

Traffic Noise Impact Assessment

Kirby Parkway
at Shelby Farms
Memphis ,Tennessee

for
Tennessee Department of Transportation
Shelby County Government

January 2006



TRAFFIC NOISE IMPACT ANALYSIS

Shelby Farms Parkway

Shelby County, Tennessee

Prepared For:

**Tennessee Department of Transportation
Shelby County Government**

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ABSTRACT

The proposed project consists of the construction of the Shelby Farms Parkway between Walnut Grove and Macon Road along with a new interchange/ramp system at Walnut Grove Road.

Palmer Engineering provided proposed alignment and design information. The information was used for input into approved traffic noise modeling techniques. An analysis of noise impacts associated with the operation and construction of the project was conducted, including Existing, Design Year (2026), No-Build, and Build Alternatives.

Four study sites were chosen to represent typical noise-sensitive receptors along the project. Some traffic noise impacts, identified on this project at Site 4, are due to predicted Build noise levels that exceed existing levels by 10dBA L_{eq} or exceed the appropriate NAC (67 dBA L_{eq}).

For Alternative L, Site 4 Build noise levels will exceed the appropriate NAC (67 dBA L_{eq}) and existing noise levels by 10 dBA L_{eq} . For Alternative M, Site 4 Build noise levels will exceed the appropriate NAC (67 dBA L_{eq}). However, noise barriers are not considered to be reasonable based on their location with respect to planned multipurpose bike and walking paths.

Based on the above considerations, noise abatement measures are not considered reasonable at the sites studied and are not recommended for this project.

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1. INTRODUCTION

This report documents the results of the noise analysis for Shelby Farms Parkway. The analysis of the highway-generated noise impact of this project has been prepared in accordance with *Governing Document 23 Code of Federal Regulations (CFR) Part 772, "Procedures for Abatement of Traffic Noise and Construction Noise"* and *"Tennessee Department of Transportation Policy on Highway Traffic Noise Abatement"*, adopted April 21, 2005. The noise analysis involved:

- Determining noise-sensitive areas and representative receptors along the project.
- Measuring existing noise levels.
- Check for validation of FHWA Traffic Noise Model (TNM 2.5[®]) with measured (2005) traffic noise levels.
- Utilizing TNM 2.5[®] to predict design year (2026) noise levels.
- Comparing predicted noise levels with noise level guidelines to determine impacts.
- Evaluating, where necessary, the feasibility of noise abatement options.

2. ALTERNATIVE DESCRIPTIONS

The proposed project is located in Memphis, Tennessee, in south central Shelby County. The proposed project consists of the construction of the Shelby Farms Parkway between Walnut Grove Road and Macon Road along with the construction of a new interchange/ramp system at Walnut Grove Road. The project location is shown in Exhibit 1.

The primary purpose and need of the proposed construction is to create a new north-south route in the East Memphis area of Shelby County which will improve system linkages, improve access between the residential areas of Bartlett and Germantown, and the commercial corridor of Poplar Avenue. Implementation of the proposed project will also improve mobility and reduce congestion along the existing routes in the project area, thus providing a safer and more efficient roadway system along with reduced travel times and delays on existing routes.

Within the existing project corridor, Whitten Road consists of two 11-foot lanes with 12-foot turn lanes located at Southbound Whitten Road and Kamali Avenue, Southbound Whitten Road at Manslick Road, and in the vicinity of Show Boat Lane. Farm Road consists of two 11-foot lanes with an additional 11-foot turn lane at the intersection with Walnut Grove Road. Walnut Grove Road is comprised of four 11-foot lanes with a 26 to 36-foot median. Turn lanes, 10-foot in width, are located at the entrance to the Shelby Farms Tournament Park BMX Track and at the intersection with Farm Road. Vehicle speeds along these facilities range from 40 mph along Whitten Road to 45 mph along Farm Road and Walnut Grove Road.

Alternative L from Walnut Grove Road to Mullins Station Road is to be constructed with a 220-foot right-of-way, four 12-foot traffic lanes (two in each direction), and curb and gutter on the inside with a 40-foot raised median. From Mullins Station Road to Macon Road, the right-of-way for Alternative L will be 100-foot, with four 12-foot traffic lanes, a 14-foot center turn lane, 10-foot shoulders, and curb and gutter on either side of the

roadway. This section also is to be constructed with a 5-foot sidewalk on each side of the roadway. A travel speed of 40 mph is proposed for Alternative L. Alternative L will also include the construction of a new grade-separated interchange with Walnut Grove Road approximately 1,900 feet east of the newly constructed Wolf River Bridge and 2,500 feet west of the existing signalized intersection of Walnut Grove and Farm Road. The trumpet interchange requires Walnut Grove Road to be relocated north of the existing roadway for 3,500 feet to provide for the loop ramp. This alternative provides Farm Road with right-in right-out access to Westbound Walnut Grove Road, while eliminating access to Eastbound Walnut Grove Road. Travel speeds associated with the interchange/ramp system will range from 20 to 45 mph.

From the interchange, Alternative L will travel in a northerly direction while curving to the west and back to the east, intersecting the proposed Sycamore View Extension at a 90⁰ angle. The Sycamore View intersection will be a signalized intersection to provide traffic movements in all directions. The alignment continues north, curving east then west, crossing north of a gas regulator station located within the farm area, then east again before crossing the relocated Mullins Station Road at a slight skew. The signalized Mullins Station Road intersection will be realigned to eliminate an existing skew and provide turn lanes on all approaches. Alternative L will then continue north along the existing alignment of Whitten Road to Macon Road.

Alternative M from Walnut Grove Road to Mullins Station is to be constructed with a variable right-of way, with four 12-foot traffic lanes (two in each direction), and a variable

width median. Alternate M will use an independent roadway concept wherein the grade and alignment will be varied to blend the roadway into the natural topography. From Mullins Station Road to Macon Road, the right-of-way for Alternative M will be 100-foot, consisting of four 12-foot traffic lanes with a 14-foot center turn lane, 10-foot shoulders, and curb and gutter on either side of the road. A 5-foot sidewalk is proposed for each side of the roadway. A travel speed of 45 mph is proposed for Alternative M. Alternative M will also include the construction of a new interchange with a fly-over for eastbound traffic using the proposed road. This alternative will also include a signalized intersection for vehicles traveling south and turning east on Walnut Grove Road. The proposed interchange will be located along Walnut Grove Road approximately 2,000 feet east of the newly constructed Wolf River Bridge and 2,200 feet west of the existing signalized intersection of Walnut Grove and Farm Road. The fly-over interchange will not require Walnut Grove Road be relocated off the existing roadway. This alternative will provide Farm Road with right-in right-out access to Westbound Walnut Grove Road and eliminate access to Eastbound Walnut Grove Road. Travel speeds associated with the proposed interchange/ramp system will range from 40 to 45 mph.

From the interchange, Alternative M will travel in a northerly direction curving to the west and back to the east, intersecting the proposed Sycamore View Extension at a 90⁰ angle. The Sycamore View intersection will be a signalized intersection to provide traffic movements in all directions. The alignment continues north curving east, crossing south of a gas regulator station located within the farm area, then back east before crossing the relocated Mullins Station Road at a slight skew. The signalized

Mullins Station Road intersection will be realigned to eliminate an existing skew and provide room for turn lanes on all approaches. Alternative M would then continue north along the existing alignment of Whitten Road to Macon Road. Travel speeds along these facilities will remain from 40 to 45 mph.

The No-Build Alternative would involve no new construction; only that is required to maintain the existing facilities within the project corridor (routine paving, striping, drainage, and maintenance). Palmer Engineering provided proposed alignment and design information.

3. NOISE DEFINITIONS

dBA A unit for describing the sound pressure level, which is weighted to approximate the human ear's response. Because of both the nature of the human ear and the logarithmic scale, an increase or decrease of 10 dBA sounds twice or half as loud, while a change of 20 dBA sounds four times or one quarter as loud.

L_{aeq1h} The A-weighted equivalent steady state sound level which in one hour contains the same acoustic energy as the time varying sound level during one hour.

Shortened to L_{eq}.

Traffic noise impacts: 23 CFR Part 772 defines traffic noise impacts as impacts which occur when the predicted traffic noise levels approach or exceed the Noise Abatement Criteria (NAC) or when the predicted traffic noise levels substantially exceed the existing noise levels. TDOT further defines approach as 1dBA less than the NAC.

Noise Level Increase: The Tennessee Department of Transportation (TDOT) has defined noise level increases from existing levels in the following manner: 0-5 dBA, minor increase; 6-9 dBA, moderate increase; and equal to or greater than 10 dBA as substantial increase.

4. EXISTING NOISE LEVELS AND VALIDATION SUMMARY

Field measurements were taken on October 19, 2005 at representative sites throughout the project area located at or near existing areas of human use (Exhibits 2 – 9). Sites were selected to be representative of a worst-case scenario and were generally the closest area of human use near the proposed roadway.

Measurements at sites along Whitten Road, Farm Road, and Walnut Grove Road were made between 6:30 am and 9:00 am and 3:30 pm and 5:30 pm during peak traffic periods (Appendix A). These measurements indicated no noise impacts within the project corridor. Weather conditions at the time of the field readings were dry and acceptable.

Equipment used for the existing sound level readings included:

- Larson Davis Model 812 Type 1 Precision Integrating Sound Level Meter S. N. 0297
- Larson Davis Model 2560 Precision Random High Incidence High Sensitivity Microphone S. N. 2313
- Larson Davis Model 828 Preamp S. N. 1085
- Larson Davis CA250 Precision Acoustic Calculator S. N. 2742
- JAMAR Technologies Model TDC-8 Traffic Data Collector S. N. T-2760

A traffic count was collected while the existing sound levels were recorded during the minimum ten-minute collection period, to allow comparison with FHWA's TNM[®] version 2.5, April, 2004. During the collection period, vehicle speeds were approximated and recorded for input into TNM 2.5[®].

Field measured L_{eq} values collected at four study sites were compared to model generated L_{eq} noise levels to validate the model. Sites 1 and 4 validated within ± 3 dBA. Site 2 did not validate due to the use of a pistol range in close proximity to the site. Site 3 did not validate also to the use of the pistol range and two vehicles on a gravel road passing within ten feet of the site. The locations of the existing noise level sites are shown in Exhibits 2 to 9.

5. ANTICIPATED NOISE LEVELS FOR THE DESIGN YEAR

TNM 2.5[®] was used to model 2026 No-Build and 2026 Build Alternatives (Appendices C to F) using traffic information provided by the Tennessee Department of Transportation (TDOT) for the design year.

6. IMPACT CRITERIA

Federal guidance for handling noise impacts and abatement are contained in 23 Code of Federal Regulations (CFR) Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." Activity Categories B (Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals) and C (exterior of commercial structures and developed lands not included in Category B) are applicable to the receptors on this project. For Category B, the Noise Abatement Criteria (NAC) is 67 dBA L_{eq} . For Category C, the Noise Abatement Criteria (NAC) is 72 dBA L_{eq} .

7. RESULTS

The FHWA TNM 2.5[®] results are summarized in Table 1. The sites selected as noise receptors are expected to have the highest noise levels of noise –sensitive areas along the project.

7.1 Alternative L Results

For Alternative L, there were four noise sensitive receptors selected for modeling. Of the four receptors selected, one receptor exceeded the NAC, one receptor experienced

an increase of 10 dBA over existing noise levels and one receptor experienced an increase of 5 dBA or less over existing noise levels.

7.2 Alternative M Results

For Alternative M, there were four noise sensitive receptors for modeling. Of the four receptors selected, one receptor exceeded the NAC and one receptor experienced an increase of 5 dBA or less over existing noise levels.

8. NOISE ABATEMENT

Because Site 4 experiences a traffic noise impact with the proposed alternatives, the following possible abatement measures will be addressed: traffic management (restrictions on truck use, traffic control devices, and exclusive lane designations); alteration of horizontal and vertical alignments; installation of noise barriers.

The proposed road will be a four-lane parkway creating a new north-south route, which will assist in improving mobility and reducing congestion on existing facilities within the project corridor. Imposing restrictions on truck traffic or reducing speed limits will limit use of the proposed facility and reduce the mobility of traffic moving through the project corridor.

The alteration of horizontal and vertical alignment is another noise abatement feature. This option is not feasible as alterations north of Mullins Station Road could create

impacts to residential areas while impacting the aesthetics of Shelby Farms Park to the south of Mullins Station Road.

Noise barriers were determined to be the only logical abatement measure to reduce noise levels for the impacted area (Exhibits 8 and 9). Per Sections 2.1 and 2.2 of the Tennessee Department of Transportation Policy on Highway Traffic Noise Abatement, noise barriers must be feasible, obtaining a minimum of 7 dBA with a barrier height generally 20 feet or less and reasonable, i.e. in locations where frequent human use occurs. Site 4, where traffic noise impacts are predicted for both Alternative L and Alternative M, is located at a sports field where exposure to traffic noise impacts will be brief. Additionally, the proposed project calls for the construction of multipurpose walking and bike paths at this location. Therefore, pursuant to Section 2.2.2 of the TDOT Policy on Highway Traffic Noise Abatement, installation of noise barriers for either Alternative L or Alternative M are not considered reasonable and are not recommended for the project.

9. CONSTRUCTION NOISE

Construction procedures shall be governed by the Standard Specifications for Road and Bridge Construction as issued by TDOT and as amended by the most recent applicable supplements. The contractor will be bound by Section 107.01 of the Standard Specifications to observe any noise ordinance in effect within the project limits. Detoured traffic shall be routed during construction so as to cause least practicable noise impacts upon residential and noise sensitive areas.

10. COORDINATION WITH LOCAL OFFICIALS

Table 3 and Appendix G indicate the future predicted noise levels and their critical distances for the proposed project. This information is being included to make local officials and planners aware of anticipated highway noise levels so that future development may be compatible with these levels. Noise levels will vary with changes in terrain and will be affected by the shielding of objects such as rows of houses or areas of continuous tree cover. These predictions are meant to be informational only and should be interpreted as such.

One segment with the highest traffic volumes for each alternative was modeled for the project contributed noise analysis. For both Alternatives L and M, the highest traffic volume was located on Walnut Grove Road. The predicted “ $L_{eq(h)}$ ” noise levels displayed are conservative and should be considered to be maximum (highest) noise levels expected at any location along the entire roadway at the same distance from the roadway. This value is defined as the equivalent steady-state sound level (measured on the “A” frequency weighting scale, dBA) which in a stated period of time (for this case, is one-hour) contains the same acoustic energy as the time-varying sound level during the same period.

Table 1
Summary and Comparison of the
Existing and Design Year (2026)
"L_{eq(h)}" Noise Levels in dBA

Site	Build Alternative	2005	Design Year	Design Year	Number and Type of Sensitive Receptors Represented ¹
		Field Measured Existing	No-Build Noise Levels	Build Noise Levels	
1	L	61*	63	65	1 Church
1	M	61*	63	65	1 Church
2	L	60*	60**	60**	1 Commercial
2	M	60*	60**	60**	1 Commercial
3	L	62*	62**	62**	Park
3	M	62*	62**	62**	Park
4	L	63*	68	73	Park
4	M	63*	68	71	Park

*Field Measured Existing Levels at these receptors were primarily the result of ambient noise.
 **The Field Measured Existing level is used when it is greater than modeled No-Build or Build levels.
¹Sensitive receptors are residences unless otherwise indicated.

Table 2 - Barrier Analysis Summary

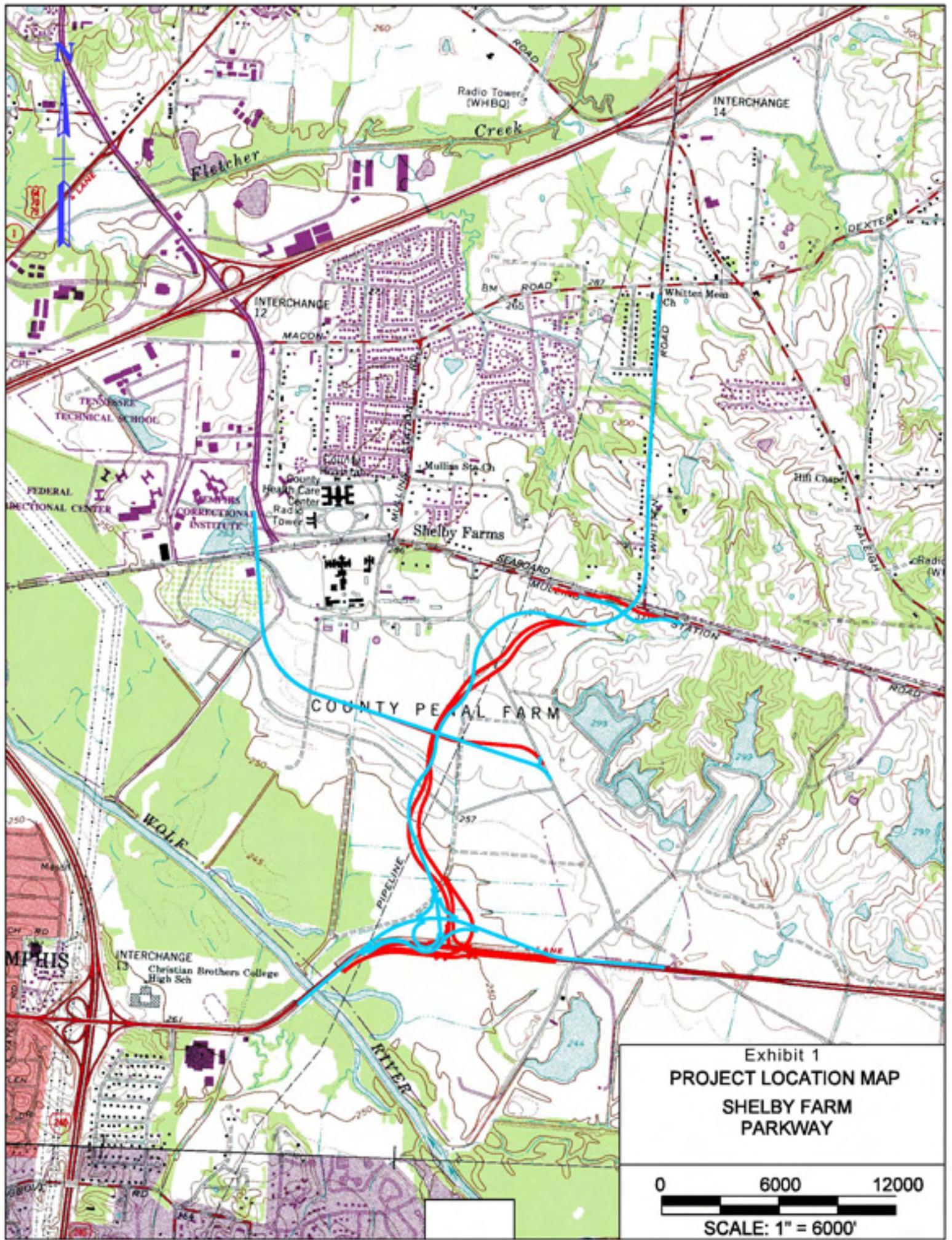
Site	Build dBA	Build - Existing	Impacted Receptors	Benefited Receptors ^[1]	Did Barrier get a 7dBA Reduction	Barrier Height ft ^[2]	Barrier Length ft	Barrier Cost	Barrier Cost/Benefited Receptor
4 - Alternative L	73	10	1	1	Yes*	20	938	\$294,023	\$294,023
4 - Alternative M	71	8	1	1	Yes**	8	100	\$16,047	\$16,047

[1]- Received a minimum 5 dBA reduction.
 [2]-Represents maximum barrier height used in analysis.
 *- The proposed barrier would not be reasonable due to the brief nature of the noise impact to the planned multipurpose paths and adjacent sports fields (BMX Tournament Track)
 **- The proposed barrier is not reasonable due to it's close proximity to a planned multipurpose path

Table 3
Design Year (2026) Predicted "L_{eq(h)}"
Project-Contributed Noise Levels (dBA)

Distance*	"L _{eq(h)} " Noise Levels	
	Alternative L	Alternative M
100 Feet (30.5 m)	73.0	73.0
200 Feet (60.9 m)	69.4	69.4
300 Feet (91.4 m)	67.0	67.0
400 Feet (121.8 m)	64.6	64.6
500 Feet (152.3 m)	61.8	61.8
600 Feet (182.9 m)	59.6	59.6
700 Feet (213.4 m)	57.7	57.7
800 Feet (243.8 m)	56.0	56.0

* Perpendicular distance from the edge of the proposed roadway for an at-grade situation modeling highest predicted traffic volumes for the L and M Alternatives.





Alternative L Southbound

Alternative L Northbound

NR-1

61 dBA
(63 dBA)
65 dBA

Exhibit 2

Legend

Existing Noise Levels	00 dBA
Design Year No-Build Noise Levels	(00 dBA)
Design Year Build Noise Levels	00 dBA

Scale : 1"=100'



Alternative M Southbound

Alternative M Northbound

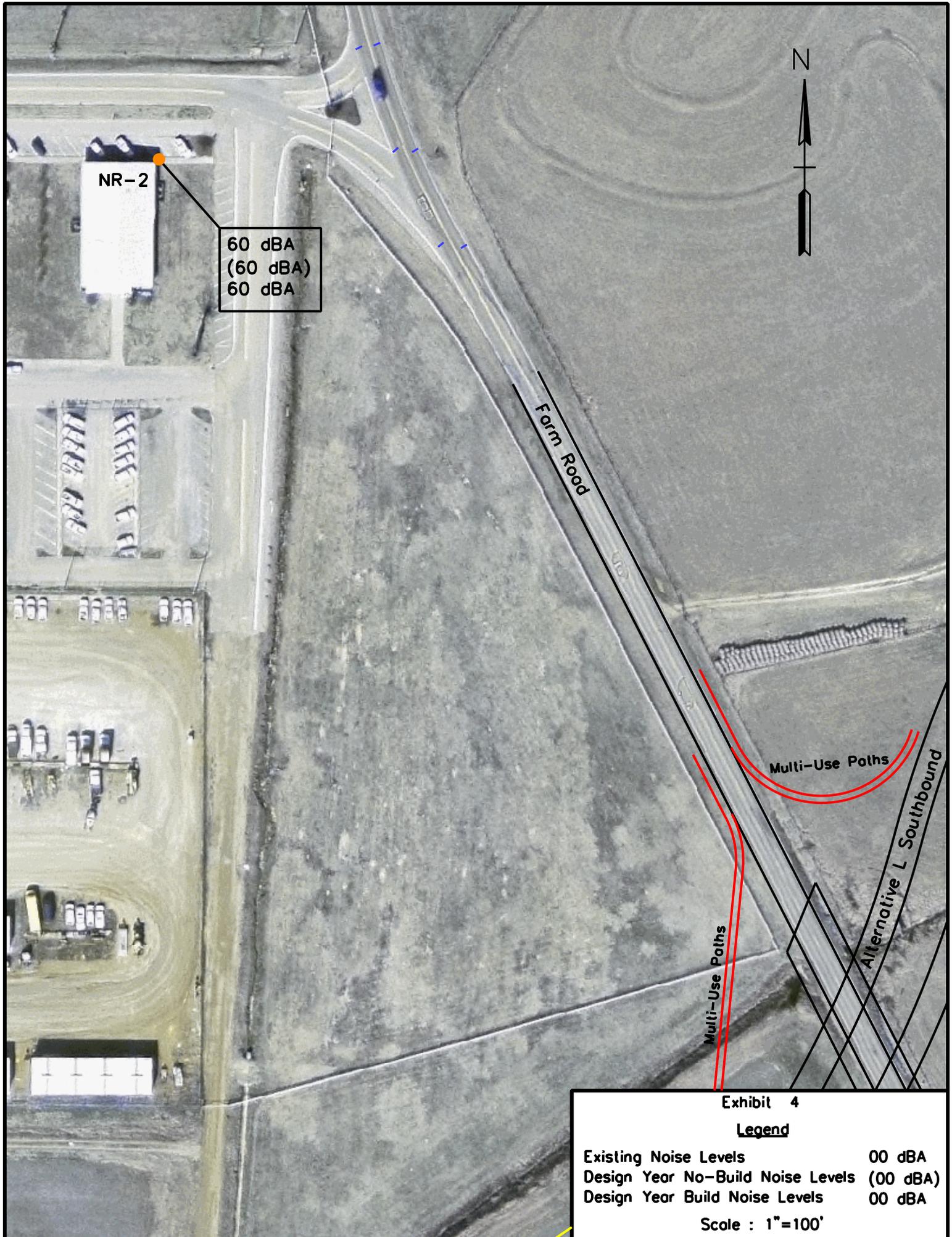
NR-1

61 dBA
(63 dBA)
65 dBA

Exhibit 3
Legend

Existing Noise Levels	00 dBA
Design Year No-Build Noise Levels	(00 dBA)
Design Year Build Noise Levels	00 dBA

Scale : 1"=100'



NR-2

60 dBA
(60 dBA)
60 dBA

Form Road

Multi-Use Paths

Multi-Use Paths

Alternative L Southbound

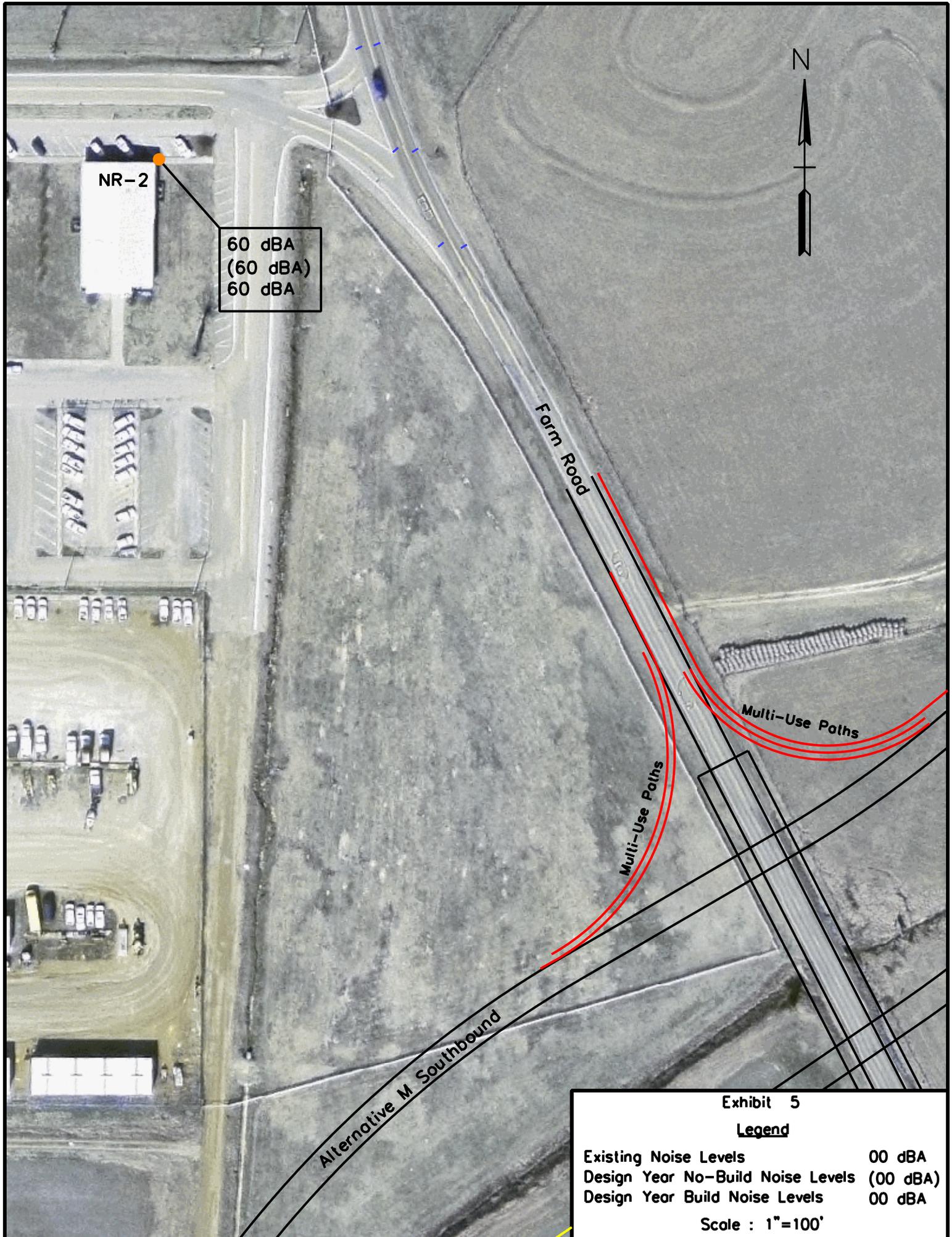


Exhibit 4

Legend

- Existing Noise Levels 00 dBA
- Design Year No-Build Noise Levels (00 dBA)
- Design Year Build Noise Levels 00 dBA

Scale : 1"=100'



NR-2

60 dBA
 (60 dBA)
 60 dBA



Farm Road

Multi-Use Paths

Multi-Use Paths

Alternative M Southbound

Exhibit 5

Legend

- Existing Noise Levels 00 dBA
- Design Year No-Build Noise Levels (00 dBA)
- Design Year Build Noise Levels 00 dBA

Scale : 1"=100'



Farm Road

Farm Road

Multi-Use Paths

Shelby Farms Park
Gate 3

NR-3

62 dBA
(62 dBA)
62 dBA

Exhibit 6

Legend

- Existing Noise Levels 00 dBA
- Design Year No-Build Noise Levels (00 dBA)
- Design Year Build Noise Levels 00 dBA

Scale : 1"=100'



Farm Road

Farm Road

Multi-Use Paths

Shelby Farms Park
Gate 3

NR-3

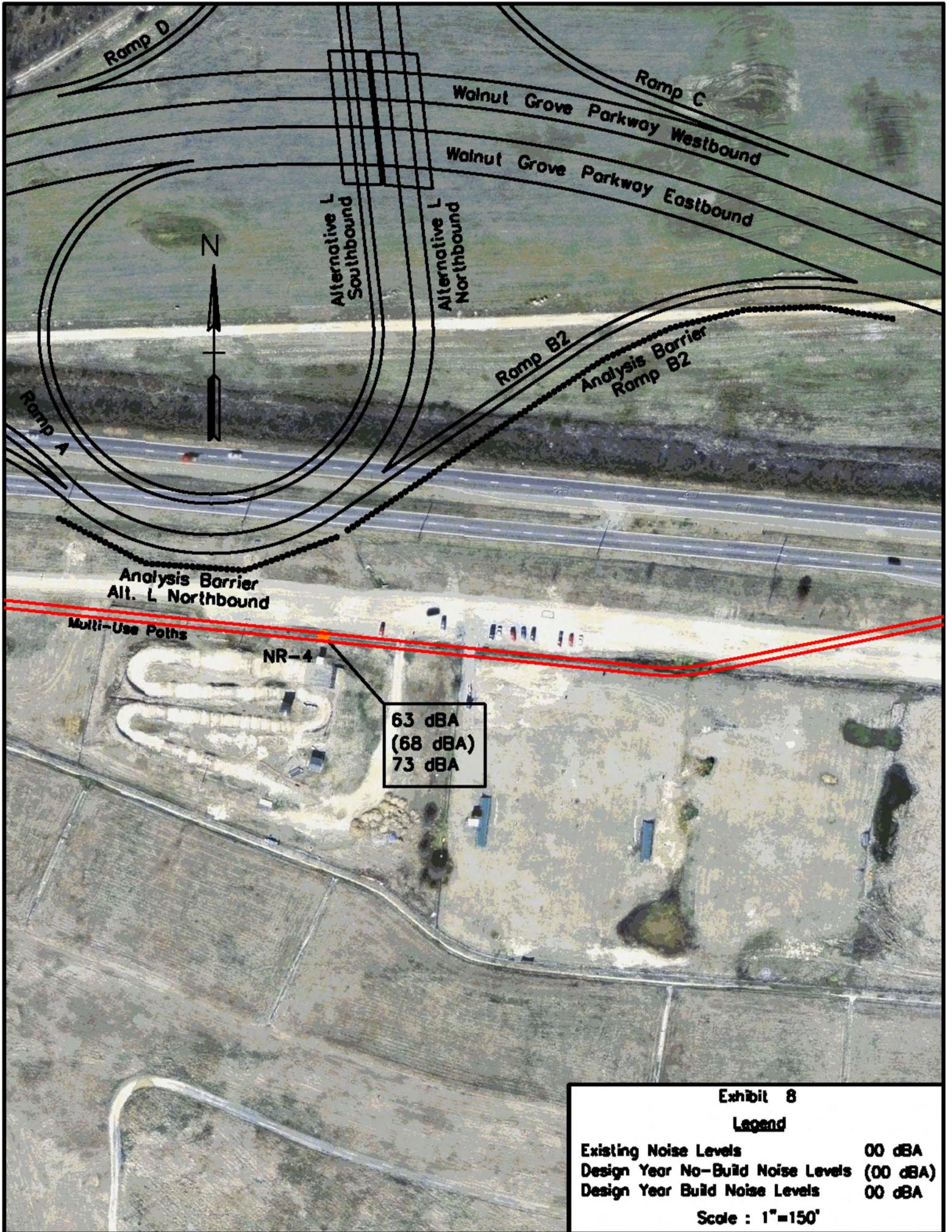
62 dBA
(62 dBA)
62 dBA

Exhibit 7

Legend

Existing Noise Levels	00 dBA
Design Year No-Build Noise Levels	(00 dBA)
Design Year Build Noise Levels	00 dBA

Scale : 1"=100'



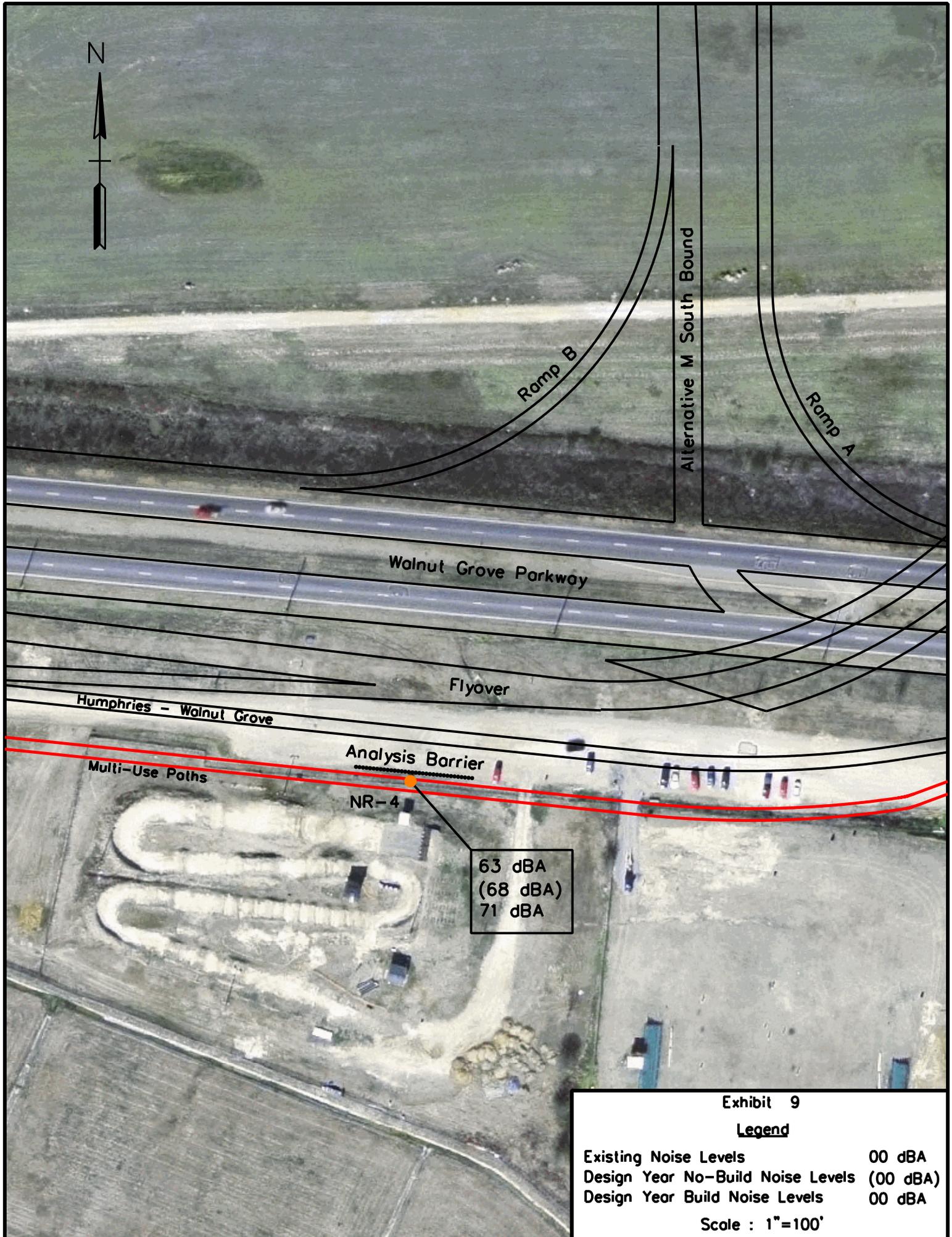


Exhibit 9

Legend

Existing Noise Levels	00 dBA
Design Year No-Build Noise Levels	(00 dBA)
Design Year Build Noise Levels	00 dBA

Scale : 1"=100'

