Chapter 3 The Built Environment – Effects on People and Community Resources

What is addressed in this chapter?

This chapter describes the community's existing built environment and how the alternatives may impact that built environment. This chapter specifically addresses the following elements:

- Land Use
- Transportation
- Noise
- Public Utilities (water supply, wastewater, stormwater)
- Visual and Aesthetics
- Historic and Cultural Resources
- Public Services (parks and recreation, schools, public safety)
- Fiscal Analysis

Noise

1 What sources and intensity of noise are currently present in the area?

The major sources of noise in the Black Diamond area are from roadways, particularly from SR 169 and the Auburn-Black Diamond Road/Roberts Drive. Existing noise levels from SR 169 have been measured between 54 and 66 decibels (dBA) depending largely on the speed of vehicles. Noise levels have been measured at 62 dBA on Roberts Drive/Auburn-Black Diamond Road at the City offices. Noise levels in more rural and undeveloped areas are as low as 31 dBA.

Sound level measurements taken in the area are indicated in Exhibit 3-9. The measurements are reported in a variety of metrics, each having a specific meaning. The L_{eq} is an average sound level for a given period of time that gives more weight to the highest and longest lasting sound levels. The L_{eq} is a good indicator of how individuals within a community experience noise. L_{max} is the maximum sound level recorded during the measurement period. The L_{max} is a useful metric for identifying the existence of short-term, high sound level noises. L_{25} is the sound level exceeded 25 percent of a period of time.

Where can I find additional technical analysis?
The original and updated noise analysis reported in this chapter is available in Appendix C of this document.

What is an A-weighted decibel (dBA)?
When addressing the effects of noise on people, it is useful to consider the frequency response of the human ear. The frequency weighting most often used is A-weighting; it approximates the frequency response of human hearing and is highly correlated to the effects of noise on people. Measurements from instruments using this system are reported in A-weighted decibels or dBA. All sound levels in this evaluation are reported in A-weighted decibels.

Exhibit 3-9
Project Vicinity Noise Measurements

No.	Location	Daytime Range Hourly L_{eq} (dBA)	Nighttime Range Hourly L_{eq} (dBA)	L_{eq} (dBA)	L_{max} (dBA)	L_{25} (dBA)
A	SR 169 south of Summit Drive			66	79	68
B	West of 25000 Franklin Drive	42–57	31–48			
C	SR 169/3rd Avenue north of James Street			54	71	41
E	32828 277th Place SE	41–50	42–49			
F	Roberts Drive west of 236th Avenue SE			66	85	62
G	32222 Bruckners Way	41–51	30–45			
H	Roberts Drive east of Morgan Drive			62	75	64
J	Lake Sawyer Road at Sawyer Woods Elementary School			60	78	54
M	SR 169 South of Jones Lake			66.4	79.2	68
L	32818 277th Place SE, east of the site	41–50	32–45			
N	Green Valley Road west of SR 169			60	78	53

Noise levels in the Black Diamond area can generally be characterized as typical of quiet rural and residential areas, which is consistent with the predominant existing land use.

2 What noise standards apply in the area?

There are no universally accepted noise standards. An acceptable noise level for a community or neighborhood is a decision to be made by the community based on their values. For example, residents in a rural or suburban single-family neighborhood may place a higher value on lower noise levels and a sense of tranquility. An urban neighborhood with high-density multi-family housing and street level commercial uses may place a higher value on the vibrant character of the neighborhood and be tolerant of higher noise levels.

Appropriate noise levels vary for other uses. Most commercial uses are generally less sensitive to higher noise levels. Park and open spaces may have a range of toleration for noise levels. An open space area that is oriented primarily to the values of peaceful retreat may seek very low noise levels, while sports fields may have high levels of noise from player and crowd activities.

State and Local Noise Standards

Maximum environmental noise levels are regulated from different classifications of land use called an "environmental designation for noise abatement" (EDNA), which includes the following:

- Class A EDNA consists of lands where human beings reside and sleep.
- Class B EDNA consists of lands involving uses requiring protection against noise interference with speech.
- Class C EDNA includes lands involving economic activities of such a nature that higher noise levels than experienced in other areas is normally to be anticipated.

The regulations vary according to both the classification of the property producing the noise and the property receiving the noise as indicated in Exhibit 3-10. Noise levels in Exhibit 3-10 describe desirable noise levels for areas of different land uses.

What is a day-night sound level?
A day-night sound level is a 24-hour sound level average, the calculation of which includes the addition of 10 dBA to actual levels measured during nighttime hours (10 p.m. to 7 a.m.) to account for potential sleep interference noise could cause during these hours.

Exhibit 3-10
State of Washington Maximum Permissible Noise Levels

Environmental Designation for Noise Abatement (EDNA) of Noise Source	EDNA of Receiving Property		
	Class A	Class B	Class C
Class A (Residential, recreational, entertainment, and community services used for habitation)	55 dBA	57 dBA	60 dBA
Class B (Commercial)	57 dBA	60 dBA	65 dBA
Class C (Storage, industrial, agriculture)	60 dBA	65 dBA	70 dBA

Traffic traveling on public roadways is exempt from the State of Washington's maximum allowable noise levels. Additionally, noise from individual motor vehicles is separately regulated.

Department of Housing and Urban Development

Other criteria are relevant to evaluating the level of noise that may be considered an adverse impact. One such index has been developed by the U.S. Department of Housing and Urban Development (HUD) (24 CFR 51.101[8][9]):

- ***Exterior noise goal:*** It is a HUD goal that exterior noise levels do not exceed a day-night average sound level of 55 dBA. This level is recommended by the Environmental Protection Agency as a goal for outdoors in residential areas (Section 24 CFR 51.101).
- ***Interior noise goal:*** It is a HUD goal that the interior auditory environment shall not exceed a day-night average sound level of 45 dBA. Attenuation measures to meet these interior goals shall be employed where feasible. Emphasis shall be given to noise sensitive interior spaces such as bedrooms.

HUD does not, however, enforce these goals as a standard. Instead, HUD sets a standard of not exceeding a day-night level of 65 dBA as "acceptable." Levels above 65 dBA, but not exceeding 75 dBA, are defined as "normally unacceptable" and require special approval and attenuation. Noise levels above 75 dBA are defined as unacceptable.

Federal Highway Administration Noise Criteria

The Federal Highway Administration (FHWA) defines a traffic noise impact to have occurred when the predicted traffic noise levels approach or exceed the noise abatement criteria shown in Exhibit 3-11, or when the predicted traffic noise levels substantially exceed the existing noise levels. FHWA delegates to the State the definitions of "approach" and "substantially exceed." The Washington State Department of Transportation (WSDOT) defines "approaching" the FHWA limits as sound levels within 1 dBA of the criterion level or 66 dBA for residences. WSDOT defines "substantially exceeding" existing noise levels as an increase of 10 dBA if the projected future noise level is above 50 dBA.

Exhibit 3-11
FHWA Roadway Noise Abatement Criteria

	Land Use Category	Hourly L_{eq} (dBA)
(A)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose	57 (exterior)
(B)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals	67 (exterior)
(C)	Developed lands, properties, or activities not included in the above categories	72 (exterior)
(D)	Undeveloped lands	N/A
(E)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums	52 (interior)

Source: Table 1 to Part 772-Noise Abatement Criteria, 23 CFR 772 FHWA.

3 What are the expected effects of construction noise on nearby uses?

During construction there would be a temporary increase in sound levels in the immediate vicinity of each of the two proposed actions, due to infrastructure and building construction. The greatest increase in noise can be expected during site grading due to the use of heavy equipment and the hauling of materials. The increase in noise levels would depend on the type of equipment being used and the amount of time it is in use (see Exhibit 3-12).

Exhibit 3-12
Typical Construction Equipment Noise

Construction Phase	Estimated Sound Level (dBA)			Types of Equipment	Estimated Sound Level (dBA)	
	50 feet	100 feet	200 feet		50 feet	100 feet
Clearing	80–96	74–90	68–84	Bulldozer	77–96	71–90
				Dump Truck	82–94	76–88
Excavation/ Grading	75–88	69–82	63–76	Scraper	80–93	74–87
				Bulldozer	77–96	71–90
Paving	72–88	66–82	60–76	Paver	86–88	80–82
				Dump Truck	82–94	76–88
Foundations	75–85	69–79	63–73	Backhoe	73–94	67–88
				Concrete Mixer	75–88	69–82
Building Construction	80–87	74–81	68–75	Saws	72–82	66–76
				Pneumatic Impact Hammers	83–88	77–82
Finishing	80–90	74–85	68–78			

The parties most likely to be affected by construction noise include residents adjacent to the site including single-family residential development to the east on both sides of Roberts Drive and one resident to the west of the property south of Roberts Drive which could experience peak noise levels up to 90 dBA. The existing development in Morganville east of Rock Creek is likely to notice construction noise but the distance will reduce peak noise levels to the around 79 dBA for clearing and around 70 dBA for other activities. These potential maximum sound levels can be avoided with appropriate mitigation.

4 What are typical construction noise reduction measures?

Construction noise mitigation employs different strategies for different noise sources.

- Noise from stationary sources such as pumps, compressors, and welding machines can be reduced by placing equipment far away from sensitive receiving locations and turning equipment off when not in use.
- Limiting hours of construction.

- Noise from construction equipment can be reduced by choosing equipment that produces less noise, or employing alternative construction practices. For example, hydraulic or electric models for impact tools such as jackhammers, rock drills, and pavement breakers often are quieter than pneumatic powered tools.

The Applicant has stated an intention to use Best Management Practices to address temporary construction noise.

5 What long-term noise disturbance will result from the proposal?

Three potential noise impacts may result from development of The Villages area:

- Impacts on sensitive receivers outside the project site from increased traffic noise on roads in the vicinity that experience increased traffic volumes generated by the project.
- Impacts to residents of the project area from traffic noise on adjacent streets.
- Impacts to residents from non-traffic noise sources.

Impacts Outside the Project from Increased Traffic Noise

Impacts of increases in traffic noise were analyzed for the cumulative impacts scenario which includes traffic generation from cumulative development in the area including:

- Development of the Lawson Hills MPD.
- Development of The Villages MPD.
- Other development in the area not part of MPD applications in Black Diamond.
- Cumulative impact analysis establishes expected total noise levels in the community over time, compared with existing noise levels, providing a greater understanding of the change in noise levels likely to be experienced in and around the project area under each alternative.

Impacts from traffic noise were estimated using the Federal Highway Administration (FHWA) Traffic Noise Model Lookup Tool. Results for major arterials in the vicinity and local streets in and adjacent to the development are indicated in Exhibit 3-13. However, noise from vehicular traffic traveling on public roads is exempt from noise regulations.

Exhibit 3-13

Projected Traffic Noise (dBA) Outside the Proposal Site

No.	Location	Existing Traffic Volume	Existing Noise Level	2025 Baseline Traffic Volume	2025 Baseline Noise Level	2025 Cumul. Traffic Volume	2025 Cumul. Noise Level
A	SR 169 south of Summit Drive	824	65.3	1,116	66.6	3,534	71.6
C	SR 169/3rd Avenue north of James Street	874	65.2	1,142	66.4	2,641	70.2
D	Auburn-Black Diamond Road east of 227th Avenue SE	500	61	557	62.2	1,566	66.5
F	Roberts Drive west of 236th Avenue SE	390	60.4	510	61.6	1,159	64.9
H	Roberts Drive east of Morgan Drive	426	61.0	557	62.2	1,566	66.5
J	Lake Sawyer Road at Sawyer Woods Elementary School	333	59.4	435	60.6	1,422	65.7
M	SR 169 South of Jones Lake	840	65.9	1,098	67.0	2,488	70.7
N	Green Valley Road west of SR 169	54	54.4	70	55.2	146	61.5
O	SR 169 south of SR 516	1,377	68.0	1,801	69.1	3,238	71.7

Defining noise impacts depends on the extent to which a community values lower noise levels in terms of the overall environment and the extent to which noise constitutes an intrusion into the desired character of the environment. Noise impacts are typically experienced differently in areas with different land uses and intensities, be they high intensity urban environments, lower intensity residential areas, rural areas, and commercial and industrial uses. At most locations, the impacts of additional traffic related to cumulative increases in traffic volumes is generally over 3 dBA, which would be noticeable to the majority of persons.

The character of noise impacts from traffic is not likely to differ substantially between the alternatives. In many cases, the increase in noise is in the range of 5 dBA, which is readily discernable by most observers as an increase. As indicated above, a doubling of traffic produces an increase in noise of about 3 dBA, which is the threshold at which most individuals perceive a difference.

Impacts within the Project Site from Increased Traffic Noise

Traffic volumes and associated noise levels at major roadways within the project site at build-out are projected in Exhibit 3-14, below.

Exhibit 3-14
Noise Levels at Project Buildout

No.	Location	2025 Cumulative Traffic Volume	2025 Cumulative Noise Level
O	Village Access south of Roberts Drive	1,845	62.4
P	Village Access east of SR 169	954	59.7
Q	Alternative Village Access Road to Green Valley Road	954	59.7

Residential areas within the development adjacent to major arterials will experience noise levels above the desirable range of 55 dBA, but well below the level of approaching 67 dBA where mitigation such as noise barriers are generally considered. In areas where open space buffers are proposed adjacent to arterials, the additional distance will reduce noise levels slightly.

Other Noise Impacts

Additional noise will impact adjacent property which generally is at levels of 32 to 50 dBA. The general ambient levels of sound in the area can be expected to be between 55 and 60 dBA in this area from residential development. The existing residential area is too far from the main arterial serving the site to be affected by arterial traffic noise. The noise environment in this area will change from low levels characteristic of a rural area to moderate levels characteristic of urban residential areas.

6 What are options for reducing long-term noise disturbance?

Long term noise disturbance from traffic generally is addressed through noise barriers. These can consist of berms or walls. Walls generally are constructed of masonry or heavy wood. The density of the wall, rather than the construction method, is the key factor in reducing noise. A community's decision on whether to employ measures to reduce noise impacts depends upon the value the community places on lower noise levels and the balance the community strikes between that value and other values, including cost and aesthetics.

The installation of a noise barrier at the street level generally will result in reduction of noise levels of 4 to 8 dBA at adjacent residential buildings where the site is at or above the grade of the street. Two criteria are generally addressed in determining whether to install a noise wall: feasibility and reasonableness.

To determine feasibility, the following factors are generally considered:

- The topography must be compatible with construction of the noise barrier. In cases where the adjacent land is substantially higher than the source of traffic noise, the wall may not effectively interrupt sound.
- The reduction in sound levels must be of a magnitude sufficient to produce a noticeable reduction in sound. Reduction of less than 3 dBA generally will not be perceived. Most receivers will not perceive a benefit from reduction of less than 5 dBA. A reduction of 10 dBA or more is desirable.
- Gaps in a noise wall to accommodate driveways or local streets generally reduce its effectiveness for receivers in the vicinity of the gap.

The reasonableness of a noise wall relates to how the noise wall will impact the character of the neighborhood, including:

- A noise barrier may block scenic views.
- A noise wall, especially a tall one, can be a visual intrusion into the streetscape that is at variance with the open character of the street. This may depend on the orientation of a neighborhood in relation to the roadway, which is the source of noise mitigated. The impact a noise wall has on the character of a street can be lessened, however, by setting it back from the street or softening it with landscaping.
- A noise wall may be perceived as a barrier that separates a neighborhood from the surrounding community. This may include physical, psychological, and social barriers.
- Noise walls can reduce the ability of residents to have "eyes on the street," hampering this effective deterrent to crime. This may depend on the orientation of a neighborhood in relation to the roadway which is the source of noise mitigated. If the roadway is a major arterial, it is unlikely that local residences include it in their normal surveillance area.

Generally, installation of noise barriers is considered at the time of major capacity or configuration upgrades to roadways. At that time, the City or the State can determine whether noise barriers are appropriate in a specific situation.