3.6 Noise

Definition of Terms

For the purposes of this analysis, noise can be described as sound that is undesired, in terms of its loudness (amplitude) and frequency (pitch).

Since the human ear is not equally sensitive to sound at all frequencies, a frequency dependant rating relates noise to human hearing sensitivity. This is called the A-weighted decibel (dBA) scale. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dBA. Therefore, a 70-dBA sound level will sound twice as loud as a 60-dBA sound level. People generally cannot detect differences of 1 to 2 dBA between noise sources of a similar nature (e.g., an increase in traffic noise compared to existing traffic noise); however, under ideal listening conditions, differences of 2 or 3 dBA can be detected by some people. Most people under normal listening conditions would probably perceive a 5-dBA change. Typical sound levels in dBA are shown on Table 3.6-1.

Noise levels that vary with time are often described in terms of the equivalent sound level (Leq). The Leq is the average steady-state sound level that, in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same time period. Because Leq is similar to average sound level, it is important to identify the time period being considered.

EPA uses the “day-night average noise level” or Ldn to quantify the 24-hour average noise levels in communities. The Ldn is the 24-hour average Leq noise level, except that the actual nighttime noise levels (10:00 p.m. to 7:00 a.m.) are increased by 10 dBA to account for heightened sensitivity to noise at night.

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. In traffic studies, an attenuation rate of 4.5 dBA per doubling of distance is often used when the roadway is at ground level and the intervening ground is effective in absorbing sound (e.g., ground vegetation, scattered trees, and clumps of bushes). When the roadway is elevated, 3-dBA noise attenuation per doubling of distance is used because the sound-absorbing effects of the intervening ground are limited.

Noise levels at different distances 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 decreasing noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is attenuated over distance.

Echoes off topographical features or buildings can sometimes result in higher sound levels (lower sound attenuation rates) than normally expected. Temperature inversions and attitudinal changes in wind conditions can also refract and focus sound waves toward a location at considerable distance from the noise source. As a result, the existing noise environment can be highly variable depending on local conditions.

Table 3.6-1. Typical Sound Levels (dBA)

Home	Work	Recreation
50 refrigerator	40 quiet office, library	40 quiet residential area
50–60 electric toothbrush	50 large office	70 freeway traffic
50–75 washing machine	65–95 power lawn mower	85 heavy traffic, noisy restaurant
50–75 air conditioner	80 manual machine, tools	90 truck, shouted conversation
50–80 electric shaver	85 handsaw	95–110 motorcycle
55 coffee percolator	90 tractor	100 snowmobile
55–70 dishwasher	90–115 subway	100 school dance, boom box
60 sewing machine	95 electric drill	110 disco
60–85 vacuum cleaner	100 factory machinery	110 busy video arcade
60–95 hair dryer	100 woodworking class	110 symphony concert
65–80 alarm clock	105 snow blower	110 car horn
70 TV audio	110 power saw	110 -120 rock concert
70–80 coffee grinder	110 leafblower	112 personal cassette player on high
70–95 garbage disposal	120 chain saw, hammer on nail	117 football game (stadium)
75–85 flush toilet	120 pneumatic drills, heavy machine	120 band concert
80 pop-up toaster	120 jet plane (at ramp)	125 auto stereo (factory installed)
80 doorbell	120 ambulance siren	130 stock car races
80 ringing telephone	125 chain saw	143 bicycle horn
80 whistling kettle	130 jackhammer, power drill	150 firecracker
80–90 food mixer or processor	130 air raid	156 capgun
80–90 blender	130 percussion section at symphony	157 balloon pop
80–95 garbage disposal	140 airplane taking off	162 fireworks (at 3 feet)
110 baby crying	150 jet engine taking off	163 rifle
110 squeaky toy held close to the ear		166 handgun
135 noisy squeeze toys		170 shotgun

Source: Center for Hearing and Communication 2010.

Points of Reference

0	The softest sound a person can hear with normal hearing
10	normal breathing
20	whispering at 5 feet
30	soft whisper
50	rainfall
60	normal conversation
110	shouting in ear
120	thunder

Noise Regulations and Guidelines

U.S. Environmental Protection Agency

The EPA has established guidelines to evaluate noise impacts in residential areas as follows:

Ldn < 55 dBA — Levels are generally acceptable; no noise impact is associated with these levels.

Ldn 55–65 dBA — Average noise impacts exist; lowest noise level possible should be

	strived for.
Ldn 65–70 dBA	Significant noise impacts; allowable only in unusual cases where lower levels are clearly demonstrated to not be possible.
Ldn > 70 dBA	Levels have unacceptable public health impacts.

Impacts and noise increases over present ambient levels are classified as follows:

0–5 dBA Ldn increase	Slight impact
5–10 dBA Ldn increase	Significant impact
> 10 dBA Ldn increase	Serious impact

The EPA guidelines also specify the information needed to evaluate noise impacts and some abatement measures that can be used if abatement is required.

FHWA Noise Standards

The Federal Highway Administration (FHWA) also has noise standards for roads and highways receiving federal funds. These criteria establish procedures for local officials to use in planning and design of highways. Refer to Table 3.6-2.

Table 3.6-2. FHWA Noise Abatement Criteria

Activity Category	NAC, Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	—	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches libraries, hospitals, and auditoriums.

Source: FHWA 2010.

Washington State Department of Transportation

Freeways and other state routes can be sources of noise. For traffic noise, the Washington State Department of Transportation (WSDOT) considers a 10-dBA or greater increase to be a significant impact; WSDOT standards apply when roadways receive state or federal funding.

Washington State Department of Ecology (Ecology)

Ecology (Washington Administrative Code [WAC] 173-60) has classified three areas or zones based on land use and established maximum permissible noise levels, titled Environmental Designation for Noise Abatement (EDNA), and are as follows:

Residential areas: Class A EDNA

Commercial areas: Class B EDNA

Industrial areas: Class C EDNA

The following sounds exempt from the noise limitation described above include, but are not limited to:

- Sounds from individual motor vehicles as regulated by WAC 173-62
- Combined traffic noise
- Daytime construction noise
- Sounds from aircraft in flight
- Sounds from railroads
- Sounds from emergency vehicles or warning devices
- Sounds from natural phenomena

Ecology controls noise from individual motor vehicles under WAC 173-62, because motor vehicle noise from vehicles with defective mufflers would regularly violate the limitations of the EDNAs described above.

Jurisdictions may designate EDNAs or their own classification. The City of Sumner (City) has adopted a Noise Control ordinance with EDNAs, which also includes nuisance noise, which broadly covers certain noise sources such as amplified sounds (e.g., radios, speakers). Chapter 18.44 Sumner Municipal Code (SMC) sets forth EDNAs, maximum noise levels between EDNAs, exceptions, deviations, variances and provisions for enforcement (Table 3.6-3).

Table 3.6-3. Sumner Maximum Permissible Noise Levels

EDNA of Noise Source	EDNA of Receiving Property		
	Class A	**Class B**	**Class C**
Class A	55 dBA	57 dBA	60 dBA
Class B	57 dBA	60 dBA	65 dBA
Class C	60 dBA	65 dBA	70 dBA

Class A Zones: LDR-4; LDR-6; LDR-7.2; LDR 8.5; LDR-12; MDR; HDR; RP; MUD
Class B Zones: NC; CBD; GC; IC
Class C Zones: M-1; M-2; AG

3.6.2 Affected Environment

Current Plan Area

Noise Levels and Sources

Traffic Noise

Noise levels within the current plan area primarily come from the state highways (State Route [SR] 410 and SR 167) and other high-volume arterials. Table 3.6-4 shows the Annual Average Daily Traffic (AADT) volumes on SR 167 and SR 410 routes from 2006 to 2009.

Table 3.6-4. State Freeway Traffic Counts (2006–2009)

	Average Daily Traffic Volume			
	2006	2007	2008	2009
State Route 167				
After Milepost 10.14 A: Right On Ramp 24th St E			84,000*	86,000*
After Milepost 7.49 A: Right On Ramp SR 410	80,000	80,000	82,000*	85,000*
State Route 410				
After Milepost 9.53 A: Right On Ramp E Main Ave				59,000*
At Milepost 10.40 A: Undercrossing SR 162	45,000	45,000	43,000	43,000*
After Milepost 10.79 A: Right On Ramp SR162	52,000	52,000	50,000	49,000*
At Milepost 11.46 A: Bridge 166th Ave E				42,000*
State Route 162				
After Milepost 0.08 A: Right On Ramp SR 410	23,000	23,000	21,000*	22,000

Source: WSDOT 2010.
*Based on Actual Counts

The level of highway traffic noise depends on three things: (1) the volume of the traffic, (2) the speed of the traffic, (3) the number of trucks in the flow, and (4) proximity. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. Vehicle noise is a combination of the noises produced by the engine, exhaust, and tires. The loudness of traffic noise can also be increased by defective or faulty equipment on vehicles. In addition, there are other more complicated factors that affect the loudness of traffic noise. For example, traffic noise levels are reduced by distance, terrain, vegetation, and natural and manmade obstacles. Traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads.

Highway traffic noise can be mitigated through motor vehicle control (prohibiting trucks), land use control (providing buffer areas from freeways, required landscaping, or more compatible zoning along freeways), and highway planning and design (including noise barriers). The responsibilities for implementing these strategies must be shared by all levels of government.

Noise levels along SR 167 are largely buffered by industrial zoning on both sides of the freeway and are not of concern for residential noise mitigation. SR 410 traverses residential areas adjacent to the roadway. Mitigation along SR 410, which is largely existing residential, could include noise barrier construction. However, noise barriers are not always required at locations where an absolute threshold is met. There is no "number standard" which requires the construction of a noise barrier. Barrier construction typically applies to: (1) the construction of a highway at a new location or (2) the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. If WSDOT identifies potential impacts on state- or federal-funded roadway projects, it must implement abatement measures, possibly including the construction of noise barriers, where reasonable and feasible.

Other Noise Sources

Other sources of noise within the current plan area include noise from new construction activities, maintenance projects such as road paving and repair, airplanes, emergency vehicle sirens, and the railroads. In general, industrial activities tend to be indoor operations, but some operations do generate outdoor noise, such as Western Wood Preserving, Woodworth Asphalt batch plant, and Manke Lumber Co. Noise sources from industrial or commercial activities could include loading docks, HVAC equipment, or other sources.

Land Uses and Noise-Sensitive Receivers

Noise-sensitive "uses" include residences, schools, parks, and churches located throughout the current plan area, but primarily between Elm Street and the Puyallup River. In general, this area is predominately single-family housing with multifamily housing in concentrated areas. Generally, residences are shielded from stationary industrial operations, except in industrially and commercially zoned areas where several homes still exist (e.g., Zehnder Street).

Although no sound level measurements were taken as part of this evaluation noise levels are expected to generally comply with noise criteria except near busy roads and freeways. Periodic noise from the railroad or airplanes would also affect some residential areas.

Orton Junction UGA Expansion Area

Noise sources would include traffic noise due to SR 410 and to a lesser degree SR 162. Noise-sensitive "uses" include residences.

East Hill UGA Expansion Area

Noise sources are expected to be major roadways. Noise-sensitive "uses" include residences.

3.6.3 Impacts

Impacts Common to All Alternatives

For all alternatives, construction of infrastructure and buildings over time will result in noise impacts. Long-term noise is associated with traffic levels generated from Sumner homes and businesses as well as from regional sources and is predicted to continue. In addition, existing, stationary sources of noise could remain and would continue to contribute noise.

Construction Noise

Construction of infrastructure, housing, and business facilities is usually accompanied by temporary increases in noise due to the use of heavy equipment and hauling of construction materials. Noise impacts depend on the background sound levels, the type of construction equipment being used, and the amount of time it is in use.

Typical noise levels from construction are displayed in Table 3.6-5. As indicated, sound levels 50 feet from construction equipment exceed environmental noise limits. Sounds from construction equipment (usually a point source) decrease about 6 dBA for each doubling in distance from the source. Construction noise may still have a temporary, localized impact on nearby residences and businesses, although construction noise is exempt from environmental noise regulations during the day.

Table 3.6-5. Typical Construction Equipment Noise (dBA)

Activity	Estimated Leq		Types of Equipment	Range of Noise Levels at 50 feet
	At 50 feet	At 200 feet		
Clearing	83	71	Bulldozer	77–96
			Dump truck	82–94
Grading	75–88	63–76	Scraper	80–93
			Bulldozer	77–96
Paving	72–88	60–76	Paver	86–88
			Dump truck	82–94
Erection	72–84	60–72	Crane	75–85
			Concrete Mixers	75–85

Source: EPA 1971.

Operational Impacts and Traffic Noise

Increased development in the current plan area would result in increased ambient noise levels. For most residents, increased traffic would result in the greatest increase in noise levels. Traffic noise pollution is typically dominant within 300 feet of major roadways. Noise from commercial uses could be noticeable to nearby residents at certain times, particularly near commercial/industrial facilities with truck loading areas or outdoor machinery. Noise from commercial and industrial facilities would be subject to Ecology EDNA standards as adopted by the City.

Current plan area population and vehicle miles travelled will increase under all alternatives at similar levels, likely resulting in homes exposed to traffic noise. Future traffic noise impacts caused by increased development could occur as a result of the following types of events:

- Increases in traffic volume along existing roadways, impacting existing homes near the roadway.
- Increases in traffic volume and traffic speed caused by improvements to existing roads, impacting existing homes near the roadway.
- Widening of existing roadways, thereby moving traffic closer to existing homes near the roadway.
- Construction of new roadways through undeveloped land.
- Construction of new homes close to freeways or arterials with high traffic volume and high speed limits.

Figure 3.6-1 shows general trends of traffic noise for a range of typical traffic volumes and traffic speeds along a representative two-lane roadway. Traffic noise typically exceeds FHWA's 66-dBA impact criterion only for homes within 300 feet of a freeway or 100 feet from an arterial roadway. The magnitude of the traffic noise impact near any given roadway would depend on the traffic volume, traffic speed, and number of lanes.

Figure 3.6-1. Estimated Noise Levels Along a Two-Lane Roadway

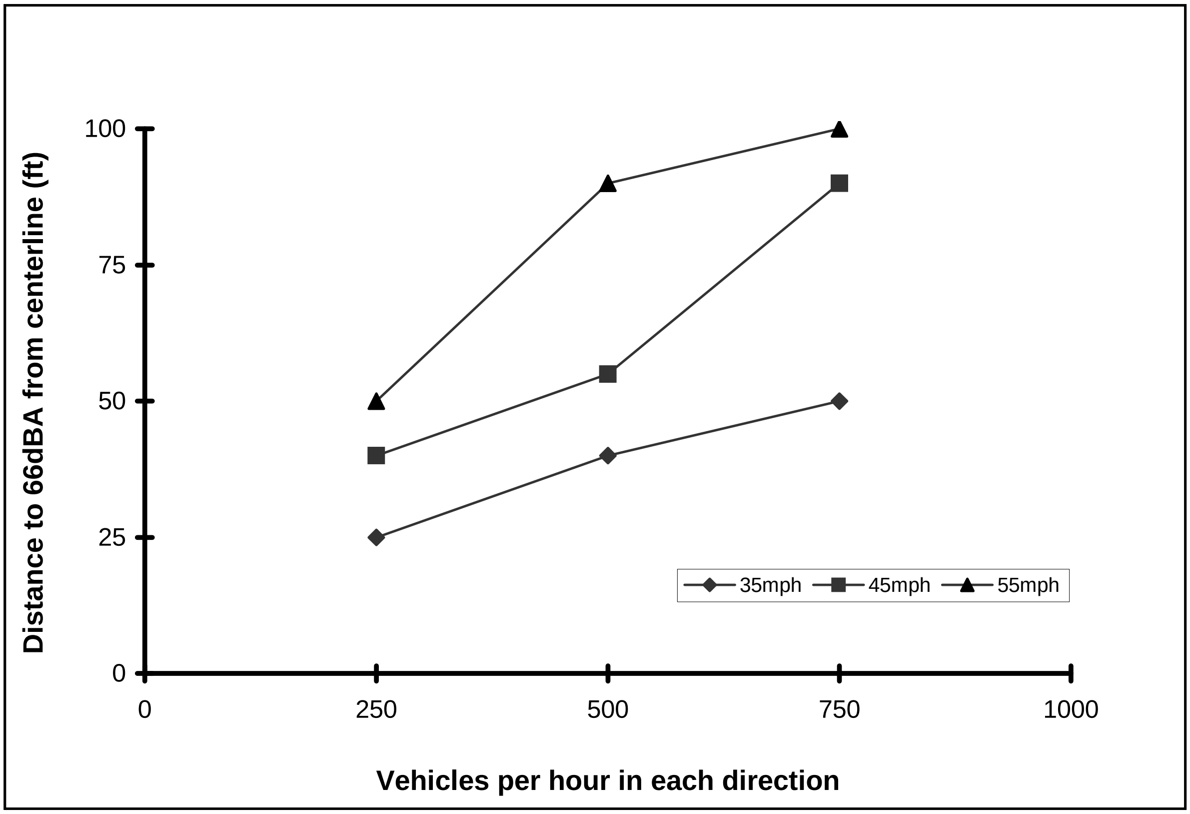

Table 3.6-6 demonstrates projected traffic volume levels for each alternative at selected locations utilizing traffic volume data provided by The Transpo Group. The level of change in dBA has not been estimated, but is expected to increase with increasing volumes. Noise levels will increase over existing levels on most roadways as development occurs. The area of greatest change among the alternatives in future conditions is on roadways south of SR 410, as described under impacts specific to each alternative.

Table 3.6-6. Comparison of Forecast PM Peak Hour Traffic Volumes

	UGA Expansion (Orton Junction) Alternative		UGA Modification Alternative		No Action Alternative	
Location	**NB/EB**	**SB/WB**	**NB/EB**	**SB/WB**	**NB/EB**	**SB/WB**
SR 167 south of 8th Street	4,050	5,830	4,150	5,860	4,040	5,830
SR 410 west of Traffic Avenue	5,400	3,330	5,380	3,350	5,350	3,240
SR 410 east of SR 162	3,330	2,490	3,340	2,530	3,320	2,430
SR 410 east of 166th Avenue E	3,200	2,160	3,230	2,210	3,190	2,140
Main St west of Valley Ave	835	550	850	550	830	530
Main St west of Main St	935	635	940	340	935	625
Fryar Ave north of Zehnder Ave	570	1,205	580	1,225	565	1,205
E Valley Hwy north of 8th St E	415	1,065	410	1,065	415	1,070
8th St E west of E Valley Hwy	70	260	70	260	70	260
E Valley Highway south of Forest Canyon Rd	330	705	330	735	325	705
Forest Canyon Rd east of E Valley Highway	500	150	450	130	505	150
E Valley Highway north of Forest Canyon Rd	345	1,075	340	1,065	345	1,080
E Valley Hwy north of E Elm St	465	950	470	970	460	940
W Valley Highway north of Sumner Heights Rd	420	785	430	495	415	790
166th Ave E south of SR 410	660	725	660	720	595	555
74th St E east of SR 162	245	225	210	210	85	50
Riverside Dr south of 78th St E	205	305	205	305	130	225
SR 162 south of Pioneer Way	660	1,765	685	1,795	660	1,765
SR 162 south of SR 410	825	1990	830	1985	705	1,860
SR 162 north of SR 410	415	885	415	890	390	875
Sumner-Tapps Highway north of 64th Street E	850	790	825	770	835	780

Impacts Specific to the UGA Expansion (Orton Junction) Alternative

Under the UGA Expansion (Orton Junction) Alternative, commercial uses would increase in proximity to rural residential areas compared to the No Action Alternative. Likewise, the potential impacts described in “Impacts Common to All Alternatives” regarding increased noise due to activities such as commercial loading would be greater under this alternative.

The alternative would result in slightly higher traffic volumes on SR 410 between SR 167 and just east of 166th Avenue East, and could result in increased noise levels. These volumes reflect the increased trip generation in the Orton Junction expansion area. The primary difference in forecast traffic volumes under this alternative are for traffic entering/exiting the Orton Junction expansion area including 74th Street East, just east of SR 162; Riverside Drive, south of 78th Street East; and 166th Avenue East south of SR 410.

Depending on the sensitivity of noise receptors, the City may require site specific noise studies along the more major routes. Since Low Density Residential zoning is planned in the Orton Junction expansion area, future residents may be subject to noise from SR 162 and SR 410, the more major noise sources given the greater traffic volumes. Alternative construction and buffering techniques may need to be considered at the time of development application review.

Impacts Specific to the UGA Modification Alternative

Impacts are similar to the UGA Expansion Alternative in terms of commercial increases and traffic volume increases. However, under this alternative the Orton Junction expansion area would be smaller and would not include Low Density Residential designations. Therefore, fewer residents would locate in the vicinity of major highway noise sources. In addition, with the UGA reduction in the East Hill area), fewer dwellings would be constructed near major roadways such as Sumner-Tapps Highway East, reducing sensitive receptors near roadway noise in that location.

Impacts Specific to No Action Alternative

Traffic volumes and associated roadway noise are expected to increase the least under this alternative compared to the action alternatives.

3.6.4 Mitigation Measures

Incorporated Plan Features

Policies encouraging alternative modes and reducing vehicular travel could reduce the potential for transportation noise sources. All alternatives incorporate concepts for neighborhood centers and urban villages to promote a greater amount of pedestrian accessibility. All alternatives include Transportation Element policies that promote bike paths, trails, and sidewalks.

Applicable Regulations and Commitments

- SMC Chapter 8.16 includes nuisance provisions.
- SMC Chapter 8.44 provides specific noise controls and dBA levels between EDNAs.
- SMC Chapter 15.34 limits hours of construction.
- The SEPA review process allows the City to consider potential noise impacts.

Other Potential Mitigation Measures

Other potential mitigation measures to address noise could include the following:

- The City could review setback standards in potentially noise-sensitive areas.
- The City could require review of noise impacts for new developments and require mitigation as appropriate through the SEPA process. The City could develop a SEPA policy specifically addressing noise for the purposes of mitigating impacts of new development.
- The City could work with transit service providers to reduce noise associated with busses.
- The City could collaborate with the railroads to create a "quiet zone" through downtown Sumner that would reduce the need for train whistles at crossings. This may include signals with individual alarms/horns that are activated when the crossing arms go down.
- The City could also implement the following measures to reduce impacts of additional noise that results from new development from *The Audible Landscape: A Manual for Highway Noise and Land Use* (FHWA 1974):
    - Acoustical site planning such as requiring buffers between the noise source and noise-sensitive activities, using buildings as barriers, orienting noise-sensitive buildings to face away from noise sources, and placing noise compatible uses adjacent one another.
    - Acoustical architecture that incorporates noise-reducing design through window and room placement, etc.
    - Acoustical construction methods such as improved airspace and insulation for walls, using windows that are designed for noise-sensitive buildings, etc.
    - Noise barriers between noise sources and noise-sensitive areas. Barriers could be constructed of earth berms, walls, dense landscaping, etc.

3.6.5 Significant Unavoidable Adverse Impacts

Noise levels will likely increase in the study area from short-term and long-term noise sources.