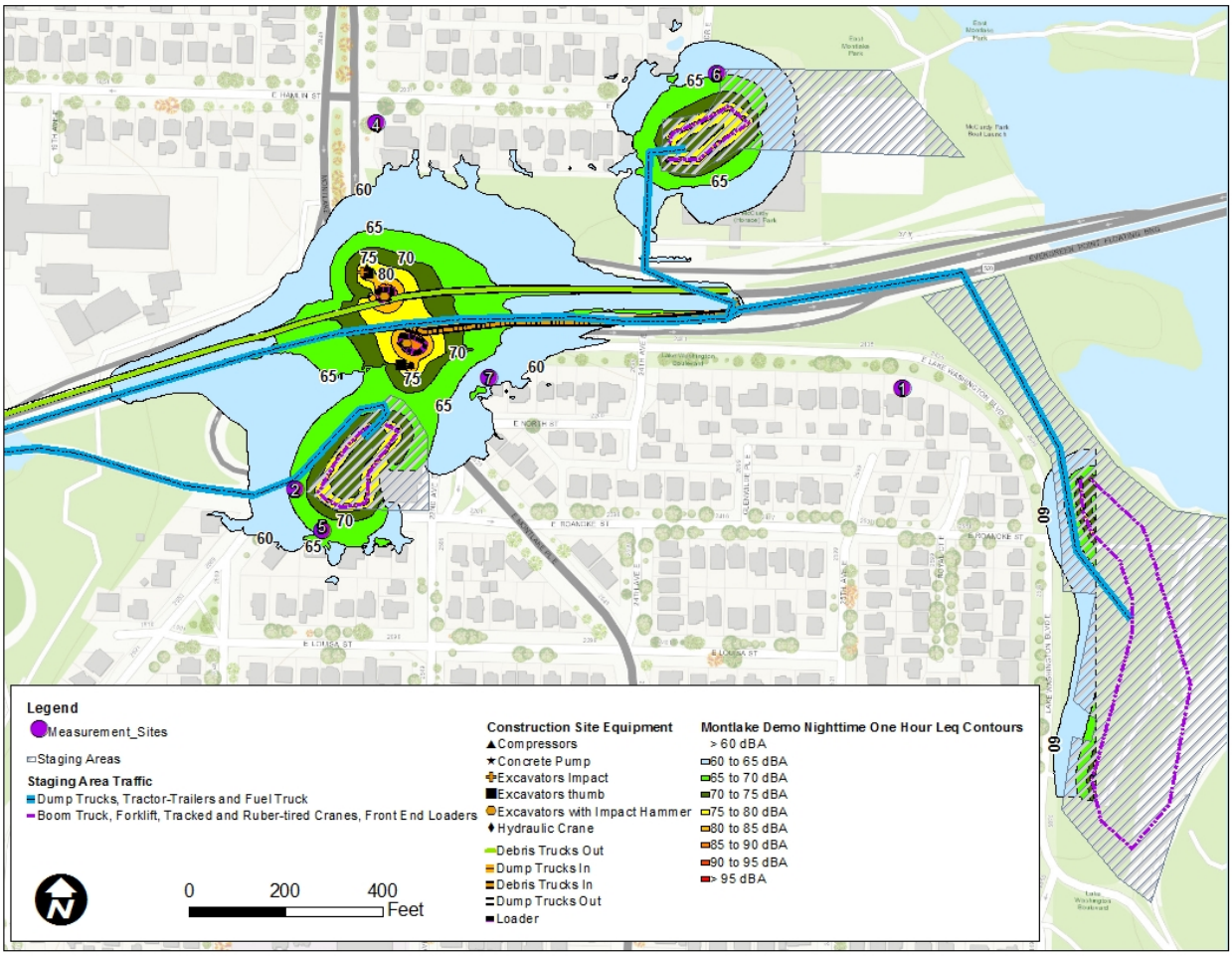
EXHIBIT 19. EXTERIOR DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE NOISE LEVELS WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
7	60	66	70	76

Note: Noise levels are hourly averages.

Exhibit 19 shows that areas that are expected to exceed the noise level limits without mitigation would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 20. DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE WITH MITIGATION



Nighttime modeled noise levels during the demolition of the existing Montlake Boulevard E. structure using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase – Shaft Installation for WABS

Non-impact shaft casing installation for the WABS structure construction is anticipated to take six months and would be the loudest activity along the WABS corridor. Nighttime noise levels were modeled near Site 3. Equipment modeled during nighttime hours include a crawler crane, two welders, a diesel generator, a drill rig, a vibratory pile installer, eight concrete trucks, and one concrete pump. Noise levels would be below the L_{eq} noise level limit (Exhibit 21) without mitigation. No nighttime L_{eq} exceedances are expected in this phase of construction, as modeled.

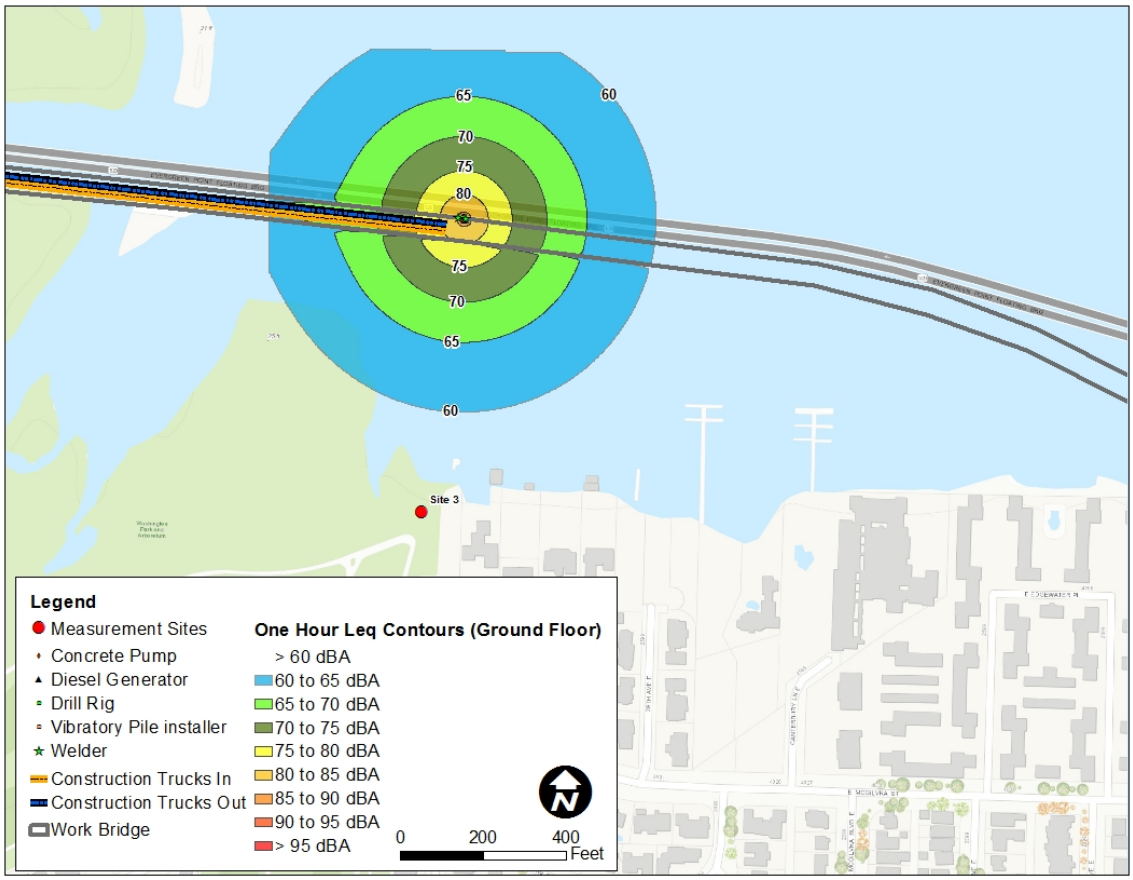
EXHIBIT 21. EXTERIOR NIGHTTIME SHAFT INSTALLATION FOR WABS

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
3	59	62	69	72

Note: Noise levels are hourly averages.

No mitigation would be needed to meet the proposed nighttime noise level limits for this phase of construction. Noise contours are shown in Exhibit 22**.** Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

EXHIBIT 22. NIGHTTIME SHAFT INSTALLATION FOR WABS NOISE LEVEL CONTOURS



Proposed Noise Mitigation Measures

Required Minimum Mitigation Measures

Key Takeaway
WSDOT has updated and increased the number of required noise mitigation measures in this updated noise variance application.

The contractor will perform the following minimum mitigation measures to minimize nighttime construction noise, except in the case of emergency, as defined by the Seattle Noise Control Ordinance (SMC 25.08.110), whenever the contractors work between 10 p.m. and 7 a.m. Monday through Friday, or between 10 p.m. and 9 a.m. Saturday through Sunday and legal holidays, and exceeds the local ordinance noise levels:

- The contractor will meet the noise levels limits established in the noise variance.
- The contractor will use broadband or strobe backup warning devices, or use backup observers in lieu of backup warning devices for all equipment, in compliance with Washington Administration Code, Sections 296-155-610 and 296-155-615. For dump trucks, if the surrounding noise level is so loud that broadband or strobe backup warning devices are not effective, then an observer must be used (WAC 296-155-610). This condition will apply to activity conducted between 10 p.m. and 7 a.m., Monday through Friday, and between 10 p.m. and 9 a.m. on Saturday, Sunday, and legal holidays. No pure-tone backup warning devices will be used after 10 p.m. and before 7 a.m. weekdays or 9 a.m. weekends and legal holidays.
- The contractor will not conduct impact work, such as auger shaking, jack hammering and impact pile driving, during nighttime hours from 10 p.m. to 7 a.m. on weekdays and 10 p.m. to 9 a.m. on weekends and legal holidays.
- The contractor will use compressors with a measured noise levels of 71 dBA at 50 feet or less for areas where modeling showed mitigation for compressors was needed to reduce noise levels below the noise level limit. The contractor will have an option to propose alternative mitigation methods providing equivalent sound attenuation, such as surrounding the compressor with a temporary noise wall or baffle system to meet the noise level limits.
- The contractor will pave construction access roads and haul routes near residences where possible to reduce dust and noise.
- The contractor will securely fasten truck tailgates.
- The contractor will use sand, rubber or plastic lined truck beds for all haul-trucks to reduce noise, unless an exception is approved by WSDOT.
- The contractor will not use compression brakes.
- The contractor will not leave equipment to idle for longer than five minutes,
- The contractor will use temporary noise mitigation shields, enclose, or use low noise-generating stationary equipment, such as light plants, generators, pumps, and air compressors near residences where practical.

Additional Noise-Control Measures

The contractor will submit to WSDOT an updated NMMP to reflect their specific construction means and methods and will detail the additional mitigation measures needed to meet the noise level limits established in the noise variance. Once WSDOT has reviewed and accepted the NMMP, the contractor will submit it to SDCI. Additional mitigation measures that the contractor could also use as necessary are listed below:

- Equip nighttime surface equipment with high-grade engine-exhaust silencers and engine-casing sound insulation.
- Use electric welders powered from utility main lines instead of gas, diesel, or internal combustion generators/welders.
- Use critical or double mufflers where practicable on machinery for off-road use, such as cranes.
- Use noise blankets, skirts, or other available means for mobile equipment to mitigate noise that does not unreasonably interfere with the operation of the engine.
- Use temporary mobile noise barriers in the immediate vicinity of loud activities nearby residences.
- Use temporary noise barriers.
- Provide earplugs and white noise machines to residents near the project area.
- Install temporary sound dampening drapes for residents.
- Provide hotel rooms for residents during high impact or extremely noisy operations.

Key Takeaway

WSDOT will coordinate any temporary noise barrier locations and sound dampening drapes use with the contractor and nearby residences.

WSDOT heard through recent outreach with frontline neighbors that several residences do not want noise walls if they interfere with views, parking, and aesthetics.

Compliance Monitoring and Reporting

Director's Rule 3-2009, Section C.2, requires that WSDOT provide for an Independent Noise Monitor (INM), who may be an individual, firm, or contracted staff member within SDCI independent from the contractor whose responsibility is to oversee the monitoring of sound levels from construction covered by the MPPCNV and to report directly to the SDCI Coordinator for Noise Abatement. WSDOT plans to dedicate the resources needed to have a WSDOT trained inspector on-site to perform the duties of the INM.

The contractor will update the Noise Monitoring Plan based on the NMMP submitted by WSDOT. The contractor will take noise measurements continuously during nighttime hours using automated noise monitoring equipment that is consistent with the American National Standards Institute Standards to Type 1 and that allows for remote access to real time results available to SDCI, WSDOT, and the contractor. The noise monitoring equipment will have the capability to log continuous L_{eq} and L_1 sound levels and to initiate a recording of audio files when the L_{eq} or L_1 sound-level thresholds are exceeded. Sound level thresholds will be set at 5 dBA below the MPPCNV nighttime L_{eq} and L_1 noise levels limits. The Noise Monitoring Plan will identify the type and location of monitoring equipment, and will identify the INM. There will be a minimum of three noise monitoring stations placed at or near the residences affected by the Montlake lid construction when construction is occurring during nighttime hours. Generally, monitors

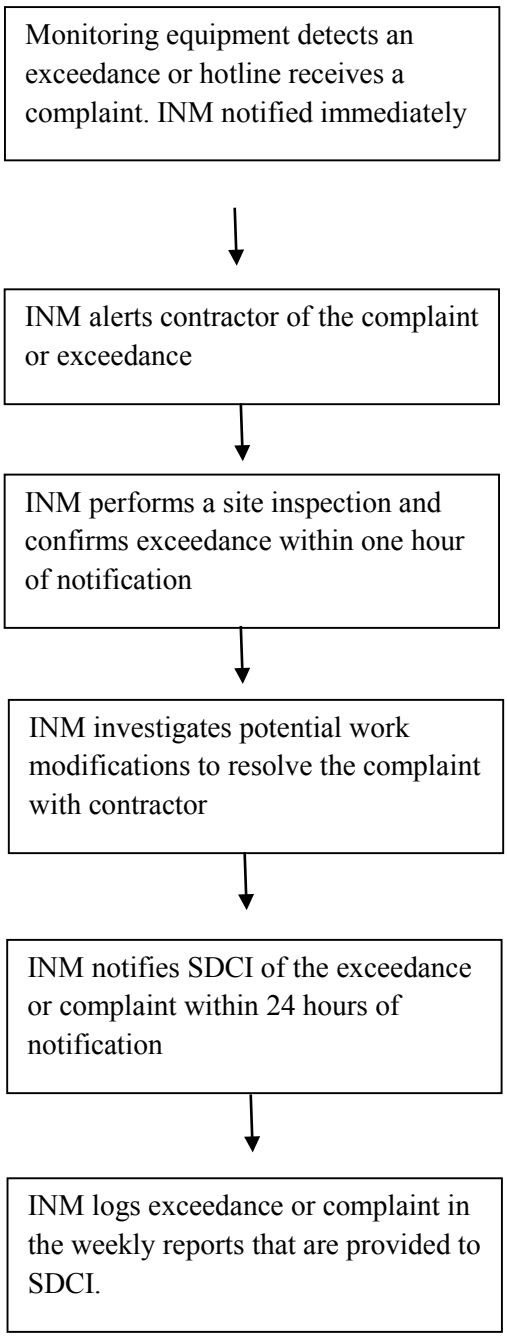
will be placed at 3 locations in the project area, one between Site 2 and Site 5, one between Site 1 and Site 7, and one between Site 4 and Site 6 at or near the residences closest to the nighttime construction work. A fourth monitor will be placed near Site 3 for the WABS construction during WABS construction. Monitors will be activated and relocated as appropriate to provide data for the nearest affected residences when nighttime construction occurs.

If the monitoring equipment detects an exceedance of the MPPCNV nighttime noise level limits, or if a caller to the hotline has a noise-related complaint and requests additional information, the INM will be notified. The INM will be on-site during all periods of scheduled night work. If the INM receives a complaint call during nighttime work hours, the INM will notify the contractor and other WSDOT inspection staff on the job, perform a site inspection within 60 minutes of receiving the complaint, conduct short-term noise measurements (minimum 15 minutes per location) while on-site to confirm whether an exceedance of the MPPCNV sound-level limits is occurring, and investigate potential work modifications to resolve the complaint. INM's regular duties include, but are not limited to:

- Coordinating with WSDOT and contractor's night time crews about planned work operations.
- Coordinating with WSDOT Communications Team and Ombudsman on any updates or concerns from neighborhood and residents.
- Coordinating with SDCI on any questions or concerns from the City regarding project noise.
- Conducting nightly verification of fixed noise monitoring stations with hand held noise monitor to validate noise monitoring results from the fixed locations.
- Conducting regular spot-check noise monitoring at various locations of the project site with hand held monitor.
- Addressing noise exceedances and monitoring alarms in the field.

The Noise Monitoring Plan will also include a provision to generate weekly and annual reports that are required as part of Director's Rule 3-2009. The reports will be provided to SDCI and will include any monitored L_{eq} and L_1 exceedances, noise complaints logged in the program database, and work modifications completed to resolve complaints. The reporting structure for noncompliance or a noise complaint is detailed in Exhibit 23. The weekly reports will be publicly available on-line.

EXHIBIT 23. REPORTING STRUCTURE FOR NON-COMPLIANCE



Public Outreach and Community Involvement

WSDOT believes public involvement is essential to a project's development and has implemented a comprehensive and ongoing public involvement program for the SR 520 Bridge Replacement and HOV Program. During construction of the Montlake Phase, WSDOT's communications team, in coordination with the City of Seattle and the selected contractor, will provide up-to-date information on construction activities and construction noise to neighbors and stakeholders.

WSDOT's approach to construction communications and descriptions of the various communications tools and activities are included below. WSDOT will keep the public informed of construction activities, promote two-way communication with the community, and work to minimize construction impacts.

As part of preparing for construction in the Montlake area in 2018, WSDOT has hired a full time SR 520 Ombudsman to support WSDOT's commitment to public involvement. The SR 520 Ombudsman serves as a strategic liaison between WSDOT, the Seattle communities affected by construction of the new SR 520 corridor, and the elected officials who represent these communities. More information is available on the Ombudsman page of the SR 520 website.

The key elements of the Montlake Phase communications plan are outlined below.

Written Materials

WSDOT uses a variety of written materials to provide advance notification and keep people informed of construction activities. All written materials have program contact information, including the email address, website, and the 24-hour live telephone construction hotline number. Examples of these types of materials include:

- Fact sheets to provide background information for the type of work occurring and project benefits.
- Fliers which are often delivered door-to-door when there are localized construction impacts.
- Mailers which are sent to neighbors in compliance with permitting requirements.

In-person Public Engagement Activities

WSDOT provides a wide range of opportunities for community members to connect face-to-face with SR 520 Program staff. These opportunities provide an additional way for the public to voice questions and concerns regarding the SR 520 Program.

Recent in-person events and meetings

- WSDOT hosted monthly public construction meetings in advance of and throughout the construction of the West Approach Bridge North.
- In preparation for the Montlake Phase nighttime noise application, WSDOT hosted a public meeting on 2/28/17 to provide an opportunity for community members to learn about the application process and share concerns about construction noise for the Montlake Phase.
- The SR 520 Program attended the University District Street Fair and the Fremont Fair in May and June 2017 as part of broader community outreach.

Planned and ongoing in-person events and meetings

- Pre-construction outreach with the future project contractor prior to the beginning of major construction activities.
- Public construction meetings provide timely updates on construction progress and upcoming activities throughout Montlake Phase construction.
- SR 520 Program briefings provided to community groups as requested.
- During established hours, a Montlake Phase storefront will serve as an in-person location for neighbors to receive answers to construction-related questions. The Montlake Phase storefront is the first of its kind for the SR 520 Program.

Online and Electronic Communications

WSDOT uses a combination of the following online and electronic communications to keep community members informed of upcoming and ongoing construction activities:

- WSDOT maintains an electronic mailing list, and regular e-mail updates are sent to provide status updates and information on current activities.
- The project website is updated regularly and provides the latest design and construction information.
- WSDOT collaborates with other agencies and organizations to provide information in their respective e-mail updates or websites.
- SR 520 social media accounts are maintained on Twitter, Flickr, and YouTube.
- The 24-hour live telephone construction hotline will be maintained for the Montlake Phase project. Real-time responses to immediate concerns and updates of the project status and current construction activities and impacts will be provided.
- During business hours, community members may contact the SR 520 Program Information Line for non-urgent, general project information.
- Detailed responses will be provided to emails received via the project e-mail address.
- Highway advisory radio, variable message signs, active traffic management signs, and project identification signs will be used as needed.

Media Relations and Social Media

WSDOT is able to reach a wide range of public located along the SR 520 corridor through the following means of mass communication:

- Community blogs and newspapers
- Regional print and broadcast media outlets
- Regular use of Twitter and Flickr social media accounts

Frontline resident outreach

In addition to the above mentioned communications and outreach methods, WSDOT is continuing to collaborate with frontline neighbors to identify and implement measures in an effort to minimize SR 520 construction effects. WSDOT initiated this level of tailored outreach during the West Approach Bridge North construction phase and worked with neighbors to identify and implement the following measures:

- Offered air conditioning in July 2015 resulting in the installation of air conditioning units in a frontline neighbor's home in August 2015 and issuance of stipends for electricity reimbursement. Also installed air conditioning units in a second neighbor's home in May 2017.
- Installed a temporary noise monitor onsite, adjacent to neighbors, in June 2016.
- In September 2016, offered neighbors the installation of Connex storage boxes along the construction site perimeter to further shield the neighborhood from construction activity noise prior to construction work moving closer to the area. The neighborhood declined this option in November 2016.
- Responded to and investigated hotline calls and email comments addressed to WSDOT.

WSDOT has continued outreach efforts with frontline neighbors as we prepare for Montlake Phase construction. Approximately 68 residences have right of way that touches WSDOT's SR 520 corridor right of way and will be directly affected by nighttime noise. Our recent outreach with neighbors living adjacent to the SR 520 highway has resulted in the following, key best management practices that WSDOT will employ in the Montlake Phase construction:

- Installing construction screening and vegetation to help shield neighbors from construction. WSDOT plans to install the screening along the WSDOT right-of-way adjacent to the Shelby/Hamlin neighborhood, as well as south of the eastbound SR 520 on-and off-ramp in Montlake. Some of this vegetation will be planted later this year.
- Paving of access roads where possible to reduce dust and noise.
- Prohibiting the contractor from parking in residential areas, and working with the contractor to identify off-site parking for the contractor.
- Requiring the contractor to develop and adhere to a construction area management plan which will include the procedures and policies for staging site operations. Included topics could include: delivery procedures, guidelines for lighting, dust control, site cleanliness, parking, and methods to limit "nuisance noise".

Conclusion

WSDOT is completing the application process for a nighttime noise variance because construction crews will work at night within the City of Seattle limits during the Montlake Phase. Nighttime construction work is necessary to avoid disrupting weekday traffic and to provide a safe environment for construction crews and the traveling public. Since nighttime work will be required, WSDOT would receive this variance from SDCI to set limits on the noise levels for nighttime construction activities.

The noise limits proposed in this updated noise variance application for the Montlake Phase are based on WSDOT and SDCI noise variance coordination efforts which started in fall 2016 and a review of prior SDCI decisions on MPPCNV applications, tailored specifically for major public construction projects, from agencies including WSDOT, Sound Transit and the Seattle Department of Transportation. By applying for a nighttime noise variance, WSDOT is complying with City of Seattle noise code for major public projects.

The SR 520 program is enhancing safety by replacing the highway's aging bridges and keeping the region moving with vital highway and transit facility improvements throughout the corridor. WSDOT understands that constructing this project in a dense, urban environment has an effect on those who live, work, travel, and play in the Montlake neighborhood. This variance requires WSDOT to implement nighttime noise limits, requires our contractor to implement noise-control measures, and ensures appropriate monitoring and enforcement of our nighttime construction activities, while also ensuring the safety of the public and our crews.

Revised City of Seattle Major Public Project Construction Noise Variance Application Attachment 1

Noise Management and Mitigation Plan for SR 520 Montlake Phase and WABS

Prepared for

Washington State Department of Transportation

Lead Author

Ginette Lalonde

WSP USA

July 6, 2017

Table of Contents

Exhibits

Appendix

Acronyms and Abbreviations

ANSI	American National Standards Institute
dB	Decibels
dBA	A-weighted decibels
HOV	High-occupancy vehicle
Hz	Hertz
INM	Independent Noise Monitor
L_1	Sound level exceeded for 1 percent of the measurement duration (i.e., 36 seconds per hour)
L_{eq}	Equivalent sound level
L_{max}	Maximum noise level
MPPCNV	Major Public Project Construction Noise Variance
NMMP	Noise Management and Mitigation Plan
RCW	Revised Code of Washington
SDCI	Seattle Department of Construction and Inspections
SMC	Seattle Municipal Code
SR	State Route
WABS	West Approach Bridge South
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Introduction

This Noise Management and Mitigation Plan (NMMP) was prepared in support of the Major Public Project Construction Noise Variance (MPPCNV) submitted to the Seattle Department of Construction and Inspections (SDCI) by the Washington State Department of Transportation (WSDOT) for the Montlake Phase of the State Route (SR) 520 Bridge Replacement and High-Occupancy Vehicle (HOV) Program. The NMMP was prepared according to the requirement of Section 25.08.655 of the Seattle Municipal Code and Director's Rule DR32009, which pertain to MPPCNV from the City of Seattle Noise Code.

WSDOT has developed expected construction activities and a schedule for the Montlake Phase. The analysis in this NMMP demonstrates that means and methods are available to meet the noise limits requested in the MPPCNV over the proposed five-year construction period. The Design-Builder will propose their own construction activities and schedule, and updated the NMMP to meet the commitments WSDOT has made in the MPPCNV application.

Examples of Montlake Phase nighttime construction work activities needing a variance that would be unreasonable to limit to daytime construction in light of public and worker safety include, but are not limited to:

- Demolishing structures next to or over the highway.
- Conducting work that is immediately adjacent to or over live traffic such as constructing lid walls, placing concrete girders for the Montlake lid and the land bridge, installing large overhead sign structures, or installing formwork and concrete placement for walls and bridges along SR 520.
- Constructing bridge foundations which involves both spread footing and drilled shaft construction.
- Delivering large equipment or materials, such as lengthy bridge girders or concrete for the new bridges and retaining walls adjacent to and over SR 520.
- Relocating utilities located within the roadway on SR 520, Montlake Boulevard and Lake Washington Boulevard.
- Managing major traffic shifts and new ramp/roadway connections along SR 520.
- Paving City streets such as Montlake Boulevard and Lake Washington Boulevard.

WSDOT has developed expected construction activities and an estimated schedule for the Montlake Phase. The analysis demonstrates that means and methods are available to meet the noise limits requested in this noise variance application. The contractor will propose their own construction activities and schedule, and create a detailed noise management and mitigation plan to meet the commitments WSDOT has made in this MPPCNV application and the noise variance issued by SDCI. Construction activities and equipment used may not be specifically identical but are likely to be similar to those identified by WSDOT in the Proposed Construction Activities section.

This Montlake Phase NMMP provides a plan to meet nighttime construction noise limits for noise-sensitive receivers near construction sites while allowing for necessary nighttime construction work

activities to occur. This NMMP will address activities occurring as part of the SR 520 Montlake Phase and will include the following:

- A description of the proposed construction activities
- Existing baseline sound levels at noise-sensitive land uses within the project areas
- Proposed sound-level limits for nighttime construction activities
- Description of the noisiest proposed construction activities
- Calculated sound levels that may be expected at noise-sensitive land uses during the noisiest nighttime construction activities
- Proposed noise-mitigation measures
- Provisions for compliance tracking and actions taken to resolve public complaints

Project Site and Description

Montlake Phase Overview and Project Site Description

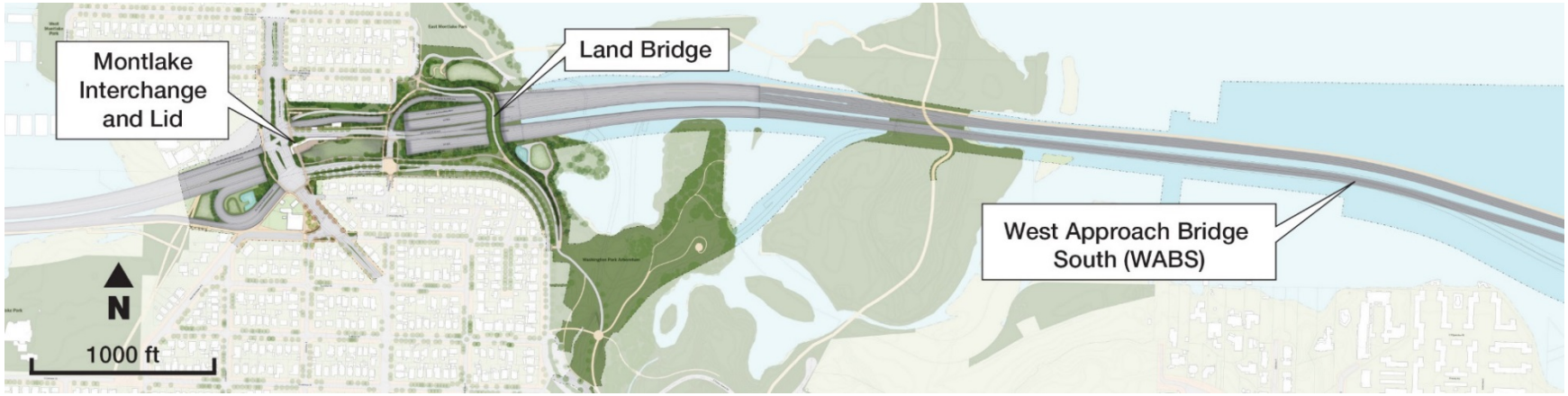
The next SR 520 project phase, known as the Montlake Phase (Exhibit 1), includes construction of the West Approach Bridge South, Montlake lid and interchange, and a bicycle/pedestrian land bridge over the highway. Construction of this first phase of the I-5 to Lake Washington Project (also known as the "Rest of the West") is scheduled to begin in 2018.

The existing SR 520 west approach bridge is built on hollow columns, which are vulnerable to a catastrophic failure during a large earthquake, and the roadway has narrow shoulders and lacks transit/HOV lanes. The West Approach Bridge South is a companion to the newly completed West Approach Bridge North and will connect eastbound traffic from Montlake to the new floating bridge. It will also feature a dedicated transit/HOV lane that will provide improved mobility for buses and carpools as they access the new floating bridge and continue to the Eastside.

The new Montlake interchange and lid will include direct-access connections for transit and HOV in addition to new bicycle and pedestrian connections to existing regional and local trails and routes. The Montlake lid will be a hub for local and regional transportation connectivity, and will include multifunctional open spaces, urban trails, undercrossings, a segment of the regional shared-use path adjacent to SR 520, and transit connections. The land bridge will be a bicycle/pedestrian path over SR 520 that provides a north-south local trail connection across the highway between the Washington Park Arboretum and points north. The Montlake Phase also features construction of stormwater treatment sites that will capture and naturally filter highway runoff to help protect the local environment.

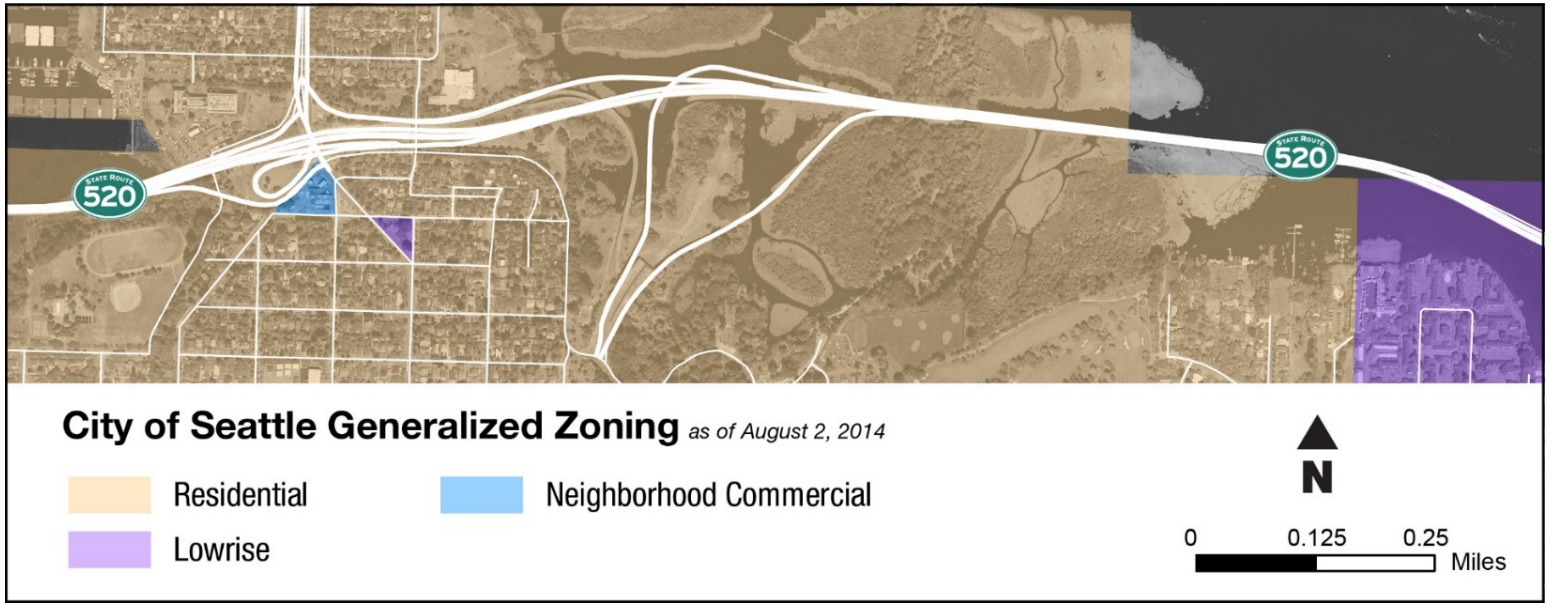
Land uses and zoning classifications are mostly residential near the project area, with the exception of the corner of Montlake Boulevard and SR 520, which is zoned as neighborhood commercial (Exhibit 2).

EXHIBIT 1. MONTLAKE PHASE PROJECT AREA



The Montlake Phase includes the construction of the West Approach Bridge South, Montlake interchange and lid, and the bicycle/pedestrian land bridge.

EXHIBIT 2. ZONING



Land uses and zoning classifications are mostly residential near the Montlake Phase, with the exception of the corner of the Montlake Boulevard and SR 520 which is zoned as neighborhood commercial.

Characteristics of Sound and Noise

Definition of Sound

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

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

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

The smallest “just noticeable” increase in sound is about 3 dBA. A 6 dBA increase is clearly noticeable, and a 10 dBA increase causes a doubling of judged loudness. For example, 80 dBA is judged to be twice as loud as 70 dBA and four times as loud as 60 dBA. Exhibit 3 summarizes how increases in perceived loudness correlate with sound level increases.

EXHIBIT 3. PERCEIVED LOUDNESS INCREASES

Sound Level Increase (dBA)	Perceived Loudness Increase
0 to 2	Not noticeable
3	Just noticeable
6	Noticeable
10	Twice as loud
20	Four times as loud

Definition of Noise

Noise is unwanted or unpleasant sound. Noise is a subjective term because, as described above, sound levels are perceived differently by different people. Magnitudes of typical noise levels are presented in Exhibit 4.

EXHIBIT 4. TYPICAL NOISE LEVELS

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

Noise Level Descriptors

Because sound levels fluctuate over time, several A-weighted sound level descriptors are used to characterize the sound.

The L_{eq} is a measure of the average noise level during a specified period of time. A one-hour period, or hourly L_{eq}, is used to measure construction 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. L_{max} is the maximum sound level that occurs during a single event and is related to impacts on speech interference and sleep disruption.

With L_n, "n" is the percent of time that a sound level is exceeded and is used to describe the range and pattern of sound levels experienced during the measurement period. For example, the L_1 level is the noise level that is exceeded 1 percent of the time. Sound varies in the environment and people will generally find a higher, but constant, sound level more tolerable than a quiet background level interrupted by higher sound level events. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in an otherwise quiet area if both environments have the same L_{eq}.

City of Seattle Noise Control Ordinance

The City of Seattle limits noise levels at property lines of neighboring properties (Seattle Noise Control Ordinance, SMC 25.08.410). The sound level limit depends on the land uses of both the noise source and the receiving property (Exhibit 5). The Montlake Phase project area and the surrounding properties are zoned residential, with the exception of a small area immediately south of the eastbound SR 520 off-ramp Montlake Boulevard, which is zoned as neighborhood commercial (Exhibit 2). The City's sound level limits apply to construction activities occurring between 10 p.m. and 7 a.m. on weekdays or 10 p.m. and 9 a.m. on weekends and legal holidays. Legal holidays are defined in SMC 25.08.155 as New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the day after, and Christmas Day. Construction activities during nighttime hours that would exceed these levels require a noise variance from the City.

EXHIBIT 5. SEATTLE NOISE CONTROL ORDINANCE – EXTERIOR SOUND LEVEL LIMITS

District of Sound Source	District of Receiving Property			
	Residential Daytime L_{eq} (dBA)	Residential Nighttime L_{eq} (dBA)	Commercial L_{eq} (dBA)	Industrial L_{eq} (dBA)
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

Nighttime hours are 10 p.m. to 7 a.m. during weekdays and 10 p.m. to 9 a.m. during weekends and legal holidays
dBA = A-weighted decibels
L_{eq} = equivalent sound level
During a measurement interval, L_{max} may exceed the exterior sound level limits shown by no more than 15 dBA.

Exceptions to the Seattle Noise Control Ordinance

Daytime Noise

Noise levels shown in Exhibit 5 may be exceeded by construction equipment between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends and legal holidays. Threshold levels for equipment are listed below:

- 25 A-weighted decibels (dBA) for equipment on construction sites, including but not limited to, crawlers, tractors, dozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors, derrick barges, tug boats, and pneumatic-powered equipment

Daytime construction activities are allowed to exceed daytime noise-level limits in Exhibit 5 by 25 dBA. These levels should be measured from the real property of another person or at a distance of 50 feet from the equipment, whichever is greater. Construction activities for the Montlake Phase would mostly occur in a residential district. The daytime construction activity associated with the Montlake Phase would be limited to 80 dBA (55 dBA + 25 dBA) for residential districts.

Impact Type Noise

In addition, the Seattle Noise Control Ordinance (SMC 25.08.425) regulates sound created by impact types of construction equipment (e.g., pavement breakers, pile drivers, jackhammers, and sandblasting tools) or those that otherwise create impulse or impact noise (as measured at the property line or 50 feet from the equipment, whichever is greater). The equipment may exceed the sound level limits (equivalent sound level [L_{eq}] described in Exhibit 5) in any 1-hour period between 8 a.m. and 5 p.m. on weekdays and 9 a.m. and 5 p.m. on weekends and legal holidays. The sound level is in no event to exceed the following:

- L_{eq} = 90 dBA continuously
- L_{eq} = 93 dBA for 30 minutes
- L_{eq} = 96 dBA for 15 minutes
- L_{eq} = 99 dBA for 7.5 minutes

Sound levels in excess of L_{eq} = 99 dBA are prohibited unless authorized by variance. The standard of measurement is a 1-hour L_{eq} measured for time periods not less than 1 minute in order to project an hourly L_{eq}.

WSDOT Term of Proposed Variance

As detailed in the MPPCNV application, WSDOT requests that construction noise generated on the site be allowed to exceed the noise level limits set by Seattle Noise Control Ordinance, SMC 25.08.410, during nighttime hours (between 10 p.m. and 7 a.m. on weekdays and between 10 p.m. and. 9 a.m. on weekends and legal holidays).

The variance is requested for the length of time that is needed to complete substantial construction of the Montlake Phase. Nighttime construction activities requiring a noise variance are expected to occur at various times throughout the project duration. Major construction is scheduled to begin in 2018, with an estimated completion date in 2023. The length of the requested variance is 5 years which is the anticipated duration necessary to complete the major construction activities

The MPPCNV is subject to review by SDCI after the first year of construction, as provided in SMC 25.08.655.D. Additional coordination with SDCI would continue throughout construction.

The noise variance application proposes nighttime construction noise limits for nighttime noise-sensitive receivers in proximity to the Montlake Phase construction area. Nighttime noise-sensitive receivers are generally properties where people are sleeping, such as a residence.

The proposed descriptors and noise limits for the Montlake Phase are based on WSDOT and SDCI noise variance coordination efforts, which began in fall 2016, and a review of prior SDCI decisions on MPPCNV applications from agencies such as WSDOT, Sound Transit and the Seattle Department of Transportation. In each of these cases, SDCI granted variances with an increase of average hourly noise level limits ranging from 6 dBA up to 15 dBA over measured existing baseline noise levels.

The Montlake Phase noise variance application proposes a 6 dBA increase over existing hourly average noise levels (L_{eq}) measured during the quietest part of the nighttime hours (the five hour period from 12 a.m. to 5 a.m.). Although these proposed noise level limits are based on measurements during only the quietest nighttime hours, the proposed limits would apply to the operation of construction equipment during all nighttime hours, from 10 p.m. to 7 a.m. on weekdays and 10 p.m. and 9 a.m. on weekends and

legal holidays. This NMMP assumes that all equipment used for the project would meet the daytime noise level limits as described in Section 25.08.425 of the Seattle Municipal Code.

The noise variance application also proposes a highest 1 percent maximum noise level limit above the nighttime L_{eq} to monitor potential short-term noises. Hourly percentile sound levels, L_n, are the sound levels exceeded for "n" percent of an hour. The measured L_1 is the sound level exceeded for 1 percent of the measurement duration (i.e., 36 seconds per hour). The proposed L_1 limits are 10 dBA above the L_{eq} noise level limit with a maximum upper limit of 80 dBA, which is the City's daytime construction hourly L_{eq} noise level limit at residentially zoned receivers. The proposed L_1 limits would be in the range of existing L_{max} sound levels measured during the late-night hours of 12 a.m. to 5 a.m. in the Montlake lid construction area (with the exception of Site 7), as described in the Existing Baseline Sound Levels section.

This noise variance application proposes to track compliance with the terms set by the MPPCNV by monitoring the measured hourly L_{eq} and L_1 sound levels. The L_1 has been found to be more reliable than the L_{max}, as stated in the Denny Substation Program Noise Monitoring and Mitigation Plan, revised February 11, 2015:

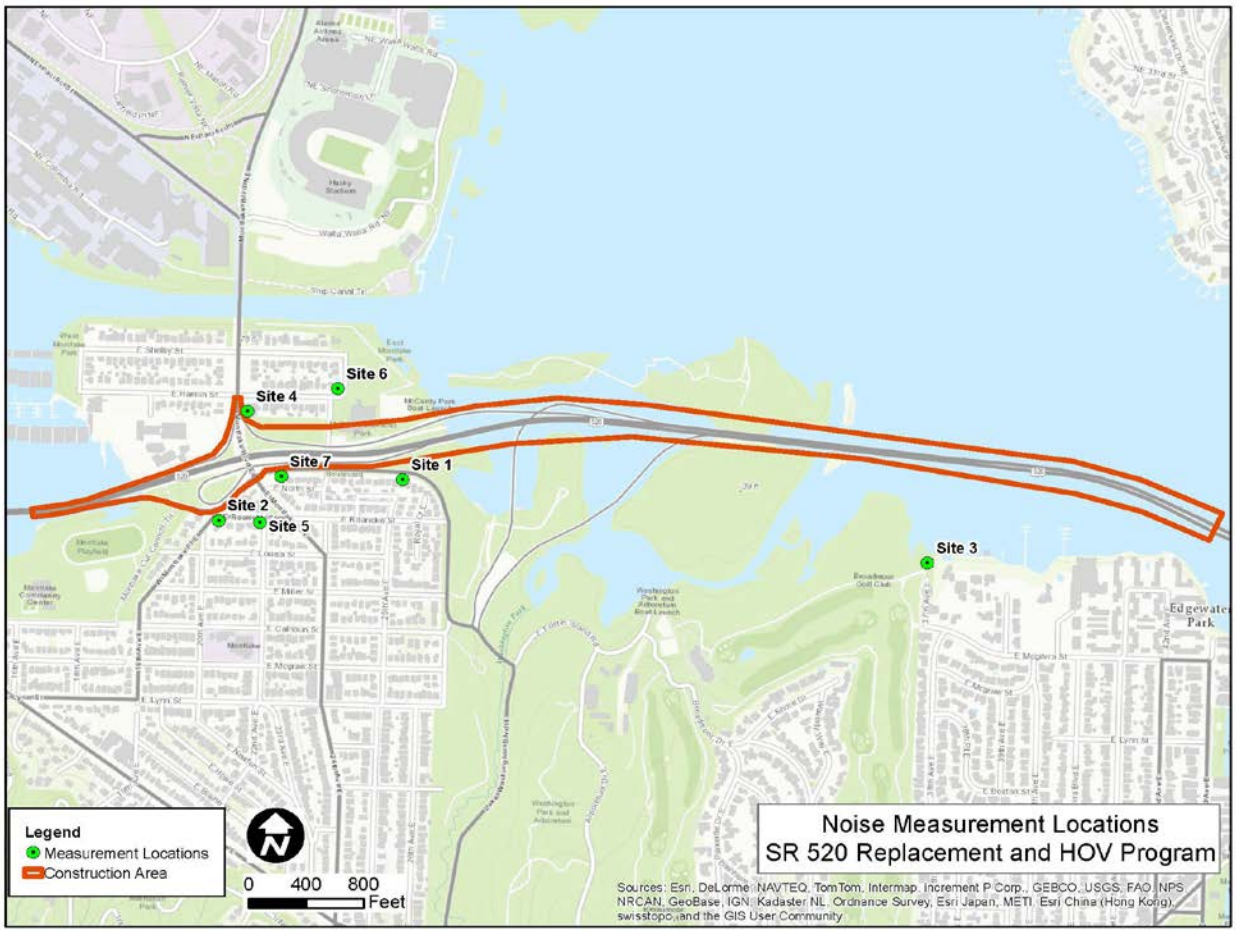
> *For the purpose of monitoring construction sound levels, the hourly L_1 has been found to be more reliable than the hourly L_{max} in tracking compliance with MPPCNV limits. As with the L_{max}, the hourly L_1 provides a representative measure of the worst-case sound levels produced by a construction activity; unlike the L_{max}, the L_1 is not susceptible to distortion by one-time, atypical events such as a tool or load being dropped, and it is more representative of sound levels produced during higher-intensity construction activities each hour.*

Existing Baseline Sound Levels

Continuous monitoring and recording of A-weighted sound levels ranging in duration from 11 days to two weeks was conducted at seven sites (Exhibit 6). Measurements were taken at Sites 1 through 6 during October and November 2016, and then at Site 7 in January 2017 with calibrated Larson Davis Model 720 (Type 2) and 820 (Type 1) noise meters, which comply with American National Standards Institute S1.4 for instrument accuracy. All sound level monitoring equipment was calibrated before and after each measurement. In addition, the noise meters are calibrated annually by an accredited laboratory. The sites listed below were identified as representing nighttime noise-sensitive receivers near each construction area:

- Site 1 – 2449 E. Lake Washington Boulevard
- Site 2 – City of Seattle property near Montlake Boulevard Market
- Site 3 – Beaver Lodge Sanctuary
- Site 4 – 2740 Montlake Boulevard E.
- Site 5 – 2015 E. Roanoke St.
- Site 6 – 2800 block E. Park Drive East and WABN construction site (former MOHAI site)
- Site 7 – 2209 E. Lake Washington Boulevard

EXHIBIT 6. CONSTRUCTION AREA AND NOISE MEASUREMENT LOCATIONS



Sound levels measured during the late night hours (12 a.m. to 5 a.m.) provide the most conservative representation of the existing baseline condition. Noise measurement sites were selected based on their proximity to construction activities. A summary of the measured existing nighttime sound levels is shown in Exhibit 7 and Exhibit 8. Detailed noise measurement data is found in Appendix A.

EXHIBIT 7. MEASURED HOURLY AVERAGE BASELINE NOISE LEVELS AND PROPOSED NIGHTTIME NOISE LEVEL LIMITS MEASURED

Site	City of Seattle nighttime noise control ordinance limit Hourly Average L_{eq} (dBA)	Measured 12 to 1 AM Log Hourly Average L_{eq} (dBA)	Measured 1 to 2 AM Log Hourly Average L_{eq} (dBA)	Measured 2 to 3 AM Log Hourly Average L_{eq} (dBA)	Measured 3 to 4 AM Log Hourly Average L_{eq}(dBA)	Measured 4 to 5 AM Log Hourly Average L_{eq}(dBA)	Measured 12 to 5 AM Log Hourly Average L_{eq} (dBA)	Proposed Nighttime Noise Level Hourly Average Limit L_{eq} (dBA)
1	45	63	61	60	59	61	61	67
2	45	72	72	72	72	72	72	78
3	45	58.	57	55	55	56	56	62
4	45	62	60	60	59	60	60	66
5	45	61	59	59	58	5	59	65
6	45	58	57	56	54	57	57	63
7	45	62	60	59	59	61	60	66

Measured hourly average L_{eq} noise levels between 12 a.m. and 5 a.m. exceed the City of Seattle Noise Control Ordinance limits by up to 27 dBA. This variance application requests a 6 dBA increase over the baseline noise levels measured between 12 a.m. and 5 a.m. The proposed L_{eq} limits are based on WSDOT and SDCI coordination efforts which started in fall 2016 and a review of prior SDCI decisions on MPPCNV applications from agencies such as WSDOT, Sound Transit and the Seattle Department of Transportation. In each of these cases, SDCI granted variances with an increase of hourly average L_{eq} noise level limits ranging from 6 dBA up to 15 dBA over measured existing baseline nighttime noise levels.

EXHIBIT 8. MEASURED L_{MAX} NOISE LEVELS AND PROPOSED L_1 NIGHTTIME NOISE LEVEL LIMITS

Site	City of Seattle nighttime noise limits Hourly Average L_{max} (dBA)	Measured 12 to 5 AM L_{max} range (dBA)	Proposed Nighttime Noise Level Hourly Limit L_1 (dBA)
1	60	71 to 83	77
2	60	72 to 89	80
3	60	55 to 78	72
4	60	75 to 94	76
5	60	45 to 90	75
6	60	53 to 92	73
7	60	70 to 92	76

Measured L_{max} noise levels between 12 a.m. and 5 a.m. exceed the City of Seattle Noise Control Ordinance limits by up to 34 dBA. The variance application proposed L_1 limits of 10 dBA increase over the proposed L_{eq} limits. These proposed L_1 limits are based on a review of prior SDCI decisions on other MPPCNV applications. The proposed L_1 limits would be up to 19 dBA lower than the measured L_{max} levels.

Existing measured baseline hourly averaged, L_{eq}, noise levels exceed the City of Seattle nighttime noise control ordinance limits of 45 dBA (L_{eq}) at all monitoring locations. The existing sound levels, which are produced primarily by traffic on public roads, are not subject to the limits of the ordinance (SMC 25.08.410-425). The comparison is presented as a baseline for evaluating potential noise impacts from proposed construction activities.

The proposed L_1 limit would be in the range of existing L_{max} sound levels measured during the late-night hours of midnight to 5 a.m. Complete tables of hourly measurements are provided in Appendix A.

Public health and safety

SDCI's decision on the Sound Transit project at 6600 Roosevelt Way NE includes the following assessment of noise levels related to public health and safety:

> *It is generally accepted that very high levels of noise have adverse physical impacts on humans including, but not limited to, hearing damage. Many standards apply to occupational exposures at high levels for prolonged periods of time. For example, the Occupational Safety and Health Act mandates a hearing conservation program by employers if sound levels exceed 85 dBA continuously over an 8-hour workday. If sound levels exceed 90 dBA continuously over an 8-hour workday, hearing protection is required.*

The proposed nighttime noise level limits anticipated by this MPPCNV application would maintain sound levels below these identified levels, as shown in Exhibit 7 and Exhibit 8. The highest 1 percent maximum L_1 variance limit would be no greater than 80 dBA for sensitive receptors. SDCI's 6600 Roosevelt Way NE decision also references U.S. DOT Guidance: *Federal Transit Authority's (FTA) guidelines recommend that a nighttime 8-hour L_{eq} of 70 dBA not be exceeded. Because this federal guideline is stated in terms of 8-hour L_{eq}, it would allow the sounds in any given hour to be louder than 70 dBA so long as the sound during other hours were quieter, to bring the 8-hour average down to 70 dBA.*

This variance application is proposing a 1-hour L_{eq} variance limit below the 70 dBA 8-hour L_{eq}, as referenced in SDCI's decisions on previous noise variances, at all but one baseline noise monitoring location. This location, Site 2, represents one residence currently experiencing a nighttime L_{eq} of 72 dBA and therefore has a proposed variance limit above 70 dBA (Exhibit 7). The proposed variance limit at most locations would be stricter than the U.S. DOT FTA guideline, as it would not allow louder hours to be averaged down by quieter hours. The 6 dBA increases from on-site nighttime project noise levels that are requested and the resulting noise levels will likely be noticed by some residents, but would not cause a danger to public health or safety.

Expected Construction Activities

The Montlake Phase will be a design-build contract. WSDOT has carefully reviewed the work to be built as part of this contract and has developed an expected list of construction activities and an estimated schedule for this work. A request for proposals is planned to be issued by WSDOT in 2017. WSDOT will evaluate the proposals received based on cost and technical credits. WSDOT expects to award the contract to the selected contractor in 2018. The contractor will develop their own approach and plan for the construction activities and schedule for this work, and update the Noise Management and Mitigation Plan (NMMP) accordingly. While the order and timing of activities may differ, the construction activities and equipment used are likely to be similar to those identified by WSDOT. The proposed Montlake Phase major construction phases and durations are as follows:

- Waterline installation, estimated 5 to 7 months
- Demolition of existing Montlake Boulevard bridge, estimated 1 month
- Demolition of existing 24th Avenue Bridge, estimated 1 month
- Demolition of existing West Approach Bridge, estimated 4 to 6 months
- Temporary work bridge construction, estimated 5 to 7 months
- Drilled shafts for WABS, estimated 12 to 16 months
- Bridge substructure and superstructure construction for WABS, estimated 14 to 20 months
- Construction of Montlake lid, estimated 48 to 60 months
- Traffic shifts, estimated 48 to 60 months
- Utility relocation, estimated 48 to 60 months
- Temporary shoring wall construction, estimated 48 to 60 months
- West Approach Bridge North widening, estimated 48 to 60 months

Expected nighttime construction activities, that require a noise variance, are part of some or all of the phases described above. WSDOT has developed an expected schedule and list of equipment to be used during nighttime hours by the contractor as noted in Exhibit 9 and Exhibit 10. The contractor will update the list of equipment and the order and timing of activities in the updated NMMP.

EXHIBIT 9. ESTIMATED SCHEDULE OF MONTLAKE PHASE NIGHTTIME CONSTRUCTION ACTIVITIES

The construction activities noted in Exhibit 9 are not expected to occur continuously on all nights for consecutive weeks and it is likely that there will be breaks in the activities. The Montlake Phase contractor will update the nighttime activities schedule in the updated Nighttime Management and Mitigation Plan.

EXHIBIT 10. EXPECTED NIGHTTIME CONSTRUCTION EQUIPMENT

Equipment Type	NMMP Modeled Construction Activities				Other Nighttime Activities		
	Demolition of structures	Construction of lid walls *(Work adjacent to or over live traffic)*	Shaft Installation for WABS	Delivery of large equipment or materials	Relocation of utilities	Making traffic shifts & new ramp/roadway connections	Paving operations on City streets
Asphalt roller						✓	✓
Bulldozer					✓	✓	
Compressor	✓	✓		✓	✓	✓	✓
Concrete pump		✓	✓		✓		✓
Concrete truck		✓	✓		✓		✓
Crawler crane	✓	✓	✓	✓			
Delivery truck	✓	✓	✓	✓	✓	✓	✓
Diesel generator			✓		✓	✓	✓
Drill rig			✓				
Dump or Debris truck	✓	✓	✓	✓	✓		✓
Excavator with crusher	✓						
Excavator with thumb	✓				✓		
Forklift	✓	✓		✓	✓		
Grader					✓	✓	
Hydraulic crane	✓	✓		✓			
Loader	✓	✓		✓	✓		✓
Street sweeper						✓	✓
Vibratory roller						✓	✓
Vibratory pile installer			✓				
Welder			✓		✓		

Montlake Phase contractor to update above list as part of updates to the Noise Management and Mitigation Plan.

WSDOT Noise Modeling

Projected nighttime major construction L_{eq} and L_1 noise levels were modeled for selected noise-sensitive receivers using Sound PLAN Version 7.0, a three-dimensional graphics-oriented program for outdoor noise propagation. Sound PLAN calculates the L_{eq} by averaging the use of each individual piece of equipment and evenly distributes the activity over an hour. Sound PLAN calculates the L_1 using the loudest 1 percent same hour as used to calculate the $L_{eq.}$ The L_1 results from Sound PLAN are an additional 10 dBA over the $L_{eq,}$ this is a conservative high level estimate for the L_1. For nighttime construction noise estimates, the noisiest nighttime construction activity that would occur at the surface of each construction site and the noisiest equipment during this activity was assumed.

The noisiest major construction activities were modeled to provide a conservative estimate of noise levels. A variety of construction activities are anticipated to occur within the footprint of the Montlake Phase, potentially using the equipment outlined in Exhibit 11. Since impact work would be prohibited during nighttime hours (10 p.m. and 8 a.m. on weekdays or 10 p.m. and 9 a.m. on weekends and legal holidays), that type of equipment was not included in the noise modeling. Construction noise includes truck operations within the construction site and not on haul routes. Haul routes are not regulated under the Seattle Noise Control Ordinance and therefore are not included in this application.

Major construction activities that are expected to be the loudest during the project were modeled to estimate the anticipated highest nighttime construction noise levels. Construction may not occur on all nights, and construction during other phases of work would generate less noise than those selected for noise modeling. The modeled levels represent the loudest nighttime construction activities that are anticipated over the construction period.

EXHIBIT 11. NIGHTTIME CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment Type	Typical Noise Level (dBA) at 50 Feet
Asphalt roller	80
Bulldozer	82
Compressor without mitigation	81
Compressor with mitigation	71
Concrete pump	82
Concrete truck	88
Crawler crane	83
Delivery truck	88
Diesel generator	81
Drill rig	83
Dump or Debris truck	88
Excavator with crusher	96
Excavator with thumb	96
Forklift	80
Grader	85
Hydraulic crane	88
Loader	85
Street sweeper	80
Vibratory roller	80
Vibratory pile installer	96
Welder	82

Source: August 2006 FHWA Construction Noise Handbook, Section 9: https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/

The construction equipment listed in Exhibit 11 is not expected to be used all together at the same time, or on all nights. The noise levels for the four expected loudest construction periods are described in the following subsections. Each subsection lists the number and type of construction equipment modeled to estimate the expected highest nighttime construction noise levels. Construction during other phases of work would generate less noise than those selected for noise modeling.

Montlake Phase – North Lid Wall and Center Lid Wall

Modeled noise levels for the construction of the Montlake lid structure are shown in Exhibit 12. The model included the construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A). These two activities are currently estimated by WSDOT to occur at the same time for a period of three to four months. Equipment used for each activity was estimated to include a hydraulic crane, crawler crane, concrete pump, two compressors, and five concrete trucks. Without mitigation, modeled noise levels would exceed the proposed L_{eq} noise level limit for a few residences near Site 1, and Site 4. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedances. Mitigation was evaluated for residences near Site 1, and Site 4.

EXHIBIT 12. NIGHTTIME NORTH LID WALL AND CENTER LID CONSTRUCTION NOISE LEVELS WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	62	67	72	77
2	62	78	72	80
3	-	62		72
4	66	66	76	76
5	62	65	72	75
6	63	63	73	73
7	65	66	75	76
Max Locations without mitigation	68 near Site 1	67	78	77
	68 near Site 4	66	78	76

Note: Noise levels are hourly averages.

Noise levels were also modeled using compressors with mitigation, to confirm that the contractor can reduce noise levels below the proposed nighttime noise level limit for all residences near Site 1 and Site 4, Exhibit 13. Mitigation requirements for the compressors are discussed in the minimum mitigation section. Exhibit 14 shows the noise level contours and the areas of construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A). The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will update the construction methods, schedule, and mitigation measures in their updated NMMP. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

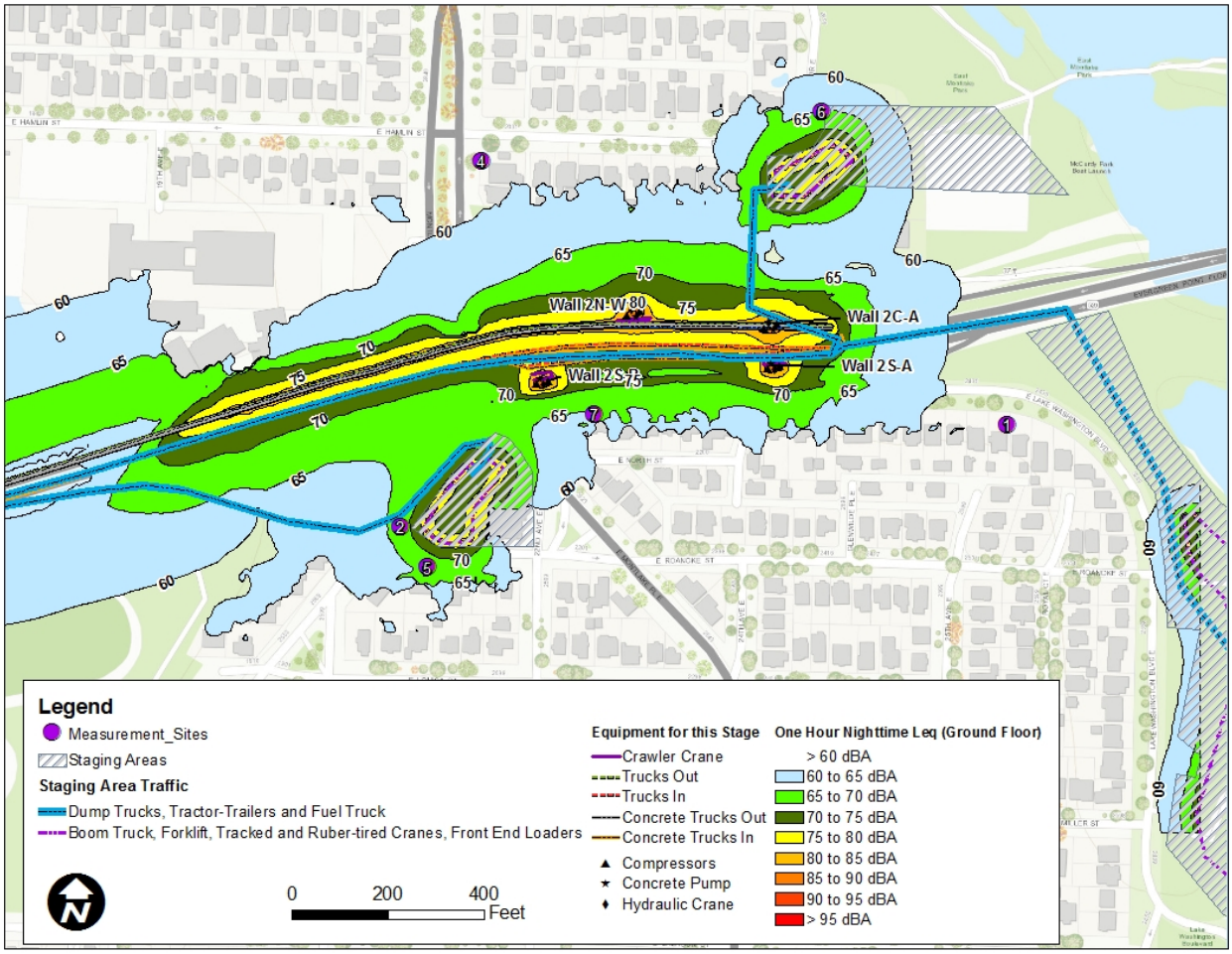
EXHIBIT 13. NIGHTTIME NORTH LID WALL AND CENTER LID CONSTRUCTION NOISE LEVELS WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
Max Locations without mitigation	62 near Site 1	67	72	77
	62 near Site 4	66	72	76

Note: Noise levels are hourly averages.

Exhibit 13 shows that areas that are expected to exceed the noise level limits, without mitigation, would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 14. NIGHTTIME NORTH LID WALL AND CENTER LID CONSTRUCTION NOISE CONTOURS WITH MITIGATION



Nighttime modeled noise levels during construction of the North Lid Wall (identified as wall sections 2N-W and 2S-B), and the Center Lid Wall (identified as wall sections 2C-A and 2S-A) using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase – North, South, and Center Lid Walls

The modeled noise levels for the construction of the Montlake structure are shown in Exhibit 15. The model included the construction activities for the North Lid Wall (identified as 5N-A), the South Lid Wall (identified as 5S-A), the Center Lid Wall (identified as Wall 5C-A), and construction of the Montlake lid adjacent to Montlake Boulevard E. Although each activity would occur over a period of three to four months, they would have different start dates, and are currently estimated by WSDOT to all overlap for approximately one month. Equipment used for each activity was estimated to include a hydraulic crane, crawler crane, concrete pump, two compressors, and five concrete trucks. Without mitigation, modeled noise levels would exceed the proposed L_{eq} noise level limit at Site 7, and for a few residences near Site 4 and Site 7. The loudest constructed noise level is identified in Exhibit 15. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedances. Mitigation was evaluated for residences near Site 4 and Site 7.

EXHIBIT 15. NIGHTTIME NORTH, SOUTH, AND CENTER LID WALLS MODELED NOISE LEVELS WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	61	67	71	77
2	59	78	69	80
3		62		72
4	65	66	75	76
5	63	65	73	75
6	57	63	67	73
7	67	66	77	76
Max Unmitigated Location	69 near Site 4	66 (same as Site 4)	79	76

Note: Noise levels are hourly averages.

Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers. Noise levels were also modeled using compressors with mitigation (Exhibit 16) to confirm that the contractor can reduce noise levels below the nighttime noise level limit for all residences. Exhibit 17 shows the construction activities for the North Lid Wall (identified as 5N-A), the South Lid Wall (identified as 5S-A), the Center Lid Wall (identified as Wall 5C-A), and construction of the Montlake lid adjacent to Montlake Boulevard E. The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will detail construction methods, schedule, and mitigation measures in their updated NMMP. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

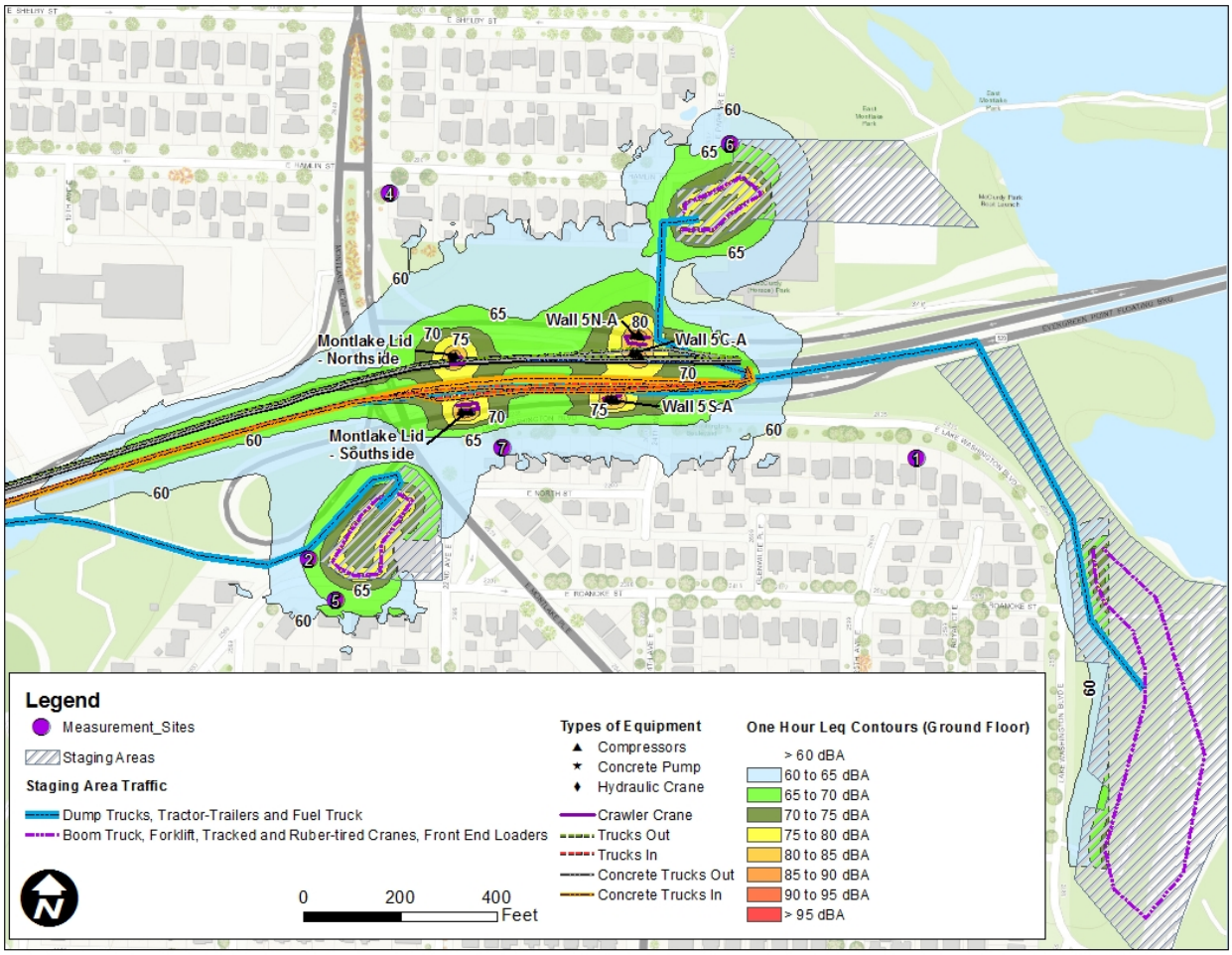
EXHIBIT 16. NIGHTTIME NORTH, SOUTH, AND CENTER LID WALLS MODELED NOISE LEVELS WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
7	62	66	72	76
Max Unmitigated Locations	60 near Site 4	66 (same as Site 4)	70	76

Note: Noise levels are hourly averages.

Exhibit 16 shows that areas that are expected to exceed the noise level limits, without mitigation, would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 17. NIGHTTIME NORTH, SOUTH, AND CENTER LID WALLS MODELED NOISE CONTOURS WITH MITIGATION



Nighttime modeled noise levels during construction of the North Lid Wall (identified as wall section 5N-A), the Center Lid Wall (identified as wall section 5C-A), and the South Lid Wall (identified as wall section 5S-A) using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase 3B – Demolition of Existing Montlake Blvd. E. Structure

Demolition of the existing Montlake Boulevard E. structure is estimated to take one month. Equipment modeled during nighttime hours was estimated to include two excavators with crushers, three compressors, five dump trucks, one loader, fifteen debris trucks, and one excavator with thumb. Excavators with impact hammers would be used during daytime hours, but impact work is not allowed during nighttime hours; therefore, impact hammers have not been modeled during the nighttime. Modeled noise levels are shown in Exhibit 18. Without mitigation, modeled noise levels would exceed the L_{eq} noise level limit at Site 7, the loudest constructed noise level is near Site 7. Compressors were the piece of equipment responsible for the nighttime L_{eq} exceedance. Mitigation was evaluated for residences near Site 7.

EXHIBIT 18. NIGHTTIME DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE WITHOUT MITIGATION

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
1	54	67	64	77
2	61	78	71	80
3	-	62		72
4	66	66	76	76
5	63	65	73	75
6	62	63	72	73
7	69	66	79	76

Note: Noise levels are hourly averages.

Noise levels were also modeled using compressors with mitigation, (Exhibit 19), to confirm that the contractor can reduce noise levels below the nighttime noise level limit for all residences near Site 7. Exhibit 20 shows the noise level contours and construction activities locations for demolition of the existing Montlake Boulevard E. structure with mitigation. Mitigation requirements for the compressors are discussed in the minimum mitigation section. Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers. The contractor could choose other mitigation measures as described in the compliance section below to reduce the noise level below the nighttime limits. The contractor will detail construction methods, schedule, and mitigation measures in their updated NMMP.

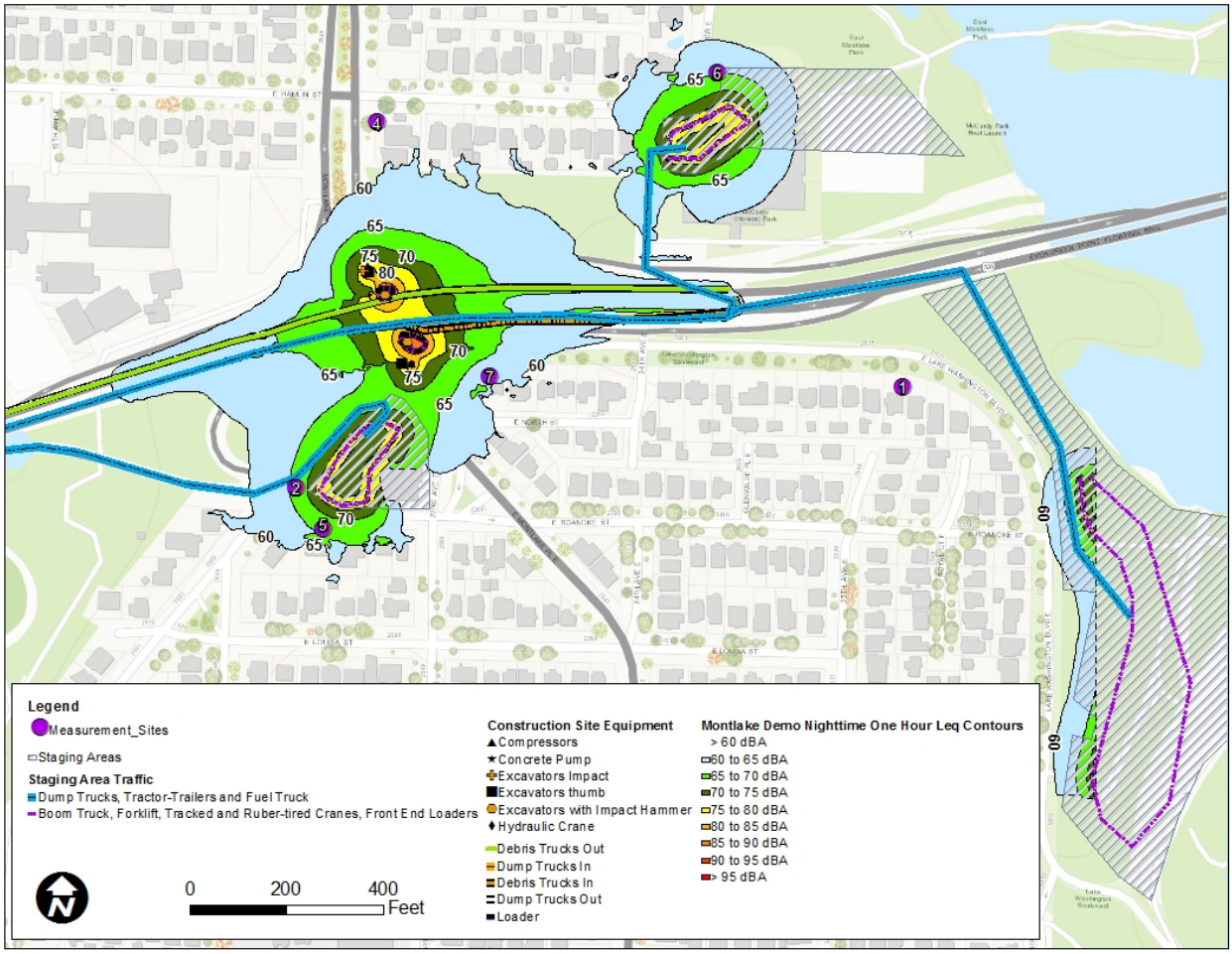
EXHIBIT 19. DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE WITH MITIGATION

Site	L_{eq} Modeled Noise Level With Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels With Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
7	60	66	70	76

Note: Noise levels are hourly averages.

Exhibit 19 shows that areas that are expected to exceed the noise level limits without mitigation would meet the proposed noise level limits if compressors with mitigation were used during construction. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

EXHIBIT 20. DEMOLITION OF EXISTING MONTLAKE BLVD E. STRUCTURE WITH MITIGATION



Nighttime modeled noise levels during the demolition of the existing Montlake Boulevard E. structure using compressors with mitigation would meet the proposed noise level limits at all residential locations. Mitigation requirements for the compressors are described in the required minimum mitigation measures section.

Montlake Phase – Shaft Installation for WABS

Non-impact shaft casing installation for the WABS structure construction is anticipated to take six months and would be the loudest activity along the WABS corridor. Nighttime noise levels were modeled near Site 3. Equipment modeled during nighttime hours include a crawler crane, two welders, a diesel generator, a drill rig, a vibratory pile installer, eight concrete trucks, and one concrete pump. Noise levels would be below the L_{eq} noise level limit (Exhibit 21) without mitigation. No nighttime L_{eq} exceedances are expected in this phase of construction, as modeled.

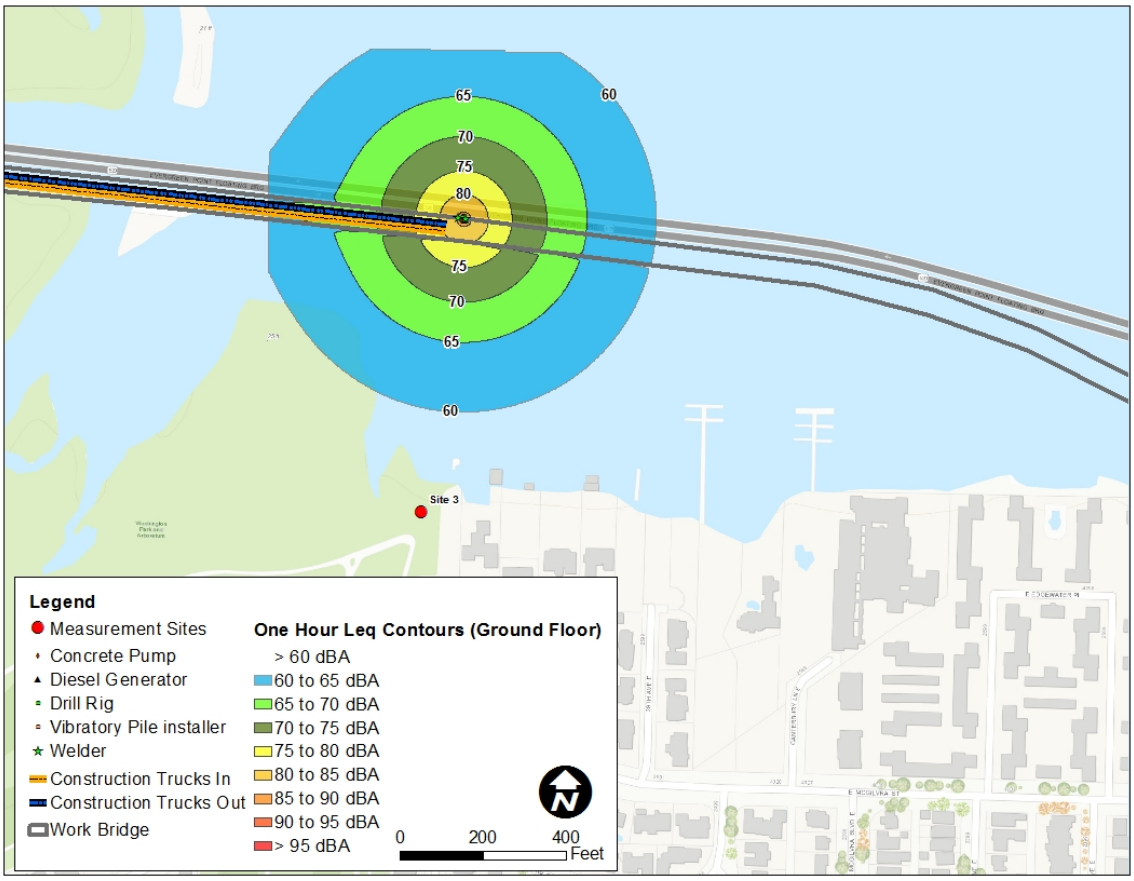
EXHIBIT 21. NIGHTTIME SHAFT INSTALLATION FOR WABS

Site	L_{eq} Modeled Noise Level Without Mitigation (dBA)	L_{eq} Proposed Noise Level Limit (dBA)	L_1 Modeled Noise Levels Without Mitigation (dBA)	L_1 Proposed Noise Level Limit (dBA)
3	59	62	69	72

Note: Noise levels are hourly averages.

No mitigation would be needed to meet the proposed nighttime noise level limits for this phase of construction. Noise contours are shown in Exhibit 22**.** Modeled equipment locations were selected to represent noise levels when equipment is located nearest noise-sensitive receivers.

EXHIBIT 22. NIGHTTIME SHAFT INSTALLATION FOR WABS NOISE LEVELS



Proposed Noise Mitigation Measures

Required Minimum Mitigation Measures

The contractor will perform the following minimum mitigation measures to minimize nighttime construction noise, except in the case of emergency, as defined by the Seattle Noise Control Ordinance (SMC 25.08.110), whenever the contractors work between 10 p.m. and 7 a.m. Monday through Friday, or between 10 p.m. and 9 a.m. Saturday through Sunday and legal holidays, and exceeds the local ordinance noise levels:

- The contractor will meet the noise levels limits established in the noise variance.
- The contractor will use broadband or strobe backup warning devices, or use backup observers in lieu of backup warning devices for all equipment, in compliance with Washington Administration Code, Sections 296-155-610 and 296-155-615. For dump trucks, if the surrounding noise level is so loud that broadband or strobe backup warning devices are not effective, then an observer must be used (WAC 296-155-610). This condition will apply to activity conducted between 10 p.m. and 7 a.m., Monday through Friday, and between 10 p.m. and 9 a.m. on Saturday, Sunday, and legal holidays. No pure-tone backup warning devices will be used after 10 p.m. and before 7 a.m. weekdays or 9 a.m. weekends and legal holidays.
- The contractor will not conduct impact work, such as auger shaking, jack hammering and impact pile driving, during nighttime hours from 10 p.m. to 7 a.m. on weekdays and 10 p.m. to 9 a.m. on weekends and legal holidays.
- The contractor will use compressors with a measured noise levels of 71 dBA at 50 Feet or less for areas where modeling showed mitigation for compressors was needed to reduce noise levels below the noise level limit. The contractor will have an option to propose alternative mitigation methods providing equivalent sound attenuation, such as surrounding the compressor with a temporary noise wall or baffle system to meet the noise level limits.
- The contractor will pave construction access roads and haul routes near residences where possible to reduce dust and noise.
- The contractor will securely fasten truck tailgates.
- The contractor will use sand, rubber or plastic lined truck beds for all haul-trucks to reduce noise, unless an exception is approved by WSDOT.
- The contractor will not use compression brakes.
- The contractor will not leave equipment to idle for longer than five minutes,
- The contractor will use temporary noise mitigation shields, enclose, or use low noise-generating stationary equipment, such as light plants, generators, pumps, and air compressors near residences where practical.

Additional Noise-Control Measures

The contractor will submit to WSDOT an updated NMMP to reflect their specific construction means and methods and will detail the additional mitigation measures needed to meet the noise level limits established in the noise variance. Once WSDOT has reviewed and accepted the NMMP, the contractor will submit it to SDCI. Additional mitigation measures that the contractor could also use as necessary are listed below:

- Equip nighttime surface equipment with high-grade engine-exhaust silencers and engine-casing sound insulation.
- Use electric welders powered from utility main lines instead of gas, diesel, or internal combustion generators/welders.
- Use critical or double mufflers where practicable on machinery for off-road use, such as cranes.
- Use noise blankets, skirts, or other available means for mobile equipment to mitigate noise that does not unreasonably interfere with the operation of the engine.
- Use temporary mobile noise barriers in the immediate vicinity of loud activities nearby residences.
- Use temporary noise barriers.
- Provide earplugs and white noise machines to residents near the project area.
- Install temporary sound dampening drapes for residents.
- Provide hotel rooms for residents during high impact or extremely noisy operations.

WSDOT will coordinate any temporary noise barrier locations and sound dampening drapes use with the contractor and nearby residences. WSDOT heard through recent outreach with frontline neighbors that several residences do not want noise walls if it interferes with views, parking, and aesthetics.

Compliance Monitoring and Reporting

Director's Rule 3-2009, Section C.2, requires that WSDOT provide for an Independent Noise Monitor (INM), who may be an individual, firm, or contracted staff member within SDCI independent from the contractor whose responsibility is to oversee the monitoring of sound levels from construction covered by the MPPCNV and to report directly to the SDCI Coordinator for Noise Abatement. WSDOT plans to dedicate the resources needed to have a WSDOT trained inspector on-site to perform the duties of the INM.

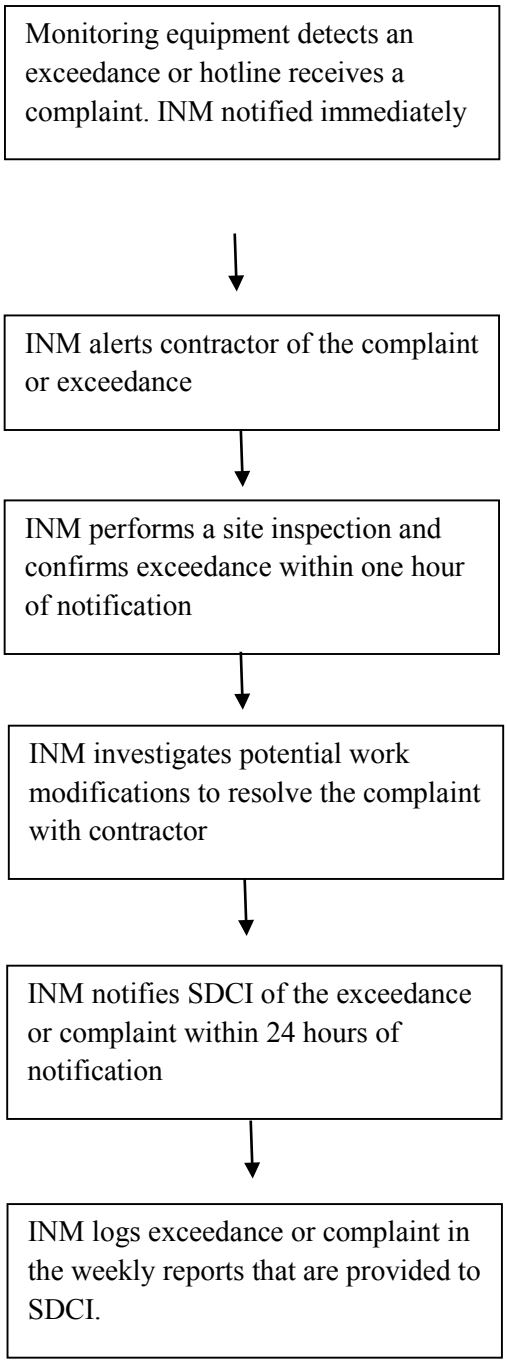
The contractor will update the Noise Monitoring Plan based on the NMMP submitted by contractor. The contractor will take noise measurements continuously during nighttime hours using automated noise monitoring equipment that is consistent with the American National Standards Institute Standards to Type 1 and that allows for remote access to real time results available to SDCI, WSDOT, and the contractor. The noise monitoring equipment will have the capability to log continuous L_{eq} and L_1 sound levels and to initiate a recording of audio files when the L_{eq} or L_1 sound-level thresholds are exceeded. Sound level thresholds will be set at 5 dBA below the MPPCNV nighttime L_{eq} and L_1 noise levels limits. The Noise Monitoring Plan will identify the type and location of monitoring equipment, and will identify the INM. There will be a minimum of three noise monitoring stations placed at or near the residences affected by the Montlake lid construction when construction is occurring during nighttime hours. Generally, monitors will be placed at 3 locations in the project area, one between Site 2 and Site 5, one between Site 1 and Site 7, and one between Site 4 and Site 6 at or near the residences closest to the nighttime construction work. A fourth monitor will be placed near Site 3 for the WABS construction during WABS construction. Monitors will be activated and relocated as appropriate to provide data for the nearest affected residences when nighttime construction occurs. Monitoring data will be available for public review.

If the monitoring equipment detects an exceedance of the MPPCNV nighttime noise level limits, or if a caller to the hotline has a noise-related complaint and requests additional information, the INM will be notified. The INM will be on-site during all periods of scheduled night work. If the INM receives a complaint call during nighttime work hours, the INM will notify the contractor and other WSDOT inspection staff on the job, perform a site inspection within 60 minutes of receiving the complaint, conduct short-term noise measurements (minimum 15 minutes per location) while on-site to confirm whether an exceedance of the MPPCNV sound-level limits is occurring, and investigate potential work modifications to resolve the complaint. INM's regular duties include, but are not limited to:

- Coordinating with WSDOT and contractor's night time crews about planned work operations.
- Coordinating with WSDOT Communications Team and Ombudsman on any updates or concerns from neighborhood and residents.
- Coordinating with SDCI on any questions or concerns from the City regarding project noise.
- Conducting nightly verification of fixed noise monitoring stations with hand held noise monitor to validate noise monitoring results from the fixed locations.
- Conducting regular spot-check noise monitoring at various locations of the project site with hand held monitor.
- Addressing noise exceedances and monitoring alarms in the field.

The Noise Monitoring Plan will also include a provision to generate weekly and annual reports that are required as part of Director's Rule 3-2009. The reports will be provided to SDCI and will include any monitored L_{eq} and L_1 exceedances, noise complaints logged in the program database, and work modifications completed to resolve complaints. The reporting structure for noncompliance or a noise complaint is detailed in Exhibit 23.

EXHIBIT 23. REPORTING STRUCTURE FOR NON-COMPLIANCE



Public Outreach and Community Involvement

WSDOT believes public involvement is essential to a project's development and has implemented a comprehensive and ongoing public involvement program for the SR 520 Bridge Replacement and HOV Program. During construction of the Montlake Phase, WSDOT's communications team, in coordination with the City of Seattle and the selected contractor, will provide up-to-date information on construction activities and construction noise to neighbors and stakeholders.

WSDOT's approach to construction communications and descriptions of the various communications tools and activities are included below. WSDOT will keep the public informed of construction activities, promote two-way communication with the community, and work to minimize construction impacts.

As part of preparing for construction in the Montlake area in 2018, WSDOT has hired a full time SR 520 Ombudsman to support WSDOT's commitment to public involvement. The SR 520 Ombudsman serves as a strategic liaison between WSDOT, the Seattle communities affected by construction of the new SR 520 corridor, and the elected officials who represent these communities. More information is available on the Ombudsman page of the SR 520 website.

The key elements of the Montlake Phase communications plan are outlined below.

Written Materials

WSDOT uses a variety of written materials to provide advance notification and keep people informed of construction activities. All written materials have program contact information, including the email address, website, and the 24-hour live telephone construction hotline number. Examples of these types of materials include:

- Fact sheets to provide background information for the type of work occurring and project benefits.
- Fliers which are often delivered door-to-door when there are localized construction impacts.
- Mailers which are sent to neighbors in compliance with permitting requirements.

In-person Public Engagement Activities

WSDOT provides a wide range of opportunities for community members to connect face-to-face with SR 520 Program staff. These opportunities provide an additional way for the public to voice questions and concerns regarding the SR 520 Program.

Recent in-person events and meetings

- WSDOT hosted monthly public construction meetings in advance of and throughout the construction of the West Approach Bridge North.
- In preparation for the Montlake Phase nighttime noise application, WSDOT hosted a public meeting on 2/28/17 to provide an opportunity for community members to learn about the application process and share concerns about construction noise for the Montlake Phase.
- The SR 520 Program attended the University District Street Fair and the Fremont Fair in May and June 2017 as part of broader community outreach.

Planned and ongoing in-person events and meetings:

- Pre-construction outreach with the future project contractor prior to the beginning of major construction activities.
- Public construction meetings provide timely updates on construction progress and upcoming activities throughout Montlake Phase construction.
- SR 520 Program briefings provided to community groups as requested.
- During established hours, a Montlake Phase storefront will serve as an in-person location for neighbors to receive answers to construction-related questions. The Montlake Phase storefront is the first of its kind for the SR 520 Program.

Online and Electronic Communications

WSDOT uses a combination of the following online and electronic communications to keep community members informed of upcoming and ongoing construction activities:

- WSDOT maintains an electronic mailing list, and regular e-mail updates are sent to provide status updates and information on current activities.
- The project website is updated regularly and provides the latest design and construction information.
- WSDOT collaborates with other agencies and organizations to provide information in their respective e-mail updates or websites.
- SR 520 social media accounts are maintained on Twitter, Flickr, and YouTube.
- The 24-hour live telephone construction hotline will be maintained for the Montlake Phase project. Real-time responses to immediate concerns and updates of the project status and current construction activities and impacts will be provided.
- During business hours, community members may contact the SR 520 Program Information Line for non-urgent, general project information.
- Detailed responses will be provided to emails received via the project e-mail address.
- Highway advisory radio, variable message signs, active traffic management signs, and project identification signs will be used as needed.

Media Relations and Social Media

WSDOT is able to reach a wide range of public located along the SR 520 corridor through the following means of mass communication:

- Community blogs and newspapers;
- Regional print and broadcast media outlets;
- And regular use of Twitter and Flickr social media accounts.

Frontline resident outreach

In addition to the above mentioned communications and outreach methods, WSDOT is continuing to collaborate with frontline neighbors to identify and implement measures in an effort to minimize SR 520 construction effects. WSDOT initiated this level of tailored outreach during the West Approach Bridge North construction phase and worked with neighbors to identify and implement the following measures:

- Offered air conditioning in July 2015 resulting in the installation of air conditioning units in a frontline neighbor's home in August 2015 and issuance of stipends for electricity reimbursement. Also installed air conditioning units in a second neighbor's home in May 2017.
- Installed a temporary noise monitor onsite, adjacent to neighbors, in June 2016.
- In September 2016, offered neighbors the installation of Connex storage boxes along the construction site perimeter to further shield the neighborhood from construction activity noise prior to construction work moving closer to the area. The neighborhood declined this option in November 2016.
- Responded to and investigated hotline calls and email comments addressed to WSDOT.

WSDOT has continued outreach efforts with frontline neighbors as we prepare for Montlake Phase construction. Approximately 68 residences have right of way that touches WSDOT's SR 520 corridor right of way and will be directly affected by nighttime noise. Our recent outreach with neighbors living adjacent to the SR 520 highway has resulted in the following, key best management practices that WSDOT will employ in the Montlake Phase construction:

- Installing construction screening and vegetation to help shield neighbors from construction. WSDOT plans to install the screening along the WSDOT right-of-way adjacent to the Shelby/Hamlin neighborhood, as well as south of the eastbound SR 520 on-and off-ramp in Montlake. Some of this vegetation will be planted later this year.
- Paving of access roads where possible to reduce dust and noise.
- Prohibiting the contractor from parking in residential areas, and working with the contractor to identify off-site parking for the contractor.
- Requiring the contractor to develop and adhere to a construction area management plan which will include the procedures and policies for staging site operations. Included topics could include: delivery procedures, guidelines for lighting, dust control, site cleanliness, parking, and methods to limit "nuisance noise".

Conclusion

WSDOT is completing the application process for a nighttime noise variance because construction crews will work at night within the City of Seattle limits during the Montlake Phase. Nighttime construction work is necessary to avoid disrupting weekday traffic and to provide a safe environment for construction crews and the traveling public. Since nighttime work will be required, WSDOT would receive this variance from SDCI to set limits on the noise levels for nighttime construction activities.

The noise limits proposed in the updated noise variance application for the Montlake Phase are based on WSDOT and SDCI noise variance coordination efforts which started in fall 2016 and a review of prior SDCI decisions on MPPCNV applications, tailored specifically for major public construction projects, from agencies including WSDOT, Sound Transit and the Seattle Department of Transportation. By applying for a nighttime noise variance, WSDOT is complying with City of Seattle noise code for major public projects. This NNMP demonstrates that means and methods are available to meet the noise limits requested in the MPPCNV.

The SR 520 program is enhancing safety by replacing the highway's aging bridges and keeping the region moving with vital highway and transit facility improvements throughout the corridor. WSDOT understands that constructing this project in a dense, urban environment has an effect on those who live, work, and play in the Montlake neighborhood. This variance requires WSDOT to implement nighttime noise limits, requires our contractor to implement noise-control measures, and ensures appropriate monitoring and enforcement of our nighttime construction activities, while also ensuring the safety of the public and our crews.

Appendix A: Noise Monitoring Data

Appendix A

Raw Existing Baseline Noise Monitoring Data

Noise Management and Mitigation Plan for SR 520 Montlake Phase and WABS

Prepared for

Washington State Department of Transportation

Lead Author

Ginette Lalonde
WSP USA

July 6, 2017

Appendix A

Table A-1: Existing Sound Levels at Site 1 Lake Washington Boulevard																														
	Leq															**Lmax**														
	Mon, Oct 17	Tue, Oct 18	Wed, Oct 19	Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thur, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31	Mon, Oct 17	Tue, Oct 18	Wed, Oct 19	Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thur, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31
0:15:00		60.1	61.4	61.6	62.9	64.5	65	61.2	60.4	60.6	60.7	60.5	65.3	66.2	59.3		73	73.9	72.1	76.5	74.1	74	74.6	71.6	72.1	74.6	71.3	82.5	73.4	74.1
1:15:00		57.9	59.6	60.1	61.3	63.2	63.2	58.3	58.8	58.2	58.1	58.7	64.5	65.1	57.2		71.2	77	73.9	75.1	74.4	72.8	76.7	71.9	72	73	71.4	74.5	73.9	73.7
2:15:00		56.6	59.6	59.9	58.4	61.9	61.7	57.3	57.3	56.9	56.7	58.2	62.9	63.7	56.1		72.4	74.3	74.3	73.1	73.5	73.9	73.2	72.4	74.6	71.3	73	80.1	73	72.8
3:15:00		56.9	60.4	60.4	58.8	59.3	58.1	58.3	58.7	57.4	57.1	57.4	60.6	60.8	56.5		73.8	76.1	75.6	72.9	76.1	73.5	74.4	73.2	72.5	73	73.2	75	72.4	71.8
4:15:00		61.5	64	62.5	62.1	59	56.9	62.3	62.4	61.5	60.9	61.4	59.5	58.9	60.6		75.5	78.4	76.3	77	74.7	72	75.9	74.2	72.4	74.2	77.6	76.9	73.1	74.1
5:15:00		65.6	67.5	66.5	66.2	60.7	58	66.2	66.2	65.1	66.2	65.6	60.4	58.9	64.7		76.3	76.9	77.4	76.4	74	71.2	78.9	78.5	74.8	75.1	73	71.1	72.3	77.4
6:15:00		70.3	71.2	70.1	70.9	63.8	62.7	70.5	70	69.1	69.7	69.2	62.2	61.5	68.9		79.4	80.4	79.2	80.9	74.3	74.6	77.3	80.4	80.3	80.1	80.4	77.8	73.2	76.2
7:15:00		70.4	70.8	69.9	72.4	67.9	64.7	70.9	69.2	68.9	68.9	70.7	65.3	63.8	68.6		81.5	77	76.4	84.4	76.2	74.2	79.2	78.6	77.3	78.1	86	83.4	75.6	75.9
8:15:00		69.7	68.4	69.3	72.1	69	66.9	67.9	67	69	67.1	69	66.8	67.1	68.3		82.2	75.5	79.8	86	79.7	77	81.2	80	78.6	74.8	77.8	78.3	74.9	78.4
9:15:00		71.4	71.6	69.1	71.8	70	68.8	71.6	70.5	69.8	70.5	70.8	68.4	69	69.7		77.9	81.9	81.2	82.6	81	81.8	82.8	77.5	79.5	80.9	76.5	75.3	79.2	80.5
10:15:00		70.3	71	70.6	70.9	70.5	70.5	70.9	69.2	70.4	68.9	70.5	68.9	69	69.1		77.4	81.9	79.2	78.7	82.9	76.3	79.8	81.4	78.5	81.1	79.9	75.9	76.4	75.9
11:15:00		69.9	71.5	70.3	70.7	70.6	70.6	70.8	68.7	69.7	69.8	71.1	69.2	69.5	68.9		84.6	83.3	83.2	82.2	79.9	78.2	77.4	82.7	78.9	78.7	85.1	75	84.9	79.7
12:15:00		69.6	71.1	69.9	70.2	70.1	70.4	69.8	68.4	69.6	68.9	71.3	69.7	69.4	68.7		78.2	82.7	79	81.7	83.2	76.7	78.4	82.4	78.2	79.7	85.8	75.8	78.3	80.9
13:15:00		69.7	70.8	69.8	70	69.6	70.3	69.4	68.5	69.6	69.6	69.9	69.4	69.2			77.7	84.3	88	84.1	80.8	81.8	83.7	79.3	85.3	83.5	86	76.1	80.6	
14:15:00		70.1	70.5	71	70.6	69.8	70		68.6	69.6	69.3	70.4	69.3	69.2			76.6	80.9	85	82.7	83	78.2		74.6	75.2	85.7	76.4	83.4	76.4	
15:15:00		70.2	71.1	70.9	70.3	70.6	71	69.5	69.1	69.7	69.7	71.2	69.8	69.3			78.9	77.5	78.7	78.7	82.3	79.1	76.9	91	80.9	83.4	84.9	84.9	75	
16:15:00	70.8	70.7	71.9	71.4	70.3	71	70.7	70.4	69.5	70.5	70	70.6	69.7	69.1		86	80.4	79.6	78.4	76.5	84.6	78.3	98.6	79.4	80.1	76.8	83.6	80.9	83.9	
17:15:00	71.2	71	71.8	71.2	70.1	70.5	70.1	69.7	70	69	69.7	70.2	69.5	68.3		90.9	75.4	80.3	79.5	81.3	82.7	77.8	80.6	78.6	76.4	78.7	82	77.5	74.1	
18:15:00	70	70.5	71.1	70.2	69.4	70.4	68.6	69.1	69.5	68.2	68.4	70.5	68.6	67.5		84	83.4	101.1	76.3	76.3	94.2	76	77.4	78.5	74.8	85.8	82.9	74.4	77	
19:15:00	68.4	69.1	69.2	69.4	68.8	68.7	67.5	68.1	68.4	67.8	68.1	69.7	68.4	66.5		75.2	78.2	76.7	75.7	75.8	79.8	78.1	75.1	77.2	78.2	74.3	81.2	74.2	74	
20:15:00	67.5	68.7	68.9	69.3	67.6	68.8	66.8	67	67.9	66.8	67.9	68.5	67.8	66.1		75	77.6	83.2	78.5	75.6	80.5	76.3	74.7	74.6	74.3	74.7	75.8	73.7	73.6	
21:15:00	66.7	67.8	67.1	68.4	67.9	69.1	68.1	66	67.2	66.2	68.2	68.8	67.6	65.3		84.2	77.3	76.3	81.8	77.5	81.4	77.6	82.3	75.7	74.3	84.8	77.8	74.4	73.6	
22:15:00	64.3	65.3	65.6	66.9	67.4	69.1	64.1	63.4	65.3	69.2	65.9	68.2	67.9	63		75.9	76.7	80.4	75.5	83.5	80	77.1	72.8	77.6	102.1	73.9	75.4	74.9	71.8	
23:15:00	62.4	64.6	64.9	64.5	66.6	67.2	62.9	62.7	63.8	62.5	63.5	66.4	66.8	61.4		79.6	75.6	79.6	77.3	85.2	78.9	74.7	71.9	81.5	83.2	74.2	73.7	73.8	72	

Table A-2: Existing Sound Levels at Site 2 Hop-In Market																														
	Leq															**Lmax**														
	Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thurs, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31	Tue, Nov 1	Wed, Nov 2	Thurs, Nov 3	Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thurs, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31	Tue, Nov 1	Wed, Nov 2	Thurs, Nov 3
0:00:00		75.2	75.4	73.7	73	74.3	74	74.5	65	67.4	67	67.1	69.4	71.2	68.9		83	83.2	80.5	83.1	79.5	83.3	79.5	88.2	87.4	80.7	76.3	74.3	75.6	74
1:00:00		75.1	75.2	72.7	72.9	74.6	74	73.2	64.1	66.9	66	66.4	69.3	71.1	69.2		82.2	84.5	78	82.1	80.2	80	79.9	77.4	79.9	82.7	77.5	76.4	75.2	73.7
2:00:00		75.1	75.2	72.4	72.8	74.5	74	73.1	63.5	65.9	64	66.3	69.4	71.1	69.4		79.4	87.1	77	80.7	79.5	79.4	89.3	75.1	77.7	74.8	83.9	74.8	74.1	74.7
3:00:00		75.1	75.1	71.8	72.7	74.3	73.8	73.1	63.7	64.6	63.7	67.8	69.2	71.2	69.6		79.6	79.1	85.3	78.5	79.4	78.6	80.6	76.2	75.1	75	82.8	73.1	75.7	74.8
4:00:00		75.1	75	71	72.8	74.4	74		65.1	64.4	63.9	69.5	68.9	71.1	69.7		79.9	79.8	76.2	80.5	79.5	79.2		81.4	81.6	72.4	83.7	74.1	77.7	75.9
5:00:00		75.4	75.3	72	73.8	74.9	74.6		67.5	65.2	65.3	70.1	68.2	70.9	69.4		81.4	87.4	78.7	89	81.4	81		83.8	78.9	81	82.4	75	76.7	75.5
6:00:00		75.8	75.2	72.4	76.2	75.3	76		69.3	65.7	66.6	71.4	68.6	71.3	69.2		92.7	82.4	82	84.5	83.6	84.3		93.4	76	73.2	91.9	75.2	81.1	76.8
7:00:00		76.5	75.2	72.6	76.4	76.8	76.5		70.2	67.5	68.4	72.2	69.6	71.7	70.3		86.3	80.7	78.5	87.8	85.7	88.4		83.6	77.9	84.5	92.5	77.8	80.1	83.5
8:00:00		76.6	75.4	75	76.6	77.4	77.4		69.5	69.6	69	71.3	69.5	70.3	69.3		85.9	84	103.7	87.2	89.7	84.4		84.8	80.3	83.8	84.2	79.5	78.2	75.5
9:00:00		76.2	75.7	73.2	77.1	77.5	77.4		69.7	70.2	68.9	72.2	69.6	70.1	69.1		84.9	83.6	82.2	103.5	87.6	87.4		87.3	92.9	77.3	87.6	76.4	79.1	81.8
10:00:00		76.2	76.2	73.9	77.2	76.9	76.5		69.8	70.2	69.3	73.3	69.5	70.1			84.2	85.3	88.1	99.1	87.8	82.3		87.8	81.2	80.2	99.5	76.8	77.6	
11:00:00		76.2	75.1	75.5	76.9	76.2	76.1		69.2	71.1	69.8	71.3	70.1	69.3			84.4	83.8	102.9	90	90.3	90.5		84.6	98.4	94.8	89.1	76.2	76.1	
12:00:00		76.9	76	74.3	76.8	75.7	76.4		69.3	70.9	74.3	71	70.1	70			87.8	97.8	90.1	88.2	83.4	91.1		84.9	81.4	104.6	88.6	77.1	77	
13:00:00		76.2	75.9	74.9	77.6	75.4	77.5		68.2	69.2	70.7	71.7	70.5	70.1			84.3	92.9	89.8	97.6	85.2	90.5		84.3	80.2	80.8	80.4	76.6	77.4	
14:00:00	76.3	76.5	75.2	75.1	76.9	76.7	77.1		69.4	68.6	70.6	72.5	71.2	70.7		84.4	85.7	90.7	85.3	81.8	104.8	83.6		85	84.6	89.3	81.3	78.7	78.7	
15:00:00	76.4	76.7	75	75.3	76.8	75.5	77.6	69.2	70.5	69.1	70.1	73.1	71.7	71.1		85.1	84.4	85.1	84.2	83.7	90.9	86.5	81.3	82.9	89.3	85.8	81.7	78.1	78.3	
16:00:00	76.5	77	75.2	75.1	77.5	76.4	77.4	69.2	70.8	69.2	69.6	73.5	72.4	71.4		87.1	85.9	90.6	81.4	88.6	81.9	85.2	87.5	86.4	78.9	78	85.2	79.9	79	
17:00:00	76.7	76.9	75.3	74.7	77.5	76.7	78.1	69	70.7	69.2	69.4	72.6	72.4	71.4		86	85.8	85.7	83.5	86.2	86.6	85.1	85.8	86.4	79.2	87.5	79.3	82.6	78.5	
18:00:00	76.7	76.6	75.3	74.6	76.9	77.8	77.7	68.8	69.6	70.3	68.7	71.7	71.8	71.3		85.1	85.2	83.8	81.1	82.5	94.3	97.2	83.9	87.4	100.6	81.9	82.1	81.6	76.6	
19:00:00	76.7	76.5	75.4	74.3	75.9	75.8	77.6	69.7	71.1	69	68.3	71.3	71.4	70.3		99.2	85.6	87.1	81.7	82.7	82.8	85.2	87	97.3	84.5	80.9	82	78	77.5	
20:00:00	76	75.9	75.4	73.7	75.6	75.2	77.5	71.5	67.9	68.8	69.2	70.3	71.3	69.8		82.2	85.8	100	79.5	82.2	82.8	86.3	100	87.8	87.6	76.1	86.8	77.5	75	
21:00:00	78.7	75.7	75.4	73.8	75.7	74.9	76.9	68.7	67.8	68.6	68.2	68.9	71.2	70.6		107.8	83.1	85.9	79.4	82.8	83.5	88.8	95.3	75.7	74.9	75.3	79.7	76.2	75.6	
22:00:00	75.5	77.4	75.2	73.2	75.6	76.3	77.2	67.6	68.6	68.2	68.2	68.5	71.2	70.4		87.7	107	82.9	82.5	81.1	88.2	86.2	82.5	82.4	78.5	87.8	77.4	75.7	75.8	
23:00:00	75.4	75.5	74.9	73.1	74.8	74.5	76.1	66.2	68.2	67.3	67.6	70	71.2	69.2		80.2	87.6	89.4	77.6	81.2	80	82.4	81	81.6	75	77.1	78.8	75.7	74.8	

Table A-3: Existing Sound Levels at Site 3 Beaver Lodge																															
	Leq																**Lmax**														
	Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thurs, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31	Tue, Nov 1	Wed, Nov 2	Thurs, Nov 3		Thurs, Oct 20	Fri, Oct 21	Sat, Oct 22	Sun, Oct 23	Mon, Oct 24	Tue, Oct 25	Wed, Oct 26	Thurs, Oct 27	Fri, Oct 28	Sat, Oct 29	Sun, Oct 30	Mon, Oct 31	Tue, Nov 1	Wed, Nov 2	Thurs, Nov 3
0:00:00		56.8	57.8	60.6	56.4	56.9	58.3	55.1	46.8	62.3	63.3	55.9	59.3	55.5	44.9		70.3	66.3	65.7	67.1	64.4	67.8	71	55.3	67.3	68.7	76.4	73.3	67.9	69	
1:00:00		54.5	55.8	58.3	53.9	55.1	55.5	52.9	45.8	61.1	62.2	53.8	55	52.4	41.9		66.8	69.7	74.3	65.7	70	64.8	65	57.7	74.7	70.1	74.3	71.6	68.1	68	
2:00:00		52.3	55	56.2	52.3	55.3	54.6	52	45.7	60.3	60.5	52	56.8	51.7	41.7		67	65.6	66.4	60	65.1	65.3	65	58.6	71	67.4	71.5	71	66.1	64.2	
3:00:00		52.4	53.8	55.5	53	54.6	55.3	53.3	47	57.9	58.7	52.4	59.1	52	42.3		66.7	77.5	67.9	64.6	71.1	68	64.3	58.3	66.4	67	69	71.6	67.7	62.8	
4:00:00		55.4	55	52.8	56.7	55.6	59.3	55.4	50.3	56.1	55.7	55.4	57.8	55.9	43.5		67.3	62.8	70.3	67.8	66.4	67.8	68.1	60.1	65.5	64.2	71.7	76.9	68.6	63.9	
5:00:00		59.4	58.1	51.7	60.4	59.5	61.1	59	55.4	55.6	54.8	58.3	60	58.5	46		69.4	68	67.9	70	68	67.7	71.4	63.8	66.5	71	72.6	74.3	65.6	65.2	
6:00:00		63.1	60	56.9	65.5	62.9	65	64.5	60.5	58.1	57.9	62.6	63	63.3	50.1		68.3	67.2	65.7	72.5	68.4	70	69.1	69.7	65	66.9	71.9	72.2	69.2	57.7	
7:00:00		67.4	65.2	60.4	66.9	63.4	64.4	65.4	61.9	61.1	60.7	62.4	63.8	63.9	52.7		73.3	72.8	68.4	74	73.1	73.6	69.5	70.7	74.5	68.7	71.1	72.7	72.1	60.9	
8:00:00		67.4	65.9	62.3	62.7	62.9	64.2	63.3	61.1	61.6	63.2	63	62.6	64.2	50.6		76.9	73.1	70.5	67.8	70.6	73.7	74	67.8	69.1	72.5	80.9	75.1	73.6	70.3	
9:00:00		65.4	64.3	61.8	66.3	63.8	66	65.5	62.1	62.4	64.2	64	63.1	64.8	49.1		72.9	70.9	68.9	70.5	72.7	74.2	70.6	68.4	70.4	72.1	77.6	75.8	70.9	63.6	
10:00:00		64.1	64.7	63.4	65.6	63	66.5	65.4	62.6	63.3	64.4	63.5	64.6	64.6	59.2		76.3	74.1	72.2	73.7	73	76.4	69.5	70.1	79.6	69.7	76.4	73.5	71.5	92.7	
11:00:00		63.8	64.6	63.8	64	61.7	65		63.7	62.9	64.4	63.3	63.1	64.7	76.2		74.7	73.3	69.5	72.1	70.2	73.8		70.5	68.5	73.7	71.9	71	72.1	100	
12:00:00		63.5	64.5	64.3	62.5	61.6	64.4		63.7	63.1	64.7	63.2	63.1	64.7			75.8	82.9	71.8	70.6	69.2	73.5		74.7	71.5	70.4	78.5	71.7	73.1		
13:00:00		63.1	62.5	64.2	62	61.5	64.3		63.7	62.7	65.3	63.5	62.6	64			72.4	72.7	76.3	72.2	72.8	72.4		71.6	72.1	74.3	82.7	75.5	73.3		
14:00:00	63.4	63.1	63.3	63.7	62.6	61.6	64.8		63.7	62.6	65.3	62.5	62.7	64.5		70.7	72	73.9	68.2	78	82.6	72.4		76.6	75.9	72.4	74.7	72.5	70.5		
15:00:00	63.4	62.5	63.4	64.9	64.1	62	64.5		64	63	65.1	62.7	63.3	65.1		70.1	73.8	68.6	72.2	78	71.1	74.3		71.4	71.4	74.8	72.6	67.6	72.4		
16:00:00	62.3	63.3	64.6	65.1	62.2	61.9	64	49.8	64.9	64.4	64.8	63.3	63	65.3		70.7	73.8	71.2	76.6	70.8	74.8	75.8	60.9	76.7	74.9	70.4	72.8	68.6	72.3		
17:00:00	62.6	63.5	65.5	65.5	63.7	62.3	64.4	50.8	66.1	65.6	63.4	62.5	62.7	64.9		73	74.7	73.8	82.6	73.4	67.7	75.3	63.8	80.9	73.7	68.3	77.3	71.4	75		
18:00:00	63.6	61.8	66.3	64	62.5	63.6	61.2	49.6	66.5	66.2	63.6	61.9	62.5	51.2		76.6	66	73.3	72.7	67.5	72.9	75.6	61.2	84.8	70.3	67.6	74.6	68.2	58.2		
19:00:00	63.1	61.7	65.6	63.1	62.8	63.6	62.2	49.3	64.9	65.7	62.6	61.1	61.4	49.4		68.2	66.2	79.1	68.7	71.5	69.1	72.9	59.1	72	69.2	71.3	68.3	67.6	57.2		
20:00:00	63.6	60.5	65.6	62	63.5	62.5	61.5	49.7	62.7	64.9	61.8	62	61.2	48.2		74	77.9	74.1	67.9	68.2	68	71.3	58.2	73.1	73.1	71.7	69.1	68.6	55		
21:00:00	64.5	60.2	64.6	63.7	62.5	64	61.2	49.7	62.4	65.6	60.9	61.8	62.1	47.6		81.1	65.7	69.5	70	69.1	72.2	70.4	60.2	67.7	72.1	79.3	72.7	69.7	54.4		
22:00:00	62	59.9	63.3	59.3	61.1	62.8	67.5	48.7	64.4	64.9	57.6	60.9	59.7	46.6		67.3	71.2	67.7	67.3	70.7	70.5	79.4	59.6	71.1	70.5	79	71.2	66.3	64.4		
23:00:00	59	59	62.8	57.8	59.5	61.3	60.8	47	64.3	64.1	56.3	61.2	58.4	44		67	75.2	78.2	66.4	67.1	75.4	71.8	57.6	70.4	68.8	78.4	74.7	67.2	64.8		

Table A-4: Existing Sound Levels at Site 4 Residence at 2740 Montlake																								
	Leq												**Lmax**											
	Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14	Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14
0:00:00		59.5	61.3	62.4	60.2	61.8	63.8	61.3	63.4	62.7	63.1	64.7		77	77.4	85.6	77.1	89.8	90.8	76.9	87.7	82.5	81.6	91.5
1:00:00		58.3	59.8	59.6	60.7	61	59.2	59.6	60.3	60.2	60.7	61.5		81.2	82.3	74.7	90.2	90	77.1	81.5	77.2	78.4	76.5	87.2
2:00:00		58.7	58.7	66.6	55.8	56.6	57.8	57.7	59.3	59.2	61.2	59.8		87.6	84.3	90.1	74.5	77	80.8	85.5	83.8	75	81.7	87.9
3:00:00		58.2	57.2	58.6	56.1	56.5	60.4	59.5	59.1	57.2	57.9	61		77.6	76.5	76.1	77.7	76.5	91.1	88.9	86.6	72.4	76.8	88.9
4:00:00		61.9	58	57.2	58.5	61.3	59	61.6	58.4	57	55.4	60.8		82	79.3	77.2	82.8	87.7	87.3	89.9	86.8	83.9	74.3	87.4
5:00:00		66.9	63.6	60.2	62.5	62.5	64.8	63.6	60.4	58.9	56.8	62.5		94.3	84.9	78.8	80.1	87	90.5	90.6	80	75.2	75.6	77.3
6:00:00		66.9	64.8	63.4	66	65.2	65.2	65.2	64.4	63.3	57.9	66.3		94.1	79.3	78.2	85.8	82.6	85	84.1	88	79.9	71.7	87.9
7:00:00		68.2	64.7	64.6	66.6	67.6	65.9	67.2	67.6	66.8	61.9	67.3		98.4	79	81.9	81.7	86.9	83.9	90.3	92.4	93	79.5	80.9
8:00:00		66.5	68.4	66.7	66.7	66.9	67	66.6	67.7	65.7	63.2	68		82.5	85.7	93.9	82.2	91.4	80.2	86.9	86.9	88.5	78.4	92.9
9:00:00		66.8	64.5	65.6	66.6	65.4	66.4	66.2	66.6	69.4	66.4	66.3		84.2	84.8	84.8	79.3	78.3	89	83	80.6	91.4	81.9	80
10:00:00		67.2	67.7	65.8	73.4	66.6	67.7	68.7	67.3	68.3	66.7	67.8		82.5	96.9	81.5	96.3	89.3	87.3	93.6	88	83.6	81.7	90.8
11:00:00		67.9	64.6	66.6	68	68.8	69.7	66.7	66.9	68.2	69.2	68		88.2	80	80.6	97.7	93.5	96.2	81.5	82.6	81.8	101.4	88.2
12:00:00		66.4	64.5	66.8	67.5	66.9	70.1	67.4	68.3	67.8	66.8	68.8		86.8	85.5	81.1	82	87.4	96.2	90.4	92.7	79.5	79.8	92.5
13:00:00		66.1	64.1	66.2	66.7	66.4	66.6	66.6	66.8	67.3	66.5	68.4		82.4	87	79.3	88.4	84.6	82.8	84	85.4	91.8	83.5	92.1
14:00:00		67	65.4	68.1	66.9	65.9	67.1	66	69.3	66.5	67.1	69.4		87.3	88	97.7	86.8	85.3	82.4	85.8	95.8	90.4	90.2	94.7
15:00:00		66.7	68.1	65.2	67	66.5	66.8	66.7	69.1	66.4	66.3	67.7		86.4	84.1	80.4	93.4	81.6	86.1	92.4	96.3	89.3	84.2	83.2
16:00:00	65.5	66.5	68.4	66.4	66.4	65.9	67.2	66.2	66.1	66.2	65.4		83	89.6	84.1	86	83.5	84.5	90.9	83.9	89.6	84.3	81.6	
17:00:00	64.8	65.4	69.8	66.2	65.6	67.2	65.8	68	66.1	67.4	66.1		80.6	80.5	87.8	80.7	83.1	93.6	78.4	93.1	80.2	86.1	78.7	
18:00:00	64.8	66	68.8	65.7	65.8	67.2	65.6	65.5	67.2	67.2	67.8		81.6	81.8	80.5	77.8	84	97.4	79.9	82.3	99.2	89.1	96.9	
19:00:00	65.3	65	68.4	65.4	65.5	66.1	67.1	64.7	64.8	67	66.1		83.7	87.3	90.8	84.5	80.4	90.3	94.8	79	91.8	89.2	85.7	
20:00:00	67.8	64.8	68.1	65.5	66.5	65.5	68.2	66.2	64.4	64.6	65.4		97	76.6	78.8	93.3	91.1	79.9	95.5	90.1	80.1	81.3	86.9	
21:00:00	65.9	65.1	67.3	65.1	64.8	65.5	65.7	65.5	67.8	63.2	65.8		91.5	84.9	89.2	87.9	79.8	82.7	92.5	78.7	96.9	81.8	84	
22:00:00	62.7	63.7	66.1	64.5	65	64.8	64.2	65.7	64.7	64.4	65.5		82.3	78.3	88.2	86.1	79.1	83.2	89.2	84.8	88	81.2	88.5	
23:00:00	61.4	64.1	64.1	61.4	62	63.2	63	64	63.6	63.7	63.4		79.5	95.3	80.9	76.4	81.7	82.9	82.1	86.7	79.5	76.9	86.5	

*Note : Monitor stopped recording data at 16:00 on November 14

Table A-5: Existing Sound Levels at Site 5 Residence at 2015 Roanoke																															
	Leq																**Lmax**														
	Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14	Tue, Nov 15	Wed, Nov 16	Thurs, Nov 17		Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14	Tue, Nov 15	Wed, Nov 16	Thurs, Nov 17
0:00:00		61.7	63.3	59.3	60.2	62.4	61.1	61.9	62.1	62.0	61.1	62.2	60.8	54.5	49.6		69.4	78.9	69.0	66.8	76.2	74.3	71.0	70.2	74.6	69.8	86.8	79.3	82.4	64.5	
1:00:00		60.5	61.6	57.5	58.9	59.8	57.9	60.0	59.9	60.4	60.8	59.4	62.0	48.7	47.4		69.9	68.1	65.5	66.9	67.5	67.2	71.0	74.8	68.8	77.9	82.2	83.4	54.2	53.9	
2:00:00		60.0	60.8	62.2	57.2	58.5	57.4	57.6	58.2	58.1	60.7	56.0	61.1	49.2	47.7		67.0	69.5	84.5	66.7	73.5	77.6	67.9	74.7	69.3	68.5	68.5	82.3	55.7	53.9	
3:00:00		59.5	59.3	54.7	56.8	56.9	56.4	57.9	56.6	56.5	60.0	57.1	62.2	48.7	45.5		65.5	68.2	65.9	65.2	67.3	67.2	70.0	68.8	65.7	73.0	81.3	84.8	55.4	50.4	
4:00:00		61.4	60.0	53.4	58.3	57.5	55.7	57.3	81.1	55.8	55.8	59.7	64.8	48.8	46.3		66.9	68.8	65.2	72.6	70.4	68.2	68.7	84.8	66.9	64.9	80.2	84.9	55.0	52.8	
5:00:00		64.4	60.9	52.6	59.8	60.7	59.8	60.2	58.4	55.9	54.2	59.7	67.2	48.2	47.0		78.1	70.9	66.5	71.9	68.0	69.4	68.5	70.4	68.4	64.0	77.7	82.6	53.6	53.7	
6:00:00		65.6	61.7	53.9	62.0	63.3	60.9	63.0	61.8	59.3	55.4	63.1	66.6	49.0	47.5		74.5	69.8	63.4	73.5	71.6	72.3	70.6	72.8	74.9	65.9	78.2	95.0	57.7	57.5	
7:00:00		69.3	62.8	55.7	65.1	66.5	64.4	66.0	64.2	61.7	58.7	66.0	49.4	49.9	49.0		89.9	68.9	64.9	73.8	75.0	77.3	76.6	76.6	78.1	67.0	76.9	58.6	57.2	57.8	
8:00:00		64.8	68.6	56.9	66.8	67.6	65.1	66.3	65.7	62.0	59.6	66.3	51.2	53.1	50.3		75.5	89.9	66.8	81.1	79.5	78.9	81.7	72.9	76.2	69.4	78.0	57.0	59.1	56.3	
9:00:00		66.0	66.3	58.2	65.2	64.5	64.3	64.9	65.9	63.4	62.4	64.3	53.0	53.6	51.7		73.6	86.1	71.0	73.9	75.1	74.4	78.5	79.5	74.0	76.4	74.9	60.1	58.9	56.6	
10:00:00		66.0	68.9	58.9	65.4	65.3	64.8	66.9	65.4	66.0	64.3	65.7	52.6	52.8	51.1		76.4	86.1	66.2	77.5	72.8	83.0	79.8	72.8	78.9	80.0	76.8	58.5	60.3	57.9	
11:00:00		65.9	65.3	59.7	65.0	65.5	67.1	65.0	65.3	65.2	65.5	65.1	50.4	50.9	49.3		73.4	74.6	68.7	74.1	73.4	79.6	72.7	73.4	75.9	77.0	74.6	57.6	57.0	53.9	
12:00:00		66.1	67.1	59.7	65.2	66.6	66.4	64.5	65.4	65.4	63.9	65.0	50.0	51.7	49.5		78.0	91.2	69.7	73.2	83.0	83.6	76.5	76.5	76.2	71.9	79.0	57.1	61.7	59.3	
13:00:00		66.7	63.5	60.1	64.9	65.3	64.6	65.2	65.7	65.0	64.9	64.7	49.8	51.8	49.5		82.9	72.5	72.9	73.0	74.3	78.6	76.8	72.1	72.3	71.2	75.2	56.4	60.1	55.5	
14:00:00		66.9	65.1	60.7	66.3	63.8	64.3	65.4	65.8	67.5	64.6	65.4	49.6	50.4	45.6		74.2	82.4	74.0	77.6	74.3	74.4	72.9	80.6	86.7	71.7	83.0	55.9	56.0	73.2	
15:00:00		66.6	65.4	64.1	67.1	65.7	65.4	65.1	66.3	67.2	64.1	68.1	50.9	52.2			77.7	84.6	71.1	73.5	84.0	77.0	76.6	81.7	78.2	76.4	84.4	56.5	56.5		
16:00:00	65.2	66.4	64.4	65.6	66.8	65.1	65.3	65.0	64.9	67.7	63.7	65.4	53.3	51.6		75.3	78.4	72.4	72.9	82.1	73.6	76.4	75.6	75.8	81.2	71.5	73.3	60.8	56.6		
17:00:00	66.8	67.2	64.4	65.5	65.0	65.5	65.7	64.7	64.5	65.3	64.7	65.5	53.0	53.4		79.2	73.3	74.0	71.7	76.3	77.6	72.6	76.6	73.2	74.7	72.4	75.7	57.8	62.6		
18:00:00	66.5	66.6	63.6	64.0	66.1	64.6	66.1	65.6	65.0	65.7	64.4	65.3	53.4	53.1		73.3	72.1	81.3	70.1	78.8	78.6	77.2	73.4	81.9	77.6	72.3	75.8	58.2	59.1		
19:00:00	65.8	64.9	64.1	64.3	65.5	63.1	65.5	64.4	63.0	65.3	64.0	65.5	52.5	53.5		72.5	71.9	81.3	70.9	71.5	72.6	79.9	70.4	70.9	74.0	77.9	75.5	60.6	57.7		
20:00:00	66.6	64.7	64.3	64.0	66.1	64.5	65.9	64.5	63.6	64.2	63.1	66.0	51.5	51.0		81.2	69.5	78.6	69.8	79.3	70.3	78.8	72.1	70.7	78.1	70.6	78.5	61.9	57.0		
21:00:00	66.3	65.2	61.9	63.3	71.2	63.9	65.2	66.3	64.0	65.6	63.5	64.1	59.0	50.0		78.6	71.0	68.3	69.2	94.1	69.6	75.8	75.4	76.9	77.3	74.5	70.0	86.6	55.7		
22:00:00	64.1	64.8	61.9	62.7	65.7	63.1	64.6	65.0	64.3	66.2	64.1	63.8	56.9	49.8		69.7	74.7	75.5	70.8	71.2	70.1	77.4	73.1	78.1	78.7	80.1	69.4	83.6	55.2		
23:00:00	63.3	63.4	60.0	61.6	61.9	62.3	62.5	63.4	63.3	61.7	61.3	61.2	53.6	49.7		69.5	71.8	66.7	67.9	68.2	71.3	72.4	71.2	70.4	70.6	81.2	72.8	76.5	55.0		

Table A-6: Existing Sound Levels at Site 6 Montlake Construction Staging Area																													
	Leq															**Lmax**													
	Mon, Oct 31	Tues, Nov 1	Wed, Nov 2	Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14	Mon, Oct 31	Tues, Nov 1	Wed, Nov 2	Thurs, Nov 3	Fri, Nov 4	Sat, Nov 5	Sun, Nov 6	Mon, Nov 7	Tue, Nov 8	Wed, Nov 9	Thurs, Nov 10	Fri, Nov 11	Sat, Nov 12	Sun, Nov 13	Mon, Nov 14
0:00:00	54.4	55.4	58.1	56.9	60.0	60.8	60.4	59.1	60.1	61.3	60.7	59.9	59.8	61.4	55.8	71.0	73.1	70.6	70.4	69.4	80.0	74.2	70.4	71.9	71.1	70.0	71.6	70.8	67.2	74.0
1:00:00	53.9	56.9	57.7	54.6	58.0	59.3	59.1	57.2	57.5	59.2	57.9	57.0	58.1	59.7	52.0	65.9	78.4	85.1	71.7	79.5	68.7	68.5	69.8	67.0	73.4	72.5	73.2	68.1	76.3	65.2
2:00:00	51.8	53.1	55.3	53.8	55.8	58.9	54.9	54.0	51.8	55.5	56.2	56.5	58.2	61.1	50.3	64.4	68.7	72.7	72.6	70.2	77.0	65.8	67.9	68.2	69.3	74.0	73.3	67.1	72.5	67.3
3:00:00	52.2	52.2	53.6	55.9	54.3	53.7	53.0	53.4	54.3	55.7	52.8	55.2	56.4	59.6	52.8	63.4	63.5	71.3	72.1	66.6	67.5	67.4	69.2	69.1	70.6	70.3	67.3	71.6	68.1	71.7
4:00:00	56.2	54.9	57.9	57.1	56.2	53.0	52.9	51.9	55.3	54.3	55.8	54.5	54.8	55.0	54.5	69.6	69.7	69.1	71.1	68.7	70.1	66.8	65.2	92.0	84.2	75.2	73.8	72.4	65.5	66.3
5:00:00	58.3	56.1	59.8	60.7	60.0	55.1	53.8	55.0	60.2	57.5	59.8	57.8	53.8	52.1		72.2	76.0	71.4	72.8	71.1	70.4	67.3	68.6	71.7	71.7	78.3	74.4	73.0	65.8	
6:00:00	62.1	58.8	63.1	63.6	62.5	57.8	56.5	58.3	61.1	58.9	59.9	59.8	55.9	52.0		71.9	82.5	79.5	90.5	78.9	79.8	68.4	79.6	76.9	96.3	77.1	78.3	76.0	67.6	
7:00:00	63.6	60.2	67.0	65.3	66.3	56.4	59.5	62.0	63.5	62.6	64.1	62.6	58.4	55.5		85.5	81.7	81.5	85.4	87.9	69.8	75.1	89.8	88.3	91.4	85.1	88.8	79.3	70.4	
8:00:00	66.5	66.3	66.3	62.9	71.8	61.5	61.1	66.3	65.6	66.1	64.2	67.7	60.1	57.7		85.0	91.9	87.3	79.5	95.2	79.6	77.4	90.3	84.7	92.0	84.8	86.7	76.1	79.8	
9:00:00	66.1	66.9	68.0	64.0	74.9	62.3	61.5	64.2	65.5	71.5	60.0	65.8	63.3	60.5		83.8	90.6	87.5	78.4	100.0	76.2	79.6	94.2	83.0	89.6	87.3	86.2	82.6	77.2	
10:00:00	69.2	64.6	64.4	65.6	71.4	63.3	62.7	68.1	66.0	67.7	67.8	66.1	66.1	61.6		90.3	85.2	78.6	79.3	99.3	75.9	79.8	92.8	88.3	87.5	89.8	80.5	81.9	80.7	
11:00:00	68.9	66.2	64.3	64.1	66.7	63.0	64.0	66.2	69.8	65.8	67.9	63.8	66.3	62.7		92.6	87.3	86.4	83.1	89.8	77.2	76.2	88.0	96.3	84.4	88.6	85.9	82.3	75.8	
12:00:00	67.7	66.0	65.0	61.6	65.1	63.9	63.5	66.6	66.9	65.2	64.0	65.0	66.8	63.0		80.7	84.0	81.6	85.4	87.7	71.7	75.3	81.7	83.1	94.5	81.9	83.7	85.7	74.8	
13:00:00	66.6	68.4	65.7	66.0	64.6	62.7	62.8	63.1	64.5	66.2	63.3	63.6	66.9	62.5		81.8	88.3	89.2	88.8	85.5	83.3	77.4	86.4	96.1	85.1	87.2	83.6	82.8	72.0	
14:00:00	67.4	68.6	70.8	65.6	65.0	62.2	62.1	63.1	66.1	65.1	67.0	65.0	66.0	62.4		88.3	92.6	93.8	87.3	87.3	84.6	73.5	84.2	100.6	83.1	78.2	87.3	80.0	72.5	
15:00:00	65.1	65.4	64.2	61.1	63.2	61.3	61.6	61.7	67.5	64.0	63.5	63.6	64.4	63.2		76.2	86.6	92.4	86.8	90.4	82.6	78.2	97.2	101.5	98.6	92.7	87.0	80.1	79.2	
16:00:00	66.9	65.8	62.0	59.2	63.4	62.2	61.7	66.8	65.5	66.8	64.7	62.3	65.2	63.0		84.6	96.5	78.0	74.7	79.5	76.7	76.1	89.4	76.0	87.1	85.8	88.1	84.0	72.5	
17:00:00	65.5	64.7	64.0	61.7	63.2	60.7	62.1	63.7	64.2	66.6	67.1	65.1	67.1	62.6		80.9	77.7	89.6	90.1	73.3	73.2	72.9	95.1	72.7	82.5	90.9	74.6	74.8	72.8	
18:00:00	63.2	64.5	66.6	62.8	63.4	59.5	62.9	63.6	61.8	63.2	67.4	61.0	63.8	60.8		75.2	76.1	89.6	84.0	83.6	70.7	72.0	76.8	95.4	75.6	81.9	72.2	74.8	69.1	
19:00:00	60.1	62.9	63.0	63.6	63.2	60.3	61.7	62.0	64.7	62.7	63.3	57.5	64.1	61.2		71.2	72.3	77.0	81.2	73.0	71.2	71.0	92.0	73.0	73.6	73.6	72.4	73.3	73.1	
20:00:00	59.1	62.3	62.4	64.9	63.1	60.0	61.8	64.6	64.1	63.4	62.5	61.1	63.2	59.3		73.4	73.8	77.3	82.5	70.1	72.0	75.1	89.9	92.8	74.9	77.4	74.4	85.6	70.9	
21:00:00	59.7	62.9	61.7	63.2	62.2	60.1	61.7	66.0	65.5	62.8	63.0	59.9	62.8	60.6		70.6	72.6	77.5	71.4	76.6	69.7	72.0	85.2	72.5	76.0	71.4	70.1	71.2	75.3	
22:00:00	58.1	61.3	60.0	62.0	59.3	61.6	57.9	65.3	62.0	63.0	63.3	60.1	62.4	60.7		74.7	74.2	76.0	70.7	73.3	70.1	68.1	71.8	72.9	83.2	72.9	71.8	71.4	70.7	
23:00:00	57.1	60.7	57.1	60.9	61.9	61.7	59.1	62.2	61.7	60.6	62.9	60.5	61.7	59.3		72.3	74.8	70.8	71.1	70.8	67.9	69.4	70.8	72.6	72.4	70.6	69.5	70.5	74.2	

Table A-7: Existing Sound Levels at Site 7 Residence at 2209 Lake Washington Boulevard																												
	Leq														**Lmax**													
	Fri, Jan 20	Sat, Jan 21	Sun, Jan 22	Mon, Jan 23	Tue, Jan 24	Wed, Jan 25	Thurs, Jan 26	Fri, Jan 27	Sat, Jan 28	Sun, Jan 29	Mon, Jan 30	Tue, Jan 31	Wed, Feb 1	Thurs, Feb 2	Fri, Jan 20	Sat, Jan 21	Sun, Jan 22	Mon, Jan 23	Tue, Jan 24	Wed, Jan 25	Thurs, Jan 26	Fri, Jan 27	Sat, Jan 28	Sun, Jan 29	Mon, Jan 30	Tue, Jan 31	Wed, Feb 1	Thurs, Feb 2
0:00:00		64	64.5	61.3	61.4	61.1	61.4	62	61	59.9	58.6	60.5	59.8	61		82.3	78.2	75.4	76.4	77.2	74.6	80.4	81.9	82.2	74.8	81.5	77.4	75.2
1:00:00		62.2	63	60.1	58.8	58.8	59	59.5	59.4	57.8	56.7	57.8	59.2	58.4		73.9	77.7	73.8	71.9	75.6	73.5	73.9	78.6	78.6	71.3	74.4	82.2	75.8
2:00:00		61.3	62	58.3	58.7	59.1	57.9	59.1	59	55.6	56.7	57.8	57.8	58.2		83.4	75.5	72.2	72.8	86.1	83.6	81.9	85.1	74.9	76.4	83	84.1	76.6
3:00:00		58.6	60.3	58.5	59.9	59.2	59	59.4	56.4	55.2	59.3	58.9	59.6	59.6		73.6	77.2	70.2	78.3	76.1	75	77	77.3	77.5	86.6	73.4	75.8	82.3
4:00:00		59.1	59.2	62	62.3	62.2	61	61.6	56.2	55.4	63.6	62	61.4	61.7		77.3	76.8	77	79.8	78.7	73.8	76.4	76.1	76.9	91.8	73.2	77.8	76.4
5:00:00		61.4	58.9	66	65.6	65.5	65.5	65.5	59.1	56.3	64.8	66.1	65.6	65.4		85.6	74.4	80.4	82.3	80.6	85.3	83.9	81.7	80.6	81.6	83.4	80.9	77.9
6:00:00		63.8	63.2	69.3	69.1	68.4	68.6	68.8	63.2	59.7	68.8	69.2	68.6	69.2		79.9	79.6	89.1	87.3	82.7	85.6	88.2	88.3	78.5	88.9	80.1	87.7	87
7:00:00		65.6	64.1	70.7	70.5	70.3	69.7	70.5	63.7	60.2	70.2	70.3	70.2	70.2		77.9	77.4	96.1	87	92.6	85	92.1	87.3	78.2	83.8	87.1	92.4	89
8:00:00		68.2	66.3	69.2	68.4	69.2	68.6	70.8	64.6	62.8	70	68.5	69.2	68.6		86.1	84	84.6	83.2	85.9	84.6	85.1	82.4	81.4	86.4	91.4	86.9	84.5
9:00:00		69.1	68.5	70.8	69.3	70.2	70.3	71.1	65.5	64	70	70.2	69.3	69.7		84.6	95.4	88.6	83.3	86	89.3	92.2	80.3	80.8	89.6	86.5	87.1	97
10:00:00		69.3	68.4	70	70.8	70.1	70.5	70.1	66.6	64.7	69.9	71.1	69.5			80.8	79.1	85.2	88.6	88.7	90.6	84.2	89.5	78.7	87.9	89.2	83.9	
11:00:00	69.7	72.3	69.8	70	69.9	70	69.9	70.7	66	65.7	69.6	70.6	69.2		83.4	103.4	88.9	88.3	83.3	84.9	89.8	89.1	83.8	82.8	93.6	83.5	81.3	
12:00:00	69.3	70.5	69.6	70	69.9	69.3	70	69.7	66.2	65.4	69.7	70	68.3		85.4	97.4	84	88.6	101.7	85.3	87.5	84.7	90.7	81.4	84	84.8	91	
13:00:00	69	68.8	69.2	69.4	69.7	69.5	70.2	69.8	65.4	65.4	69.7	69.6	68.2		82.6	83.2	79.8	82.3	94.4	82.7	94.9	88.2	82.6	78.7	90.1	82.3	84.7	
14:00:00	68.9	69.5	68.8	69.7	68.3	69.8	69.9	69.8	66	65.6	69.5	69.7	68.2		80.1	92.9	79.9	89.2	83	87.7	86.5	82.9	83	88	83.2	78.5	83.1	
15:00:00	69.8	69.6	69.2	70.3	70.1	69.5	69.6	70.1	65.6	65.9	70	70.3	69.2		90.6	88.1	84.5	84.1	87.7	80.8	87.7	89.6	78.5	85.9	83.8	83.3	98.1	
16:00:00	68.9	68.2	69.4	69.7	70.2	69	69	69.9	65.9	66	69.6	69	68.6		79	87.1	81.2	80	91.6	86.4	89.4	86.2	85.1	93.5	89.3	87.3	85.2	
17:00:00	68.5	68.2	69.7	69.2	69.7	68	69.8	69.2	65	65.6	69	68.3	68.7		83.5	79.8	83	84.2	85.1	88.2	84.7	82.3	81.7	83.7	82	83.4	86.4	
18:00:00	68.7	68	68.4	70	69.1	67.8	69.5	67.2	65	65.4	68.9	69	68.7		83.8	79.2	78.7	83.5	91.5	82.7	84.4	82.8	84.1	77.3	80	85	82.9	
19:00:00	68.2	67.6	67.7	69.8	68.8	68.7	69	68.4	64.1	65.2	67.3	68	68.2		84.8	82.6	78.7	88.9	82.2	85.2	80.4	82.9	78.9	80.1	85	77.6	81	
20:00:00	68.6	67	67.3	68.1	67.9	67.7	68.2	67.6	63.2	64.9	66.4	67.8	67.9		86	79.6	86	78.6	79.7	78	80.8	82.6	81.7	78.3	81.9	81.1	84	
21:00:00	67.3	67.2	69.1	67.2	66.8	67.2	68	67.9	62.3	64.1	66.6	67.4	67.2		78.3	81.1	91.2	77.8	77.8	78.9	78	81.5	78.3	78.7	89.9	82.5	80.3	
22:00:00	66.1	66.8	64.7	65.3	64.7	65.3	66	66.9	62.8	62.4	64.1	65.8	66.1		80.2	80.8	81.3	78.9	78.8	79.9	83	80	84.7	82.7	81	80.8	93.9	
23:00:00	65.5	65.7	63.7	63.8	63.2	63.9	64.6	64.5	61.1	59.6	62.8	63.7	63.2		76.5	85.3	78.9	79.6	76.6	82.1	78.1	88.5	80.3	80.7	83.1	82.4	77.2	