

4.10 Noise

4.10.1: Existing conditions

Traffic on roadways and commercial and industrial operations generate ambient noise levels within developed urban areas. Traffic noise, however, is most directly linked to changes in land use, population, and employment.

Noise Terminology

Noise is defined by the following terms:

Sound - a vibratory disturbance transmitted by pressure waves through a medium (e.g., air, water, and solids) and capable of being detected by a receiving mechanism, such as the human ear or a microphone.

Noise - a sound that is loud, unpleasant, unexpected, or otherwise undesirable. In general, sound waves travel away from a ground-level noise source in a hemispherical pattern. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the noise source.

Decibel (dB) - a measure of sound intensity based on a logarithmic scale that indicates the squared ratio of actual sound pressure level to a reference sound pressure level (20 micropascals).

A-Weighted Decibel (dBA) - a measure of sound intensity is weighted to account for the varying sensitivity of the human ear to different frequencies of sound. Typical A-weighted noise levels for various types of sound sources are summarized in the table.

Equivalent Sound Level (Leq) - Leq represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level that would contain the same acoustical energy as the time-varying sound that actually occurs during the monitoring period. The 1-hour A-weighted equivalent sound level (Leq 1h) is the energy average of A-weighted sound levels occurring during a 1-hour period.

Day-Night Level (Ldn) - the energy average of the A-weighted sound levels occurring during a 24-hour period, with a 10-dB penalty added to sound levels between 10:00 p.m. and 7:00 a.m.

Typical A-weighted sound levels

Source	dBA*	Typical response
Carrier deck jet operation	140	Limit amplified speech
Limit of amplified speech	130	Painfully loud
Jet takeoff - 200 feet	120	Threshold of feeling and pain
Auto horn - 3 feet	120	Threshold of feeling and pain
Riveting machine	110	Threshold of feeling and pain
Jet takeoff - 2,000 feet	110	Threshold of feeling and pain
Shout - 0.5 feet	100	Very annoying
New York subway station	100	Very annoying
Heavy truck - 50 feet	90	Hearing damage if 8 hours
Pneumatic drill - 50 feet	90	Hearing damage if 8 hours
Passenger train - 100 feet	80	Annoying
Helicopter in flight - 500 feet	80	Annoying
Freight train - 50 feet	80	Annoying
Freeway traffic - 50 feet	70	Intrusive
Air conditioning unit - 20 feet	60	Intrusive
Light auto traffic - 50 feet	60	Intrusive
Normal speech - 15 feet	50	Quiet
Living room, bedroom, library	40	Quiet
Soft whisper - 15 feet	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

*** A-weighted decibel levels**

Source: Federal Transit Administration 2006

A doubling of acoustical energy from a noise source results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is

able to discern 1-dB changes in sound levels if exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000–8,000 hertz [Hz]) range. In typical noisy environments, most people are able to detect sound-level increases of 3 dB, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, doubling sound energy (e.g., doubling the volume of traffic on a highway) is generally perceived as a detectable but not substantial increase in sound level.

Attenuation rate - is used to describe the rate at which the intensity of a sound signal declines as it travels outward from its source. When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (e.g., vehicle traffic on a highway), sound levels decrease by about 3 dBA for every doubling of distance.

Noise levels can also be affected by several factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can affect the reduction of noise levels. Atmospheric conditions (e.g., wind speed and direction, humidity levels, and temperatures) also can affect the degree to which sound is attenuated over distance.

MLK subarea land uses and noise-sensitive receivers

Noise-sensitive receivers generally include residences, schools, parks, and places of worship. Generally, outdoor areas of frequent human use are considered noise sensitive.

Noise-sensitive land uses in the MLK subarea are primarily associated with single-family houses, residential condominiums, apartment buildings, parks, places of worship, office buildings, and commercial buildings.

Existing background noise levels

The MLK subarea is likely affected by the following existing noise sources:

- vehicles on public roads within the study area consisting primarily of MLK Jr Way, Yakima Avenue, and South 11th and 19th Streets
- emergency vehicles and medical helicopters serving the hospitals
- traffic on Interstates 5 and 705, and SR-509
- industrial noise in the Port of Tacoma shipping terminals

- railroad noise from the BNSF and Amtrak trains and switching yards
- un-suppressed aircraft noise from Joint Base Lewis-McChord over flight operations
- rooftop equipment (e.g., ventilation systems) on buildings

Although no sound-level measurements were taken as part of this evaluation, noise levels within the MLK subarea are expected to be relatively high along the ridgelines overlooking the Nalley Valley and I-5, and the hillside overlooking the downtown and Port.

Typical background outdoor, daytime noise levels are estimated to be between 55 and 65 dBA in the MLK subarea, depending on the proximity to I-5 and I-705.

4.10.2: Impacts

Both alternatives

Both alternatives will allow development and redevelopment in the MLK subarea for urban uses and activities to various intensities. An increase in urban development and thereby the overall employee and resident population will in turn increase traffic volumes and noise levels associated with traffic, particularly if local employees and residents continue to commute to places of employment and/or housing outside of the MLK subarea in private vehicles on MLK Jr Way, Yakima Avenue, and South 11th and 19th Streets.

An increase in urban development and thereby the overall population will also create traffic congestion, particularly on the city’s arterial roadway grid and at major intersections and connections on South 11th and 19th Streets. Congestion and background traffic noise will increase if these arterial collectors remain the primary vehicular travel corridor with the surrounding city, and to local community business and service activities.

Both alternatives will also temporarily increase construction noise levels on project sites and from truck and other equipment traffic into and out of the MLK subarea.

4.10.3: Mitigation measures

Both alternatives

Federal and state traffic noise impact criteria

Federal Highway Administration (FHWA) - adopted criteria for evaluating noise impacts

associated with federally funded highway projects, and for determining whether such impacts are sufficient to justify funding of noise abatement. These criteria are specified in the Code of Federal Regulations (23 CFR 772), Procedures for Abatement of Highway Traffic Noise and Construction Noise.

WSDOT - adopted the FHWA Noise Abatement Criteria (NAC) for evaluating noise impacts and determining whether impacts are sufficient to justify funding of noise abatement for roadway improvement projects with state funding. In cases where no state or federal funding is involved, WSDOT protocols are not applicable, but the WSDOT standard is considered a relative indicator of impact for State Environmental Policy Act (SEPA) evaluations.

For WSDOT roadway projects, a noise impact occurs when a predicted traffic noise level under the design year conditions exceeds the WSDOT impact criteria, or when the predicted traffic noise level substantially exceeds the existing noise level. A 10-dBA increase over existing noise levels is considered to be a substantial increase and a traffic noise impact.

	FHWA NAC dBA Leq	WSDOT dBA Leq	Description
A	57 exterior	56 exterior	Lands where serenity and quiet are of extraordinary significance and that 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	66 exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 exterior	71 exterior	Developed land, properties or activities not included in A or B above.
D	72 exterior	71 exterior	Undeveloped lands

E	52 interior	51 interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.
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Source: Federal Highway Administration (FHWA) and WSDOT

Noise abatement criteria may be exceeded justifying noise barriers, landscaping, building soundproofing, and other mitigation efforts that have been installed along portions of I-5 through Nalley Valley.

While traffic volumes will increase on MLK Jr Way, Yakima Avenue, and South 11th and 19th Streets, the lower operating speed on these roadways will likely maintain noise levels below levels requiring major noise abatement projects or regulations.

Tacoma environmental policies

Chapter 8 of the Tacoma Comprehensive Plan includes the following policies governing noise abatement.

E-N-1 Buffer Noise Sources

Encourage the use of buffer areas and/or noise absorbing barriers between sources of noise and residential areas or other noise sensitive land uses.

E-N-2 Noise Reduction Measures

Promote the use of construction techniques, building siting and other means that reduce the level of internal and external noise, particularly in high noise areas.

E-N-3 Noise Impacted Areas

Discourage development in noise impacted areas that will significantly increase noise levels by either a direct contribution or by removing an existing natural feature that acts as a noise absorbing barrier.

E-N-4 Noise Sensitive Land Uses

Discourage the development of noise sensitive land uses within or near high noise areas.

Alternative 2: MLK Subarea Plan

In addition to the measures listed above, the following measures have been incorporated into Alternative 2: MLK Subarea Plan to mitigate possible adverse impacts by installing vegetation and other natural materials that can buffer direct noise impacts:

28: Greenways - designate a system of coordinated open spaces, conservation corridors, greenways and green streets to link MLK parks and community facilities, and

connect the MLK district to adjacent neighborhoods, the Prairie Line Trail, UW Tacoma and the Thea Foss Waterway.

29: Community gardens - plant community or pea patch gardens on vacant sites as well as other available lands within MLK to restore habitat, grow healthy foods for local use, and improve visual appearances, in some cases to serve as temporary uses on sites waiting for redevelopment.

32: Native habitat - plant street trees, reforest open spaces, remove invasive species, and promote use of native and drought resistant plants to restore wildlife habitat in and around MLK's public facilities and within MLK's green, urban, and parkway street corridors.

33: Stormwater - develop rain gardens, green roofs and walls, bio-filtration swales, and other green development features in and around the MLK subarea's public facilities and within the MLK area's green and urban streets as well as in new project developments.

4.10.4: Unavoidable adverse impacts

Under both alternatives, the undeveloped and underdeveloped lands in the MLK subarea will be redeveloped for higher intensity uses that will increase noise levels as a result of increased levels of general urban activity, including vehicle traffic on MLK Jr Way, Yakima Avenue, and South 11th and 19th Streets, and temporary noise created by construction activities.

The application of mitigation measures will prevent any unavoidable adverse impacts on plans and policies that have not already been accounted for.