



Traffic Noise Technical Report

SH 114 (Trophy Lake Drive to Kirkwood Boulevard)

SH 170 (Roanoke Road to SH 114 Interchange)

Date: January 2016

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1. Introduction

This analysis was accomplished in accordance with TxDOT's (FHWA approved) *Guidelines for Analysis and Abatement of Roadway Traffic Noise (2011)*.

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "dB."

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

The traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC) for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur (**Table 1**).

Table 1: FHWA Noise Abatement Criteria (NAC)

Activity Category	dB(A) Leq	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extra-ordinary 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)	Residential
C	67 (exterior)	Active sport areas, amphitheatres, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F.
F	--	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	Undeveloped lands that are not permitted.

A noise impact occurs when either the absolute or relative criterion is met:

Absolute criterion: the predicted noise level at a receiver approaches, equals or exceeds the NAC. "Approach" is defined as one dB(A) below the NAC. For example: a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dB(A) or above.

Relative criterion: the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal or exceed the NAC. "Substantially exceeds" is defined as more than 10 dB(A). For example: a noise impact would occur at a Category B residence if the existing level is 54 dB(A) and the predicted level is 65 dB(A).

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

The FHWA traffic noise modelling software was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type and speed of vehicles; highway alignment and grade; cuts, fills and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

2. Noise Analysis Results

Existing and predicted traffic noise levels were modelled at receiver locations (Table 2 and Figure 1A & 1B) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

Table 2: Traffic Noise Levels dB(A) Leq

Representative Receiver	NAC Category	NAC Level	Existing	Predicted 2036	Change (+/-)	Noise Impact
R1 – Multi-family	B	67	57	61	+4	No
R2 - Church	C	67	58	60	+2	No
R3 - Single Family	B	67	68	71	+3	Yes
R4 – Single Family	B	67	70	72	+2	Yes
R5 – Single Family	B	67	71	74	+3	Yes
R6 – Single Family	B	67	71	73	+2	Yes
R7 – Single Family	B	67	67	70	+3	Yes
R8 – Single Family	B	67	63	66	+3	Yes
R9 – Single Family	B	67	63	66	+3	Yes

Representative Receiver	NAC Category	NAC Level	Existing	Predicted 2036	Change (+/-)	Noise Impact
R10 – Single Family	B	67	65	68	+3	Yes
R11 – Single Family	B	67	65	70	+5	Yes
R12 – Single Family	B	67	63	66	+3	Yes
R13 – Single Family*	B	67	58	60	+2	No
R14 – Single Family*	B	67	57	58	+1	No

*Existing 12' Noise Wall

As indicated in **Table 2**, the proposed project would result in a traffic noise impact and the following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, and acquisition of undeveloped property to act as a buffer zone and the construction of noise walls.

3. Noise Abatement

Before any abatement measure can be proposed for incorporation into the project, it must be both feasible and reasonable. In order to be "feasible," the abatement measure must be able to reduce the noise level at greater than 50% of impacted, first row receivers by at least five dB(A); and to be "reasonable," it must not exceed the cost-effectiveness criterion of \$25,000 for each receiver that would benefit by a reduction of at least five dB(A) and the abatement measure must be able to reduce the noise level at least one impacted, first row receiver by at least seven dB(A).

Traffic management: control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dB(A) per five mph reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on state highways.

Alteration of horizontal and/or vertical alignments: any alteration of the existing alignment would displace existing businesses and residences, require additional right of way and not be cost effective/reasonable.

Buffer zone: the acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and, therefore, is not feasible.

Noise walls: this is the most commonly used noise abatement measure. Noise walls were evaluated for each of the impacted receiver locations.

R8-R12/ Figure 1A: These receivers represent 30 single family residences. Based on preliminary calculations, a noise wall 2,887 feet in length and 14 feet in height would reduce noise levels by at least 5 to 7 dBA for a total cost of \$727,524 or \$24,250 for each benefited receiver.

R3-R7/Figure 1B: These receivers represent 16 single family residences. Based on preliminary calculations, a noise wall 1,646 feet in length and 12 feet in height would reduce noise levels by at least 5 to 7 dBA for a total cost of \$355,536 or \$22,221 for each benefited receiver.

TABLE 3: NOISE WALL PROPOSAL (preliminary)						
Noise Wall	Representative Receivers	Total # Benefited	Length (feet)	Height (feet)	Total Cost	\$/Benefited Receiver
1	R-8 thru R-12	30	2,887	14	\$727,524	\$24,250
2	R-3 thru R7	16	1,646	12	\$355,536	\$22,250

Any subsequent project design changes may require a re-evaluation of this preliminary noise walls proposal. The final decision to construct the proposed noise walls will not be made until completion of the project design, utility evaluation and polling of adjacent property owners.

4. Noise Impact Contours

To avoid noise impacts that may result from future development of properties adjacent to the project, local officials responsible for land use control programs must ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2035) noise impact contours.

Table 4: Noise Impact Contours

Land Use	Impact Contour	Distance From Edge of Pavement
NAC Category B&C	66 dB(A)	290 feet
NAC Category E	71 dB(A)	80 feet

Noise associated with the construction of the project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration;

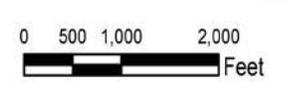
therefore, any extended disruption of normal activities is not expected. Provisions will be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

A copy of this traffic noise analysis will be available to local officials. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the project.



Legend

- Non-impacted Receptors
- Benefitted Receptors
- Noise Wall
- ▭ Project ROW



SH114 AND SH170
 FROM KIRKWOOD BOULEVARD TO ROANOKE ROAD
 NOISE RECIEVERS MAP



FIGURE 1A

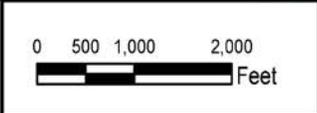
DENTON AND TARRANT COUNTIES, TEXAS

DATE:
 JANUARY
 2016



Legend

- Non-impacted Receptors
- Benefitted Receptors
- Noise Wall
- ▭ Project ROW



SH 114 AND SH 170
 FROM KIRKWOOD BOULEVARD TO ROANOKE ROAD
 NOISE RECIEVERS MAP



FIGURE 1B

DENTON AND TARRANT COUNTIES, TEXAS

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