



I-694 Snelling Avenue/TH 10 Interchange Reconfiguration

Noise Advisory Committee Meeting

Thursday March 25, 2010

6:00 – 7:30 p.m.

Arden Hills City Hall

1245 W. Highway 96

Arden Hills, Minnesota

Your Destination...Our Priority





Tonight's Agenda

- Proposed Project Overview
- NAC Goals and Objectives
- Traffic Noise
 - Noise Terminology
 - Minnesota Noise Rules
 - Traffic Noise Modeling
 - Noise Barrier Evaluation
- Noise Monitoring





NAC Goals and Objectives

- Provide two-way communication between community and project team
- Provide greater understanding of the noise evaluation process
- Review noise analysis methodology and results
- Provide feedback to City Council and communicate project information to neighborhood residents





NAC Meetings Anticipated Schedule

- March 2010
- April 2010
- Third meeting to be determined





What is Noise?

- A vibration that causes pressure variations in air and water
- Unwanted sound
 - Your neighbor's dog
 - Your children's music
 - Your neighbor cutting the lawn at 7:00 am





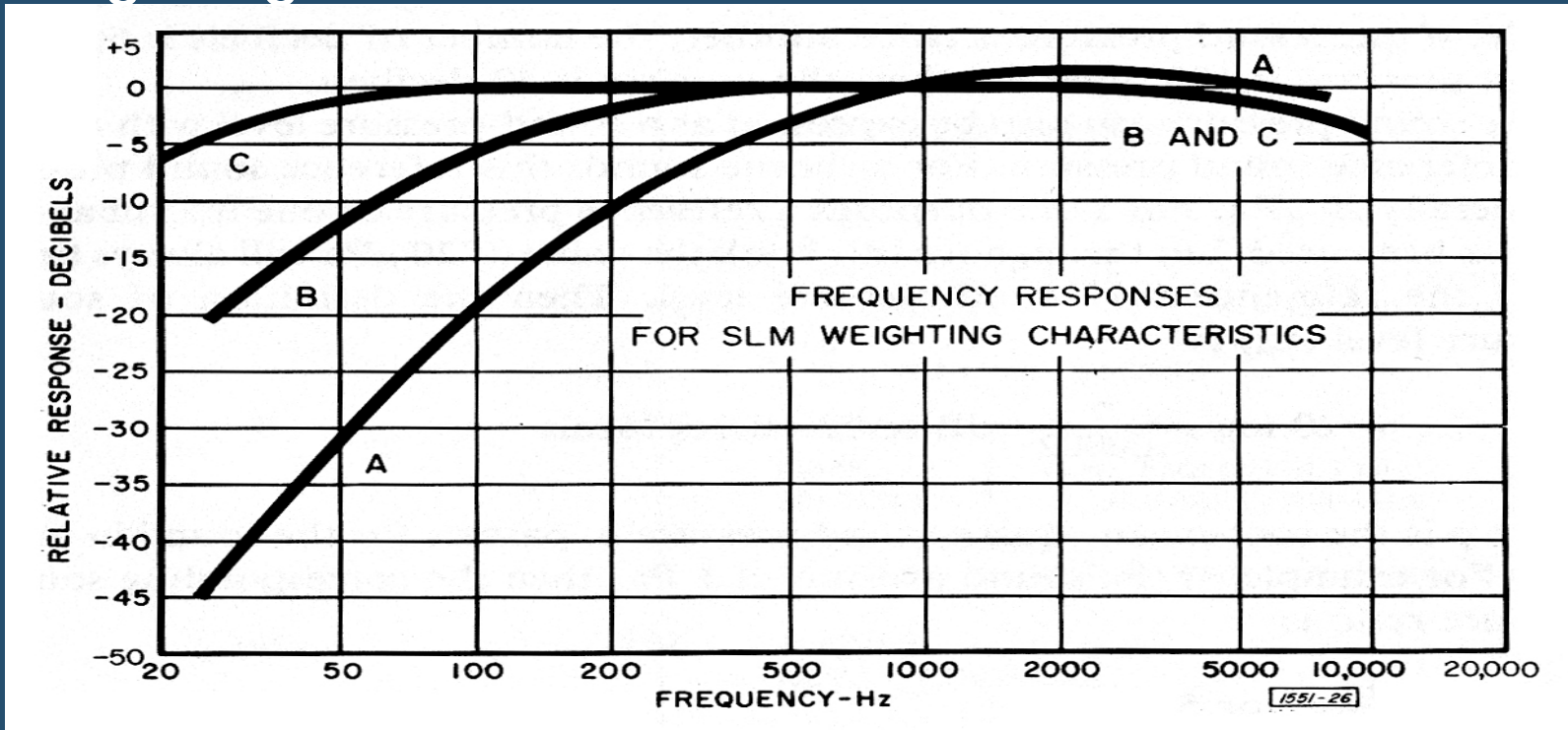
Sound Pressure Level and Decibels

- Sound pressure level (SPL) is used to measure the intensity of sounds
- SPL measured in units called decibels, or dB
- A-weighted decibels, or dBA
 - Gives a scale for noise levels as experienced or perceived by the human ear



dBA

- Weighting Curves



Addition and Subtraction of Sources

- A doubling of energy, or doubling of identical sources, results in an increase of 3 dBA



4000 vehicles per hour is 3dB louder than



2000 vehicles per hour





Noise Level Changes in an Outdoor Environment

- 1 dBA (increase or decrease) = not noticeable
- 3 dBA (increase or decrease) = threshold of perception
- 5 dBA (increase or decrease) = clearly noticeable
- 10 dBA (increase or decrease) = perceived as twice as loud (or half as loud)

Source: Minnesota Pollution Control Agency. 2008. *A Guide to Noise Control in Minnesota*





Distance Attenuation

- Beyond approximately 50 feet from a sound source such as a highway, doubling of distance will yield:
 - Sound level decrease by 3 dBA over hard ground (pavement, water)
 - 50 feet = 70 dBA
 - 100 feet = 67 dBA
 - Sound level decrease by 4.5 dBA over soft ground (vegetation)
 - 50 feet = 70 dBA
 - 100 feet = 65.5 dBA

Source: Minnesota Pollution Control Agency. 2008. *A Guide to Noise Control in Minnesota*





FHWA Noise Abatement Criteria

Hourly A-Weighted Sound Level in Decibels (dBA)

Activity Category	L ₀₉ (h)	L ₁₀ (h)	Description of Activity Category
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.





FHWA Noise Abatement Criteria

(continued)

Hourly A-Weighted Sound Level in Decibels (dBA)

Activity Category	L ₀₉ (h)	L ₁₀ (h)	Description of Activity Category
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	--	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.





Minnesota Noise Rules

- Minnesota Rules Chapter 7030, defines the allowable receiver-based noise limits and source-based motor vehicle noise limits for trucks, motorcycles, and automobiles
- Minnesota Statute 116.07, empowers the MPCA to enforce the limits defined in the state rule





Minnesota Noise Rules

(continued)

- Noise Area Classifications (NAC) based on land use activities
 - NAC-1: Residential
 - NAC-2: Business
 - NAC-3: Industrial





Minnesota Noise Rules (continued)

- Noise limits apply to outdoor atmosphere only
- Noise limits are established for daytime and nighttime (Minnesota Rules 7030.0020)
 - “Daytime” is defined as the hours from 7:00 a.m. to 10:00 p.m.
 - “Nighttime” is defined as the hours from 10:00 p.m. to 7:00 a.m.



Minnesota Noise Rules

(continued)

- Receiver Based Noise Limits (dBA)

	Daytime		Nighttime		
	NAC	L10	L50	L10	L50
1 (Residential)	65	60	55	50	
2 (Commercial)	70	65	70	65	
3 (Industrial)	80	75	80	75	

Minnesota's noise pollution rules are based on statistical calculations that quantify noise levels according to duration over a one-hour monitoring period. The L10 calculation is the noise level that is exceeded for 10%, or 6 minutes, of the hour, and the L50 calculation is the noise level exceeded for 50%, or 30 minutes, of the hour.





How do We Evaluate Traffic Noise?

- Noise Monitoring
 - Document existing noise levels
 - Comparison to model results
- Noise Modeling
 - Receptor sites affected by construction of project
 - Loudest hour of daytime and nighttime periods
 - Existing conditions
 - Future No-Build and Build conditions (generally a 20-year traffic projection)





How is Traffic Noise Modeled?

- Noise prediction program “MINNOISE”
 - Traffic volumes
 - Traffic speeds
 - Vehicle types (cars, medium trucks, heavy trucks)
 - Characteristics of roadway (horizontal and vertical alignments)
 - Receptor sites (outdoor place where frequent human use occurs
 - represent residences or businesses)
 - Elevations (receptors, ground lines, noise barriers, berms)





Is there a Traffic Noise Impact?

- Do noise levels exceed Minnesota daytime and/or nighttime noise standards?
- Receiver Based Noise Limits (dBA)

NAC	Daytime		Nighttime	
	L10	L50	L10	L50
1 (Residential)	65	60	55	50
2 (Commercial)	70	65	70	65
3 (Industrial)	80	75	80	75



What if there is a Traffic Noise Impact?

- Consideration of mitigation measures, which includes evaluating noise barriers (i.e., noise walls)
- Noise barrier construction decisions are based on a study of feasibility and reasonableness





How Does Mn/DOT Determine if a Noise Wall is Feasible and Reasonable?





Feasibility and Reasonability Criteria

- “Feasibility” is determined by physical and/or engineering constraints (i.e., could a noise barrier feasibly be constructed on the site)
- “Reasonability” is based on several factors including:
 - Acoustical effectiveness limits
 - Mn/DOT’s cost-effectiveness criteria
 - Desires of affected property owners





Barrier Feasibility Considerations

- Does Mn/DOT have the required right of way to construct the wall?
- Safety concerns such as sight distances and clear zones
- Buried utilities or utility relocation needs
- Impacts to drainage or drainage features within right of way
- Soil types or wetland areas





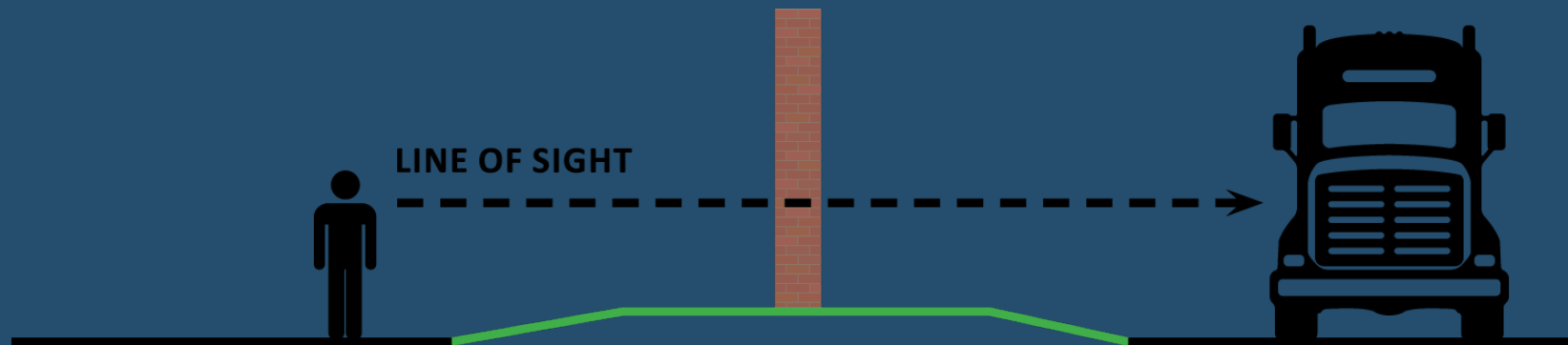
Mn/DOT Reasonability Criteria

- Acoustical effectiveness:
 - Will the wall provide a substantial reduction in noise (at least 5 dBA)?
- Cost effectiveness:
 - Will the wall meet a cost effectiveness value $\leq \$3,250$ per residence per dBA of reduction?
 - Based on wall costs of \$15/sq ft; \$18/sq ft on bridges
 - Consideration of other costs such as retaining walls, guardrail



How Do Noise Walls Work?

- Block the direct path of sound waves from the highway to adjacent residences
- High enough and long enough to block line of sight between the highway and residences
- Will not block or eliminate all noise





Noise Barrier Effectiveness Considerations

- Distance between the listener and the noise source (most effective for the first one or two rows of adjacent residences, or approximately 400-500 feet from the barrier)
- Topography
- Existing features such as intervening structures and/or earthen berms





Cost-Effectiveness (CE) Calculation

Example #1

- Barrier Cost = \$1,000,000
- Avg. Reduction = 10 dBA
- 10 Benefitting Residences
- \$1,000,000/10 dBA/10 residences
- Barrier CE = \$10,000/dBA/residence

Barrier Exceeds CE Threshold

Example #2

- Barrier Cost = \$300,000
- Avg. Reduction = 10 dBA
- 10 Benefitting Residences
- \$300,000/10 dBA/10 residences
- Barrier CE = \$3,000/dBA/residence

Barrier Meets CE Threshold





What is the Final Step in the Noise Barrier Decision Process?

- If a noise barrier meets the Mn/DOT cost-effectiveness criteria and is found to be feasible, then the barrier is constructed with the project
- Unless the affected community formally requests to Mn/DOT that the barrier not be constructed





Documentation

- Environmental Assessment Worksheet (EAW)
 - Results of monitoring and modeling
 - Results of noise mitigation analysis
- Noise Standards Exemption Request
 - Process between Mn/DOT and MPCA
 - Final noise analysis
 - Exceed noise standards even though all reasonably available mitigation measures implemented





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Questions?

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