

G. NOISE

1. Noise Definitions

Noise can be defined as undesirable or unwanted sound. Even though noise is somewhat subjective, it affects the full range of human activities and must be considered in local and regional planning. Most of the sounds heard in the environment are not composed of a single frequency but a band of frequencies, each with a different intensity or level. Levels of noise are measured in units called decibels. Since the human ear cannot perceive all pitches or frequencies equally, these measurements are adjusted or weighted to correspond to human hearing. This adjusted unit is known as the A-weighted decibel, or dBA. The A-weighted sound level (dBA) is useful for gauging and comparing the subjective loudness of sounds.

Since dBA describes a noise level at just one instant, and since ambient noise levels are constantly varying, other ways of describing noise levels (especially over extended periods) are used. Three commonly applied descriptors are the L_{10} , L_{eq} , and L_{dn} . L_{10} represents the noise level exceeded ten percent of the time during the period of measurement. The equivalent noise level, or L_{eq} , is defined as the level of continuous sound containing the same amount of acoustical energy as the fluctuating sound over the same period. L_{eq} is used in the prediction of future noise levels (by logarithmically adding the contributions from new noise sources to the existing levels) and in relating annoyances to increased noise levels. L_{eq} is increasingly recognized as an appropriate noise measure by national and international regulatory agencies.

It should be noted that a one decibel change in noise is the smallest change detectable by the human ear under suitable laboratory conditions. However, under normal conditions, a change in the noise level by two or three decibels is required for the average person to notice a difference. The perception of noise changes is shown in Table IV.G-1.

Environmental noise is considered not only with regard to level, which relates to

perceived loudness of a noise, but also its character, duration, time of day, and frequency of occurrence.

Table IV.G-1
Perception
Of Changes In Noise Levels

Change (dBA)	Average Ability to Perceive Changes in Noise Levels (Human Perception of Change)
2 - 3	Barely Perceptible
5	Readily Noticeable
10	A Doubling or Halving of the Loudness of Sound
20	A Dramatic Change
40	Difference Between a Faintly Audible Sound and a Very Loud Sound

Source: Bolt Baranek and Neuman, Inc. *Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703*. Prepared for Federal Highway Administration, June 1973.

The standard measurement of noise is the decibel (dB), generally adjusted to the A-scale (dBA) which corresponds to the frequency response of an average human ear when listening to ordinary everyday sounds. The A-scale frequency weighting de-emphasizes the noise contribution from the lower frequency noise component and emphasizes the higher frequency noise component where the human ear is most sensitive. Most people can only detect sound level changes of 3 dB outside a controlled laboratory environment, where a 5 dB change is more readily noticeable. A 10 dB change in sound is usually judged as a doubling (or halving) of sound. "Sound Levels and Loudness of Typical Noises of Indoor and Outdoor Environments" are presented on Table IV.G-2.

Table IV.G-2

Sound Level and Loudness of Typical Noises of Indoor and Outdoor Environments

Noise Level (dBA)	Subjective Impression	Typical Sources		Relative Loudness (Human Response)
		Outdoor	Indoor	
120-130	Uncomfortably Loud	Air raid siren at 50 feet (threshold of pain)	Oxygen torch	32 times as loud
110-120	Uncomfortably Loud	Turbo-fan aircraft at take-off power at 200 feet	Riveting machine Rock band	16 times as loud
100-110	Uncomfortably Loud	Jackhammer at 3 feet		8 times as loud
90-100	Very Loud	Gas lawn mower at 3 feet Subway train at 30 feet Train whistle at crossing Wood chipper shredding trees Chain saw cutting trees at 10 feet	Newspaper press	4 times as loud
80-90	Very Loud	Passing freight train at 30 feet Steamroller at 30 feet Leaf blower at 5 feet Power lawn mower at 5 feet	Food blender Milling machine Garbage disposal Crowd noise at sports event	2 times as loud
70-80	Moderately Loud	NJ Turnpike at 50 feet Traffic in downtown urban area	Loud stereo Vacuum cleaner Food blender	Reference loudness (70 dBA)
60-70	Moderately Loud	Residential air conditioner at 100 feet Gas lawn mower at 100 feet Waves breaking on beach at 65 feet	Cash register Dishwasher Theater lobby Normal speech at 3 feet	1/2 as loud
50-60	Quiet	Large transformers at 100 feet Traffic in suburban area	Living room with TV on Classroom Business office Dehumidifier Normal speech at 10 feet	1/4 as loud
40-50	Quiet	Bird calls Trees rustling Crickets Water flowing in brook	Putting on clothes Using computer	1/8 as loud
30-40	Very quiet		Walking on carpet Clock ticking in next room	1/16 as loud
20-30	Very quiet		Bedroom at night	1/32 as loud
10-20	Extremely quiet		Broadcast and recording studio	
0-10	Threshold of Hearing			

Sources: *Noise Assessment Guidelines Technical Background*, by Theodore J. Schultz, Bolt Beranek and Newman, Inc., prepared for the US Department of Housing and Urban Development, Office of Research and Technology, Washington, D.C., undated; Sandstone Environmental Associates, Inc.; *Highway Noise Fundamentals*, prepared by the Federal Highway Administration, US Department of Transportation, September 1980; *Handbook of Environmental Acoustics*, by James P. Cowan, Van Nostrand Reinhold, 1994.

2. Existing Noise Levels

The objective of the noise monitoring program was to characterize existing noise levels in the vicinity of Cross County Shopping Center. Site reconnaissance and review of the site plans and traffic data indicated that three monitoring sites would be needed to characterize noise levels at the residential areas surrounding the site. The noise monitoring locations are summarized in Table IV.G-3.

Table IV.G-3
Noise Monitoring Locations

Receptor Number	Near Intersection No.	General Location	Major Noise Sources
1	17	At apartment building setback (40' from curb) north side of Midland Avenue	Roadway traffic on Midland Avenue and the Cross County Parkway
2	8	At single family house setback (25' from curb) south side of Vredenburgh Avenue	Roadway traffic on all approaches to the intersection
3	14	At apartment building setback (40' from curb) east side of Kimball Avenue	Kimball Avenue & North Drive

Field Procedures

Noise measurements were obtained using a Quest Model 2200, which is an ANSI Type 1 standard meter. The field procedures that were followed during the noise monitoring are as follows:

- A free field microphone was mounted approximately 5 feet (1.5 meters) high and at least 4 feet (1.2 meters) from any reflecting surfaces.

- A wind screen was used on the microphone.
- Field notes were documented and include: calibration factors, selected instrument range, monitoring period, general weather data and time of day, and unusual occurrences (e.g., aircraft flyovers).
- No monitoring was conducted during periods of significant precipitation, snow or ice cover, or wet pavement.
- Sound level meters were calibrated every hour.
- Batteries were checked before and after each measurement period.
- No monitoring was conducted during winds of 10 mph or more.

Noise Levels

The results of the ambient noise assessment are presented in Table IV.G-4.

Table IV.G-4
Noise Monitoring Results, April 18, 2005

Receptor Number	Near Intersection No.	Time Period	Leq, dBA
1	17	5:25-5:40 pm	65.0
2	8	4:50-5:05pm	57.0
3	14	4:20-4:35pm 5:45-6:00pm	59.3 60.9

Noise levels along Kimball Avenue ranged from 59 to 61 dBA, and along Vredenburgh Avenue was 57 dBA. The noisiest site was Site #1 which was heavily influenced not only by Midland Avenue, but also by the Cross County Parkway. Automobile traffic noise was the dominant noise source at all locations. Contributing to the background were: airplanes; car radios and horns; trucks; buses; and birds.

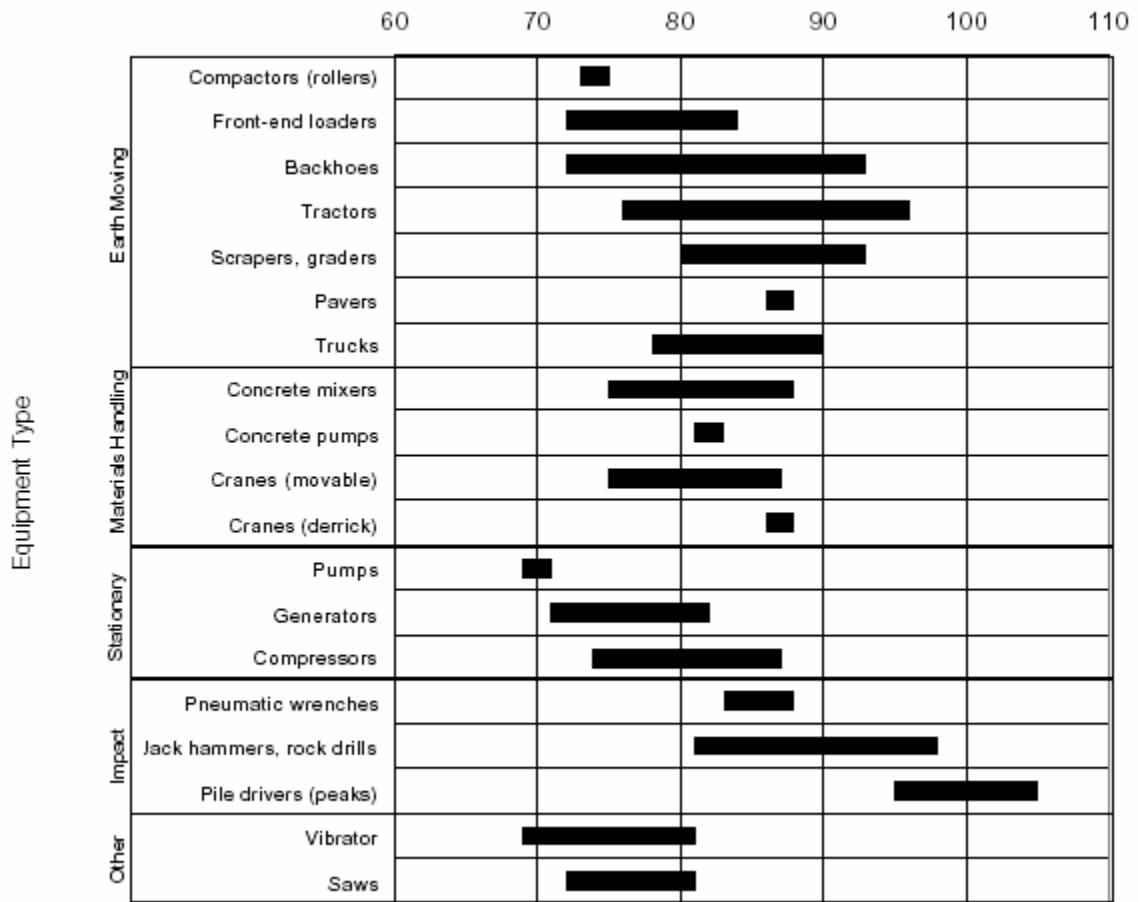
3. Potential Impacts

Construction Noise

Construction equipment noise will vary somewhat depending on the types and size of the equipment used for the project. The project will use high-noise construction processes, such as blasting, pile driving, rock drilling and rock crushing. Blasting, rock drilling and pile driving can produce noise levels greater than 90 dBA at the source. Table IV.G-5 and Table IV.G-6 provide typical noise levels of various types of heavy construction equipment at 50 feet. Table IV.G-7 shows typical noise levels from blasting as a function of distance from the source.

Table IV.G-5

Typical Construction Equipment Noise Levels (dBA at 50 feet)



Source: Central Puget Sound Regional Transit Authority, Long-Range Plan Final Supplemental EIS, June 2005

Table IV.G-6

Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (impact)	101
Pile Driver (sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88
Source: Federal Transit Authority, Transit Noise and Vibration Impact Assessment, April 1995	

Table IV.G-7

Estimated Blasting Noise, Distance Attenuation

Distance to Receptor (feet)	Sound Level at Receptor (dBA)
50	94
100	88
200	82
400	75
600	71
800	69
1,000	66
1,500	62
2,000	59
2,500	56
3,000	53
Source: Farad Diversion Dam Replacement Project, Draft Environmental Impact Report, March 2002.	

To assess potential adverse impacts associated with noise, typical noise levels from construction activities were used to extrapolate noise levels at nearby residential areas. Table IV.G-8 indicates the closest residences and potential noise levels for blasting and rock drilling. Table IV.G-9 indicates the potential noise impacts to residences surrounding the rock crushing operation. Table IV.G-10 indicates the potential noise impacts to residences associated with pile driving for each year of proposed operation (Figure I.A-7D).

Table IV.G-8

Noise Impacts Associated with Blasting and Rock Drilling Operations

Residential Areas	Nearest Blasting Source	Distance to Source, ft	Expected Noise at Residence, unattenuated, dBA	Expected Noise at Residence, attenuated by intervening features, dBA
Midland Co-Op Apartment Building	Midland Avenue Widening (rock drilling)	25	>98	98
Apartment North of Midland Avenue	Midland Avenue Widening (rock drilling)	100	92	92
Apartments on Kimball Avenue	North Drive Widening (blasting)	250	80	80
Single Family Homes North of Kimball Ave)	Blasting South of Sears Building	250	80	70

As seen from Table IV.G-8, the rock drilling has the potential for significant impacts on the adjacent Co-Op apartment building on the south side of Midland Avenue, as well as on the apartment building on the north side. The drilling operation itself will occur over an intermittent total of approximately 2 weeks out of an 8-week operation. In between drilling, a hydraulic excavator with a chipping hammer will knock the drilled rock from the side, fracturing the rock along the drill holes, causing the rock to fall off. The hydraulic excavator will be located on the Midland Avenue right-of-way, below the grade of the Co-Op, helping to mitigate noise impacts to some degree. The apartments facing Kimball Avenue, in the apartment complex on the southeast side of Kimball Avenue, will be subject to peaks of approximately 80 dBA during the blasting for the north driveway. In other areas the increases will be 5 dBA above background. While clearly audible, the blasting noise will be short term in nature (like a thump) and not overly intrusive.

Table IV.G-9
Noise Impacts Associated with Rock Crushing Operations

Residential Areas	Distance to Source, ft	Expected Noise at Residence, unattenuated (assuming 104 dBA at 4 meters), dBA	Expected Noise at Residence, attenuated by intervening features, dBA
Single Family Homes East of Central Park Avenue Southbound	>600	71	68
Single Family Homes North of Kimball Avenue	1300	64	59
Single Family Homes North of Cross-County Parkway	1400	63	58
Single Family Homes Southeast of Site (South of Vredenburg Ave)	1150	65	60

The rock crusher is proposed to be located in the space currently occupied by the existing vacant Stop & Shop basement. The former basement will be excavated to create a pad to house the crusher below grade. The minimum attenuations thus provided are shown in Table IV.G-9. The attenuated values are generally within the

existing background values. While the noise generated will be audible in the neighborhood it will only raise total decibel levels by 2 or 3 decibels.

Table IV.G-10
Noise Impacts Associated with Pile Driving Operations

Year of Operation	Residential Areas	Distance to Nearest Source, ft	Expected Noise at Residence, unattenuated (assuming 101 dBA at 50 ft)	Expected Noise at Residence, attenuated
2006	North of Kimball Ave	>600	79	71
2006	South of Vredenburg Ave	925	76	76
2006	North of Cross County Parkway	1100	74	74
2007	North of Cross County Parkway	550	80	80
2007	West of Central Park Avenue Southbound	700	78	78
2007	North of Kimball	500	81	76
2008	West of Central Park Avenue	500	81	81
2008	South of Vredenburg Ave	800	77	77
2008	North of Kimball Ave	850	76	71

Operation Noise

The dB scale of noise measurement is a logarithmic one. With all other factors remaining the same, it would take a 22 percent increase in traffic volume to cause a 1 dB increase in noise levels, a 58 percent increase in traffic volume to cause a 2 dB increase, and a 100 percent increase in traffic volume to cause a 3 dB increase. As previously documented studies have shown, a 2 to 3 dB increase in noise levels is imperceptible to most observers.

The traffic volume growth for no-build and build conditions is summarized on Table IV.G-11. Traffic volume increases from No-Build to Build ranged from 3 to 6% in the PM peak hour with improvements and 3 to 4% without improvements. Traffic volume increases from No-Build to Build ranged from 5 to 29% in the Saturday peak hour with

improvements and 4 to 10% without improvements. Thus, for all time periods the noise level increases would be 1 dBA or less, and result in an imperceptible change.

TABLE IV.G-11 TRAFFIC VOLUME INCREASES ADJACENT TO NOISE RECEPTORS

Noise Receptor (Traffic Intersection)	Location	PM Peak Hour							Saturday Peak Hour						
		Existing Volume	No-Build Volume	% Growth Existing to No-Build	Build Volume	% Growth No-Build to Build	Build/Improv Volume	% Growth No-Build to Build/Improv	Existing Volume	No-Build Volume	% Growth Existing to No-Build	Build Volume	% Growth No-Build to Build	Build/Improv Volume	% Growth No-Build to Build/Improv
1 (17)	MIDLAND AVENUE & C.C. PARKWAY WB RAMPS	1,540	1,617	5%	1,658	3%	1,658	3%	1,484	1,552	5%	2,007	29%	1,607	4%
2 (8)	VREDENBURGH AVENUE & MILE SQUARE ROAD & TRENCHARD STREET	1,563	1,765	13%	1,810	3%	1,869	6%	1,480	1,693	14%	1,809	7%	1,858	10%
3 (14)	KIMBALL AVENUE & NORTH DRIVE	2,590	2,818	9%	2,921	4%	2,967	5%	2,688	3,020	12%	3,173	5%	3,138	4%

4. Mitigation Measures

The project construction will consist of site work, foundation work, steel erection and finishing work. Work activities on most phases will overlap. The sound levels generated from the construction activities can vary greatly depending on such factors as the type of equipment, the specific equipment model, the operations being performed, and the overall condition of the equipment. Typical noise levels will be generated by an assortment of mechanical operations throughout the construction processes. Examples of these operations may include, delivery and internal trucking, excavation activities, drilling operations, blasting, pile driving, mechanical fastening and the use of small gasoline powered motors.

In general, the type of rock drill equipment can help reduce the resulting noise level. For example, hydraulic drills are generally quieter than pneumatic drills.

Recommended mitigation measures for blasting operations include:

- No blasting on Sundays, legal holidays and between the hours of 8 PM and 8 AM
- Notifying nearby residences whenever blasting work will be occurring.

Pile driving is potentially the greatest source of vibration associated with equipment used during construction of a project. Impact pile drivers produce a high vibration level for a short time (0.2 seconds) with sufficient time between impacts to allow any resonant response to decay.

Mitigation methods for noise vibration associated with pile driving include:

- Avoid night time pile driving. People are more aware of vibration in their homes during the night time hours. Pile driving will be limited to the hours 8:00 AM to 3:30 PM Monday through Friday. The duration of pile driving the various phases of construction is illustrated on Figure I.A-7D;

- Alternate methods of driving or foundation support;
- Use of multiple pile drivers to reduce the total time required for driving piles;
- Use of engine and pneumatic exhaust controls to reduce exhaust noise;
- Piles may be pre-drilled prior to their installation to accommodate lower noise levels.

Two major highways abut the site – the New York State Thruway along the west side and the Cross County Parkway along the north side. Wheel noise generated at the pavement level by the existing vehicles along these corridors will be dispersed to adjacent areas and will serve to mask construction related noise within the site. This condition, along with general vehicular traffic in and around the center, currently exists and may serve to reduce and/or muffle construction noises. The natural change in grade as the site progresses from west to east will also help to shield the residences located along Kimball and Midland Avenues from noise generated during the redevelopment activities.

The majority of rock removal will be done by controlled blasting. Given the muffled sound and the short duration of a blast, this will not be a significant noise impact. However, some areas will require the rock to be removed by mechanical means. The intermittent use of drills and hammers can produce noise above ambient levels, but will be strictly monitored to maintain compliance with all regulatory standards.

As discussed in Section IV.G, rooftop equipment on new buildings will be installed a minimum of 15 feet inward from the edge of the roof, and in addition, no proposed building is situated any closer than any existing building to any existing residences. The closest new building is the propose Sears expansion, which is approximately 270 feet from the nearest residential property, with an intervening rocky knob in between.

No additional mitigation measures are recommended.