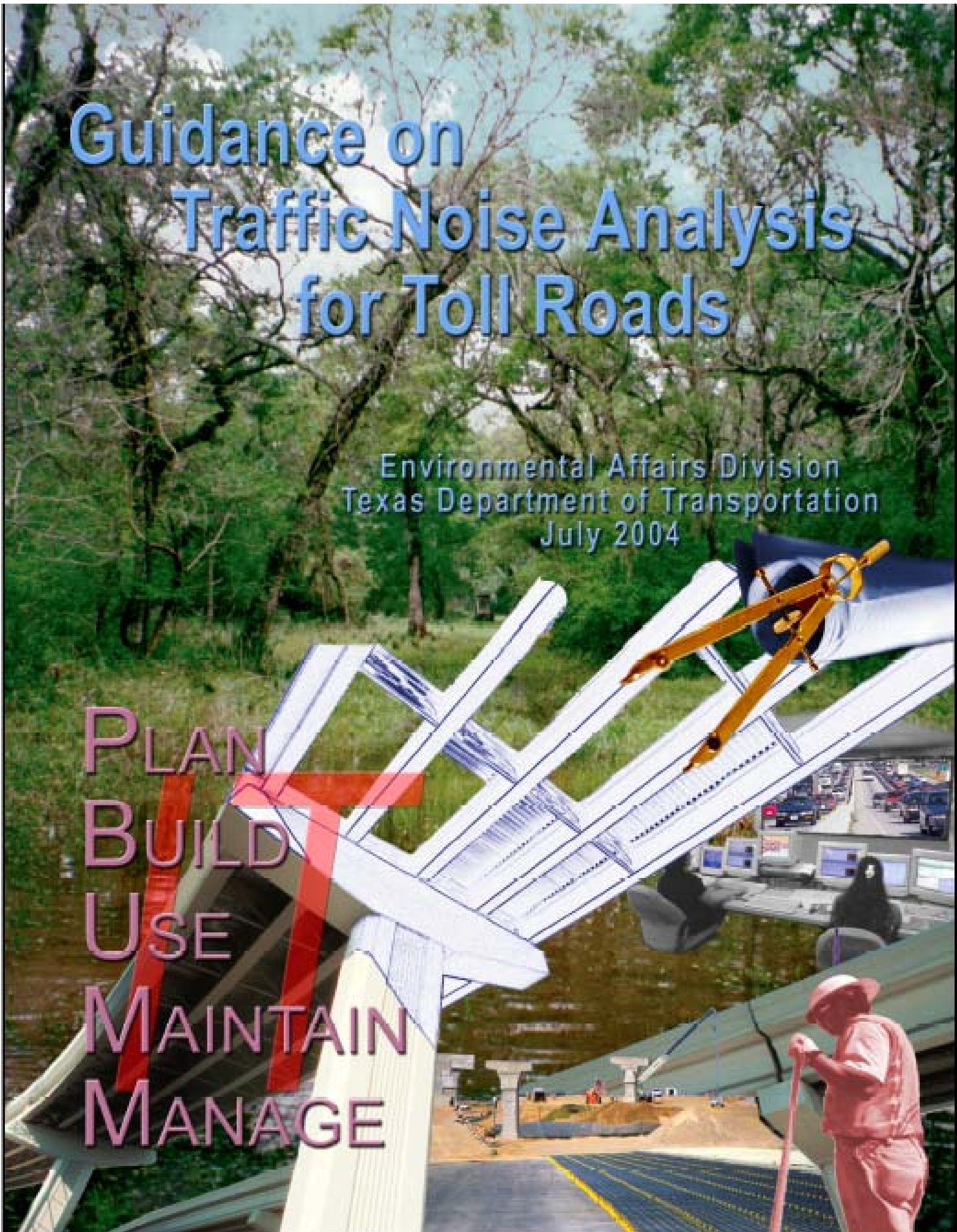


# Guidance on Traffic Noise Analysis for Toll Roads

Environmental Affairs Division  
Texas Department of Transportation  
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PLAN  
BUILD  
USE  
MAINTAIN  
MANAGE



## Introduction

This guidance is specifically intended for use in the early stages of planning/development of a toll road project or for associated toll road feasibility studies -- before the beginning of formal environmental studies/traffic noise analyses -- to provide general guidance for planners and noise analysts to determine when a traffic noise analysis would be required for a toll road project, to estimate the “possible” effects a new or conversion toll road project could have on noise levels in adjacent land use activity areas, to respond to possible questions/concerns from the public and to document any associated traffic noise analyses in environmental studies.

This guidance applies to all five scenarios for toll facility implementation:

1. Environmental studies are being initiated for a toll project;
2. Environmental studies have begun, but the decision whether to toll has not been made;
3. The decision to toll is made after the environmental studies are completed, but prior to letting/construction;
4. The decision to toll is made during construction;
5. Conversion of an existing roadway under traffic.

NOTE: this guidance does not replace or negate any information contained in TxDOT’s “Guidelines for Analysis and Abatement of Highway Traffic Noise.” Also, it is not intended to address all possible toll road projects or to be used in place of information obtained from complete, comprehensive traffic noise analyses.

## Requirements for Traffic Noise Analyses of Toll Road Projects

New Toll Road Projects: the specific requirements for traffic noise analyses of new toll road projects are the same as the requirements for all other new highway projects. Therefore, complete, comprehensive traffic noise analyses are required for all toll road projects classified as Type I highway projects that involve any of the following:

- Construction of a highway on new location.
- The physical alteration of an existing highway that substantially changes either the horizontal or vertical alignment.
- An increase in the number of through-traffic lanes.

Toll Road Conversion Projects: the decision to toll an existing/planned non-tolled roadway, in and of itself, does not automatically mean a completely new traffic noise analysis would be required. As with any highway project, when any change occurs, a traffic noise analysis would only need to be revised/updated if the associated change(s) was sufficient to alter the outcome of the analysis or constitute a new Type I highway project. Therefore, a revision/update to a traffic noise analyses would typically only be required for toll road conversion projects that involve the addition of toll plazas or the addition of grade separations, as outlined below:

Considerations for a traffic noise analyses for a toll plaza or grade separation:

Although toll plazas or grade separations would not typically be on new location and not increase the number of through-traffic lanes, they would substantially alter the roadway alignment (horizontal and vertical) and, therefore, would require a traffic noise analysis. However, the following factors should also be considered:

- If a toll road conversion project is limited to the addition of a toll plaza(s) or a grade separation(s), the analysis would only be required for land use activity areas within the area of influence of the associated traffic noise (typically within 500')...not for the entire length of the project.
- For some projects, the traffic noise analysis may be limited to a site visit and a comprehensive review of the land use activity areas adjacent to the project. If, based on all available information, it can be determined that there are no receivers in the vicinity of a toll plaza or grade separation that would be impacted by traffic noise and/or benefit from any feasible and reasonable noise abatement measures, an in-depth/comprehensive traffic noise analysis would not be warranted/required. This would also apply to any project where there are either no Category B receivers in the vicinity of the project or all receivers that are in the vicinity of the project are Category C (noise barriers are not feasible and reasonable for commercial receivers).

Reevaluations: as with reevaluations of any highway project, a completely new traffic noise analysis would only be required for toll road projects if there have been/would be substantial changes that would alter the outcome of an original/previous traffic noise analysis.

## **Traffic Noise Effects from Toll Road Projects**

The information contained in this section cannot and does not address all possible traffic noise effects that could be expected from all toll road projects, rather, it focuses on the following items that are most likely to have an effect on noise levels in adjacent land use activity areas or that might be of concern to the public:

- Traffic Volumes
- Traffic Redistribution
- Toll Plazas
- Grade Separation

### **Traffic Volumes**

Some toll road projects, such as the conversion of a non-tolled road, could result in a change in associated predicted traffic volumes. Table A-1 provides estimates of the changes in noise levels that could be expected from associated changes (increase or decrease) in traffic volumes ...assuming all other variables (traffic mix/speed, roadway geometry, receiver locations, etc.) remain unchanged.

NOTE: some toll conversion projects could actually result in a reduction in the predicted traffic volumes/noise levels due to the redistribution of some traffic to non-tolled/free alternatives.

## Traffic Redistribution

A toll road conversion project could result in the redistribution of some traffic from tolled main lanes to non-tolled/free alternatives such as frontage roads and could affect a traffic noise analysis in the following areas:

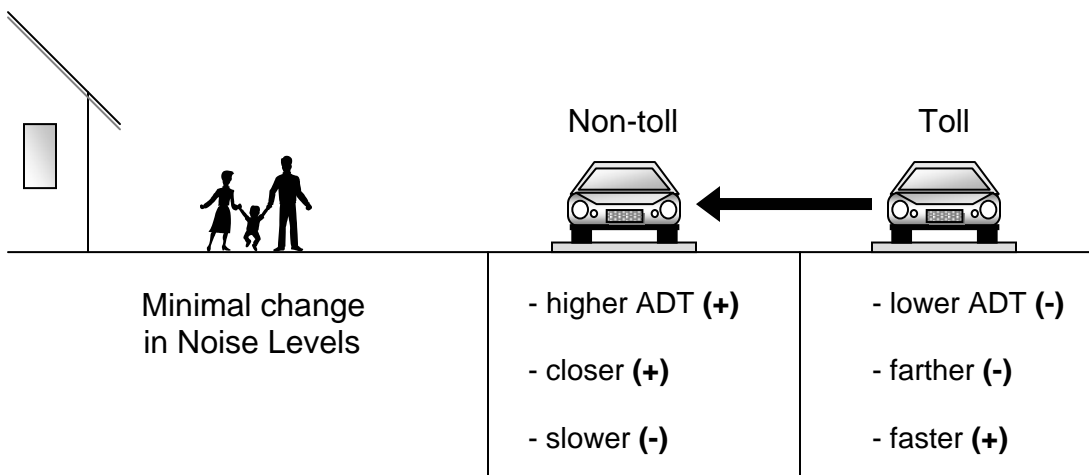
- Noise Levels
- Noise Barriers
- Indirect Impacts

### Noise Levels

The redistribution of some traffic from main lanes to frontage roads would move the sources of noise closer to adjacent land use activity areas and, therefore, could change the noise levels in these areas. Although the specific change in noise levels could not be determined until the exact conditions were modeled, these changes would be minimal (less than 1 dB) for most projects. As illustrated in Figure 1, any expected increase in noise levels from an increase in traffic on frontage roads would be minimized by the corresponding decrease in the faster/louder traffic on the main lanes.

NOTE: it is assumed that this redistribution of traffic would not involve any increase in the overall, aggregate volume of traffic for the project.

**Figure 1: Traffic Redistribution**



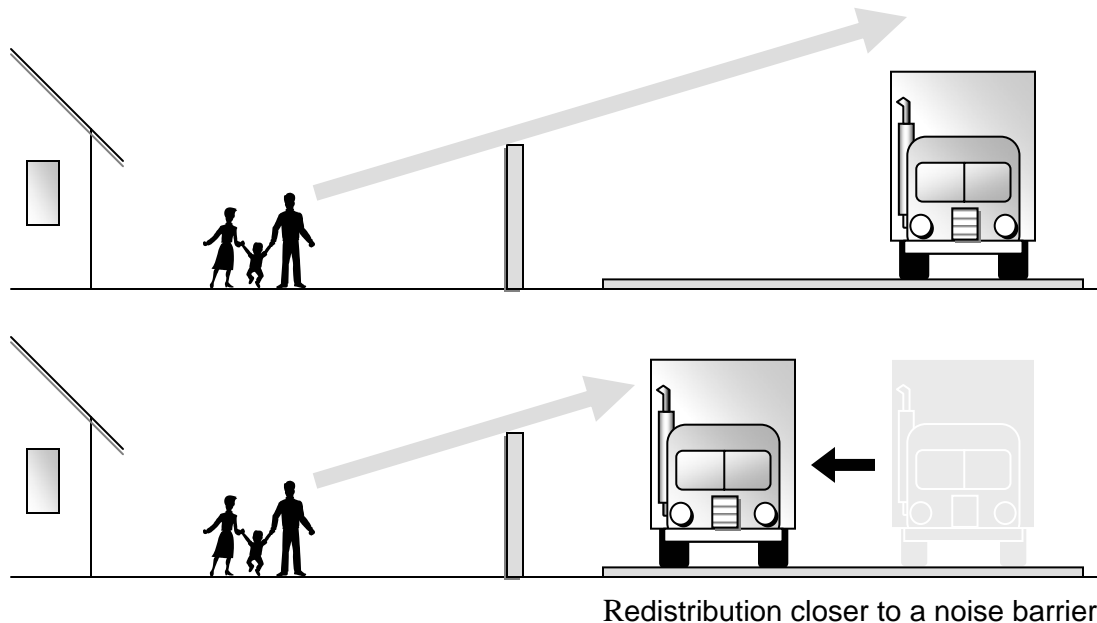
(+) higher noise levels    (-) lower noise levels

## Noise Barriers

The overall effectiveness of a noise barrier depends on a number of factors including the location of the noise sources (traffic) relative to the location of the noise barrier. Noise barriers are most effective when they are located close to either the noise source or the noise receiver. The redistribution of traffic from main lanes to frontage roads would move some of the noise source closer to the noise barrier and, therefore, should not alter the effectiveness of a noise barrier.

As illustrated in Figure 2, if heavy trucks are redistributed closer to receivers, the associated “line-of-sight” from the noise receiver to the noise source may shift enough to allow the top of trucks (at or near exhaust stacks) to be visible and, therefore, could result in the “perception” that a noise barrier would be less effective. However, the vast majority of traffic noise is generated by a vehicle’s tires and engines -- at heights substantially lower than exhaust stacks. Therefore, the fact that a part of a truck can be seen over the top of a noise barrier does not mean that a noise barrier would be less effective in achieving the minimum “feasible” reduction of 5 decibels.

**Figure 2: Line-of-Sight to Heavy Trucks**



## Indirect Impacts

Some toll road projects could result in increased traffic on non-tolled/free roads within a community in the general vicinity of the toll road project. Table A-1 provides an estimate of the increases in noise levels that could be expected from associated increases in traffic volumes (assuming all other variables remain unchanged). As indicated in the table, even in the unlikely event that a toll road project would cause traffic to increase by 50%, the associated increase in noise levels would not be perceptible to the human ear; therefore, toll road projects would typically not result in any indirect noise impacts.

## **Toll Plazas**

Toll plazas could have an effect on noise levels in adjacent land use activity areas as a result of the following:

- Additional Lanes: lanes added closer to receivers.
- Truck Lanes: trucks restricted to the outside lanes -- closer to receivers.
- Interrupted-flow: stop-and-go, slow-and-go traffic.

### **Additional Lanes**

Toll plazas that add several lanes to facilitate the collection of tolls would substantially widen the footprint of the project in the vicinity of the plaza and, therefore, would likely result in an increase in noise levels in adjacent land use activity areas even though these lanes would not increase the overall volume of the traffic.

### **Truck Lanes**

Toll plazas that restrict trucks to the outside lanes closer to receivers would increase noise levels at these receivers and could increase the height required for a noise barrier to achieve the minimum noise reduction goal of 5 decibels. Also, trucks are louder than autos under stop-and-go conditions. Any lanes dedicated exclusively to trucks can and should be modeled to determine the associated effects on noise levels.

NOTE: when/where possible, to minimize the possibility of noise impacts, trucks should be routed as far as possible/practical from high density residential areas.

### **Interrupted-flow**

Toll plazas that include “stop-and-go” or “slow-and-go” lanes at toll plazas would interrupt the flow of traffic. Uninterrupted traffic under continuous, non-accelerating, constant throttle conditions would produce higher noise levels at faster speeds and lower noise levels at slower speeds. Traffic accelerating under full throttle from a stop or slow-speed condition can produce noise levels that are very similar to noise levels for traffic under continuous flow at higher speeds. Various “interrupted-flow” conditions can and should be modeled to precisely determine the associated effects on noise levels.

NOTE: when/where possible, to minimize the possibility of noise impacts, toll plazas should be located as far as possible/practical from high density residential areas.

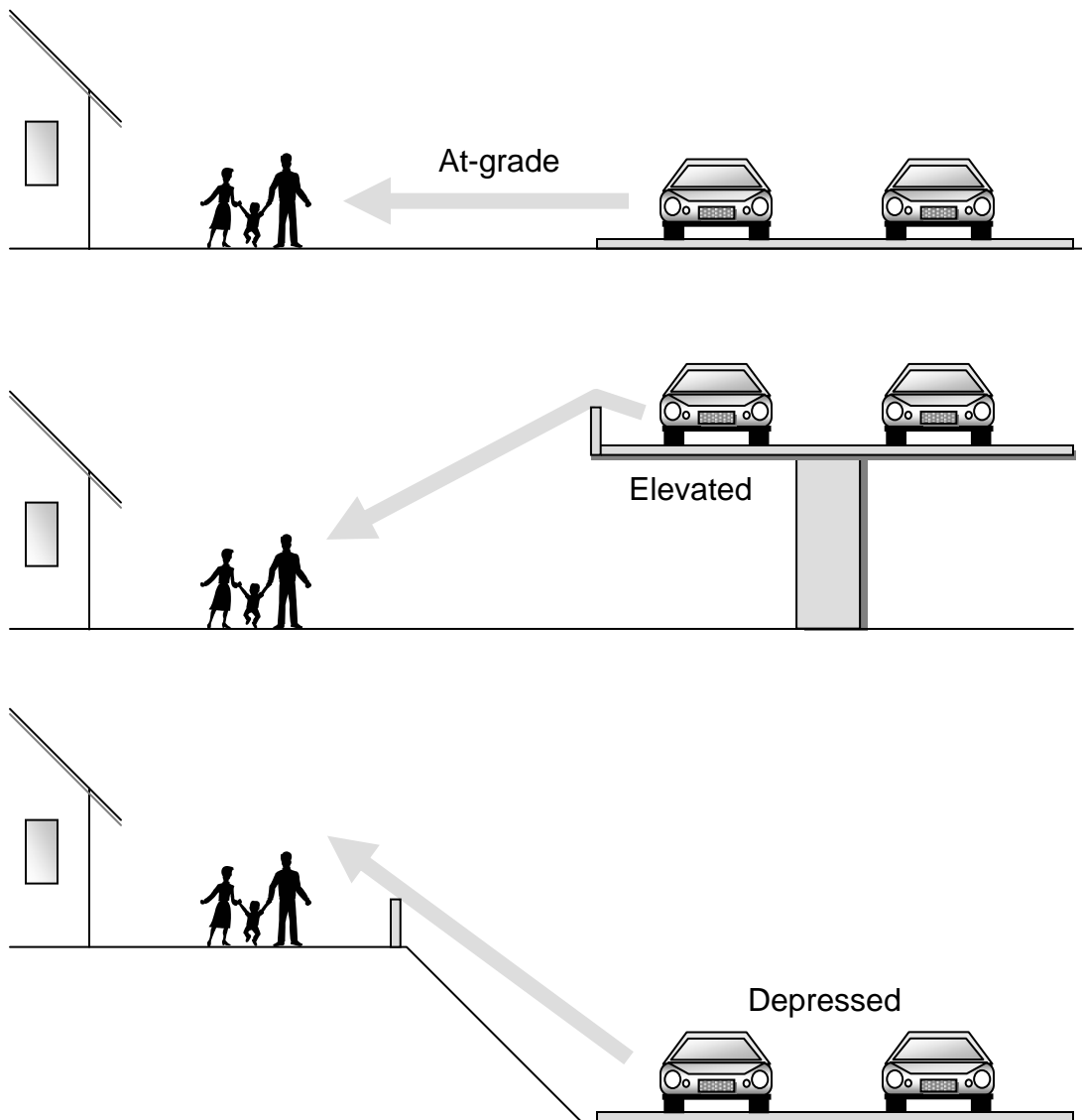
## **Grade Separation**

A toll road project could involve the addition of grade separations (overpass/elevated and underpass/depressed) in order to control access to the facility. Even though these projects may not add capacity, the vertical alignment of a roadway has a direct/definitive effect on noise levels as outlined below and as illustrated in Figure 3.

- At-grade geometry: there are few elements associated with this design that would noticeably affect the propagation of noise.
- Elevated geometry: the elevated surface and concrete traffic barriers in this design provide horizontal and vertical elements that noticeably affect the propagation of noise.
- Depressed geometry: the retaining wall in this design provides a solid vertical element that noticeably affects the propagation of noise.

NOTE: grade separation projects (elevated or depressed) often result in lower noise levels than at-grade projects with similar traffic (volume, mix and speed).

**Figure 3: Roadway Geometry and Noise Level Propagation**



## Documentation

The information contained in the “Effects” Section of this guidance is intended primarily for planning purposes and, as such, should not be used in the documentation of a traffic noise analysis in any final environmental document for a specific toll road project unless supported by information derived from a complete, comprehensive traffic noise analysis.

Overall: as with all traffic noise analyses for any highway project, the documentation of a traffic noise analyses for new or conversion toll road projects should adhere as closely as possible to the appropriate example of recommended text provided by TxDOT/ENV, as supplemented below:

**Example T-1**: analysis required but there are no valid receivers.

“An analysis of the land use activity areas adjacent to the proposed project indicated there are no receivers that would be impacted by traffic noise or benefit from any feasible and reasonable noise abatement measures.”

**Example T-2**: toll alternative (no toll plaza or substantial realignment).

“The toll alternative would not involve any design or traffic volume changes that would alter the results of the traffic noise analysis for the non- toll alternative. Therefore, the toll alternative would also ...(impact/no impact, abatement/no abatement).”

**Example T-3**: reevaluations (no substantial changes).

“The original traffic noise analysis concluded ...(impact/no impact, abatement/no abatement). Since that time, there have been no changes to the project that would alter this conclusion; therefore, the original traffic noise analysis remains valid.”

## Summary

For most new and conversion toll road projects, any associated changes in traffic volume, redistribution of traffic or design changes such as grade separations should not result in any perceptible effects on noise levels. However, a design element/change that involves a toll plaza could substantially affect noise levels in land use activity areas in the vicinity of the toll plaza. In any/all cases, the specific effects on noise levels can only be determined by a complete, comprehensive traffic noise analysis.

As stated previously, this guidance cannot and does not address the requirements for traffic noise analyses or the associated traffic noise effects for all possible toll road projects. For any additional information/guidance on a specific toll road project, contact the Noise Specialist in TxDOT/ENV.

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