NOISE

Introduction

This section describes the noise impact and mitigation assessment for the proposed project. It discusses existing noise levels and affected environment on and near the proposed development sites, considers potential impacts of the alternatives and facility operation, and recommends mitigation to address identified adverse impacts.

Methodology

The noise impact assessment of the proposed project and the alternatives included measurements of existing sound levels to characterize the acoustic environment adjacent to or potentially affected by the proposed project. For residential areas potentially affected by project-related traffic, the impacts of the alternatives were assessed using the Federal Highway Administration (FHWA) Traffic Noise Model Lookup tool. This simple noise model was used to estimate existing and future (2015) traffic-related noise levels during the p.m. peak hour at representative noise model receptor locations, with and without the project's alternatives. This model estimates traffic noise based on volumes, vehicle classes, vehicle speeds, and distance. It cannot, however, account for terrain or any intervening structures that may absorb or reflect sound. Predicted noise levels were compared to the FHWA noise impact criteria to assess the potential for noise impacts. Construction noise and noise from future on-site sources were considered qualitatively. Potential impacts for non-traffic sources were defined by levels allowed by the Washington Administrative Code noise regulations (WAC 173-60).

Existing Conditions / Affected Environment

Noise Level Terminology

Noise is sometimes defined as unwanted sound. This report makes no such distinction, and the terms noise and sound are used interchangeably throughout the text. The human ear responds to a very wide range of sound intensities. The decibel (dB) scale used to describe sound is a logarithmic rating system capable of assessing large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. For example, a 70-dB sound level would sound about twice as loud as a 60-dB sound level. Because the dB scale used to describe noise is logarithmic, a doubling of sound energy from a noise source (e.g., twice as many vehicles on a road) produces a 3-dB increase at a noise receiver.

People generally cannot detect sound level differences (increases or decreases) of 1 dB in a given noise source. Differences of 2 dB or 3 dB can be detected under ideal laboratory situations, although they are often difficult to discern in an active, outdoor noise environment. However, a 5-dB change in a given noise source or environment would likely be perceived by most people under normal listening conditions.

When assessing the effects of noise on people, it is necessary to consider the range of frequencies that the human ear perceives the best. Sound-measuring instruments are, therefore,

designed to "weight" sounds based on the way people hear. The frequency weighting most often used to evaluate environmental noise is known as A-weighting, and measurements from instruments using this system are reported in A-weighted decibels or dBA. All sound levels discussed in this evaluation are reported in A-weighted decibels. Sound levels associated with a range of common noise sources are listed in **Table 1.**

Factors affecting the sound transmission from a given source, which in turn affects the potential for noise impacts, include distance from the source, frequency of the sound, absorbency of the ground surface, the presence or absence of obstructions and their absorbency or reflectivity, and the duration of the sound. The degree of impact on humans also depends on existing sound levels at the receiving location, who is listening, and their attitude regarding the noise source.

Sound levels from relatively long-line sources, such as roads, decrease with distance at a rate of 3 dBA per doubling of the distance from the source. Sound levels from discrete events or stationary point sources, such as a single vehicle's tire squeal, decrease at a rate of about 6 dBA per doubling of the distance from the event. Conversely, moving half the distance closer to a source increases sound levels by 3 dBA and 6 dBA for line and point sources, respectively.

Federal regulatory agencies often use the equivalent sound level (L_{eq}) to characterize sound levels and to evaluate noise impacts. The L_{eq} is the level of a *constant* sound that has the same sound energy as the actual, fluctuating sound. As such, the L_{eq} can be considered an energy average sound level. But unlike a simple arithmetic average, which can obscure very high and very low variations from the average, the L_{eq} gives most weight to the highest and the longest lasting sound levels because they contain the most energy. The L_{eq} noise metric has been found to be highly correlated to community response to noise, and is often the metric calculated by noise models used to assess potential adverse impacts and the need for mitigation.

Table 1. Common Sound Sources and Levels

Thresholds/ Noise Sources	Sound Level (dBA)	Subjective Evaluations [(a)]	Possible Effects on Humans [(a)]
Human Threshold of Pain Carrier jet takeoff at 50 ft	140	Deafening	Continuous exposure to levels above 70 can cause hearing loss in majority of population
Siren at 100 ft Loud rock band	130		
Jet takeoff at 200 ft Auto horn at 3 ft	120		
Chain saw Noisy snowmobile	110		
Lawn mower at 3 ft Noisy motorcycle at 50 ft	100	Very Loud	
Heavy truck at 50 ft	90		
Pneumatic drill at 50 ft Busy urban street, daytime	80	Loud	
Normal automobile at 50 mph Vacuum cleaner at 3 ft	70		Speech Interference
Air conditioning unit at 20 ft Conversation at 3 ft	60	Moderate	
Quiet residential area Light auto traffic at 100 ft	50		Sleep Interference
Library Quiet home	40	Faint	
Soft whisper at 15 ft	30		
Slight rustling of leaves	20	Very Faint	
Broadcasting Studio	10		
Threshold of Human Hearing	0		

[(a)] Note that both the subjective evaluations and the physiological responses are continuums without true threshold boundaries. Consequently, there are overlaps among categories of response that depend on the sensitivity of the noise receivers.

Source: U.S. Environmental Protection Agency, 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, and others; Compiled by ENVIRON International Corp.

Noise Regulation Overview

The proposed Lawson Hills project property is located in and regulated by the City of Black Diamond, Washington. Therefore, the noise regulations established by the City of Black Diamond are pertinent to this assessment. Although unincorporated King County abuts some portions of the project site, there are no noise-sensitive properties in these areas that would be affected by the project. So the King County noise rule does not pertain.

City of Black Diamond/Washington State Noise Regulations

The City of Black Diamond is in the process of revising its zoning code. The Black Diamond Municipal Code draft section 18.78.030 (Draft BDMC 18.78.030) adopts the State of Washington's environmental noise regulations set forth in (WAC 173-60). These rules limit the levels and durations of noise crossing property boundaries. Regardless of whether or not this draft code is ultimately adopted, a jurisdiction without its own specific regulations regarding noise (e.g., the City of Black Diamond) is subject to the State limits and regulations.

Chapter 173-60 of the Washington Administrative Code (WAC 173-60) establishes limits on sounds crossing property boundaries based on the Environmental Designation for Noise Abatement (EDNA) of the sound source and the receiving properties. The Black Diamond draft zoning code (Draft BDMC 18.78.030) establishes Class A EDNAs as all living areas (single-family, multifamily, etc.), Class B EDNAs as all commercial areas, and Class C EDNAs as all industrial areas. This conforms to the State's designations of EDNAs. The applicable noise limits for each EDNA source and receiver combination are listed in **Table 2**.

Table 2. WAC 173-60 Maximum Environmental Noise levels (dBA)

EDNA of Source Property	EDNA of Receiving Property		
	Class A Day/Night	Class B	Class C
Class A (Residential)	55/45	57	60
Class B (Commercial)	57/47	60	65
Class C (Industrial)	60/50	65	70

The limitations for noise received in Class A EDNAs are reduced by 10 dBA during nighttime hours (10 p.m. to 7 a.m.).

Source: WAC 173-60-40

The maximum environmental noise levels in **Table 2** may be exceeded by a total of not more than 15 minutes in any one-hour period when comprised of one or any combination of the following: 5 dBA for no more than 15 minutes in any hour, or 10 dBA for no more than 5 minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. These allowed short-term increases can be described in terms of the percentage of time a certain level is exceeded. For example, L_{25} represents a sound level that is exceeded 25 percent of the time, or 15 minutes in an hour. Similarly, the $L_{8.3}$ and $L_{2.5}$ are the sound levels exceeded 5 and 1.5 minutes in an hour, respectively. At no time can the allowable sound level be exceeded by more than 15 dBA,

represented by an L_{max} noise limit. Using these statistical descriptors, the WAC noise limits can be represented by the measured or calculated hourly L_{25}, $L_{8.3}$, $L_{2.5}$, and L_{max}.

The following sources are exempt from the state noise limits:

- sounds created by motor vehicles traveling on public roads when regulated by WAC 173-62 (noise limits for individual vehicles)
- Sounds caused by motor vehicles, licensed or unlicensed, when operated off public highways, except when such sounds are received in Class A EDNAs
- sounds created by warning devices (such as back-up alarms on vehicles) not operated continuously for more than five minutes
- sounds from temporary construction activities during daytime hours (7 a.m. to 10 p.m.) at all receiving locations and during nighttime hours (10 p.m. and 7 a.m.) in Class B or Class C EDNAs

Federal Highway Administration Noise Impact and Abatement Policies

The Federal Highway Administration (FHWA) has adopted traffic noise impact criteria that apply to traffic noise associated with its projects. *These criteria do not apply to this project* because they are intended for analyzing effects related to new, expanded, or substantially modified roads controlled by state or federal agencies. However, the FHWA traffic noise criteria and the Washington state implementation of these rules through state policies are discussed below to provide readers a perspective on the noise levels related to traffic sources.

The FHWA defines a traffic noise impact as a predicted traffic noise level approaching or exceeding 67 dBA at exterior locations associated with residential uses, or when the predicted traffic noise levels substantially exceed the existing noise levels. FHWA leaves the definition of "approach" to the states. The Washington State Department of Transportation (WSDOT) defines "approaching" the FHWA limits as sound levels within 1 dBA of the criterion level (i.e., 66 dBA for residential properties). WSDOT defines "substantially exceeding" existing noise levels as an increase greater than 10 dBA.

Existing Land Use and Terrain

The project site consists of three distinct areas: the upper portion of the Main Property, the lower portion of the Main Property, and the North Triangle Property. Existing land uses adjacent to these project properties include undeveloped areas of wetlands, forest, and meadows and a built environment consisting of residences, historic mining operations, and small retail/commercial entities in the downtown core. The proposed development would be located entirely within the City of Black Diamond, and while most of the development would border other areas within the City limits, some portions of the project property would abut property in unincorporated King County.

Most of the upper portion of the Main Property is currently undeveloped, with a few residences that would be removed as part of the project. The upper Main Property also surrounds several scattered single-family residences that are not part of the project. Other adjacent property is

primarily undeveloped forest. The upper Main Property slopes upward to the east and overlooks downtown Black Diamond.

The lower portion of the Main Property is primarily undeveloped/forested land. The lower Main Property borders the Lawson Hills Estates single-family residential development and includes the Railroad-Lawson Connector road. The lower Main Property also abuts the historic John Henry Mine property on its north edge. Terrain on the lower Main Property is generally flat with some elevation gain between from State Route 169 (SR-169) to Lawson Street.

The North Triangle Property consists primarily of undeveloped forest and is bordered on the southeast by the Diamond Glen single-family residential neighborhood. It is bordered on the north by the Black Diamond Natural Area and Cranberry Slough, and on the east by SR-169. The terrain of the North Triangle Property is relatively flat.

Existing Sound Sources and Measured Sound Levels

The existing acoustic environments vary throughout the project areas in relation to their relative distances from and the presence of obstructions to the major source of traffic noise in the area, SR-169. Other noise sources which affect existing sound levels include noise from aircraft, dogs, residential properties, and distant periodic train horns at crossings.

Sound level measurements (SLMs) were taken at five locations in the project area. Three SLMs were long term measurements (approximately 48 hours) and two were short term measurements (15 minutes). These measurements represent existing sound levels at nearby existing and potential future residential locations. These measurements were taken using Type I sound level meters with levels of accuracy about 1 dBA. The meters had been factory certified within the previous 12 months and were field calibrated immediately prior to measurements. The microphones of the meters were fitted with windscreens and were set approximately 5 feet above the ground. Long term SLMs were fitted with bird-repelling and acoustically neutral weather heads. The SLM locations are depicted in **Figure 1** and some of the sources observed are described in **Table 3.** Additional noise measurement data are available in Noise Attachment 1.

The measured L_{eqs} at each location are a convenient way to compare overall levels based on energy-averages over hour-long periods. The L_{max} levels are the highest very short-term (i.e., 0.125 second) sound events that occurred during each hour of the measurements, and these levels may derive from a variety of sources like a train whistle or loud motorcycle. At SLM locations that represent existing or future potential residences, the day-night (L_{dn}) levels provide a good indication of overall noise, and this metric is weighted to reflect the potential for sleep disturbance from nighttime noise. A widely accepted L_{dn} suitability threshold for an urban environment is 65 dBA.[1] The measured hourly L_{25} levels can be compared with the WAC's 60/50-dBA day/night L_{25} noise limits (**Table 2**). The measured hourly L_{eqs} during peak travel periods can also be used to determine whether existing traffic-related noise exceeds the FHWA noise abatement criteria. Based on measurements, existing noise levels are below WAC and

[1] For example, the U.S. Department of Housing and Urban Development (HUD) uses the Ldn 65 as the threshold between "normally acceptable" and "normally unacceptable" sound levels for residential uses (HUD 1985).

FHWA noise limits at each location. In addition, the pattern of existing hourly L_{eqs} indicates that the loudest noise levels occur during daytime hours and decrease substantially at night. In locations near roads, daily sound level patterns reflect changes in traffic, and are highest during commute periods. At other locations, during non-peak traffic periods, existing sound levels are much lower.

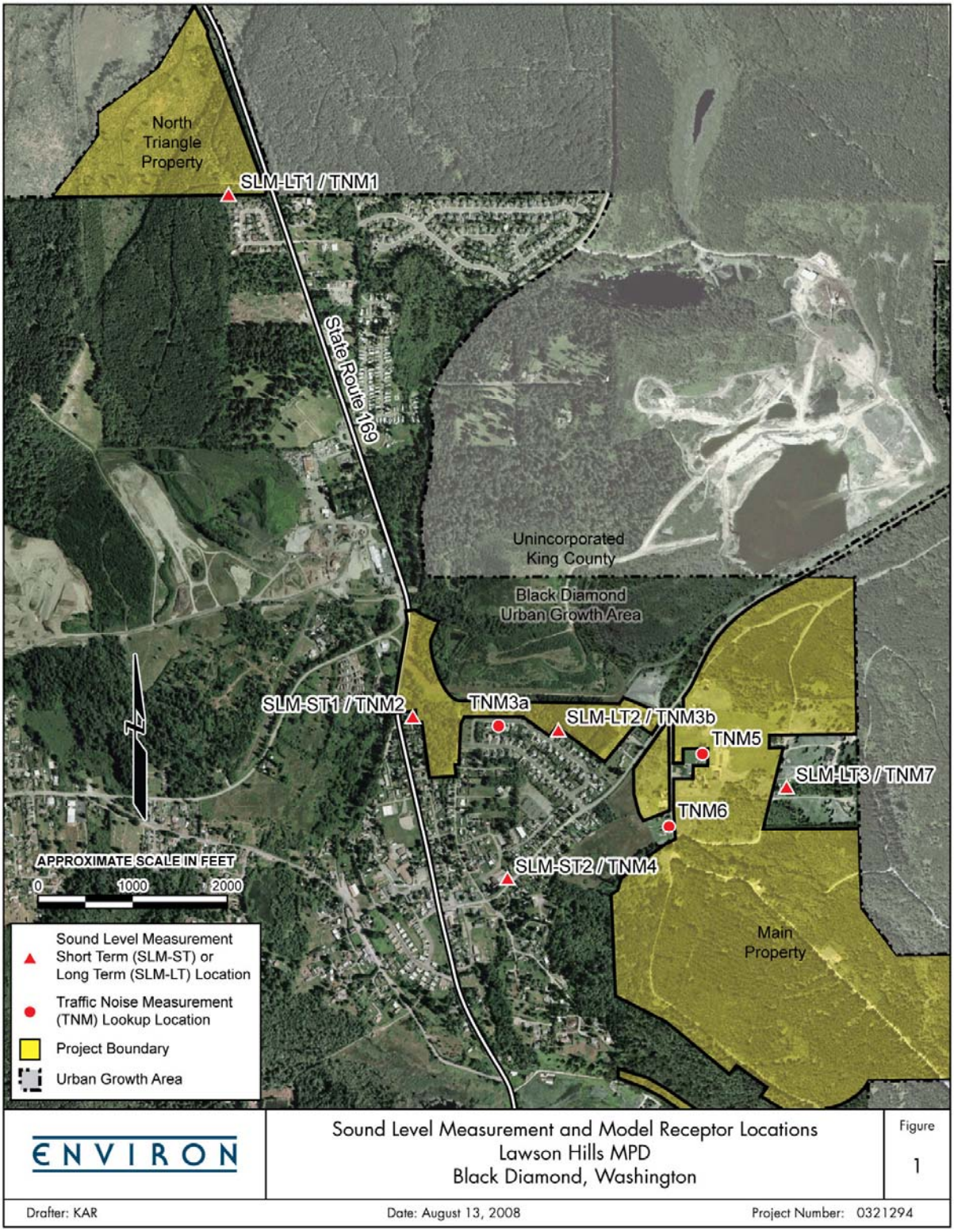

Figure 1. Sound Level Measurement and Model Receptor Locations

Table 3. Measured Existing Sound Levels (dBA)

SLM Location	Day/Night	Range of Measured Hourly Level			
		Leq	L25	Lmax	Ldn
Long-term (48-hour) Measurements					
SLM-LT1 25000 Franklin Dr.	Day	42-57	42-48	55-85	50
	Night	31-48	29-46	49-72	
SLM-LT2 32514 McKay Ln.	Day	39-51	35-47	59-80	48
	Night	27-45	27-42	41-69	
SLM-LT3 SE Mountain View Dr.	Day	39-47	36-44	59-80	47
	Night	28-45	27-46	41-69	
Short-term Measurements (15 minutes)					
SLM-ST1 32018 James St.	2:44 p.m. Jan 17, 2008	54	41	71	-
SLM-ST2 25610 Lawson St.	2:19 p.m. Jan 17, 2008	57	50	74	-

Sound Level Measurement Location and Sound Source Descriptions

SLM-LT1 was measured in the woods near 25000 Franklin Drive, near SR-169. The measurement began January 17, 2008 at 10:44 a.m., ending January 19, 2008 at 10:30 a.m. Major sources of noise observed during field work included traffic on SR-169, residential sources such as dogs and children, and periodic noise from a rail line. This measurement is representative of the sound levels experienced at residential properties that would border the North Triangle Property.

SLM-LT2 was measured in the woods behind 32514 McKay Lane. The measurement began January 17, 2008 at 11:28 a.m., ending January 19, 2008 at 10:57 a.m. Major sources of noise affecting this measurement consisted primarily of residential noise sources, birds, and dogs. This measurement is representative of noise levels experienced near Lawson Hills Estates that would border the lower portion of the Main Property.

SLM-LT3 was measured on the hillside east of Southeast Mountain View Drive. The measurement began January 17, 2008 at 12:11 p.m., ending January 19, 2008 at 11:18 a.m. Major sources of noise include residential sources, dogs, and local traffic. This measurement is representative of the sound levels at residences near the Upper portion of the Main Property that would remain after full build out.

SLM-ST1 was taken at the driveway of 32018 James Street. This location overlooks SR-169 at 3rd Ave., 190 feet from the center of the road. The measurement began January 17, 2008 at 2:44 p.m., ending at 2:59 p.m. Traffic on SR-169 was noted as the major source of noise during measurement. This measurement is representative of the sound levels from traffic on SR-169 near the downtown core.

SLM-ST2 was measured at 25610 Lawson Street, on the Gateway Ministries property, overlooking Lawson Street. The measurement began January 17, 2008 at 2:19 p.m., ending at 2:34 p.m. The meter was located 40 feet from the center of Lawson Street and 20 feet from the center of 6th Avenue. Major sources of noise noted during the measurement include traffic on Lawson Street, dog barks, overhead aircraft, and emergency vehicles on State Route 169. This measurement represents residences affected by traffic on Lawson Street.

NOTES:

"Day" refers to the hours between 7 a.m. and 10 p.m. "Night" refers to the hours between 10 p.m. and 7 a.m.

The Leq is the "energy average" sound level, a constant sound with the same sound energy as the actual fluctuating sound. This metric is used extensively in characterizing and describing sound levels.

The L25 is the sound level exceeded 25% of the time, in this case during a 1-hour period. These values can be compared with the 60-dBA L25 noise limit (see **Table 2**).

The Lmax is the maximum sound level recorded during the measurement period. The Lmax is a useful metric for determining the contribution from sources which emit short-term, high energy sounds.

The Ldn is the day-night sound level calculated for the measurement period. This is a widely recognized metric for assessing potential impacts of noise on people and residential uses over a 24-hour period, including the potential for sleep disturbance.

Source: ENVIRON International Corp.

As indicated in **Table 3**, the range of hourly L_{eq} sound levels measured at SLM-LT1 near the North Triangle Property were higher than levels at other long term SLM locations. This is likely due to this location's proximity to a portion of SR-169 where vehicles travel at faster speeds than in the town itself. Also, the active rail line north of Black Diamond is nearer to the measurement location. The measured L_{max} and L_{25} levels during day and night hours were also higher than measured levels at other SLMs. Compared to the WAC limits, existing noise levels near SLM-LT1 are less than the 60/50-dBA day/night L_{25} noise limits. Although noise levels at the Lawson Hills Estates residential neighborhood represented by SLM-LT1 are dominated by traffic noise from SR-169, measured hourly values remain below the 66-dBA noise impact level established by WSDOT for residential uses. Also, the calculated day-night sound level (L_{dn}) at SLM-LT1 is well below HUD's 65 dBA acceptable threshold for residential uses.

Traffic noise from vehicles traveling on SR-169 is also the dominant noise source at SLM-ST1, while traffic on Lawson Street is the dominant noise source at SLM-ST2. The measured noise levels at SLM-ST1 were less than those measured at other locations dominated by traffic noise (SLM-LT1 and SLM-ST2), likely due to the distance from the travel lanes as well as the shielding effects of neighborhood buildings and terrain at SLM-ST1. Measured values at SLM-ST1 and SLM-ST2 are less than the FHWA noise limits.

Measured noise levels at SLM-LT2 and SLM-LT3 (representing parcels near the lower and upper portions of the Main Property) are nearly identical and well below the WAC's L_{25} limits. Dominant noise sources at these locations were not traffic-related but were more influenced by the residential neighborhood. For example, both meters were located near residences with dogs, which could have contributed to the 80-dBA L_{max} values at each location. Train horns at crossings near Henrys, Washington and sirens could also be heard at both meters and may have also influenced the measurement levels. Similar to measured levels at SLM-LT1, noise levels at sensitive receivers on the Main Property represented by SLM-LT2 and SLM-LT3 are below pertinent noise limits or guidelines provided in the WAC, FHWA, and HUD regulations.

Impacts

Development of the project properties under any of the build alternatives would result in the generation of noise during construction as well as operational (e.g., traffic and neighborhood) noise after development. Both aspects of the proposed project and its alternatives are considered below.

Impacts Related to the Proposed Action (Lawson Hills MPD)

Noise Impacts from Construction

During construction of the proposed Lawson Hills MPD, there would be temporary increases in sound levels near active construction areas of the properties due to the use of heavy equipment and along roadways used for hauling construction materials. The increases in noise levels would depend on the type of equipment being used and the amount of time it is in use. Expected activities would include excavation, grading, commercial/retail building construction, residential neighborhood construction, and development of trails and outdoor use areas.

Table 4 displays typical noise levels produced by some of the sorts of equipment that could be used during construction of this project. Sound levels near many types of construction equipment listed below exceed the levels recommended for residential land uses, and decrease at a rate of about 6 dBA for each doubling of distance from the source(s). Typical construction sound levels in are given for distances of 100, 200, and 400 feet to give some idea of equipment sound levels at varying distances.

Table 4. Typical Noise Levels From Construction Activities & Equipment (dBA)

Activity	**Range of Hourly Leqs**		
	At 100 Feet	**At 200 Feet**	**At 400 Feet**
Clearing	77	71	65
Grading	69-82	63-76	57-70
Paving	66-82	60-76	54-70
Erection	66-78	60-72	54-66
Types of Equipment	**Range of Hourly Sound Levels**		
	At 100 Feet	**At 200 Feet**	**At 400 Feet**
Bulldozer	71-90	65-84	59-78
Dump Truck	76-88	70-82	64-76
Scraper	74-87	68-81	62-75
Paver	80-82	74-76	68-70
Generators	65-76	59-70	53-64
Compressors	68-75	62-69	56-63
Source: EPA, 1971 Compiled by ENVIRON International Corp.			

Construction of the proposed development could generate relatively high sound levels on and near the project properties during the construction phases of the project. Primary sound sources could include cranes, excavation equipment, and concrete and other large haul trucks. Noise from these sources and use of a number of smaller pieces of equipment like generators, compressors, and pumps all could increase the general drone from activity during construction. The WAC noise rule exempts noise from temporary construction activities during daytime hours (7 a.m. and 10 p.m.), construction noise associated with the Proposed Action is not subject to any level or duration noise limits. The WAC nighttime noise limits would pertain if construction activities were to occur during nighttime hours (10 p.m. to 7 a.m.).

Whether or not noise limits apply, under some circumstances, noise levels could have an adverse affect on nearby residents, businesses, or other sensitive uses. To minimize the potential for

noise disturbance, the developer would employ best management practices to reduce construction noise.

Noise Impacts from the Completed Development

Noise sources associated with the completed development of the Proposed Action include project-related traffic on nearby roads as well as non-traffic sources such as building heating and air conditioning systems (HVAC) associated with mixed-use or commercial/office parcels, and other noises associated with mixed-uses of the site (e.g., commercial vehicles, loading docks, etc.). A new elementary school building and associated playfields would be provided for on the Main Property but are not addressed at this time.[2]

Traffic Noise

The TNM Lookup Program model was used to assess project-related traffic noise impacts at representative receptor locations along routes to the North Triangle Property and to the Main Property during the existing and future p.m. peak travel periods. **Figure 1** (page 8) displays the locations of the TNM Lookup model receptors, and the modeled sound levels are presented in **Table 5**. Note that both **Figure 1** and **Table 5** use similar designations to depict the sound measurement and modeling locations. So "SLM#" and "TNM#" denote measurement and modeling locations, respectively. Additional traffic and TNM Lookup modeling data are included in Noise Attachment 1.

As shown in **Table 5**, although noise levels would increase compared to existing and future No Action conditions at most locations, maximum-predicted traffic noise levels under all of the alternatives are well below the FHWA noise abatement criterion for residential locations. At two locations, however, modeling of peak-hour sound levels with full build out indicates project-related traffic could potentially increase peak-period noise more than 10-dBA over existing conditions. Any such increases would typically be considered an adverse impact according WSDOT criteria but would not rise to the level of significant impact. However, because the project is not subject to WSDOT criteria as described earlier, the criteria are merely represented as useful indicators of the potential for what may be perceived as adverse impacts from traffic noise.

[2] Approximately 15 acres of the Main Property would be set aside for a new elementary school building and school playfields. The potential impacts from noise generated by school activities are not addressed because there is insufficient information regarding the development of the school parcel. However, school-related traffic has been included in the traffic assessment and this aspect of the school's noise impacts will be addressed in the cumulative impacts section.

Table 5. Calculated Peak-Hour Traffic Noise Levels (dBA)

TNM	Location	Existing Leq	2015 No Action [b]		2015 Proposed Action			2015 Alternative 1		
			Leq	Change From Existing	Leq	Change From Existing	Change From No Action	Leq	Change From Existing	Change From No Action
1	25000 Franklin Dr.	48	51	3	52	4	1	51	3	0
2	32018 James St.	51	52	1	60	9	8	58	7	6
3a	McKay Ln	42 [a]	42 [a]	0	56	14	14	55	13	13
3b	32514 Mckay Ln.	42 [a]	42 [a]	0	55	13	13	54	12	12
4	25610 Lawson St.	59	62	3	61	2	-1	58	-1	-4
5	Future Road A	48	50	2	56	8	6	55	7	5
6	Botts Dr.	44 [a]	44 [a]	0	52	8	8	51	7	7
7	SE Mountain View Dr./Future Road B	44 [a]	44 [a]	0	49	5	5	48	4	4

Notes:
All noise levels are rounded to the nearest whole decibel value.
Underline values denote substantial increases (i.e., greater than 10 dBA).
[a] Existing L_{eq} is based on measured values during the p.m. peak hour from the representative associated SLM (SLM-LT2 or SLM-LT3). Future levels are assumed to be the same as existing because these SLM locations are not dominated by nearby traffic volumes and noise sources affecting measured levels are not anticipated to significantly change at these locations in the absence of project development.
[b] Traffic data for Existing and Alternative 1 are based on traffic data dated June 2008 while No Action and Proposed traffic conditions are based on revised traffic dated September 2008.

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TNM model receptor 1 (TNM1) represents the existing residences in the Diamond Glen neighborhood nearest the proposed North Triangle property that are farthest from SR-169. Under the No Action scenario in 2015, calculated p.m. peak traffic noise levels are predicted to increase over existing levels by 3 dBA due to an almost doubling in predicted future traffic volumes on SR-169. Although increases of 3-dBA may be discerned in controlled settings, an increase of this magnitude might go unnoticed in an active outdoor environment where the noise source is existing and increases slowly over a period of time. With the Proposed Action, traffic would be generated on SR-169 and on the new North Connector in the North Triangle property. Traffic noise generated by vehicles on the new North Connector would not substantially contribute to overall noise levels near TNM1 due to the large distance provided by the retained open space between the North Connector and this receptor location. In addition, given the large volume of traffic already on SR-169, TNM Lookup modeling indicates project-related traffic would result in virtually no increase in traffic-related noise levels compared to the No Action scenario. For these reasons, project-related traffic noise is not expected to adversely affect the residences in Diamond Glen.

TNM2 represents several residences near downtown Black Diamond that are relatively near SR-169 but behind other residences that effectively block the direct line of sight to SR-169. This

location may be affected somewhat by traffic on SR-169 but is more likely to be affected by the new Railroad-Lawson Connector. As shown in **Table 5,** model-predicted noise levels during p.m. peak travel periods increase slightly with the 2015 No Action scenario compared to existing conditions due to a moderate increase in traffic volumes on SR-169, but the overall levels are still below FHWA impact criteria. With the Proposed Action, peak-period traffic noise at this location is projected to increase an additional 8 dBA over the No Action noise levels due to the presence of the Railroad-Lawson Connector as contemplated in the City's Comprehensive Plan. Such increases would most likely be noticeable to most people and could be perceived as an adverse impact by some. However, the overall noise levels at TNM2 during the pm-peak hour would remain well below the FHWA residential traffic noise impact criterion of 66 dBA and the anticipated increase due to the project is less than 10 dBA. Therefore, no significant adverse impacts would be expected.

Two additional areas affected by the Railroad-Lawson Connector are represented by model receptors TNM 3a and TNM 3b on McKay Lane just east of the James Street neighborhood. The residences in the Lawson Hills Estates near both the lower portion of the Main Property and the proposed Railroad-Lawson Connector would be the most likely to be affected by the proposed development and the proposed Connector. Because these residences are not dominated by traffic noise from SR-169 or any other traffic source, the existing and No Action noise levels in **Table 5** are represented by levels measured during the p.m. peak-hour at SLM-LT2. The measured 42 dBA noise level is well below the FHWA impact criterion for residential uses.

Peak hour traffic noise levels with the Proposed Action are predicted to increase up to 14 dBA and 13 dBA at TNM3a and TNM3b, respectively, compared to noise levels without the project. Residences represented by TNM3a (four residences facing north on the south side of McKay Lane), would be slightly more affected by project-related traffic noise than residences represented by TNM3b due to their direct line-of-sight and closer proximity to the new roadway. Although projected overall noise levels at both TNM3a and TNM3b are more than 10 dBA less than the 66-dBA considered an impact by WSDOT, the projected 13 to 14 dBA increases in peak-hour traffic noise levels would be considered "substantial increases" over existing noise levels, and that would be considered a noise impact under WSDOT guidelines. Although the WSDOT criteria do not apply to this project, a 13 or 14-dBA increase due to the Proposed Action would be perceived as more than a doubling of loudness and could affect about 15 existing residences near the proposed Railroad-Lawson Connector during the peak travel period. These maximum predicted noise level increases are based on p.m.-peak hour traffic under full build out conditions of the Lawson development. Assuming traffic patterns (and associated traffic noise) in the general vicinity of Black Diamond remain similar as those observed during the sound level measurements, exterior traffic noise would be lower during evening and nighttime hours but could still be noticeably higher than existing conditions during all hours of the daytime due to increased traffic, but still less than peak-hour traffic noise as modeled. (See Attached Figure for daily noise patterns.) Although overall predicted noise levels would be considered acceptable compared to the WAC residential noise limits, the acoustic noise environment would change substantially compared to existing conditions. In addition, it should be noted that at 11 residences represented by TNM3b (northeast-facing residences on the north and south sides of McKay Lane with direct line of sight to the Connector), traffic noise levels could be about 5-7 dBA lower than predicted because full build out of the proposed project

would probably result in houses being constructed *between* TNM3b and the Railroad-Lawson Connecter that would effectively act as a noise barrier for the existing homes. This would result in overall sound levels in the upper 40s dBA and increases of less than 10 dBA at residences represented by TNM3b and would reduce the impacts at the existing residences represented by TNM3b to less than significant levels.

Existing residential locations along Lawson Street are represented by model receptor TNM4. As shown in **Table 5**, traffic-related noise levels under the No Action condition increase 3 dBA over existing noise levels due to future traffic growth on Lawson Street unrelated to the project. With the Proposed Action, traffic volumes are expected to decrease significantly on Lawson Street, thereby reducing traffic-related noise levels by about 4 dBA compared to future 2015 No Action noise levels. This would result in a benefit to the residences along Lawson Street.

On the upper portion of the Main Property, some existing residences would likely be affected by project-related development on parcels adjacent to theirs. These residences are represented by TNM model receptors TNM5, TNM6 and TNM7. Under existing conditions, noise levels at these locations are not dominated by traffic noise, but locations represented by TNM5 are much closer to Lawson Street so noise levels are likely to be influenced by traffic on that road than other locations further away. Existing and No Action noise levels were predicted for TNM5 based on traffic data for each scenario and the distance from the road. But modeling was not used to estimate p.m. peak noise levels at TNM6 and TNM7 because they are less influenced by traffic noise. Instead, existing p.m. peak-hour noise levels were represented by measured p.m. peak levels at SLM-LT3. Although some development would likely occur by 2015, the No Action condition on the Main property at these locations would not be expected to change substantially and noise levels would likely remain about the same or only slightly higher than existing conditions.

With the Proposed Action, by 2015 full build out of the proposed development on the Main Property would include new access and circulation roads that would change the overall noise environment of the upper portion of the Main Property. Noise levels at residential parcels represented by TNM5 would likely be more affected by traffic than other remaining existing residential parcels because TNM5 would be closest to the Main Property primary access road, Future Road A. As shown in **Table 5**, project-related traffic noise levels at TNM5 increase 8 dBA and 6 dBA over existing and future No Action noise levels, respectively, but remain well below FHWA impact criterion and the WAC noise limits for residential parcels. This projected increase is due to more traffic (about 900 vehicles) accessing the Main Property than those currently traveling on the existing roads. An increase of 8-dBA would most likely be noticeable to most people if it occurred rapidly, but would be less noticeable and potentially less disruptive if it occurred over time as expected here. Because the overall noise levels and increases are less than the WSDOT impact criteria, no project-related impacts would be expected based on estimated future traffic noise levels.

Noise levels for the remaining parcels near the Main Property (TNM6 and TNM7) are also likely to be affected by project-related traffic. As indicted in **Table 5**, modeling suggests project-related increases of 8 dBA at TNM6 and 5 dBA at TNM7 compared to existing and future No Action conditions. Under the conditions with the proposed action, p.m. peak-hour traffic volumes on

Botts Drive (TNM 6) and Future Road B (TNM 7) are low (up to 150 vehicles), but because there is even less traffic on nearby existing roads and because existing noise levels are low (44 dBA), even small increases in traffic could cause noticeable increases in noise. For these locations in addition to increasing traffic noise, the project would also alter the existing acoustic environment as the parcels on the Main Property would be fully developed. Although these changes in the environment would likely be noticeable, the overall noise levels are expected to remain less than FHWA impact criteria and within acceptable levels for residential areas defined by the WAC, so no project-related impacts would be expected.

Non-Traffic Noise

Heating, ventilation, and air conditioning (HVAC) units may be installed to service either residential units or proposed mixed-use facilities. Depending on the types of commercial uses that occupy the mixed-use area of the Proposed Action, refrigeration units also may be required to protect food at restaurants and grocery stores. Specific noise levels generated by such equipment would depend on the location, height, and design characteristics of individual equipment and building systems, and these specific details about the HVAC and refrigeration units are not yet available. Such information would be considered during the building permitting process. Noise from such units could be audible at nearby off-site receivers, but noise from these types of sources would need to be controlled so as to comply with the noise limits at the property lines of off-site receivers during both day and night hours. Residences near the mixed use parcels of the North Triangle Property, on the Railroad-Lawson Connecter between James and McKay Streets, and north of the access road to the Main Property would all potentially be affected by noises generated by HVAC and/or refrigeration units of the Proposed Action. However, given that there are few residences near these proposed parcels and that the intervening distances are generally greater than 500 feet, and provided such equipment is constructed and positioned in a manner that shields these sources of noise from the nearest on-site and off-site residential receivers (i.e., through use of screening on rooftops and placement away from residences), no noise impacts would be expected.

There could also be loading docks associated with the commercial and retail buildings of the North Triangle Property. Back-up beepers, engine noise, and other sounds associated with any loading docks would not likely affect the nearest residential receivers in Diamond Glen because these receivers are a minimum of 800 feet away. Delivery trucks and small loading areas may also be part of the smaller retail locations of the mixed use parcels of the Main Property that are much closer to nearby residences and could result in sound levels that could be audible nearby, especially at night. With careful planning, loading areas could be located as far as possible from nearby residences and positioned in a manner so that the buildings themselves would act to shield residences from noise from these activities. Noise from idling trucks could be minimized by effectively implementing a "no idling" policy for locations near homes. These details would be worked out in the design and permitting of the actual facilities. With proper design, noise associated with delivery trucks and loading docks would be unlikely to adversely affect either the nearby residences or the office/business uses that might share the commercial portions of the site.

Noise from maintenance activities on the properties and at new on-site residences would add to the overall noise in their respective vicinities and would be a new source of infrequent noise. There is, however, sufficient distance between the nearest proposed on-site residences and existing off-site sensitive locations such that noise impacts created by these sources would be unlikely.

Noise from other miscellaneous minor sources like voices or car doors would be unlikely to cause noise impacts at off-site locations due to the low sound emission levels and the large intervening distances (typically >500 feet) between on-site uses and the nearest off-site receivers.

Noise from other intermittent on-site activities such as parcel delivery and garbage trucks and parking lot traffic also could affect sensitive receivers at night. But again, there is probably sufficient distance between these types of sources and the nearest off-site sensitive receivers to reduce the potential for noise impacts from these sources.

Outdoor recreation trails are also part of the Proposed Action. These types of uses are typically not likely to generate noise levels that would affect nearby residences, other than an occasional annoyance which may be addressed under other ordinances.

Noise Impact Summary for the Proposed Lawson Hills MPD

The noise impact analysis suggests that noise related to the Proposal would be unlikely to cause off-site noise impacts at residences near the site, except at residences near the Railroad-Lawson Connector. Traffic noise could adversely affect some residences near the new Connector, but the degree of impacts would be minimized under the current full build out plan assuming the intervening parcels are developed. On the Main Property, the acoustic environment is likely to change, not only due to neighborhood development but also due to new traffic traveling on the spine roads. While noise increases would be noticeable compared to existing conditions, the effect is less substantial when changes occur gradually over time. In some instances, traffic-related noise levels could decrease due to changes in traffic patterns associated with access roads as part of the project. Construction noise could result in temporary impacts at nearby residents, businesses, or other sensitive uses, but with best management practices (BMPs) any impacts would be less than significant.

Impacts Related to Alternative 1

Noise Impacts from Construction

For Alternative 1, the proposed land uses are essentially the same as the Proposed Action. The primary difference between the Proposed and Alternative 1 is the density of residential development so the construction activities and their duration would be similar to those for the Proposed Action. Construction activity noise would be noticeable and at times loud. But while construction noise levels could adversely affect nearby residents, businesses, or other sensitive uses similar to the Proposed Action, BMPs would reduce the likelihood of such impacts. Any such temporary increases in noise levels due to construction during daytime hours, although exempt by regulation, would be unlikely to be considered a significant impact.

Noise Impacts from the Completed Development

Project-related traffic volumes associated with Alternative 1 are essentially the same as those predicted for the Proposed Action. As shown in **Table 5** (page 13), traffic-related noise levels would be the same or slightly less (1 or 2 dBA) than the noise levels associated with the Proposed Action. Similar to the Proposed Action, all noise levels represented by TNM model receptors are well below the FHWA noise impact criterion and the WAC level for residential locations (which don't apply per WAC exemptions), but substantial increases in traffic noise are predicted near the Railroad-Lawson Connector during the peak hour. As with the Proposed Action, increases in traffic-related noise at TNM 3a suggest that residences along McKay Lane with a direct line-of-sight to the new road would likely experience adverse impacts due to project traffic but these impacts would not be considered significant. As with the Proposed Alternative, development of homes on intervening parcels would reduce potential impacts at most residential locations affected by the Railroad-Lawson Connector.

With Alternative 1, additional retail and office/mixed-use is proposed on the same parcels as the Proposed Action. Similar to the Proposed Action, non-traffic sources such as HVAC and refrigeration units could potentially affect nearby residences and possibly on-site uses that share the same parcels, but such noise would be subject to compliance with the WAC limits. Sounds generated by delivery trucks, loading docks, other operational activities such as maintenance and other activities (e.g., garbage collection) would be similar to those for the Proposed Action. Therefore, the potential for adverse impacts would be the same for Alternative 1 as for the Proposed Action. There is, however, sufficient distance between the nearest proposed on-site uses and existing off-site sensitive locations such that noise impacts created by these sources would be unlikely.

Impacts Related to the No Action Alternative

With the No Action alternative, the project properties could be developed in a manner similar to the proposed project up to the land use limits included in the Comprehensive Plan. Any such development would likely occur over a longer time period than with the Proposed Action. In addition, the total development by 2015 would likely be substantially less than under either the Proposed Action or the Alternative. Construction activities would be similar to either of the alternatives but could be less frequent and less coordinated. Construction noise could still adversely affect nearby existing residences, but effective BMPs could minimize the degree of impact.

Traffic-related noise associated with similar types of development but less density than the proposed action alternatives would generally be the same as existing levels at most modeled locations, except north of Roberts Road along SR-169 and along Lawson Street where growth in traffic volumes would cause traffic-related noise increases. But without the proposed development, the Railroad-Lawson Connector would not be built, so noise levels in the Lawson Hills Estates would remain similar to existing conditions. (The Connector is a proposed element in the City's Comprehensive Plan so this road may be built at some time but is not assumed in this analysis for the No Action Alternative.) Traffic-related noise levels would be well below the

FHWA noise impact criterion for residential locations and any increases due to growth would not be significant.

Sounds generated by delivery trucks, loading docks, other operational activities would be similar to those discussed under either of the Action Alternatives. But with less development, the number of locations to be potentially affected by 2015 is likely less, and as with the other alternatives, sufficient distance exists between the nearest probable uses and existing off-site sensitive locations such that noise impacts created by these sources would be unlikely.

Cumulative and Secondary Impacts

The introduction of residential and mixed land uses near the North Triangle and on the Main project properties would add to existing noise in the project vicinity due to increased traffic and other operational noise as described in previous sections. The traffic impact analysis considered projected cumulative traffic volumes based on growth throughout the area (including the Villages MPD) as well as traffic generated by the potential new elementary school. Because traffic levels would be about the same as the Proposed Action, cumulative traffic-related noise levels and impacts would be similar to those described for the proposed project. Because other, non-traffic cumulative noise sources would be unlikely to result in off-site noise impacts, no additional cumulative or secondary noise impacts would be anticipated.

Mitigation

Construction Noise Mitigation Measures Common to All Alternatives

Although construction noise is exempt from the WAC noise limits during daytime hours and no mitigation is legally required, noise from construction activities related to the Proposed Action or Alternative 1 could nonetheless disturb nearby residents. The potential for such disturbance could be reduced with common BMPs described below. The following construction noise reduction techniques are suggestions for times when construction activities occur close to existing residences or businesses.

- Construction noise could be minimized with properly sized and maintained mufflers, engine intake silencers, engine enclosures, and turning off equipment when not in use.
- Stationary construction equipment should be located away from sensitive receiving properties where possible. Where this is infeasible, or where noise impacts would still be likely to occur, portable noise barriers should be placed around the equipment (pumps, compressors, welding machines, etc.) with the opening directed away from the sensitive receiving property. In addition to providing about a 10-dBA reduction in equivalent sound levels, the portable barriers demonstrate to the public the contractor's commitment to minimizing noise impacts during construction.
- Although as safety warning devices back-up alarms are exempt from noise ordinances, these devices emit some of the most annoying sounds from a construction site. Where feasible, equipment operators should drive forward rather than backward to minimize this noise.
- Ensure that all equipment required to use backup alarms utilize ambient-sensing alarms that broadcast a warning sound loud enough to be heard over background noise but

without having to use a preset, maximum volume. Or, use broadband backup alarms instead of typical pure tone alarms. Such devices have been found to be very effective in reducing annoying noise from construction sites.

- Requiring operators to lift rather than drag materials wherever feasible can also minimize noise from material handling.
- Substituting hydraulic or electric models for impact tools such as jackhammers, rock drills and pavement breakers would also reduce construction noise.
- Electric pumps could be specified if pumps are required.
- If pile driving becomes necessary, impact pile-driving should be minimized in favor of less noisy pile installation methods. If impact pile driving is required, the potential for noise impacts should be minimized by strict adherence to daytime only (or more stringent limits), especially when pile driving is within 500 feet or less of sensitive on or off-site receivers. Pile driving noise may also be reduced using sound-absorbing barriers or other means.
- Finally, the developer will establish a noise control "hotline" that would allow neighbors affected by noise to contact the City or the construction contractor to ask questions or to complain about particularly noisy activities.

Noise Mitigation Measures Common to All Alternatives

The analysis of the environmental noise implications of operation of the proposed project or the alternatives concluded that noise from project-related activities would be unlikely to result in significant adverse impacts at off-site locations as long as noise is effectively considered in the site design. Specific means to mitigate on-site operational noise at off-site locations is therefore not warranted or proposed beyond the application of simple techniques could be implemented to ensure that noise from developed parcels would not exceed the WAC noise limits for residential or other sensitive receivers. These techniques include the following:

- Construct rooftop parapets or other screening to a height exceeding that of the noise source to block line-of-sight propagation of noise from HVAC units.
- Align HVAC units so that the noise source (fans) faces away from potentially affected residences.
- Construct small rooftop noise barriers (screens) near HVAC units to reduce noise.
- Locate HVAC units so that they are not visible from the proposed elementary school or play fields to shield these locations from HVAC noise.
- Use HVAC units designed for attenuating noise from the fans and louvers.
- Schedule deliveries and pickups during daytime hours.
- Locate garbage compactors, delivery truck entries, and truck loading docks away from sensitive receivers.
- Construct brick or masonry walls to shield any delivery docks.
- Restrict noisy work to daytime hours when people nearby are not trying to relax or sleep.

Noise Mitigation Measures Common to the Action Alternatives

Traffic noise generated by the new Railroad-Lawson Connector could potentially cause increases in outdoor noise levels that could affect four residences at the west end of McKay Lane with

direct sight to the new road. Traffic noise reduction techniques could include some sort of noise barrier or earthen berm to shield these residences from traffic noise. At other locations on McKay Lane (facing northeast toward the new road), it is likely that several residences would benefit from placement of houses associated with the proposed development such that the new buildings would act as a barrier between the road and existing residences affected by the road. By shielding these residences from traffic noise, outdoor noise levels would likely be reduced. If these intervening parcels are not constructed as planned in the action alternatives, then similar noise techniques as described earlier could be employed. These potential noise reduction techniques would be considered when the Railroad-Lawson Connector is under engineering design review.

Unavoidable Significant Adverse Impacts

No project-related significant adverse noise impacts have been identified or would be anticipated.

References

FHWA (U.S. Federal Highway Administration). 2004. Traffic Noise Model Lookup Program.

State of Washington. 2008. Washington Administrative Code 173-60.

U.S. Department of Housing and Urban Development, 1985. The Noise Guidebook. Environmental Planning Division, Office of Environment and Energy

U.S. Environmental Protection Agency. 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. NTID 300.1

U.S. Environmental Protection Agency, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.

Noise Attachment 1

Lawson Hills MPD Traffic Volumes

Intersection	Existing [a]			2015 No Action			2015 Proposed p.m.			2015 Alternative p.m. [a]			2015 Cumulative PM		
	LOS	Vol	Avg Delay (s/veh)	LOS	Vol	Avg Delay (s/veh)	LOS	Vol	Avg Delay (s/veh)	LOS	Vol	Avg Delay (s/veh)	LOS	Vol	Avg Delay (s/veh)
SE Covington-Sawyer Rd & 216th Ave SE	B	1010	17.2	C	1075	20.3	C	1368	26.3	B	1130	19.4	D	1795	54.3
SE 296th St & 216th Ave SE	B	600	15.4	B	940	14.8	B	972	12.5	B	985	15.1	B	1400	12.6
SE Auburn-Black Diamond Rd & Lake Sawyer Road	unsignalized			C	1680	27.1	B	1446	18.1	C	1640	25	D	2645	51.1
North Connector & SR 169	unsignalized			A	1660	6.6	D	2792	41.9	C	2130	20.4	E	3053	55.8
Railroad-Lawson Connector & SR 169	Not built			Not built			B	2101	14.3	B	1575	10.6	C	2188	20.5

[a] Existing and 2015 Alternative 1 traffic information based on June 2008 traffic report.

Lawson Hills TNM Lookup Input and Results

Location	Build [a]	Volumes Based on Intersection:		Distance	Total Volume	HT %	Light Duty vph	Heavy Truck vph	Speed	Calculated dBA	Entire Road	Multiple Sources	SLM [b],[c] Measurement
TNM1 (SLM-LT1)	Existing	Avg **169**/288th and 169/Black Diamond-Ravensdale rd	NB	446	295	5%	280	15	35	43.2	**47.8**		45.3/46.1 Avg:45.7
			SB	434	548	5%	520	27	35	46			
	No Action	**SR 169** (with North Connector)	NB	446	590	5%	561	30	35	46.2	50.4	**50.5**	
			SB	434	965	5%	917	48	35	48.4			
		North Connector	NB	884	95	0%	95	0	25	25.2	28.3		
			SB	896	100	0%	100	0	25	25.4			
	Proposed	**SR 169** (so North Connector)	NB	446	912	5%	866	46	35	48.1	52.2	**52.3**	
			SB	434	1406	5%	1336	70	35	50.1			
		North Connector	NB	884	613	0%	613	0	25	33.3	35.6		
			SB	896	441	0%	441	0	25	31.8			
	Alternative	**SR 169** (with North Connector)	NB	446	630	5%	599	32	35	46.5	51.1	**51.2**	
			SB	434	1145	5%	1088	57	35	49.2			
		North Connector	NB	884	510	0%	510	0	25	32.5	34.4		
			SB	896	275	0%	275	0	25	29.8			
TNM2 (SLM-ST1)	Existing	**169** @ Roberts	NB	174	260	6%	244	16	35	47.1	**51.4**		53.7
			SB	186	650	3%	631	20	35	49.4			
	No Action	**169** @ Roberts	NB	174	345	6%	324	21	35	48.3	**52.1**		
			SB	186	715	3%	694	21	35	49.7			
	Proposed	**169** (@Lawson connector)	NB	174	369	6%	347	22	35	48.5	52.3	**59.6**	
			SB	186	751	3%	728	23	35	50			
		169 @**Railroad-Lawson Connector**	WB	122	435	0%	435	0	30	54.5	58.7		
			EB	99	580	0%	580	0	30	56.6			
	Alternative	**169** (@Lawson connector)	NB	174	265	6%	249	16	35	47.1	50.9	**58.4**	
			SB	186	540	3%	524	16	35	48.5			
		169 @**Railroad-Lawson Connector**	WB	122	285	0%	285	0	30	52.6	57.6		
			EB	98	495	0%	495	0	30	55.9			
TNM3a	Proposed	169 @**Railroad-Lawson Connector**	WB	197	435	0%	435	0	30	52.2	**56.3**		41.4/42.6 Avg: 42.0
			EB	173	580	0%	580	0	30	54.1			
	Alternative		WB	197	285	0%	285	0	30	50.4	**55.2**		
			EB	173	495	0%	495	0	30	53.4			
TNM3b (SLM-LT2)	Proposed	169 @**Railroad-Lawson Connector**	WB	242	435	0%	435	0	30	51.3	**55.2**		
			EB	218	580	0%	580	0	30	53			
	Alternative		WB	242	285	0%	285	0	30	49.4	**54.1**		
			EB	218	495	0%	495	0	30	52.3			

Continued…

Lawson Hills TNM Lookup Input and Results

Location	Build [a]	Volumes Based on Intersection:		Distance	Total Volume	HT %	Light Duty vph	Heavy Truck vph	Speed	Calculated dBA	Entire Road	Multiple Sources	SLM [b],[c] Measurement
TNM4 (SLM-ST2)	Existing	169 @ **Lawson**	NB	46	115	0%	115	0	40	56.7	**58.9**		57.2
			SB	34	60	0%	60	0	40	55			
	No Action		NB	46	190	0%	190	0	40	58.9	**61.6**		
			SB	34	125	0%	125	0	40	58.2			
	Proposed		NB	46	183	0%	183	0	40	58.7	**60.9**		
			SB	34	93	0%	93	0	40	56.9			
	Alternative		NB	46	40	0%	40	0	40	52.1	**57.5**		
			SB	34	75	0%	75	0	40	56			
TNM5	Existing	Lawson Street[d]	NB/SB	525	175	0%	175	0	25	**47.8**			42.2/45.1 Avg: 43.9
	No Action		NB/SB	525	315	0%	315	0	25	**50.4**			
	Proposed	Main o/s Road	WB/EB	100	907	0%	907	0	25	**56.3**			
	Alternative		WB/EB	100	680	0%	680	0	25	**55**			
TNM6	Existing	Botts Drive	NB/SB	50	no information								
	No Action		NB/SB	50	no information								
	Proposed		NB/SB	50	156 [e]	0%	156	0	25	**51.7**			
	Alternative		NB/SB	50	117 [e]	0%	117	0	25	**50.5**			
TNM7 (SLM-LT3)	Existing	Road B	NB/SB	70	no information								
	No Action		NB/SB	70	no information								
	Proposed		NB/SB	70	134 [e]	0%	134	0	25	**49.4**			
	Alternative		NB/SB	70	101 [e]	0%	101	0	25	**48.2**			

Notes

All except TNM1 assume hard surface (worst-case scenario)

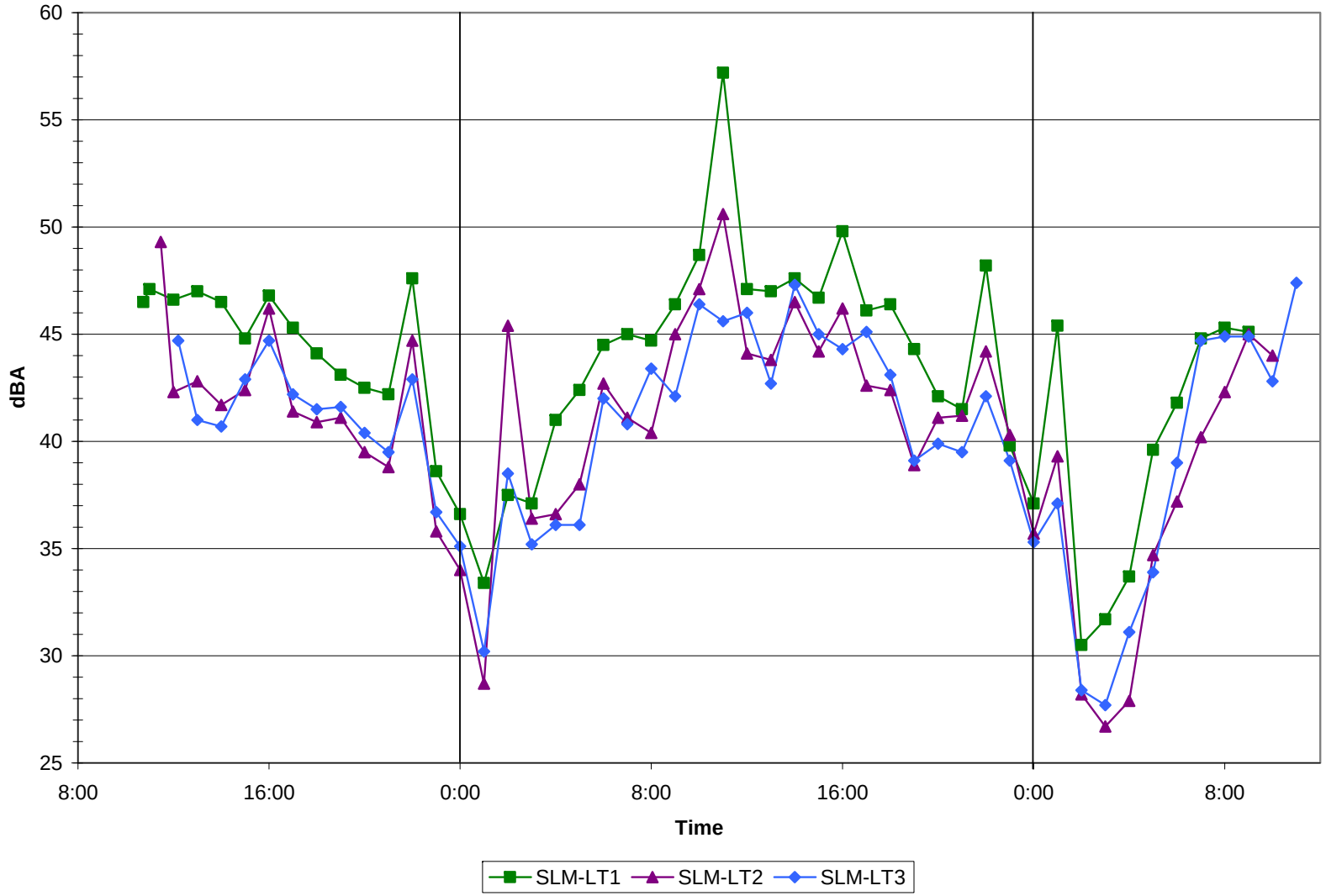
[a] Existing and Alternative traffic data from traffic report dated June 2008. No Action and Proposed traffic data from traffic report dated September 2008.

[b] Long term sound level measurements (SLM-LT) measured two PM-peak traffic periods. Reported values represent the first, second day, and logarithmic average in dBA.

[c] Short term sound level measurements (SLM-ST) are not meant for direct comparison because they were measured during an off-peak traffic period. Reported values are for reference purposes only.

[d] At TNM 5, traffic on Lawson Street affects noise levels for the Existing and No Action scenarios. The dBA calculated at this location is based on sound attenuation from TNM4.

[e] Volume based on ratio of PM peak traffic to average daily traffic (ADT) for Lawson St / On site intersection. Ratio then applied to ADT for this road.



ENVIRON

Lawson Hills Development – Long Term LeqS
Lawson Hills MPD
Black Diamond, WA

Figure
Noise-1

Drafter: KAR | Date: September 09, 2008 | Project Number: 0321294A