



U.S. Department of Transportation
Federal Highway Administration

FHWA Noise Compatible Land Use Curriculum

- Lesson 1: Discussion of Roadway Noise and FHWA Guidelines**
- Lesson 2: Essential Elements of Noise Compatible Land Use Planning**
- Lesson 3: Noise Compatible Reduction Techniques – Physical Responses**
- Lesson 4: Noise Compatible Reduction Techniques – Policy and Administrative Strategies**



**PREPARED FOR THE
FEDERAL HIGHWAY ADMINISTRATION**

BY

**THE CENTER FOR TRANSPORTATION TRAINING
AND RESEARCH
TEXAS SOUTHERN UNIVERSITY**



November 2006

Contents

Curriculum Design, Overview, and Sources for Additional Information

Lesson 1: Discussion of Roadway Noise and FHWA Guidelines

Lesson 2: Essential Elements of Noise Compatible Land Use Planning

Lesson 3: Noise Compatible Reduction Techniques – Physical Responses

Lesson 4: Noise Compatible Reduction Techniques – Policies and Administrative Strategies

Curriculum Design

The 4-part curriculum is structured to be taught in sessions of 90 minutes each. It is expected that the instructor will utilize this information as a foundation and will supplement the core information with specific local examples and additional detail. If one of the companion workshop videos is chosen to supplement the material in any lesson, adjust the length of discussion for the remaining material. It is envisioned that the curriculum could be part of a two-week module for a college level course or a one day seminar.

Overview

Appropriately accommodating highway noise is a critical component of project planning and implementation for engineers across the nation. The Federal Highway Administration (FHWA) prescribes a three-part approach for addressing roadway noise including: 1) source controls and quiet vehicles, 2) reduction measures within highway construction, and 3) developing land adjacent to highways in a way that is compatible with highway noise. Much emphasis has been given to the first two parts. First, trucks and tires have become quieter. Second, through the end of 2004, forty-five State DOTs and the Commonwealth of Puerto Rico have constructed over 2,205 linear miles of barriers at a cost of over \$2.6 billion (\$3.4 billion in 2004 dollars). However, sufficient attention is often not given to the noise compatible land use planning option. Departments of transportation and local communities would greatly benefit by increased attention to the third method, focusing on land use and adjacent roadway compatibility—Noise Compatible Land Use Planning (NCP). The Federal Highway Administration commissioned a brochure in 2002 entitled *Entering the Quiet Zone* that provided information to planners and decision makers with the intent of encouraging better highway-compatible land use decisions for properties proximate to highways. Noise Compatible Land Use Planning recommends controls that can minimize or eliminate future noise impacts. Local governments should exercise control through appropriate zoning or development approvals to restrict the development of noise sensitive land uses when development has the potential to be noise impacted. ***Responsibility and authority for implementing NCP are the auspices of local government; the role of FHWA and state departments of transportation is to encourage and educate local governments about this noise mitigation option.***

Between April and September 2005, FHWA sponsored a series of 5 workshops strategic locations around the United States. As a next step, FHWA advocates greater dissemination through this four-lesson curriculum to acquaint engineers, planners, developers, students, and other stakeholders with the tools to conduct NCP. This document may be used alone or as a companion to video summaries from the 5 workshops. Detailed information about noise compatible land use planning is available at the FHWA website, www.fhwa.dot.gov/environment/noise.htm.

Sources for Additional Information

23 U.S.C. 109(i) “23 United States Code”

http://www.fhwa.dot.gov/environment/109_h.htm (Retrieved June 26, 2006)

23 Code of Federal Regulations (CFR), Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise),

<http://www.nonoise.org/library/highway/appendix.htm>

Corbisier, Chris (2003). “Living with Noise” <http://www.tfrc.gov/pubrds/03jul/06.htm>

Federal Highway Administration, “Noise Compatible Land Use Planning”

<http://www.fhwa.dot.gov/environment/noise/quietzon/index.htm> (Retrieved June 26, 2006)

Federal Highway Administration, “Highway Noise: A Reprint of the Audible Landscape: A Manual For Highway Noise And Land Use

<http://www.fhwa.dot.gov/environment/audible/> (Retrieved June 26, 2006)

Federal Highway Administration, “Highway Traffic Noise,”

<http://www.fhwa.dot.gov/environment/noise/index.htm> (Retrieved June 26, 2006)

A slide presentation, the Noise Compatible Workshop Proceedings Report and accompanying videos are available to support this curriculum. It is helpful to utilize a laser pointer with the slide presentation. Students will benefit by reading material on the FHWA websites prior to beginning the curriculum.

Lesson 1: Discussion of Roadway Noise and FHWA Guidelines

Lesson 1 Objective: To present an overview of important highway noise elements and introduce the student to basic key definitions.

Estimated Presentation Time: 90 minutes

At the end of this module, the student should know:

- *FHWA's 3 pronged approach to roadway noise*
Basics regarding FHWA's guidelines
- *Key definitions*
- *The fundamental components of noise assessment*
 - *The role of traffic data*
 - *TNM Model*
 - *How sound is measured*

Roadway Noise

Roadway noise is unwanted sound resulting from vehicles traveling on a street or highway. States and federal government set guidelines noting acceptable decibel levels at Leq 65 dBA for exterior residences, schools, parks, and churches proximate to roadways. Federal guidance governing noise abatement is largely contained in two documents: 23 Code of Federal Regulations (CFR), Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise) first issued in 1982 it may be better to state that the most recent was issued in 2005 and the FHWA Policy and Guidance for Highway Traffic Noise Analysis and Abatement, issued in 1995. The purpose of the guidance is to provide procedures for noise studies and noise abatement measures to help protect public health and welfare, to supply abatement criteria, and to establish requirements for information to be given to local officials in planning and designing highways. As a companion to the federal guidelines, each state also develops its own procedures important for noise analysis and monitoring.

Noise abatement regulations are in accordance with the National Environmental Policy Act (NEPA) 1969, which provides responsibility for evaluating and mitigating any negative environmental effect resulting from a federally funded project.

The Federal Highway Administration categorizes projects into two types, depending on whether noise abatement is under consideration for an existing roadway (Type 2) or one that is new or anticipated to experience change (Type 1). Noise abatement is required for Type 1 projects, where new highway projects are proposed or where a change is recommended in the physical alignment or size of an existing roadway. Individual state policy guides Type 2 abatement; some states have Type 2 programs, others do not. Important definitions for discussing noise impacts are defined in Table 1.

Summary of Process for Noise Assessment

Initial noise impact assessment for all projects should determine whether noise sensitive receivers are within the project area and if noise impacts will be likely to occur. Assessments may include computer modeling, a review of land use plans, aerial photography and similar efforts. If the review indicates the possibility of a noise impact, then a detailed noise study is performed, consisting of field data collection and computer analysis. Computer analysis will use the Federal Highway Administration (FHWA) Traffic Noise Model (TNM). Noise analyses may be conducted by state departments of transportation or consultants following the guidelines established by FHWA and the state Department of Transportation (DOT). The fully developed noise analysis is submitted as part of the Environmental Assessment (EA) or Environment Impact Statement (EIS).

Measuring Sound

Strength of sound is measured on a relative scale of sound pressure levels termed decibels (dB). Decibels are a logarithmic scale, based on values of 10. A sound level of 70 dBA will seem twice as loud as 60 dBA. Sound measurement is weighted as to what the human ear can hear, termed A-weighted. The noise level descriptor will be the hourly equivalent sound level, L_{Aeq1h} . L_{Aeq1h} represents the steady state of A-weighted sound level over a 1-hour period. In actuality, sound varies across an hour. L_{Aeq1h} contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a one-hour period. Attention should be paid to background noise when sound measures are undertaken. Aircraft and farm equipment are examples of sounds that can affect readings. Highest noise levels are expected in peak hours, but non-peak hours may be evaluated if other variables might cause higher noise levels at other times.

In determining and abating traffic noise impacts, primary consideration is to be given to outdoor activity areas. Mitigation is usually necessary only where frequent human use occurs and a lowered noise level would be of benefit. Exterior noise impact criteria for residences, schools, parks, and churches are Leq 67 dBA. Above this level, two people standing three feet apart may have trouble hearing one another. Exterior noise abatement criterion for commercial activities is Leq 72 dBA. Traffic noise impacts can also occur when the future predicted noise levels substantially exceed the existing noise levels. A substantial increase is defined by State DOTs and is typically 10 dBA or more. Table 2 shows noise levels of common audible sounds.

Noise Sensitive Receiver (Receptor)

The nuisance level for traffic noise is perceived differently by people. For instance, roadway noise may not bother people walking to a commercial establishment, but may disturb people at a backyard pool. A noise sensitive receptor is any property where frequent exterior human use occurs and where a lowered noise level would be beneficial. In locations where there is no exterior activity to be affected by traffic noise, interior noise levels may be assessed.

Traffic Data

A key variable in predicting noise levels is traffic data which are needed to predict existing and future traffic noise levels. Traffic data are collected for roadway segments of the project and other roadways that may contribute noise to receptors. Traffic noise predictions will be made using the methodology in the FHWA Traffic Noise Model (FHWA TNM).

Maximum peak-hourly traffic representing Level of Service (LOS) "C" or demand LOS of "A", "B", or "C" are generally used unless analysis shows that other conditions create a 'worst-case' level. Noise specialists are encouraged to use the maximum volume at the highest posted speed that will maintain a LOS of "C" or higher. If the posted speed for the future build condition is unknown, engineers use the existing posted speed or design speed whichever seems most logical. Speeds in excess of the legal speed limit may be used in the prediction of noise levels if field measurements indicate that this condition might be the norm.

The TNM Model

Highway traffic noise has been a federal, state, and local problem, even before the first noise barrier was built in 1963. Over the years, planners and engineers have worked to improve noise measurement and modeling tools that aid state transportation agencies in addressing the highway traffic noise problem. The FHWA TNM, the approved model, is a computerized model used for predicting noise impacts proximate to highways under a variety of conditions. It uses advances in acoustics and computer technology to improve the accuracy and ease of modeling highway traffic noise, including the design of efficient, cost-effective highway noise barriers. The FHWA TNM contains the following modeling components:

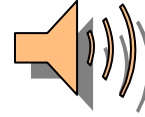
- Five standard vehicle types, as well as user-defined vehicles.
- Constant-flow and interrupted-flow traffic.
- Effects of graded roadways.
- Sound-level computations based on a one-third octave-band database and one-third octave-band algorithms.
- Graphically interactive noise barrier design optimization.
- Attenuation over/through rows of buildings and dense vegetation.
- Multiple diffraction analyses.
- Parallel barrier analyses.
- Contour analyses

Table 1: Definitions

<p>Abatement: any positive action taken to reduce the impact of highway traffic noise.</p> <p>Abatement measures: measures that must be considered in traffic noise analysis when a highway project will result in a noise impact to include:</p> <ul style="list-style-type: none">Traffic managementAlteration of horizontal and vertical alignmentsAcquisition of real property to serve as a buffer zoneInsulation of public use or nonprofit institutional structuresConstruction of noise barriers <p>Absolute criterion: one of two criteria used to determine when a noise impact occurs. Under this criterion, a noise impact occurs when the predicted noise level approaches, equals or exceeds the FHWA Noise Abatement Criteria. (See also Relative Criterion)</p> <p>Approach: one (1) dBA below the FHWA Noise Abatement Criteria (See Absolute Criterion.)</p> <p>Attenuation: reduction or lowering of the level of sound or noise.</p> <p>Design year: The future year used to estimate the probable traffic volume for which a highway is designed. A time, 10 to 20 years, from the start of construction is usually used.</p> <p>Existing noise levels: The noise, resulting from the natural and mechanical sources and human activity, considered to be usually present in a particular area.</p> <p>L10. The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration.</p> <p>L10(h): The hourly value of L10.</p> <p>Leq: The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.</p> <p>Leq(h): The hourly value of Leq.</p> <p>Receiver or receptor: the specific location of an outdoor area where frequent human activity occurs that might be impacted by highway traffic noise and may benefit from reduced noise levels. If no outdoor location can be identified, an interior location may be used.</p> <p>Traffic noise impacts: Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria (Table 1), or when the predicted traffic noise levels substantially exceed the existing noise levels.</p> <p>Type I projects: A proposed Federal or Federal-aid highway project for the construction of a highway on new location; the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.</p> <p>Type II projects: A proposed Federal or Federal-aid highway project for noise abatement on an existing highway.</p>
--

Sources: Definitions from Texas Department of Transportation Guidelines for Analysis and Abatement of Highway Traffic Noise (June 1996), Change 1, July 1997 and 23 CFR 772.

**Table 1
COMMON NOISE LEVELS**



Noise Source	Sound Level (dBA)	Subject Impression
Jet Aircraft take off	120	Uncomfortably Loud
Heavy Truck/Motorcycle	90	Very Loud
Food Blender	90	Very Loud
Lawn Mower/Vacuum	70	Moderately Loud
Light Auto Traffic/Dishwasher	50	Quiet
Quiet urban (night)/Library	30	Very Quiet
Acoustic Test Chamber	10	Just Audible
	0	Threshold of Hearing

Sources: Synthesized from Texas Department of Transportation, Guidelines for Analysis and Abatement of Highway Traffic Noise, June 1996 (Change 1, July 1997) and League for the Hard of Hearing (<http://www.lhh.org/noise/decibel.htm>)

Optional Student Exercise

Most states have web sites with their noise manuals and individual state guidelines; students should conduct a web based search to find on-line noise planning guidelines for their state. Focal points for review include: 1) Is noise compatible land use planning prominently displayed as an option in the on-line material? 2) Is information available that enhances your understanding of this subject? 3) Is there a link or drop down option for examples of local communities within the site? and 4) Is there a link or drop down option to FHWA's noise guidance?

Lesson 2: Essential Elements of Noise Compatible Land Use Planning

Objective: Lesson 2 is focused on encouraging advanced planning and shared responsibility between highway engineers and local governments.

Presentation Time: Approximately 90 minutes

At the end of this module, the student should know:

- *What constitutes Noise Compatible Land Use Planning*
- *Benefits of Noise Compatible Land Use Planning*
- *Potential Hindrances to Implementing Noise Compatible Land Use Planning*

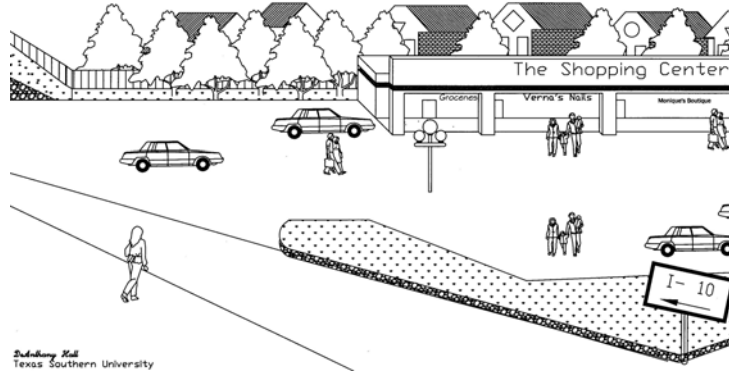
Purpose of Noise Compatible Land Use Planning (NCP)

Noise Compatible Land Use Planning eliminates or reduces the undesirable effects of highway traffic noise by encouraging less noise sensitive land uses next to highways, promoting the use of open space, or using special building construction techniques to minimize noise impacts. The objective is to help address potential highway noise before problems occur. The concept is to establish appropriate development next to highways, preventing noise problems before they occur. Many land use categories such as commercial, industrial, office, retail, and parks – parks are listed as a category B receiver due to its sensitivity to noise, should be removed or open space benefit from locating near a highway.

Commercial, Office, Retail, or Industrial Uses

Commercial, office, retail or industrial uses next to highways experience improved accessibility and appreciate easy access to transportation arteries. Visibility is better for customers and deliveries, as well. These land uses are not negatively affected by the noise and they can serve to buffer residential or other sensitive uses from roadway generated sound. Vegetation may be planted to further buffer commercial uses from residential areas. Exhibits 1 and 2 show examples of commercial and other uses next to roadways.

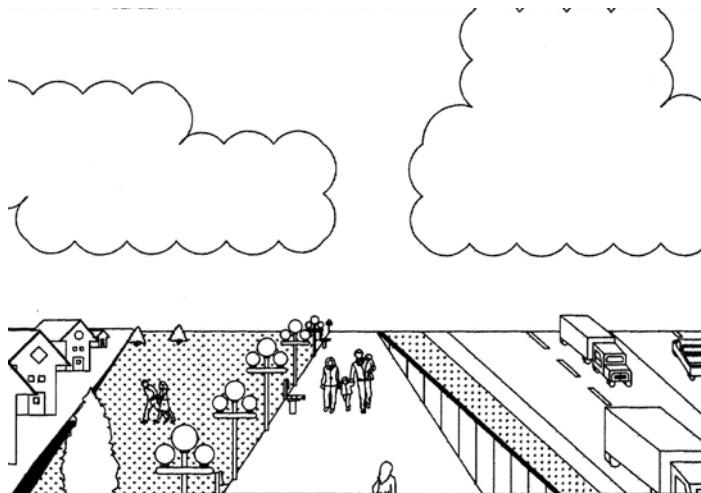
Exhibit 1: Commercial Buffer



Open Space

Community planners should actively seek opportunities to reserve undeveloped land and open space in locations where future roadways may be constructed. Open space allows sound to diminish before reaching sensitive receivers. Open space strategies may be used in combination with other strategies including commercial uses or noise reducing construction methods for buildings. Walking and bike paths and other recreational activities are options in the open space.

Exhibit 2: Open Space Buffer



Special Construction Techniques

A lack of vacant land and pressures to develop or redevelop in urban areas result in residential next to highways. In these instances, residential uses can be specially oriented or constructed to reduce the negative effect of nearby highway noise. Details about the techniques and materials are included in Lesson 4.

Benefits of “Noise Compatible Planning”

Benefits to Noise Compatible Land Use Planning are numerous. NCP better positions communities for proactive as opposed to reactive planning to address noise impacts. Planning ahead can lead to better quality of life for adjacent landowners and residents. When communities land uses are designed so that residences are separated from highways by commercial or retail uses or an adequate distance so noise is diminished, homes are a less affected by high noise levels. Sound planning reduces the number of complaints from residents. An added advantage can be future cost savings realized by not constructing as many noise barriers. Also, property value increases may be observed compared to communities not practicing noise compatible land use principles.

Planning for future highway noise promotes public-private shared responsibility for accommodating highway noise. Developers are encouraged to leave open space and reorient less sensitive uses away from the roadway or to consider building a noise barrier by increasing the height of a privacy wall.

Difficulties Communities Face When Implementing Noise Compatible Land Use Planning

A number of obstacles prevent aggressive implementation of NCP. Developers may perceive that NCP is cost prohibitive. They fear requirements for setbacks and open space will reduce the amount of usable property for development. Some communities may be concerned that differing guidelines within a region could lead to intergovernmental conflicts. Communities implementing NCP principles may feel disadvantaged and that with a choice, developers might choose communities without noise compatible guidelines. There is a potential for conflicts with zoning and other ordinances. Inadequate data exists to prove numerically or statistically the benefits of NCP. Some policy makers are wary of potential lawsuits and ensuring maintenance of property owner rights. Planners and engineers convinced of noise compatible land use advantages are not confident about selling the idea of NCP to developers and elected officials. Also, some appropriate noise compatible uses, such as industrial activity, may be viewed as unpleasant along city corridors (strip development).

It is important that leaders and policy professionals within a community encourage the following:

- Increased use of noise compatible land use strategies.

- Accumulation of resources (video, reports, course curriculum) to better educate citizens, developers and others in their communities
- Create a culture to use noise walls less frequently as future impacts of roadway noise are minimized by advanced planning.

The case study below shows the outcomes from a citizen based committee that recommended changes in policy documents to include NCP.

**Case Study
Fredrick County Maryland**

In 2003, Fredrick County Maryland’s Citizens Zoning Review Committee circulated a discussion paper which encouraged its county to implement a noise compatible program. They noted studies indicating a substantial increase in the projected number of residential units that would be exposed to noise levels of 66 dBA by 2020. Existing regulations required that new developments with noise sensitive uses adhere to Maryland Department of Transportation (MDOT) Noise standards. MDOT notified counties in their state that future noise abatement retrofit funds would not be available if counties did not adopt suitable mitigation regulations.

The Committee emphasized the influence of individual attitudes and values in contributing to determining unacceptable noise levels. Perception about the noise is partly based on the importance a person gives to the source of the noise, general sensitivities and feelings of fear associated with the noise. Also, of note is the activity the person is engaging in when the noise occurs. Other variables found to influence attitudes about noise are the income and educational background of the individuals; those of higher incomes and educational levels are more likely to be offended by higher than expected noise levels. People are less accommodating of elevated noise levels in the summer when outside activities increase.

Frederick County’s Citizen Committee recommended administrative techniques, such as zoning, subdivision regulations or physical techniques including acoustical site planning, design or construction. Proposed zoning changes could include the creation of an “overlay zone”. Such a zone would be superimposed over the regular zoning map. Areas where additional noise regulations are applicable would be designated according to the overlay map. Another method would be to segment the existing zoning map, identifying with new notations, areas that could potentially be impacted by noise. The committee also proposed increased density incentives in exchange for reserved open space.

Site planning and design techniques take advantage of the property’s natural shape and site buildings so hills or contours or the land can serve to buffer sound. Also room arrangement or window placement and design can reduce noise impacts. Lastly, fence materials and design are available to minimize sound impacts from adjacent roadways.

Source:

<http://www.co.frederick.md.us/planning/> (Look Under Comprehensive Plans, then under Frederick County Comprehensive Plan: Appendix E—Guidelines for Evaluating and Mitigating Highway Noise Impacts)

Lesson 3: Noise Compatible Reduction Techniques – Physical Responses

Lesson 3 Objective: To make the student aware of the impact of the physical environment on how sound is heard, as well as provide an understanding of the physical strategies that can be applied as part of noise compatible land use planning.

Presentation Time: Approximately 90 minutes

At the end of this module, the student should know:

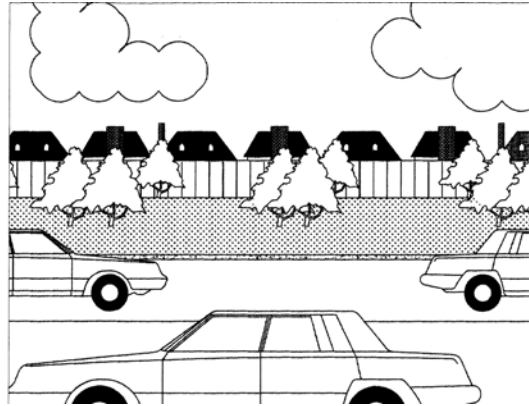
- *How the physical environment and distance affect the way noise is heard*
- *A site can be planned to better shield sensitive uses from roadway noise*
- *Architectural design and construction techniques can reduce the impact of roadway noise*

The physical environment near the roadway effects the way sound is heard by the human ear. For example, sound measurements are impacted if the surface is hard like concrete or permeable like grass, if there is an incline or decline next to the roadway, or if there is a fence or wall serving as a buffer. Among the most prominent variables effecting noise are the following:

Distance

The greater the distance between the source of the sound and the receiver, the lower the noise level. Distance can be achieved by providing open space, as with recreational uses or publicly owned property that creates a buffer (such as state right-of-way). Local codes or ordinances can require “setbacks,” which mandate the locations for the front line of buildings. Setbacks reduce the impact of traffic noise if they are sited so as to allow enough space between the roadway and the receiver for sound to dissipate to acceptable levels (Exhibit 1).

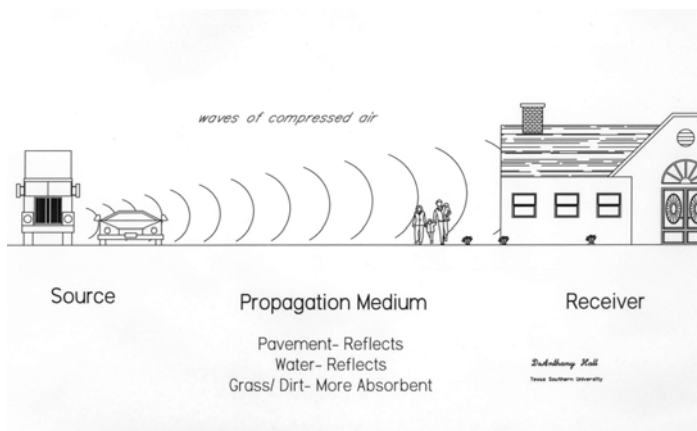
Exhibit 1: Setbacks Allow Sound to Dissipate



The Surface

“Propagation medium” describes the area between the sound source and the receiver, including the type of ground surface (Exhibit 2). For instance, a fence reflects or deflects sound according to its height, thickness and material. Sound is affected by the type of surface, as well. Porous surfaces, like dirt or grass, absorb some sound; surfaces not so porous, like asphalt or concrete, will reflect some sound affecting how it’s heard by the human ear.

Exhibit 2: Source, Propagation Medium and Receiver



Topography

Sound waves are affected by the terrain – whether hilly or flat – between the source and the receiver. A berm or hill will block sound and diminish its intensity. A ditch or gully deflects the sound and depending on its depth and dimension will diminish the sound and/or cause a change in its path. Where hills are available, constructing noise sensitive uses behind the hills helps reduce sound problems.

Exhibit 3: Topography Influences Sound Paths



Note:

FHWA does not consider vegetation as an abatement measure. In order to block sound, evergreen vegetation must provide a canopy from the ground to top of receiver and be thick enough to not be seen through. Vegetation can provide a psychological buffer or aesthetic treatment of the area near a roadway.

Acoustical Site Planning

Buildings can be located on parcels to reduce the potential impact of roadway noise from adjacent roadways. Bedrooms designed for the area of the home farthest from the road, provide space for sound to dissipate where quieter rooms are desired. Rooms where the television, radio or other background sounds will be louder are more appropriate closer to the roadway. Kitchens and bathrooms are also less sensitive to noise than some other rooms. Residential subdivisions with a range of home styles that place single story homes proximate to the highway will protect interior rooms better than two story homes next to the road.

Developments that include common spaces, such as clubhouses or recreational space may place these uses next to the roadways. Detached garages are suitable for locating adjacent to highways and increasing the distance between roadway noise and more sensitive residential areas.

Acoustical Architectural Design

A variety of architectural design features can assist with noise attenuation. Walls or fences erected for privacy, when extended a few feet taller can block noise from 1st floor rooms. In order to block a substantial amount of noise the fence cannot have gaps and must block the line of sight to the source of the noise.

Acoustical Construction

Certain developers with property adjacent to highways constructed their residential units without windows on the roadway side, and with large ample exterior windows on the side opposite the highway. These residences include special insulation, which blocks additional noise from the roadway. Other acoustical options are double or triple paned windows, increasing the building mass and selecting more sound buffering equipment, solid doors, and noise dampers on air intakes.

Optional Student Exercise

Take a tour through a community near a major highway or roadway. Observe building locations (Are they set back)? Is there fencing - or some other medium - that would absorb sound? What about the topography—are there berms or hills to shield residential buildings? Obtain a disposable camera and photograph examples of noise compatibility visible in your community. Label photographs and compare with other students in your class.

Lesson 4: Noise Compatible Reduction Techniques – Policies and Administrative Strategies

Lesson 4 Objective: To familiarize the participants with the variety of tools available to local governments in support of noise compatible land use planning. Communities across the nation are beginning to apply these tools.

Presentation Time: Approximately 90 minutes

At the end of this module, the student should know:

- *Legal strategies available to local communities to encourage NCP*
- *Example communities that have implemented such strategies*

Local and municipal governments have the greatest authority to mandate or encourage implementation of noise compatible land use principles. State transportation entities do not have jurisdiction over local land use matters. Depending on the each state's legislative guidelines, counties may or may not have the option of shaping land use decisions. Such power ordinarily is under the auspices of the municipality. People arguing against municipal statutes regulating land use often concentrate their position in the area of property rights—those who own the land should be able to utilize it at their discretion.

Strategies for Municipalities

Zoning: The strongest category of land control is zoning. Zoning specifies the types of allowable land uses for parcels of land. For example, in support of noise compatible land use, parcels next to roadways or anticipated roadways can be zoned for commercial, industrial or other uses considered suitable next to a highway. Opposition to such zoning designations might arise from property owners, desiring to utilize their property for a use other than that identified in the zoning ordinance. Another issue could center on the community needs; if residential uses are desired and the best suited property is next to the roadway, overall community goals could be compromised if needed housing were not permitted.

- **Overlay Districts** – Overlay districts are established where more stringent requirements are desired than in the basic zoning legislation. Geographic boundaries are designated, which cover (*are laid over*) the base zoning maps. Additional setbacks, construction requirements, or noise buffers may be necessary in these overlay districts (or zones.)

- Performance Zoning – Measurable standards are set and developments are assessed as to how well they meet these “performance” characteristics. Specific uses are not required (i.e., any use is acceptable) as long as it is developed or mitigation is included to reduce potential noise impacts.

Other Ordinances or Regulations: A number of regulations could be written, which restrict construction in areas identified as sensitive to noise. Some may be included in the zoning regulations, others may be independent of zoning.

- Clustering—Clustering allows a developer to concentrate structures on the parcel farthest away from the source of the noise. Open space or other less sensitive uses may be placed closer to the roadway and other requirements, such as density characteristics, could be relaxed.
- Plat notation – A note on the plat can alert builders and potential buyers to their responsibility relative to future noise that might affect their property.

Preservation Buffer: Municipalities might purchase and maintain land as vacant property to preserve the distance between the roadway and proximate land uses. In addition to direct purchase, municipalities might receive land as a gift, a condition of subdivision approval or as a transfer from another governmental entity.

<p>Sample Language (Subdivision Ordinance)</p>
<p>Buildings shall be discouraged within the designated traffic noise impact area of a developed tract that is wholly or in part within the traffic noise impact area. Required open space may be strategically located between major traffic noise sources and building lots.</p>

Source: Pennsylvania “Model Traffic Noise Ordinance

<p>Sample Language (Plat Notation)</p>
<p>For residential development adjacent to State right of way, the Developer shall be responsible for adequate setback and/or sound abatement measures for future sound mitigation.</p>

Source: City of San Antonio, Texas,

The following case study reflects one community’s experience with statutorily moving to NCP.

Town of Gilbert, Arizona

Gilbert is a suburb of Phoenix with a 2004 population of 152,000. Arizona DOT adopted a policy of providing noise mitigation for noise sensitive uses that existed adjacent to a freeway *prior* to publication of their Environmental Assessment for a pending freeway. They termed this the “date of public knowledge.” Gilbert adopted the noise ordinance in 2000, which designed an overlay district (for Santan Freeway Corridor) and identifies land 300 feet from the edge of the pavement on each side of the proposed freeway. Anyone who develops in the overlay zone must have an environmental design analysis prepared by an architect, registered engineer or transportation noise analyst. A summary of requirements in Gilbert are as follows:

- The Environmental Design Analysis must include a noise assessment incorporating traffic volumes for 20 years in the future (using TNM or other approved model.)
- The Environmental Design Analysis must examine exterior and interior noise levels.
- Site and Building Design strategies must be employed, including construction techniques and materials.
- Buildings partially or completely within 150 feet next to the edge of the right-of-way boundary cannot be more than one story.
- Developers must provide noise barriers according to Arizona DOT guidelines, obtaining a 5dBA reduction.
- In lieu of the above, developers may opt to provide mitigation funding to Arizona DOT.

Sources: Wyckoff, Mark A. (President, Planning & Zoning Center, Inc) Draft, May 24, 2004. Case Studies on the Implementation of Two Traffic Noise Ordinances.

Optional Student Exercise

Check the noise regulations for your city or county. Are there regulations covering NCP? Identify corridors in your area that are ripe for NCP.

Sample of Communities with Noise Compatible Statutes

Gilbert Arizona, Guidelines <www.ci.gilbert.az.us/general/sitemap.cfm?name=menu3> (Look under General Plan, then under Environment; scroll to noise. Also look under all maps to see the maps referenced in the Noise section under Environment (Noise Exposure—Environmental Planning Element.)

Anne Arundel County, Maryland. Wyckoff, Mark A. (President, Planning & Zoning Center, Inc) Draft, May 24, 2004. Case Studies on the Implementation of Two Traffic Noise Ordinances.

Fredrick County Maryland. <http://www.co.frederick.md.us/planning/> (Look under Publications, then under Community Design Principles—Highway Noise: Its Evaluation and Mitigation.)

[Also Frederick County Comprehensive Plan, Volume I: Countywide Plan, Appendix E. Guidelines for Evaluating and Mitigating Highway Noise Impacts for standards and approaches for dealing with highway noise impacts.](#)

Pennsylvania Department of Transportation (PENNDOT) “Model Traffic Noise Ordinance”
<http://www.dot.state.pa.us/internet/web.nsf/TextOnlyIndex?OpenPage#PublicTrans>

Carrington Development (Virginia). Corbisier, Chris (2003). “Living with Noise”
<http://www.tfhrc.gov/pubrds/03jul/06.htm>

Class Conclusion

You are encouraged to look for opportunities to advise others of options to improve compatibility of roadways and adjacent land uses. Encourage local governments and developers to adopt these strategies.

Curriculum developed by Dr. Carol A. Lewis with support from Gwen Goodwin, Mary Rollins, Sharon Boxill and Denita LaShore as part of Federal Highway Administration Contract DTFH61-04-RA-0001 to Texas Southern University Center for Transportation Training and Research.

