FREQUENTLY ASKED QUESTIONS

1. When does a traffic noise impact occur?

In Illinois, traffic noise impacts are interpreted to occur in the following situations:

- Design year traffic noise levels are predicted to approach (within 1 dB(A)), meet, or exceed the Noise Abatement Criteria (NAC).

OR

- Design year traffic noise levels are predicted to substantially increase (greater than 14 dB(A)) over existing noise levels.

(See Section 2.3.2)

2. When is a traffic noise analysis required?

A noise analysis is required for state or federal highway construction or reconstruction projects that have been determined to meet the definition of a Type I project. These projects have the potential to increase traffic noise.

(See Section 3.2)

3. Is every house analyzed for noise impacts?

Every house in close proximity to the roadway is considered in the noise analysis, either directly or indirectly by representation in an area. Noise receptors are used to represent areas that are similar in land use, proximity to roadway, and basic topography. Predicting noise levels at every house is not necessary when similar location and topography would provide like noise levels. The selected representative receptor generally represents the worst-case (*i.e.* it is the closest to the roadway) of all receptors included in the area and noise levels can be expected to be similar for all receptors within the group. The representative area is called a Common Noise Environment (CNE).

(See Section 3.4)

4. Are noise levels evaluated for floors above the ground level (*i.e.* 2nd or 3rd floor, *etc.*)?

Noise Abatement Criteria (NAC) are generally developed for activities occurring outdoors where frequent human activity occurs. Typically, this would be a ground level activity area with the most direct exposure to the traffic noise source. However, due to topography of either the roadway or the receptor, the ground floor may be shielded from the roadway outside of the line of sight and therefore a higher floor (*i.e.,* 2nd or 3rd level floor) may have the potential for greatest impact. A higher floor will only be evaluated if frequent outdoor human activity occurs, such as on a balcony, or the receptor is being evaluated as Activity Category D.

(See Section 3.4)

5. Is the number of occupants taken into consideration when determining the number of receptors?

The number of receptors is not related to the number of occupants. For example, one single-family home is counted as one receptor, regardless of how many people live there. Other land uses may be dependent on the number of units with the facility such as the number of classrooms in a school.

(See Section 3.4 and 4.2.1.2)

6. If a receptor is located beyond 500 feet from the project area, should it be included in the noise analysis?

Although 500 feet is used as the initial screening distance for receptors, sensitive receptors, such as nursing homes or schools, located further than 500 feet should be included on a case-by-case basis if the potential exists for them to be impacted by the project.

Factors to consider when evaluating receptors greater than 500 feet include terrain and other structures between the receptor and the roadway that may be blocking the line-of-sight. For example, if a church is located 600 feet from the roadway and there is only open field in between, it should be included in the noise analysis; however, if there are several rows of homes in between the church and the roadway, it would not have to be included.

(See Section 3.4)

7. Is weather accounted for when measuring noise levels?

Weather conditions can have some effect on noise measurement readings. Noise measurements should not be taken if the wind speed exceeds 12 m.p.h. A wind screen on the noise monitor should be used at all times to reduce wind effects. Other site conditions necessary during the monitoring include dry pavement and no snow cover. The conditions during monitoring should always be recorded for comparison and review purposes. In the computer traffic noise model, the default weather used for analyses is 50% relative humidity and 20°C (68°F) temperature.

(See Section 3.5.2)

8. Why isn't noise monitoring results used instead of modeling results when determining impacts?

Monitored noise levels represent a snapshot of existing conditions. This means the monitored noise levels reflect weather and traffic conditions for that time period only. In addition, noise monitoring detects all noise sources present at the monitoring location, which may result in higher traffic noise levels that would not only be from the roadway.

As part of the noise analysis process, noise levels are predicted for both the existing and future conditions. The computer model is used to consistently predict future traffic noise levels at peak traffic which is a worst-case condition.

(See Section 3.5)

9. What is the source of the traffic data used in the computer model?

There are two types of traffic data that can be used in traffic noise modeling:

1) Peak Hourly Traffic; and
2) Average Daily Traffic (ADT) - The total traffic volume during a given period divided by the number of days in that period. Current ADT volumes can be determined by continuous traffic counts or periodic counts.

Existing volumes are typically generated from actual traffic counts. Design volumes are typically projected by the District or a Metropolitan Planning Organization. These design volumes are based on typical traffic growth rates, planned development and projected growth for the area.

(See Section 3.6.1)

10. Can IDOT prohibit trucks along roads or reduce speed limits? Won't that reduce noise levels?

Both of these options may reduce noise levels; however, the use of these options depends on the use of the road. If the road is a main route into and out of a city, or if there are commercial and industrial businesses along the route, a prohibition of trucks would result in adverse economic impacts. Also, by law, truck traffic cannot be prohibited on State marked routes and Interstates.

Lowering speed limits may slightly reduce traffic noise levels, but the speed reduction would lower the capacity of the roadway, thereby increasing delays, air pollutant emissions, and the overall cost of transporting goods and services. Speed limits are determined by the roadway design and speed studies.

(See Section 4.1.2)

11. Would a berm be as effective as a noise wall in reducing noise levels and how does its effectiveness compare to noise walls?

Earth berms are just as effective as noise walls. Studies have shown that earth berms actually reduce noise levels to a greater extent than noise walls. This is partially due to the soft surface of the berm (*i.e.* grass) providing more absorption. In addition, the flat top of the berm diffracts sound waves twice, resulting in more attenuation. However, the use of berms depends on the space available. For maintenance reasons, IDOT requires at least a 3:1 slope on berms. For example a 12-foot berm with a 3:1 slope would be approximately 72 feet wide at the base. The available area for abatement would need to accommodate this base width.

(See Section 4.1.1)

12. Can trees/vegetation be planted to help reduce noise levels?

Vegetation, such as a dense growth of evergreens, would need to be at least 200 feet in width and 18 feet high to reduce noise levels by 5 to 10 dB(A). In most cases, 200 feet of space

between the roadway and receptors is not available. Vegetation/trees can potentially help screen the highway traffic from view.

(See Section 4.3.1)

13. Why isn't noise abatement designed to reduce noise levels below the NAC?

The Noise Abatement Criteria (NAC) identifies the noise level at which noise abatement should be evaluated. It is not a noise abatement goal. The objective of noise abatement is to achieve a noise reduction that will result in a noticeable difference from the unabated traffic noise levels and can be implemented in a cost effective way. A reduction of 5 dB(A) is considered to be "readily perceptible" to the human ear. Under typical noise abatement evaluations, a substantial noise reduction is considered to be an 8 dB(A) traffic noise reduction. As part of the noise abatement evaluation, noise abatement measures must reduce noise level by at least 5 dB(A) for at least one **impacted** receptor to be considered feasible, and by at least 8 dB(A) for at least one **benefited** receptor to be considered reasonable. For example, the following table demonstrates the noise reduction goals in order to meet the criteria.

Location	Future Noise Level	NAC	Noise Reduction Design Goal	Target Noise Level
Site 1	69 dB(A)	67 dB(A)	8 dB(A)	61 dB(A)
Site 2	78 dB(A)	67 dB(A)	8 dB(A)	70 dB(A)

(See Section 4.2.1.2)

14. Why aren't noise barriers proposed in some cases?

A noise barrier may be proposed when a noise impact occurs and the noise barrier is determined to be feasible and reasonable. A noise barrier is determined to be feasible if it achieves at least a 5 dB(A) traffic noise reduction for at least one impacted receptor. Issues, such as driveway access and elevation of the receptor, may prevent achievement of a 5 dB(A) reduction, and therefore it may not be feasible.

A noise barrier must also be reasonable, which includes three criteria. It must first meet the noise reduction design goal of achieving at least an 8 dB(A) reduction for at least one benefited receptor. Secondly, the estimated build cost per benefited receptor must be less than the allowable cost per benefited receptor. The base allowable cost per benefited receptor is $24,000 per benefited receptor. The allowable cost may be adjusted based on the absolute noise level, the change in noise level and the construction date of the receptor relative to the roadway facility. For example, if a noise barrier will benefit 10 residences, and the total cost of the noise barrier is $240,000, then the cost per benefited receptor would be $24,000 and the noise barrier would be considered economically reasonable.

The third reasonableness factor is the consideration of the benefited receptor viewpoints. The viewpoints need to be considered for noise abatement measures that are determined to be feasible and achieve the first two reasonableness factors. If the majority of the viewpoints are in favor of the noise barrier, then the noise barrier would be considered "likely to be implemented".

If a noise barrier is not considered feasible or reasonable for an area, the noise barrier abatement measure will not be implemented as part of the project.

Other feasibility factors that influence if a noise barrier will be proposed include whether or not sufficient right-of-way is available for the safe placement of the barrier, impacts to the line-of-sight of approaching vehicles in the vicinity of on-ramps, off-ramps, and intersecting streets and/or interference with utilities and/or drainage design elements.

(See Sections 4.2.1.2)

15. What is the cost of a noise wall?

The average unit cost of noise wall construction used for the noise wall evaluation is $25 per square foot. This cost is based on Illinois construction costs and walls built. In areas where there are utilities or drainage issues that may need to be addressed, additional costs may be incurred. Typical noise walls cost $1,500,000 per mile.

The unit cost is re-evaluated by IDOT at least every five years and is based on actual costs incurred by IDOT from the previous years.

(See Section 4.2.1.2)

16. How did IDOT determine the base value of $24,000 per benefited receptor as economically reasonable?

IDOT considers $24,000 per benefited receptor as a reasonable base value with a threshold of 5 dB(A) reduction of noise defining benefited residence.

(See Section 4.2.1.2)

17. Can the base value of $24,000 per benefited receptor be adjusted based on site specific conditions?

IDOT allows for the adjustment of the base value allowable cost per benefited receptors based on the absolute build noise level, the change in noise level between the existing condition and the build noise level, the whether or not the receptor was present before the construction of the roadway facility proposed for improvement. Based on the adjustments, the maximum allowable cost per benefited receptor is $37,000 per benefited receptor.

(See Section 4.2.1.2)

18. When is sound insulation viable?

FHWA/IDOT only participates in sound insulation for land uses with Activity Category D, which does not include residential units. An interior noise analysis for these land uses would be conducted if it has been determined that there are no exterior human use activity areas present or that the exterior human use areas are sufficiently shielded from the traffic noise source.

Sound insulation may be considered for Activity Category D land uses if an impact has been identified on the interior and after all other noise abatement measures have been determined to be not feasible or reasonable. If it is determined that alternative noise abatement measure other than sound insulation would be feasible and reasonable based on all the criteria other

than the viewpoints of the benefited receptor, IDOT will only consider sound insulation on a case-by-case basis.

(See Section 4.1.6)

19. How do you determine the noise impacts and feasibility of noise abatement of special types of land uses, such as schools or parks?

IDOT uses a "Representative Receptor Unit" for determining the number of receptors potentially impacted and/or benefited by a project. The evaluation then proceeds the same as for a residential receptor.

Potential Benefited Receptor Units*

Receptor Type	Potential Benefited Receptor Unit(s)
Single-family Residence	Each residential unit
Multi-family Residence	Each residential unit with access to the exterior common area or with exterior use areas, such as a patio or balcony
Nursing Home	Each residential unit with access to the exterior common area
School	Each classroom
Hospital	Each hospital room with a bed(s)
Hotel/Motel	Each hotel/motel room
Cemetery	Each point of anticipated gathering (*i.e.* bench, information board)
Places of Worship	Each point of anticipated gathering (*i.e.* bench, patio, gazebo)
Parks	Each gazebo, group of picnic tables, playground
Trails and Trail Heads	Each point of anticipated gathering (*i.e.* bench, information board)
Libraries	Each point of anticipated gathering (*i.e.* bench, patio, gazebo)
Business	Each business unit
Undeveloped Lands	Each unit with a building permit

* To be considered benefited, each receptor unit location must receive at least a 5 dB(A) traffic noise reduction to be considered as part of the cost-effective evaluation.

(See Section 4.2.1.2)

20. Can alternative materials or designs to IDOT standard noise barriers be used?

Based on testing and research results, IDOT has currently approved three types of materials for noise barriers:

1. Barrier walls using concrete;

2. Barrier walls using composite materials; and
3. Earth berms.

Other materials may be considered if they meet IDOT's criteria for noise abatement wall materials. The noise wall material must achieve a sound Transmission Loss (TL) (*i.e.,* a reduction in sound transmitted through the material) equal to or greater than 20 dB in all one-third octave bands from 100 hertz to 5000 hertz, inclusive. Testing for TL shall be in accordance with ASTM E90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions." Specialty items and materials that are not covered by ASTM, AASHTO, or other IDOT specifications must have the prior approval of the Illinois Highway Development Council (IHDC). Contact the Engineer of Technical and Product Studies at the Bureau of Materials and Physical Research for additional information on the IHDC process. "Non-standard" noise wall designs, such as alternative patterns for a concrete wall, may be considered, but any costs exceeding that of a "standard" noise wall must be funded by the local sponsor.

(See Section 4.2.2)

21. Does a noise wall absorb noise or does noise bounce off the wall?

This depends on the type of noise wall constructed. An absorptive noise wall is designed to absorb sound and keep it from reflecting off the noise wall. The absorptive capacity of the wall material is specified by the NRC, which can range from 0.00 to 1.00, with 1.00 representing 100 percent absorption. To be considered absorptive by IDOT, the NRC must be at least 0.80 on the roadway side of a noise wall and at least 0.65 on the side of the wall away from the roadway.

A reflective wall is a wall not composed of an absorptive material and consequently, sound reflects off the wall back toward the source. The reflected sound level is significantly less than the sound level coming directly from the noise source. This is due to the additional distance the reflected sound travels, thereby dissipating the sound (reducing noise energy). Generally, the increase in sound levels due to reflections is not perceivable and therefore negligible.

(See Sections 4.2.2 and 4.2.6)

22. When is it appropriate for parallel barriers to be proposed?

Parallel barriers can be proposed; however, it is strongly recommended that the reduction in performance due to multiple noise reflections be evaluated using the parallel barrier analysis sub-program of TNM. For parallel barrier situations, the noise wall configuration shall be provided for both a reflective (non-absorptive) noise wall material and an absorptive noise wall material, as there may be height differentials between barrier types that should be identified. Construction of noise walls on both sides of the roadway should be designed with width-to-height ratios of at least 10:1, with a 20:1 ratio being preferred. The width is the distance between the two noise walls and the height is the average wall height above the roadway.

(See Section 4.2.6)

23. How long does the noise wall need to be?

Generally to be effective, the noise wall should extend 4 times the distance between the receptor and the noise wall. In other words, if the distance between the house and the noise wall was 50 feet, the noise wall would need to extend 200 feet beyond the receptor in each direction.

(See Section 4.2.4)

24. Why can't a taller wall be built to get greater noise reduction?

The barrier height is just one element that affects the traffic noise reduction achieved. A noise wall that breaks the line of sight between the traffic noise source and noise receiver reduces traffic noise up to 5 dB(A). Each additional two feet of noise wall improves the traffic noise reduction by approximately 1 dB(A); however, beyond a certain height, incremental changes in height do not provide additional perceptible reduction in noise level (see the table below). This occurs because the wall has already intercepted a high percentage of noise energy.

A noise barrier should not be designed at a height beyond that which is necessary to obtain the targeted level of noise reduction.

Reduction in Sound level	Degree of Attainability
5 dB(A)	Easily Attained
10 dB(A)	Attainable
15 dB(A)	Very Difficult
20 dB(A)	Nearly impossible

(See Section 4.2.5)

25. When should interior noise be evaluated?

Interior noise should only be evaluated when it has been determined that there are no exterior activities that could be potentially impacted by traffic noise. Interior noise impact analysis applies to Activity Category D.

(See Section 3.7.1)

26. How does IDOT address construction noise?

Construction noise is an inevitable result of project construction but IDOT considers ways to eliminate and/or minimize noise. IDOT may evaluate construction noise to see:

- if there is sufficient need for recommending construction of barriers prior to completion of remaining portions of project construction
- if provisions for any of the following measures should be used requiring special construction measures:
  - work hour limits
  - equipment muffler requirements
  - location of haul roads
  - elimination of "tail gate banging," reduction of backing up for equipment with alarms

  - use of “sound curtains”
  - placing material stockpiles to form temporary noise barriers
  - positioning equipment as far as practical from sensitive areas
- if the duration of contract period should be limited (calendar date of completion)
- if construction during special events, such as outdoor concerts and athletic events, should be limited

(See Section 5)

27. What are some of the positive and negative attributes of noise wall construction?

- Positive Attributes
  - Easier conversation
  - Better sleeping conditions
  - Windows open more often
  - Outside more in summer
  - More privacy
- Negative Attributes
  - Restricted view
  - Feeling of confinement
  - Loss of air circulation
  - Loss of sunlight and lighting
  - Eyesore if barrier not maintained
  - Graffiti
  - Maintenance requirements

28. Can noise contour lines generated in TNM be used to determine traffic noise impacts and/or in the noise abatement analysis?

Using noise contour lines to determine noise impacts or for the noise abatement analysis is not recommended as they provide only an approximation of the noise levels. Typically, noise contour lines are only used for planning purposes. This would be an acceptable method to depict the information needed to share with local officials for undeveloped lands. The contours would allow for the depiction of the areas anticipated to be impacted based on the various NAC.

(See Section 3.7.5)

29. If a benefited receptor is a rental property, whose input is sought when determining the desire for noise abatement?

As part of the reasonableness evaluation, the viewpoints of benefited receptors are required for the evaluation. In the case of rental properties, both the property owner and renter are solicited as input. Each renter in a benefited unit would provide one “vote” while the property owner would provide one vote per benefited unit.

(See Section 4.2.1.2)

30. Is a noise analysis required for a Type III Project?

A traffic noise analysis or abatement evaluation is not required for a Type III project. Type III projects do not involve added capacity, construction of through lanes, changes in the horizontal or vertical alignment of the roadway, or exposure of noise sensitive land uses to a new or existing highway noise source.

(See Section 3.2)

31. During the CSS process for the project, the stakeholders indicated that they did not want a noise wall. Does IDOT solicit the viewpoints from project stakeholders, or only from benefited receptors?

Public input on traffic noise and traffic noise abatement received through the public involvement process including CSS, is encouraged. However, when it comes to the viewpoint solicitation process as part reasonableness evaluation, only the viewpoints of the benefited receptors are considered. This is as per the FHWA regulations provided in 23 CFR Part 772.

(See Section 4.2.1.2)

32. If a noise wall is determined to be feasible and reasonable for a land use under Activity Category D, but the benefited receptor(s) determine that they don't want the noise wall, does sound insulation need to be evaluated?

If the noise abatement evaluation for Activity Category D determines that a noise wall would be feasible (achieves a 5-dBA traffic noise reduction at the impacted receptor) and reasonable (achieves an 8-dBA traffic noise reduction for a benefited receptor AND is cost-effective), but the viewpoint solicitation indicates a lack of desire for the noise wall, the availability of sound insulation as a viable option for noise abatement would need to be discussed with IDOT and FHWA.

(See Section 4.1.6)

33. I have a Type I project that the primary land uses are commercial (Land Use Category E,) along the proposed improvement. Am I required to perform a traffic noise assessment for commercial properties?

Yes. Even though the area is primarily commercial activities, traffic noise impacts need to be evaluated based on the NAC for Land Use Category E if there are exterior use areas. If noise impacts are identified, then a noise abatement evaluation needs to be conducted. Noise abatement found to be feasible and reasonable should then be presented to the commercial properties to determine the desire for noise abatement. This should be conducted through the viewpoint solicitation process.

(See Section 2.3.1)

34. My project consists of a bridge replacement only. During project development, due to geometric deficiencies, the road profile needed to be raised, therefore, raising the bridge profile. This profile change resulted in exposing the line-of-sight between a receptor and the traffic noise source. Is this a Type I project?

Yes. This project would meet the definition of a Type I project since the raised profile has exposed receptors to the traffic noise. A noise analysis would be required for this project.

(See Section 2.3.1)

35. The proposed project consists of resurfacing a 2.5 mile stretch of road and adding 2 new lanes of roadway along half mile stretch within the full 2.5 mile project. There are no sensitive land uses along the half-mile stretch where the add-lanes are proposed, but there are residential land uses along the section proposed for resurfacing only. Do I perform a traffic noise assessment for the add lanes section only or for the entire 2.5 miles of the project?

Though resurfacing a roadway, if taken alone, is not considered a Type I project, the project needs to be considered as a whole. If any portion of a project is Type I, the entire project corridor must be treated as a Type I project. Since the lane additions would be considered Type I, the entire project is considered a Type I project and therefore, a traffic noise assessment is required to be performed for the entire 2.5 mile project.

(See Section 2.3.1)

36. If a project is primarily Activity Category B with intermittent Activity Category D land uses (Activity Category C with no exterior use areas), would the noise analysis suffice if it just evaluated the Activity Category B areas?

No, the noise analysis needs to evaluate all activity categories within the defined project limits.

(See Section 2.3.1)