

Noise Memorandum

Magnolia Bridge Replacement Project

Seattle, Washington

July 9, 2014

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Seattle Department of Transportation

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Noise Memorandum

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Noise Memorandum

1.0 INTRODUCTION

The purpose of the Magnolia Bridge Replacement Project is to replace the existing Magnolia Bridge structure, approaches, and related arterial connections with facilities that maintain convenient and reliable vehicular and non-motorized access between the Magnolia community and the rest of the City of Seattle. The preferred alternative would replace the existing bridge with a new structure immediately south of the existing bridge. Connections at the east and west ends of the bridge would be similar to the existing bridge.

The bridge provides an important link to the Magnolia community in Seattle (see **Figure 1-Project Location Map**). The project purpose also includes maintenance of access to Terminal 91, Smith Cove Park, Elliott Bay Marina, and U.S. Navy property.

Figure 1 - Project Location Map



2.0 NOISE ANALYSIS OVERVIEW

This memorandum presents the results of a noise screening of the proposed Magnolia Bridge Replacement project. The noise screening presents the existing condition and future acoustical environment at various receptors in the project area.

The determination of noise impacts is in compliance with the Federal Highway Administration's (FHWA) Procedures for Abatement of Highway Traffic Noise and Construction Noise as presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772) and the Washington State Department of Transportation (WSDOT) *2011 Traffic Noise Policy and Procedures*, dated October 2012.

Noise Model and Analysis

The FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise is presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772). This regulation, plus other guidance documents written to explain the regulation, sets forth the process for performing a traffic noise analysis.

WSDOT's Noise Policy is the state's tool for implementing 23 CFR 772. The noise abatement criteria (NAC) presented in 23 CFR 772 establishes the criteria for various land uses. The noise level descriptor used is the equivalent sound level, L_{eq} , defined as the steady state sound level which, in a stated time period (usually one hour), and contains the same sound energy as the actual time-varying sound.

Noise abatement measures will be considered when the predicted noise levels approach or exceed those values shown for the appropriate activity category in Table 1, or when the predicted traffic noise levels substantially exceed the existing noise levels. WSDOT "considers a predicted sound level of 1 dBA below the NAC as sufficient to satisfy the condition of 'approach', or approaching the NAC, required by FHWA for all land use categories. For example, where the NAC is 67 dBA for outdoor use at a residence, a noise level of 66 dBA is considered an impact. Receivers are also considered impacted when the worst hourly traffic noise is predicted to increase 10 dBA ('substantial increase') or more between the Existing and Build conditions."¹

TNM[®] 2.5 was used to analyze existing and future noise levels in the project area. TNM[®] 2.5 is FHWA's computer program for highway traffic noise prediction and analysis.

¹ *2011 Traffic Noise Policy and Procedures*, Washington State Department of Transportation, October 2012, page 17.

**Table 1: Noise Abatement Criteria (NAC)
 Hourly A-Weighted Sound Level-Decibels (dBA)**

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

* $L_{eq}(h)$ are A-weighted (dBA) hourly equivalent steady state sound levels used for impact determination and are not design standards for abatement.

Source: 2011 Traffic Noise Policy and Procedures, Washington State Department of Transportation, October 2012, page 17.

3.0 NOISE MODELING

The latest version of the FHWA's Traffic Noise Model, TNM[®]2.5², was used to model existing (2002-2003) and future build (2030) worst hourly traffic noise levels within the study area. Thirty-four (34) representative noise receptors, numbered N1 through N34 as shown on **Appendix A**, were modeled. These receivers were selected to model representative noise impacts at two residences (N5 and N9) and 32 park locations. The results of the computer modeling are presented in **Table 2**.

² M.C. Lau, C.S.Y. Lee, J.L. Rochat, E.R. Boeker, and G.C. Fleming. FHWA Traffic Noise Model[®] Users Guide (Version 2.5 Addendum). Federal Highway Administration, April 2004

Table 2
Design Hour Noise Levels, dBA (Leq(h))

Receiver Location	Land Use	Activity Category	FHWA / WSDOT NAC	PM Noise Level, $L_{eq}(h)$ (dBA)			
				Predicted Existing (2002-2003)	Predicted Build (2030)	Change (Fut – Ex)	Impact
N1	Park	C	67	62	63	1	N
N2	Park	C	67	64	65	1	N
N3	Park	C	67	66	67	1	I
N4	Park	C	67	69	70	1	I
N5	Residential	B	67	68	68	0	I
N6	Park	C	67	59	58	-1	N
N7	Park	C	67	63	63	0	N
N8	Park	C	67	66	66	0	I
N9	Residential	B	67	68	69	1	I
N10	Park	C	67	63	62	-1	N
N11	Park	C	67	66	66	0	I
N12	Park	C	67	68	69	1	I
N13	Park	C	67	59	58	-1	N
N14	Park	C	67	61	60	-1	N
N15	Park	C	67	64	60	-4	N
N16	Park	C	67	56	54	-2	N
N17	Park	C	67	57	55	-2	N
N18	Park	C	67	58	54	-4	N
N19	Park	C	67	53	51	-2	N
N20	Park	C	67	49	49	0	N
N21	Park	C	67	50	49	-1	N
N22	Park	C	67	51	50	-1	N
N23	Park	C	67	52	50	-2	N
N24	Park	C	67	53	51	-2	N
N25	Park	C	67	52	54	2	N
N26	Park	C	67	50	50	0	N
N27	Park	C	67	51	51	0	N
N28	Park	C	67	52	53	1	N
N29	Park	C	67	53	53	0	N
N30	Park	C	67	55	56	1	N
N31	Park	C	67	50	51	1	N
N32	Park	C	67	57	55	-2	N
N33	Park	C	67	58	56	-2	N
N34	Park	C	67	59	56	-3	N

Boldface and italicized indicates the noise levels approach, equal or exceed the NAC

4.0 IMPACT ASSESSMENT

Predicted existing (2002-2003) traffic noise levels ranged from 49 to 69 dBA. The proposed Magnolia Bridge Replacement project would create noise levels within the project area that range from 49 to 70 dBA. Seven of the future noise levels (2 residences and 5 locations in Ursula Judkins Viewpoint park) would approach or exceed the NAC for their respective receptors.

The NAC for a park is 67 dBA; with a noise level of 66 dBA considered as an impact. Contour lines for the existing and proposed scenarios are shown on **Appendix A**. These lines show the distance to noise impacts as defined by the NAC. The proposed contour is 17 feet south of the existing contour at the western extents of the project improvements (near N2 and N3). East of N2 and N3, the existing and proposed contours have similar setback distances near N11. East of N11, the proposed contour runs to the proposed bridge, while the existing contour proceeds diagonally northeast towards the existing bridge. It extends an additional 90 feet east of the proposed contour.

5.0 IMPACT MITIGATION

Within the framework of WSDOT's criteria, various methods were reviewed to mitigate the noise impact of the proposed improvements. Among those considered were traffic management measures (reduction of speed limits, restriction of truck traffic to specific times of the day, a total prohibition of trucks), alteration of horizontal and vertical alignments, acquisition of real property or interests therein to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise land use facilities listed in **Table 1**, the construction of berms, and the construction of noise barriers.

Reductions of speed limits, although acoustically beneficial, are seldom practical unless the design speed of the proposed roadway is also reduced. Restriction or prohibition of trucks is counter to the project purpose and need. Design criteria, recommended termini and the preliminary design process leading to the preferred alternative preclude substantial horizontal and vertical alignment shifts that would produce noticeable changes in the projected acoustical environment. Acquisition of undeveloped property for buffer zones is typically neither feasible nor reasonable due to the amount of land needed to create an acoustically effective buffer zone and the desire to keep as much land as possible in the local community's tax base. The construction of noise berms or noise barriers is neither feasible nor reasonable because of the amount of space that would be required and due to access requirements of the residences abutting the local streets north of West Galer Street on both sides of Magnolia Way West as well as access to the Ursula Judkins Viewpoint parking lot south of West Galer Street.

6.0 CONSTRUCTION NOISE

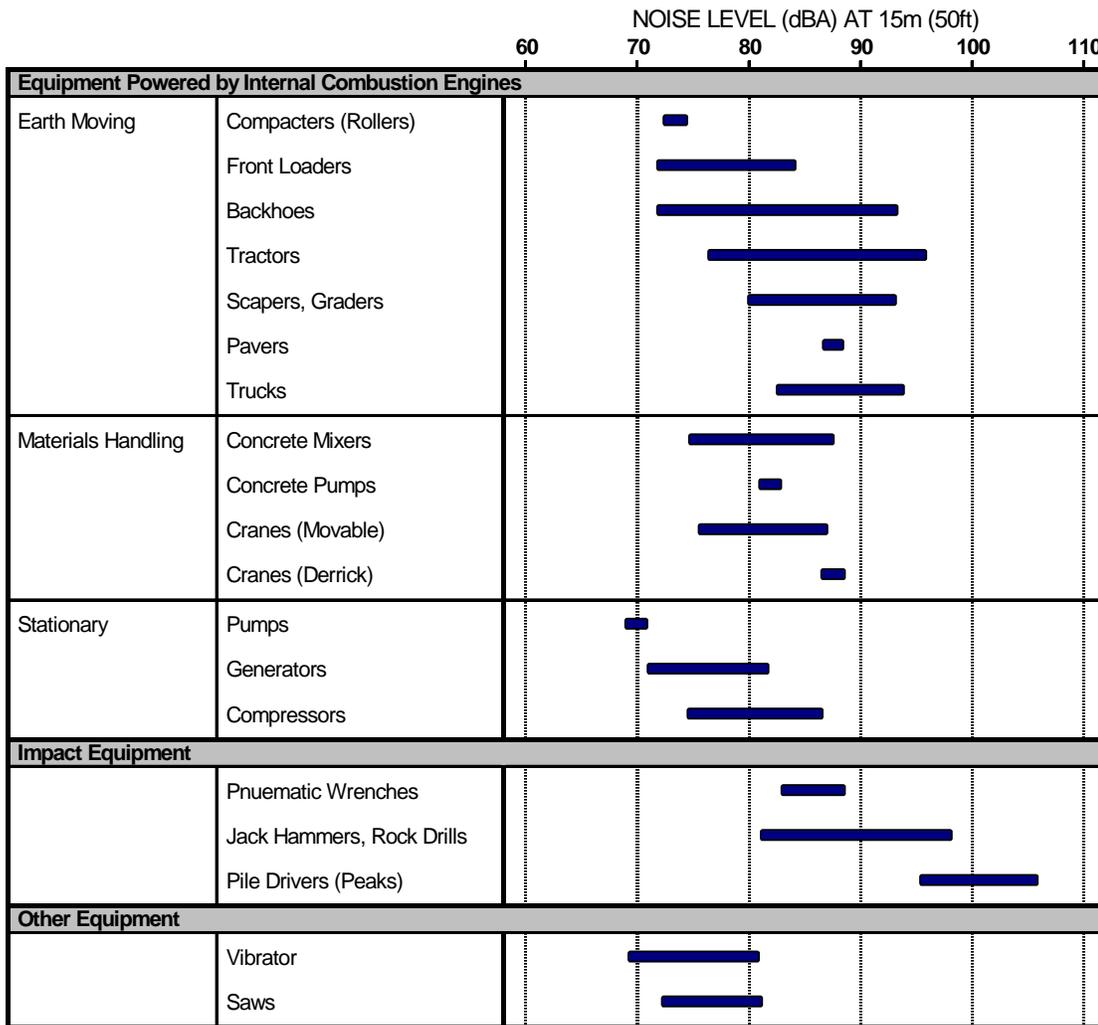
Construction noise is temporary but may affect nearby property owners or residents. During project development, and before construction begins, project office staff should consider ways to reduce or mitigate the impacts of construction activities. All reasonable methods shall be incorporated in the plans and specifications of the contract.

In most cases, daytime noise from construction activities is exempt from state and local laws. However, in some cases, coordination with, or permits from, local agencies may be needed. For temporary night construction noise, a variance or exemption from the municipal or county codes is typically required. Local jurisdictions may need to be contacted to clarify local

regulations, determine if a permit is required, and discuss if there are concerns or restrictions that could affect the project. Some acoustical information and analysis may be needed before the local agency will grant a permit. This is done on a case-by-case basis.

In general, the noise analysis should identify the local regulations that apply to construction noise under standard situations. The acquisition of applicable permits or variances is typically handled by the project owner through a process separate from the noise analysis.³

**Table 3
Construction Equipment Sound Levels**



SOURCE: U.S. Report to the President and Congress on Noise, February, 1972.

³ 2011 Traffic Noise Policy and Procedures, Washington State Department of Transportation, October 2012, page 38.

7.0 CONCLUSION

Based on the study completed, mitigation of noise impacts for the Magnolia Bridge improvements does not appear to be feasible or reasonable for the proposed alternative.

8.0 REFERENCES

Lau, M.C., C.S.Y. Lee, J.L. Rochat, E.R. Boeker, and G.C. Fleming. FHWA Traffic Noise Model[®] Users Guide (Version 2.5 Addendum). Federal Highway Administration, April 2004.

“2011 Traffic Noise Policy and Procedures”, Washington State Department of Transportation, October 2012.

APPENDIX A

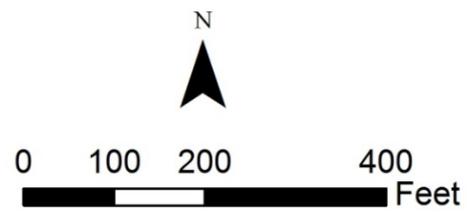


Image courtesy of USGS Earthstar Geographics SIO © 2014 Microsoft Corporation

66 dBA Leq Contour

- Existing
- Proposed

- Impacted Receptor
- Noise Modeling Location



APPENDIX A

**Magnolia Bridge Replacement
Noise Modeling Locations**