INDOT's New Traffic Noise Policy

Purdue Road School

March 7, 2007

Overview

- Background
  - Previous policy and the need for change
- How Noise Studies Are Conducted
  - Identifying impacts
  - Evaluating abatement
  - Design
- Gene Lamberson, Durisol

The Previous Policy

- … Was approved October 15, 1997
- … Was directed by the basic guidelines established by the Federal Highway Administration (FHWA).
- … Met all technical requirements.
- …Was 1550 words/5 pages

The New Policy

- … Was approved February of 2007.
- … Is based on Federal Highway Administration guidelines and experience answering questions and resolving conflicts.
- … Is 4984 words/14 pages

Our First Audience

- Legal and Technical:
  - Lawyers, judges
  - Other professionals reviewing/critiquing our work
- The policy worked for this group.

Our Second Audience

- The Public
  - Homeowners
  - Business owners
  - Local elected officials
- The old policy wasn't addressing these groups' concerns.

Ben's 2006 Noise Correspondence

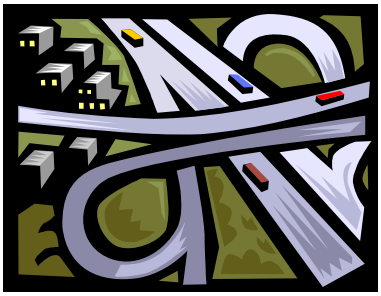
Is my neighborhood getting a wall?	51.5%
Walls block visibility for my business.	21.6%
Walls are a waste of tax dollars.	8.2%
Concrete is noisy. Use asphalt.	6.2%
The walls are ugly.	3.6%

Ben's 2006 Noise Correspondence (cont.)

Walls worsen air pollution.	3.1%
Specifications/technical questions	2.1%
Airport noise questions	1.5%
Building walls will scare away birds.	1.0%
Walls worsened my drainage.	0.5%
Walls made it louder.	0.5%

When are Noise Studies Required?

- Type I Projects
  - Added capacity
  - Eligible for consideration of noise abatement
- Type II Projects
  - Stand-alone abatement projects
  - No Type II Program in Indiana



I

A Few Terms

- dBA – Noise levels measured in A-weighted decibels
  - Gives greater weight to sounds within the range of normal human hearing
- Leq – Noise levels averaged over a period of time

X

Noise Analysis Procedures

The Elements of a Noise Study

- Steps:
  - Identify noise-sensitive land uses (receivers) in project area.
  - Determine existing noise levels.
  - Predict future noise levels.
  - Identify noise impacts.
  - Evaluate abatement.

Identify Receivers

- Locate Receivers (within 500 ft) [NEW]

II.A

Identify Receivers

- Identify “Planned and Programmed” development
  - Building permit is required. [CHANGE]

Counting Receivers

- Apartment buildings and hotels
  - Number of receivers = number of units
  - Property owner makes all decisions regarding whether barriers are desired. [CLARIFICATION]

II.A

Counting Receivers

- Recreational Properties
  - Assume equal visitor distribution throughout the property. Assign a number of receivers proportional to the area within 500 feet. [NEW]
  - Example:
    - 10 acre park, 50 visitors/day = 5 receivers/acre
    - 1 acre within 500 feet of project = 5 receivers
  - More specific information can be used if available.

II.A

Determine Existing Noise Levels

- Measure who? Representative receivers
  - At each receiver for small projects
  - Grouping receivers is acceptable for large numbers of receivers, but consistency is important
- Measure when? Loudest time of day
  - Not necessarily the highest-volume hour
  - Traffic may be loudest at times of:
    - Higher truck percentage
    - Higher vehicle speeds

II.C

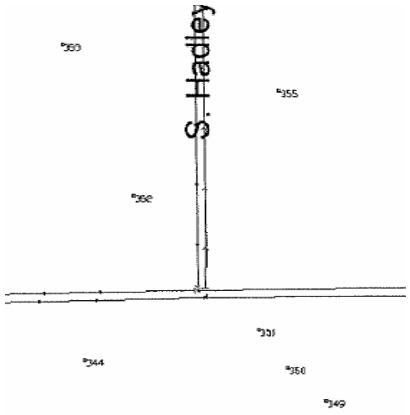
Existing Noise Levels, Cont.

- Measure where? Locations of exterior human activity [CLARIFICATION]
  - Swing sets
  - Patios
  - Pools
  - Other areas of frequent occupation
  - The location must be documented

II.C

Predict Future Noise Levels

- Federal Highway Administration Traffic Noise Model (FHWA TNM)



II.D

Predict Future Noise Levels

- Modeling scenarios:
  - All build alternatives
  - “No Build” alternative
  - Current year
  - Design year

Noise Abatement Criteria (NAC)

Category	NAC, Leq(h)	Description
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance…
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Identify Noise Impacts

- Impacted Receivers:
  - Approach or exceed (within 1 dBA) the Noise Abatement Criteria (NAC), or
  - Will experience noise levels that "substantially exceed" (+15 dBA) current noise levels [SAME]

II.E

Consideration of Abatement

- 23 CFR Part 772 requires
  - "… the incorporation of reasonable and feasible noise mitigation measures into the highway project…"

Feasible Abatement

- Could effective noise abatement be built using standard engineering and construction practices?

Reasonable Abatement

- Considerations should include:
  - Cost-Effectiveness
  - Timing of Development
  - Severe Noise Impacts
  - Views of receivers

II.F.2

Cost-Effective Abatement

- The Cost-Effectiveness criteria is now $25,000 per receiver. [CHANGE]
  - $30,000 for development that was in place prior to construction of the roadway. [NEW]
- Third-Party Cost Sharing

II.F.2.a

Severe Noise Impacts

- Additional consideration can be given for receivers with severe noise impacts (82 decibels for residential properties). [NEW]

II.F.2.a

Views of Receivers

- 23 CFR 772.11 (f):

  "The views of the impacted residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided. "

II.F.2.b

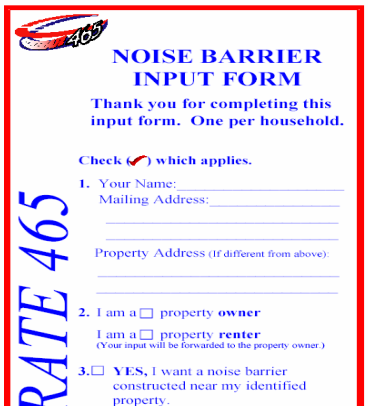
Public Involvement

- Initial outreach: Mass mailing to those in the project area [NEW]
  - Notification that we're looking at noise abatement
  - First opportunity to get yes/no input

III

Public Involvement

- Public hearing during the NEPA phase to present proposed barriers
- After the contract is let, public input is taken on color, texture, etc.



NOISE BARRIER INPUT FORM

Thank you for completing this input form. One per household.

Check (✓) which applies.

1. Your Name: _____
   Mailing Address: _____
   _____
   _____
   Property Address (If different from above): _____
   _____

2. I am a ☐ property **owner**
   I am a ☐ property **renter**
   (Your input will be forwarded to the property owner.)

3. ☐ **YES,** I want a noise barrier constructed near my identified property.

RATE 465

Undeveloped Land

- Sometimes walls will need to be extended in front of vacant land.
- Abatement for undeveloped land is not required.

II, VI.B

Local Government Coordination

- 23 CFR 772.15: Noise levels are disclosed to the governments for both developed and undeveloped land.
- This is to encourage noise-sensitive land-use planning.

IV

Important!

- If a local government allows noise-sensitive development on undeveloped lands where highway traffic noise impacts were predicted by INDOT to occur, then any future desired mitigation will be the responsibility of the local government and/or property owner. [CLARIFICATION]

IV.B

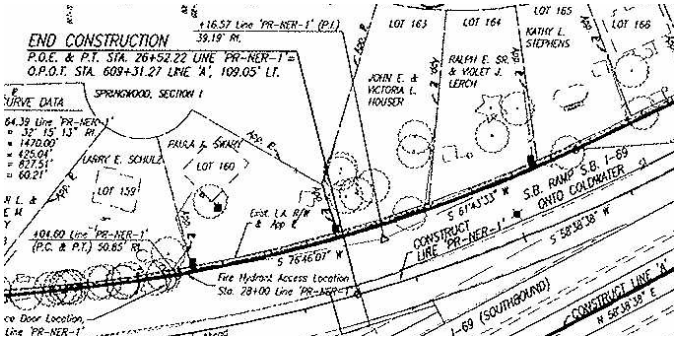
Reassessment in Design

- Noise impacts and abatement must be reassessed in the Design phase, taking into account:
  - Final grades
  - Drainage structures
  - Utilities
  - Other….

II.E

Other Design Issues

- Barrier Termination [NEW]
- Barriers off of the Right of Way [NEW]



VI

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¿Questions?

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Indiana Department of Transportation
Traffic Noise Policy

Office of Environmental Services
Division of Production Management
January 2007

Approved: _____ 2/1/07
Karl B. Browning — Date
Commissioner
Indiana Department of Transportation

Approved: _____ 2/26/07
Robert F. Tally, Jr., PE — Date
Indiana Division Administrator
Federal Highway Administration

Table of Contents

I. Introduction

The Federal-Aid Highway Act of 1970 mandated that the Federal Highway Administration (FHWA) develop highway traffic noise standards. Title 23, Code of Federal Regulation, Part 772, entitled "Procedures for Abatement of Highway Traffic Noise and Construction Noise", are these noise standards and describe highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials. Also, FHWA policy requires each State Department of Transportation to adopt a State-specific noise policy, approved by FHWA, and which defines specific terms and describes how the State implements the noise standard.

These noise standards describe that if a "Type I" project includes a Federal action (use of Federal-aid funds or a Federal approval of any kind), then traffic noise impacts must be evaluated (a traffic noise impact may already exist under current conditions or may be caused by a transportation project). Noise abatement must be evaluated for any noise impacts, and any abatement measures that are determined to be "reasonable" and "feasible" must be included as a part of the project. This assessment, if applicable, is conducted during the National Environmental Policy Act (NEPA) process during project development, and the final NEPA evaluation will identify for Type I projects any noise impacts and include commitments to implement any reasonable and feasible noise abatement measures.

This policy is applicable to Type I projects. This policy is not applicable to Type II projects. For more information, see http://www.fhwa.dot.gov/environment/noise/mem_nois.htm .

II. Noise Analysis

Noise analyses are conducted on Type I projects, as required by FHWA noise standards. If a project is not a Type I project, a noise analysis will not be conducted. Therefore, the process begins by determining if a proposed project is a Type I project. Type I projects are generally projects to construct roadways on new location, or projects for existing roadways that will substantially change its location or add a through lane. (See the definition of Type I project for more clarification.) This decision is made by the Office of Environmental Services in Central Office early in the NEPA evaluation stage.

A. Identification of Receivers and Applicable Noise Abatement Criteria

If a project is identified as Type I, the next step is to identify the area(s) with potential for noise impacts, the associated land uses in each area, the "receivers" of noise in each area, and the applicable Noise Abatement Criteria (NAC) for each receiver identified. All receivers must be identified within 500 feet from each reasonable alternative (edge of the outside travel lane) identified in the NEPA evaluation. Once identified, receivers are classified by land use and the appropriate Activity Category identified in the NAC (see Table 1 below).

Under most situations, a single structure is considered a single receiver. However, structures that contain multiple residential units (e.g. hotels, apartment buildings) are

considered to contain one receiver per unit. For "Special Use Properties" (see definition of Special Use Property), the number of receivers should be equal to the percentage of the property's acreage that is within 500 feet of the roadway, multiplied by the average number of daily visitors. For example, if 1 acre of a 10 acre park is within 500 feet of the roadway, the number of receivers for that property is 1/10, or 10% of the park's daily number of visitors. If more specific data is available for the property in question, then it may be used but the rationale must be documented.

FHWA regulations require that the noise analysis include undeveloped land that is "planned, designed, and programmed". INDOT has defined undeveloped lots to be planned, designed and programmed if building permits have been issued for construction by local authorities. If no zoning or building permit process is in place then land is considered undeveloped unless foundations for new construction are in place. For land where construction is not visible, those who build adjacent to a highway are presumed to understand and accept the possibility of traffic noise.

FHWA also requires INDOT to identify the date when the public is officially notified of the adoption of the location of a proposed highway project. This date establishes the "date of public knowledge" and determines the date when the FHWA and INDOT are no longer responsible for providing highway traffic noise abatement for new development, which occurs adjacent to the proposed highway project. INDOT has defined this as the date that the final NEPA approval is made (approval of Categorical Exclusion, Finding of No Significant Impact or Record of Decision). FHWA and INDOT are not responsible for providing highway traffic noise abatement for development that has been determined to be "planned, designed and programmed" (building permits have been issued) after the "date of public knowledge" (NEPA approval).

B. The Traffic Noise Model (FHWA TNM) and FHWA TNM Lookup

If future noise levels are not anticipated to be 60 dBA or higher, then the FHWA Traffic Noise Model (FHWA TNM) Lookup program may be used. The FHWA TNM Lookup program is a simplified version of the full FHWA TNM program. If the FHWA TNM Lookup program indicates that existing or future traffic noise levels for all "build" alternatives are below 60 dBA, then no further analysis is needed. The use of the FHWA TNM Lookup program may also be an appropriate approach when noise barriers cannot be constructed due to lack of access control, but there is a requirement to disclose expected noise levels to the public and local officials. Note that certain assumptions are built into the FHWA TNM Lookup program. The FHWA guidance should be checked (http://www.fhwa.dot.gov/environment/noise/tnmtbl_m.htm) to verify that any particular project can reasonably be approximated with the simplified model.

If existing and/or future noise levels are shown to be 60 dBA or higher, then a full analysis described below is necessary.

C. Determination of Existing Noise Levels

The next step is to determine the existing noise levels, which is started by measuring the noise at each receiver or representative set of receivers (for very large numbers of receivers). These measurements must be taken at a time of day that reflects the loudest hourly highway traffic noise levels occurring on a regular basis under normal traffic conditions. It is possible that the period with the loudest sound levels is not at the peak traffic hour, but instead, during some period when traffic volumes are lower but the truck mix or vehicle speeds are higher. Measurement should be in units of decibel Leq (dBA) and be according to FHWA Report No. FHWA-PD-96-046, "Measurement of Highway-Related Noise".

Receivers should be located at a location where frequent human activity occurs. This may be a swing set, patio or other area of frequent use depending on the particular location. The choice of receiver location must be documented for later verification, if needed.

If on-site noise meter measurements are not possible, then estimates must be made according to the full FHWA Traffic Noise Model (FHWA TNM). The most current version of the FHWA TNM computer model must be used in the noise analysis, and if appropriate should be validated and calibrated with noise measurements taken at noise receivers.

D. Prediction of Future Noise Levels

Predicted noise levels should be derived according to the most current version of FHWA TNM. Input data such as current and future traffic volumes, traffic speed, and mix of vehicle types should reflect the traffic characteristics which yield the loudest hourly traffic noise levels on a regular basis under normal conditions. The period with the loudest traffic noise levels may not be at the peak traffic hour. Additional traffic measurements may need to be acquired. Noise analyses are conducted for all build alternatives and the "do nothing" alternative, and for the current year and the design year (generally 20 years in the future).

E. Identification of Impacted Receivers

Traffic noise receivers are identified as "impacted" under either of two conditions:

1.) The predicted noise levels approach (INDOT defines as 1 dBA) or exceed the NAC (see Table 1).

2.) The predicted traffic noise levels substantially exceed the existing noise levels (INDOT defines this as 15 dBA).

The next step is to compare the predicted noise levels for each project alternative with the NAC and existing noise levels.

The exterior NAC is to be used in all cases except where no exterior activities are affected by traffic noise, such as with some hotels. If no exterior activities at a location would be affected by traffic noise, then interior NAC are used, based on exterior measurements, modified as described in Table 7 of section 772.11 of the FHWA guidance dated June 1995 and entitled "FHWA's Highway Traffic Noise Analysis and Abatement Policy and Guidance".

If no present or future traffic noise impacts are identified, then the analysis is complete.

FHWA regulations require that noise levels of undeveloped land that is not planned, designed, and programmed be communicated to local officials to facilitate noise-compatible development in these areas. This information will specifically be communicated directly by providing a copy of the noise study to local officials near the end of NEPA.

If appropriate, an additional noise analysis will be conducted in the final design phase of project development to confirm the findings of the analysis done in the NEPA phase. This analysis will be based on final alignments and grades that may not be known at the NEPA stage of the project, particularly for entirely new roadways on new location. The assessment will also verify the best choice of height, length and location of any previously-recommended barriers. Walls confirmed to be reasonable and feasible at the design stage will be incorporated into the construction contract.

F. Consideration of Abatement

If traffic noise impacts are projected to occur at a receiver, INDOT must consider measures to mitigate/abate the traffic noise impacts. Once traffic noise impacted receivers have been identified, an assessment must be conducted to evaluate how to abate the noise impacts and determine whether the abatement is both "reasonable" and "feasible". This ensures that sound engineering judgment is used, and that mitigation makes wise use of public funds.

If noise levels at a receiver indicate a noise impact, then noise abatement must be evaluated. The goal of abatement is to provide a substantial reduction of at least seven (7) dBA in the design year, compared to average non-abatement levels. The resulting noise level may or may not be at or below the NAC levels. There can be no guarantee of complete quiet, as noise sources beyond the control of INDOT (factories, concert venues, neighborhood lawn mowers, etc.) may be present in the area. "Spikes" in noise levels are also possible from poorly-maintained vehicles, engine braking, or other short-duration events.

Traffic noise abatement measures can be in many forms and may include traffic control measures (TCM), alteration of vertical or horizontal alignment, acquisition of buffering land, noise insulation of public use or non-profit institutional structures, and/or construction of traffic noise barriers. Due to limitations on INDOT's ability to acquire property for mitigation or to mitigate sites off of State Right-of-Way, the most common form of abatement is the construction of noise barriers. Other forms of abatement will be

evaluated on a case-by-case basis. INDOT will choose the most feasible and reasonable form of abatement. Noise abatement measures will be evaluated using FHWA TNM to determine their effect on noise levels.

All noise abatement incorporated into a Type I project must be feasible and reasonable. Conversely, all feasible and reasonable noise abatement must be incorporated into a Type I project. The final NEPA evaluation will include a summary of this analysis and must include commitments to incorporate any reasonable and feasible noise abatement into the project.

1. Feasibility

Feasibility analysis deals with engineering considerations to determine if a particular form of abatement can actually have an effect on the traffic noise levels at a receiver. It takes into account such considerations as topography, drainage, safety, and access/maintenance needs (which may include right-of-way considerations). FHWA requires that traffic noise abatement achieve a "substantial noise reduction". INDOT's goal for substantial noise reduction is to provide at least 7 dBA reduction for impacted first row receivers in the design year. However, conflicts with adjacent property uses may result in shorter walls that produce lower levels of protection for some receivers. In these situations, INDOT will consider noise abatement to be feasible if a majority (50% +1) of first row receivers will experience at least a 7 dBA reduction in the design year.

Feasibility needs to be evaluated regardless of the type of highway (i.e. full access control, uncontrolled access, etc). If controlling access along a roadway is not a practical alternative, then noise barriers may not be considered feasible, depending on the number and distance between breaks in the barrier to allow for driveways.

2. Reasonableness

Reasonableness is a more subjective criterion than feasibility. INDOT has identified multiple factors to consider in determining whether noise abatement is reasonable. A determination of reasonableness for abatement measures will include consideration of the following range of factors:

a.) Cost Effectiveness

To determine cost effectiveness, the estimated cost of constructing a noise barrier (including installation and additional necessary construction such as foundations or guardrail) will be divided among the number of benefited receivers (those who would receive a reduction of at least 5 dBA). A cost of $25,000 or less per benefited receiver is considered to be "cost effective". Based on the increased cost of noise barriers in excess of twenty (20) feet in height, no wall taller than twenty (20) feet will be considered to be cost-effective.

Development in which a majority (50% + 1) of the receivers were in place prior to construction of the highway will receive additional consideration for abatement. The cost-effectiveness criteria to be used for these cases will be 20% higher ($30,000).

Severe noise impacts may warrant special consideration of highway traffic noise abatement measures beyond what would normally be considered. Severe noise impacts are defined as exceeding the NAC by greater than 15 dBA. These may merit abatement beyond the standard cost criteria and could include measures that are not normally considered, such as purchase of buffer land or impacted properties, or noise insulation of public use or non-profit institutional buildings.

b.) Views of Impacted and/or Benefited Receivers

If noise abatement is determined to be feasible and cost effective, then potentially affected property owners will be surveyed to determine whether they do or do not want noise abatement. This survey will preferably be by prestamped/preaddressed return postcards, and will include a package of material that describes the noise barrier under consideration and the noise effects with and without the barrier. It will also describe the decisionmaking process that INDOT will follow to assess the survey results and make a decision on whether to build the barrier. The survey may also be after a public meeting where noise impacts and abatement is discussed. If the total respondents to the survey do not total a majority (50% + 1) of the impacted and/or benefited receivers, then a second attempt will be made to solicit the views of those who did not respond. No third attempt is required if a majority (50% + 1) did not respond.

A majority (50% + 1) of the total impacted and/or benefited receivers must state that they want a barrier constructed for it to be considered reasonable. All such opinions must be expressed in writing to INDOT, either by letter or by response postcard. If a majority (50%+1) of the total impacted and/or benefited receivers do not respond affirmatively or do not respond after the second attempt, then INDOT will base their decision on the survey responses they received even though a majority of responses was not received. Note that for apartment complexes and hotels, the decision as to whether a barrier is desired rests with property owners rather than occupants.

Generally, residential property owners prefer protection by barriers, while commercial property owners prefer to maintain visibility for their business from adjacent roadways. This can cause conflicts in mixed-use developments, as walls to protect residences may block line of sight to adjacent businesses. When a mutually satisfactory compromise cannot be reached between businesses and residences, barriers may be terminated at

the property line dividing the two areas. Whether this arrangement may render barriers entirely infeasible must be evaluated. These conflicts can be minimized by Noise-Compatible Planning. See Coordination with Local Government Officials, below.

III. Public Involvement

Property owners in areas where noise barriers are being considered will be contacted early in project development and given an opportunity to provide input on their desire to have a barrier. Formal hearings and/or information meetings will also be conducted to discuss the results of noise studies and solicit input from the public on barriers that are likely to be included in the final design. If a barrier is to be constructed, property owners will also be given an opportunity to express a preference as to the type and style of barrier facing away from the roadway. INDOT will select the color and texture of the barrier surface facing the roadway.

Barriers proposed early in project development may change due to other revisions to the project scope or alignment. If a barrier's status (reasonableness and/or feasibleness) changes, additional notification will be made to affected property owners to discuss the changes.

IV. Coordination with Local Government Officials

A. Information Sharing

INDOT will furnish the results of all highway traffic noise analyses to local government officials who have jurisdiction over land use in the project area. Local coordination will specifically be accomplished through the distribution of highway project environmental documents and noise study reports to these selected officials. The following information, specified by 23 CFR 772.15, will be furnished to the local officials:

1.) Estimated future noise levels at various distances for developed and undeveloped lands in the immediate vicinity of the proposed highway project. In areas with undeveloped land that is not planned, designed and programmed, one should use noise contours to indicate anticipated future traffic noise levels.

2.) Locations nearby that in the future are susceptible to noise impacts if anticipated projects for existing and proposed highways were to be built.

If noise abatement to protect residences is determined to be reasonable and feasible, local governments may object to the construction of barriers. The reasons for this objection should be clearly outlined in writing to INDOT.

B. Noise Compatible Planning

Highway traffic noise should be reduced through a program of shared responsibility. Local governments should use their power to regulate land development in such a way

that noise sensitive land uses are either prohibited from being located adjacent to a highway or that the developments are planned, designed and constructed in such a way that noise impacts are minimized for the areas developed.

If a local government allows noise-sensitive development to occur on undeveloped lands where highway traffic noise impacts were predicted by INDOT to occur, then any future desired mitigation will be the responsibility of the local government and/or property owner. In these locations, traffic noise abatement will only be provided by INDOT when proposed roadway improvements would impact pre-existing noise abatement measures. For example, a shoulder-widening project might require barriers to be relocated. In these cases INDOT will replace the abatement measures with equivalently protective measures. INDOT is only responsible for determining noise impacts and considering abatement during a Federally-funded Type I project.

Beyond zoning, municipalities with noise concerns may have other tools at their disposal to control traffic noise, such as ordinances prohibiting engine braking. A commitment to diligent enforcement of laws and ordinances will be required to make these measures effective.

V. Consideration of Construction Noise

Efforts to minimize construction noise are effected by local ordinances that may require the contractor to make every reasonable effort to minimize noise impacts. In all cases contractors shall be required to comply with local ordinances unless waivers are obtained. Also, if permanent noise walls are included in the project, then a commitment could be made to require the contractor to construct them early during construction in order to provide mitigation for construction noise.

VI. Additional Design Considerations

A. Construction off of Right of Way

Noise barriers will only be constructed or maintained on property that is owned by the State of Indiana. Also, INDOT will not construct or maintain a noise barrier on an INDOT easement.

B. Barrier Termination

Where adjacent property use is compatible for noise barrier protection, a “rule-of-thumb” is to extend walls beyond the last protected receiver a distance four (4) times the distance between the wall and that receiver to ensure adequate protection. For example, a wall twenty (20) feet from a house may extend eighty (80) feet beyond the end of that home. FHWA TNM will be used to determine the optimal barrier design, including the height and length of a barrier beyond the last receiver. Compromises may be necessary to accommodate the needs of adjacent development. See Section II.F.2.B.

Additionally, walls will be stepped down in regular intervals at each end for aesthetics as space allows. If the adjacent property owner does not want a noise wall, barriers may be designed and constructed to end at the dividing property line without stepping down.

VII. Third-Party Cost Sharing

When desired, government entities may contribute toward the cost of noise barriers if special aesthetic treatments or functional enhancements are desired beyond the basic textures/colors offered by INDOT. Private-party funding may be used for aesthetic improvements but must be directed through governmental entities. Third-party funding *cannot* be used to determine feasibility and cost-effectiveness of noise barriers.

VIII. Removal of Barriers

If a party wishes to have existing noise barriers removed, they must demonstrate that protection of receivers will not be compromised by removal of the barrier or barrier segment. This demonstration may either be through conducting a noise study (coordinated with INDOT, at the requestor's cost) or by demonstrating that noise-sensitive receivers are no longer present in the area that is being protected. Removal of any barriers shall also be at the cost of the requestor. If barriers are to be removed, then INDOT and the affected party must coordinate to ensure that removal is conducted in a safe manner.

IX. Model Validation and Updates

FHWA routinely evaluates and updates the TMN software, to ensure that it represents the State-of-the-Art in noise analysis. INDOT does not generally conduct separate validation of the noise model, but field validation may be warranted when significant non-highway sources of noise may be in the area that are not adequately represented by the model.

X. Definitions

Access Control: Restrictions on driveways and cross-street connections along a roadway.

Added Capacity Project: A project which adds at least 1.5 miles of additional through-lane capacity to the highway system. The addition of an auxiliary lane between interchanges to improve operational efficiency is a Type I project if the lane is at least 1.5 miles long or if the lane is made continuous through a series of interchanges.

Approaching Noise Abatement Criteria: Within one decibel (1 dBA) of the set FHWA Noise Abatement Criteria.

A-Weighted Sound Level (dBA): A measurement of noise energy weighted to give greater importance to sounds within the range of human hearing.

Benefited Receiver: A receiver for whom a five decibel (5 dBA) reduction would be achieved by construction of a noise barrier.

Cost-Effective: A barrier is determined to be cost-effective if a five decibel (5 dBA) reduction can be achieved at a cost of no more than $25,000 per receiver.

Date of Public Knowledge: The date of public knowledge is the date that a project's environmental analysis and documentation is approved, i.e., the date of approval of Categorical Exclusions (CE), Findings of No Significant Impact (FONSI), or Record of Decision (ROD).

Feasible: This term means that a barrier can be constructed using standard engineering practices to produce a substantial noise reduction in the design year. Although the goal is to achieve a substantial noise reduction at all first row receivers, noise abatement is considered to be feasible if it reduces the noise level by seven decibel (7 dBA) in the design year at a majority (50% +1) of first row receivers.

Impacted Receiver: A receiver who experiences predicted noise levels that approach or exceed the FHWA Noise Abatement Criteria, or when the predicted noise levels substantially exceed the existing noise levels.

Leq: Equivalent (Noise) Level. This is the total noise energy averaged over a period of time.

Level of Service: A measure of congestion along a highway. Level of Service (LOS) ranges from A (congestion-free) to F (severely congested).

Noise Abatement Criteria: A numerical impact criteria issued by the Federal Highway Administration, published in 23 CFR 772 and included below as Table 1.

Table 1. FHWA Noise Abatement Criteria in dBA (hourly A-weighted sound level)

Activity Category	NAC, Leq(h)	Description of Activity Category
A	57 (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)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above
D	-------	Undeveloped lands.

E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: (Federal Highway Administration)(23 CFR 772)
Note: These sound levels are only to be used to determine impact. These are the absolute levels where abatement must be considered. Noise abatement should be designed to achieve a substantial noise reduction – not the noise abatement criteria.

Noise Barrier: A solid wall or earthen hill constructed to reduce noise to receivers.

Noise-Compatible Planning: Control of development by ordinance or zoning that discourages noise-sensitive development adjacent to known, existing sources of objectionable noise.

Planned, Designed and Programmed: An undeveloped lot is considered to be Planned, Designed and Programmed if a building permit has been issued by the local authorities prior to the Date of Public Knowledge for the relevant project. If no zoning or building permit process is in place then land is considered undeveloped unless foundations for new buildings are in place.

Reasonable: This term means that a barrier can be built in a cost-effective manner and can be fit into surrounding land uses. This criteria considers the views of the affected public and ensures that any proposed abatement will be a wise use of public funds.

Receiver: A receiver is a point where noise impacts are measured or modeled. Single family residences are considered one receiver. Each unit within a hotel or apartment building shall be considered as a receiver.

Severe Noise Impacts: Circumstances in which noise impacts are so severe as to merit special consideration for abatement. Such situations occur when the noise levels in the design year are expected to be 15 dBA or more over the NAC.

Significant Horizontal/Vertical Alignment Changes: Raising or lowering a roadway, or changing its horizontal alignment such that noise patterns change in the area. INDOT defines this as a vertical change of greater than thirty (30) feet, or a horizontal change of one half of the distance between the roadway and any receiver.

Special Use Property: Cemeteries, parks, picnic areas, campgrounds, recreational areas, playgrounds and active sports areas.

Substantially Exceeds: Future noise levels are defined as substantially exceeding existing noise levels when the difference between current and future levels is fifteen decibels (15 dBA) or greater.

Substantial Noise Reduction: FHWA requires that noise abatement substantially reduce traffic noise. INDOT defines this to mean a reduction of seven decibels (7 dBA) or greater. Note that noise abatement may result in noise levels that are still above the NAC, or in some cases may result in noise levels below the NAC.

Type I Projects: Proposed Federal-aid highway projects that include one or more of the following:

1) construction of a highway on a new location, or
2) physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or
3) an increase in the number of through-traffic lanes.
4) construction of a new interchange or ramps
5) construction of a High-Occupancy Vehicle (HOV) or truck-climbing lane

Type I projects with potential receivers nearby will be considered for noise abatement.

Type II Project: Stand-alone projects solely for the abatement of noise on existing highways. The implementation of Type II projects is not required by Federal law or FHWA regulations. If INDOT were to implement a Type II program, Federal regulations specify that funding would only be available for Type II projects which:

1) Are designed to abate noise for areas that were developed prior to the existence of any highway, or
2) Were approved prior to November 28, 1995.

No Type II projects were approved in Indiana prior to November 28, 1995.