APPENDIX C

Noise

TECHNICAL MEMORANDUM

Date:	February 16, 2007
To:	Jesse Hamashima
From:	Peter Chen
Subject:	Traffic Noise Analysis
cc:	Dan McReynolds
Project Number:	214-1588-036
Project Name:	Rhodes Lake Road

This technical memorandum summarizes the traffic noise analysis conducted for the Rhodes Lake Road Corridor Draft Environmental Impact Statement (EIS). The affected environment for this analysis includes areas along 116th Street SE and 128th Street NE east of SR 162 in Puyallup, the east side of SR 162 north of 128th Street, and Bridge Street SE and Bridge Street SW east of S Washington Avenue in Orting.

The traffic noise analysis presented below is limited to potential long-term traffic noise impacts associated with passenger and freight vehicles using roadways in the study area. The analysis provides worst-case projected noise levels for the roadways evaluated. This analysis does not include noise levels generated by construction vehicles that could be used in the short-term for project construction and are subject to different construction noise regulations.

METHODOLOGY

Sound (noise) levels were measured in April 2006 at the five locations shown on Exhibit 1. These locations included:

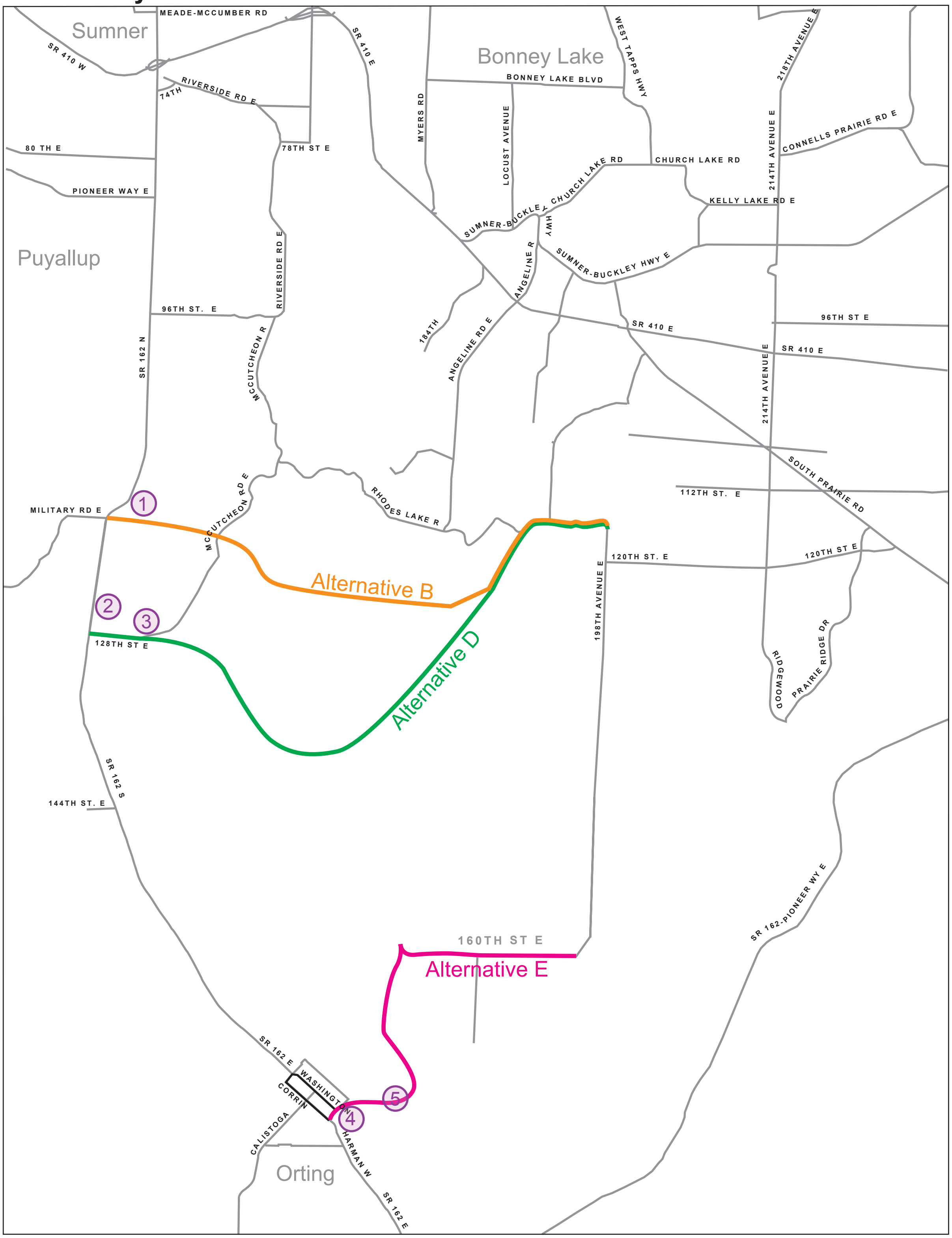
- Site 1 – 15404 116th Street E, Puyallup.
- Site 2 – 12615 SR 162, Puyallup.
- Site 3 – 14801 128th Street E, Puyallup.
- Site 4 – 110 Bridge Street SW, Orting.
- Site 5 – 302 Bridge Street SE, Orting.

Noise level observation sites were identified based on location of noise-sensitive receptors (e.g., residences), areas of frequent human activity, and the degree to which the sites were representative of the study area and potential impacts. All noise readings at the five locations were recorded for a 15-minute period between 4:00 PM and 6:00 PM.

The five sites were modeled using FHWA's Traffic Noise Model (TNM) 2.5, which is the required noise prediction software used to estimate potential noise impacts to noise-sensitive land uses (Report No. FHWA-RD-77-108; "Highway Traffic Noise – Release and Phase-In of the FHWA Traffic Noise Model Version 2.5"; April 14, 2004). Each location was modeled to incorporate existing roadway conditions (e.g., lane widths, flow control, speed limit), receiver characteristics (e.g., elevation, height above ground), type of ground surface (e.g., lawn, pavement, hard soil), and vegetative site characteristics (presence and density).

Exhibit 1

Noise Study Locations



Temperature and humidity defaults (68 degrees Fahrenheit, 50 percent relative humidity) and pavement type were used per FHWA guidelines. At each location, the area of frequent human activity was assumed to be in the direct line-of-site of the roadway to provide conservative estimates, and was generally between 30 and 50 feet from the edge of the existing roadway. Modeled locations were accurate to within 3 dBA of observed noise levels, which FHWA considers appropriate calibration.

Excluding proposed roadway elements, existing roadway conditions, receiver characteristics, ground surfaces, and vegetative features at each location were assumed to generally remain similar in the future, and the future baseline and build alternative models differed only in the traffic volumes forecasted for the worst-case scenario (from a traffic noise perspective). The worst-case scenario modeled at each of the noise observations locations is as follows:

- Site 1 – 15404 116th Street E, Puyallup: Alternative B.
- Site 2 – 12615 SR 162, Puyallup: Alternative D.
- Site 3 – 14801 128th Street E, Puyallup: Alternative D.
- Site 4 – 110 Bridge Street SW, Orting: Alternative E.
- Site 5 – 302 Bridge Street SE, Orting: Alternative E.

A traffic composition of 2 percent heavy vehicles was assumed for the Existing, 2030 Baseline, and 2030 build alternatives, which the Highway Capacity Manual (HCM 2000) recommends as a default value if local data are unavailable.

RESULTS

Exhibit 2 summarizes the 2030 2-way link traffic volume forecasts (PM peak hour) at each of the noise observation sites, as well as the relative changes for the worst-case scenario.

Exhibit 2. Existing, Baseline, and Project PM Peak Hour Traffic Volumes

		Existing 2006	2030 Baseline		2030 With Project		
Site	Receiver	2-Way Link Volume	2-Way Link Volume	Δ Existing	2-Way Link Volume	Δ Existing	Δ Baseline
1	15404 116th St	10	68	+58	3819	+3809	+3751
2	12615 SR 162	1640[1]	3146	+1506	5059	+3419	+1913
3	14801 128th St	241	1255	+1014	3750	+3509	+2495
4	110 Bridge St SW	110	115	+5	2315	+2205	+2200
5	302 Bridge St SE	65	95	+30	2275	+2210	+2180

[1] Existing volumes for SR 162 were taken from 2002 traffic data.

As shown in Exhibit 2, 2030 traffic volumes are forecasted to substantially increase along SR 162 and 128th Street both with and without the project, although projected traffic volumes for Alternative D would result in the greatest traffic volume increases along these routes. Traffic forecasts for 116th Street, Bridge Street SW, and Bridge Street SE are expected to marginally increase with the 2030 Baseline, but traffic volumes would substantially increase on these roadways with Alternatives B and E, respectively.

Traffic noise levels are expected to increase in 2030 both with and without the project. Exhibit 3 provides modeled noise levels at each of the observation sites for the Existing Condition, 2030 Baseline, and 2030 worst-case conditions. Exhibit 3 also provides the relative changes in noise levels.

Exhibit 3. Existing Condition, 2030 Baseline, and Project Noise Levels (dBA-Leq)

		Existing 2006	2030 Baseline		2030 With Project		
Site	Receiver	dBA	dBA	Δ Existing	dBA	Δ Existing	Δ Baseline
1	15404 116th St	43	54	+11	72	+29	+18
2	12615 SR 162	70	73	+3	75	+6	+2
3	14801 128th St	58	65	+7	73	+15	+8
4	110 Bridge St SW	57	59	+2	72	+15	+13
5	302 Bridge St SE	57	59	+2	68	+11	+9

Based on forecasted volumes, TNM estimates that the build alternatives would increase noise levels between 6 to 29 dBA compared to the existing conditions, and between 2 to 18 dBA compared to the 2030 Baseline. Compared to 2030 Baseline, SR 162 would experience the smallest increase in traffic noise levels (2 dBA increase for the worst-case) for the build alternatives since this roadway is forecasted to have the smallest change in traffic volumes (increase of 1,913 PM peak hour trips) compared with the 2030 Baseline. Similarly, 116th Street is forecasted to have the most substantial change in traffic volumes (increase of 3,751 PM peak hour trips) and traffic noise levels (18 dBA increase) compared to the 2030 Baseline since these calculations assume a road corridor would be established in a location where a roadway does not currently exist.

REGULATORY FRAMEWORK

The Rhodes Lake Road Corridor alternatives extend through portions of unincorporated Pierce County, and the City of Orting. Building a new roadway corridor would change noise levels in areas where traffic volumes would increase compared to existing conditions. As such, noise criteria established by local, state, and federal agencies are relevant to this project. Applicable noise regulations may include FHWA's Noise Abatement Criteria (23 CFR 772), the Washington State Department of Transportation's (WSDOT) interpretation of FHWA's Noise Abatement Criteria, and Ecology's noise level regulation for motor vehicles (WAC 173-60), which is adopted by Pierce County (PCC 8.76). Orting does not have specific traffic noise regulations.

If local funds are used to build a new roadway corridor, noise mitigation would most likely not be proposed by Pierce County. If federal funds are used, mitigation would be required to be evaluated and proposed as part of more detailed project-level analysis.

Washington State and Pierce County Noise Standards

Noise from individual motor vehicles is regulated in WAC 173-62 and adopted by Pierce County in PCC 8.76. These regulations set limits on the maximum permissible noise levels generated by individual motor vehicles in certain vehicle classes and are based on noise levels at specific distances and speeds. Limits generally range from 72 dBA to 90 dBA depending on the vehicle class and speed. However, these regulations are generally aimed at nuisance infractions associated with modified/disabled engines and exhaust systems, and have no bearing on the traffic noise analysis for the project.

Federal Highway Administration Noise Abatement Criteria

FHWA defines a traffic noise impact as a predicted traffic noise level approaching or exceeding the noise abatement criteria for specific land use categories, or substantially exceeding the existing noise levels. FHWA leaves the definition of “approach” to the states. WSDOT defines “approaching” the FHWA limits as sound levels within 1 dBA of the criterion level. WSDOT defines “substantially exceeding” existing noise levels as an increase of 10 dBA or more if the calculated future sound level is greater than 50 dBA. FHWA’s land use categories, with respect to their Noise Abatement Criteria, are described in Exhibit 4.

Exhibit 4. FHWA Noise Abatement Criteria Land Use Categories

	Land Use Category	Noise Level (dBA-Leq)
(A)	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	57 (exterior)
(B)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals	67 (exterior)
(C)	Developed lands, properties, or activities not included in the above categories	72 (exterior)
(D)	Undeveloped lands	------
(E)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums	52 (interior)

In addition to the above criteria used to identify traffic noise impacts, WSDOT also defines severe noise impacts to be traffic noise levels of 75 dBA or higher for outdoor activity areas or a predicted design year increase of at least 15 dBA over existing noise levels.

DISCUSSION

As described above, FHWA and WSDOT define traffic noise impacts with respect to absolute traffic noise levels (per FHWA land use categories) and relative increases in traffic noise levels. With respect to absolute traffic noise levels, land uses along the project alignments are generally classified as land use categories B or C, which are considered to have traffic noise impacts at 66 and 71 dBA, respectively (1 dBA less than the 67 and 72 dBA criterion levels). Based on the forecasted traffic volumes for the worst-case conditions, all five noise observation locations are expected to exceed the prescribed state and federal criteria. Additionally, Sites 1 and 4 are expected to have an increase of 13 to 18 dBA over the 2030 Baseline conditions, which is defined as a substantial increase (greater than 10 dBA).

POTENTIAL MITIGATION MEASURES

In areas where traffic noise levels would exceed federal and state criteria, potential mitigation measures could be evaluated as part of project-level environmental review to determine if they would meet both feasible and reasonable criteria set forth in state guidelines. The effectiveness of potential noise mitigation measures would be evaluated using cost/benefit criteria developed by the state.

There are three basic approaches to mitigating traffic noise impacts which include:

1. Control of the noise at the source, which can include:
   a. Reducing traffic volumes on the roadway through traffic management measures.
   b. Incorporating materials that reduce noise generation from tires on the pavement.
   c. Building roadways with lower grades.
2. Control along the path of the noise, which can include:
   a. Increasing the distance to receptors, which can include acquiring land as buffer zones to place receivers further from the source of noise, or realigning the roadway to place the roadway further from especially sensitive receivers.
   b. Building below-grade roadways.
   c. Installing barriers (vertical noise walls or earth berms).
3. Control at the receptor, which can include providing noise insulation for structures where interior noise levels are the primary concern for public use or nonprofit institutional structures.

Given the elements of the project (e.g. alignment, grades, volumes) and characteristics of the affected environment, construction of noise barriers are the most likely mitigation option that may reduce exterior traffic noise levels to acceptable levels. There are several conditions in the study area that may limit the effectiveness of noise barriers or result in them not meeting the State’s cost/benefit criteria. These limiting factors include:

- Noise walls may or may/not be considered acceptable by property owners based on aesthetics.
- Construction of earth berms may require additional right of way, or may not be feasible where existing uses are close to the existing right-of-way and displacement is infeasible.
- Gaps for driveways may limit the effectiveness of barriers or require special design features such overlapping walls
- In areas of low-density development, the State’s cost/benefit criteria may not be met

It is likely that a number of noise mitigation options would need to be considered and implemented together to reduce noise levels. These potential mitigation options and their effectiveness are not readily predictable from the modeling done to date. If federal funds are used to build a new roadway corridor, more detailed analysis would take place as part of project-level environmental documentation.