
I-70 and Route (K) Project

St. Charles County, Missouri
City of O'Fallon

Job Number: J612418

Preliminary Noise Analysis Report



Prepared for:

City of O'Fallon, Project Sponsor

and

Missouri Department of Transportation, Lead Agency

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Acronyms

| | |
|-------------------|---|
| ANSI | American National Standards Institute |
| MoDOT | Missouri Department of Transportation |
| CFR | <i>Code of Federal Regulations</i> |
| dB | decibel |
| dBA | A-weighted decibel |
| DD | doubling of the distance |
| FHWA | Federal Highway Administration |
| I-70 | Interstate 70 |
| I-75 | Interstate 75 |
| IEC | International Electrotechnical Commission |
| Hz | hertz |
| km/h | kilometers per hour |
| L ₁₀ | sound level exceeded 10 percent of the time |
| L _{eq} | hourly equivalent sound level |
| mph | miles per hour |
| NAC | noise abatement criteria |
| SPL | sound pressure levels |
| T ₂₄ | percent of trucks during the 24-hour period |
| TCE | Temporary Construction Easement |
| μPa | micro Pascals |
| μN/m ² | micro Newtons per square meter |

A. Executive Summary

This report documents the results of a noise analysis and abatement design as part of the project widening I-70 (K) project in the city of O'Fallon, St. Charles County, Missouri. The purpose of this project is to improve the functionality of the I-70 through O'Fallon. The Preferred Alternative for this project includes:

- The conversion of the existing outer roadway north of I-70 from TR Hughes Boulevard to Route K to a westbound one-way outer roadway system.
- The addition of a new one-way eastbound outer road south of I-70 from Route K to TR Hughes Boulevard.
- New slip ramps to/from I-70 on both the north and south outer roads.
- Access management improvements along Route K from I-70 to Veterans Memorial Parkway (VMP) and improvements at the VMP/ Route K Intersection.
- Improved pedestrian facilities along Route K (under I-70) from Mariae Lane to Veterans Memorial.
- The Route K interchange will be modified. Two new west-bound slip ramps will be added. The east-bound slip ramp will be widened. To accommodate the traffic on the one-way outer roads, a Texas U-Turn will allow vehicles to cross over the interstate and travel from the one-way north outer road to the one-way south outer road avoiding the signalized intersections at Route K.
- The TR Hughes interchange (an existing single point urban interchange) will be slightly modified. A Texas U-turn will be added (allowing the traffic on the westbound one-way north outer road to avoid the signalized intersections at Route K when traveling from the one-way westbound north outer road to the one-way eastbound south outer road). A transition from the proposed one-way to the existing two-way outer road system is also required.
- The traffic signals at East Terra Road and Sonderen Loop Road will be removed.

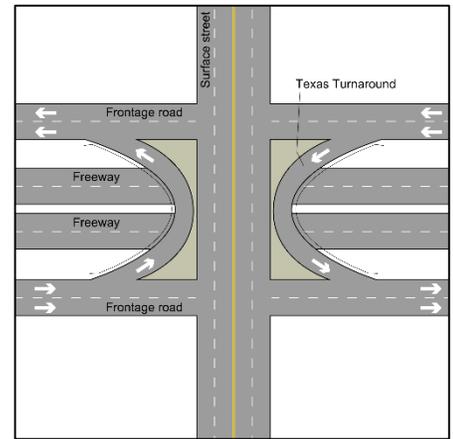


Diagram showing the operation of a Texas Turn-Around

Eleven Noise Study Areas (NSAs) were identified along the project, listed below roughly from east to west:

1. The **Veterans Memorial Walk** is located in the southeastern quadrant of the Belleau Creek Road/Veterans Memorial Parkway. The Veterans Memorial Walk was dedicated in 2001 as a place to honor all U.S. soldiers, past and present.
2. The **Evelyn Homestead** is a single home located at 8105 Veterans Memorial Parkway.
3. The **Hilltop Manor Subdivision** is a large collection of single-family residences on East Terra Lane, just east of Sonderson Street, on the northern side of i-70.

4. The **Gardenview Senior Center** is located on the opposite side of I-70, from the Hilltop Manor Subdivision. It is a medical facility for senior citizens, which includes long-term accommodations for Alzheimer's patients. The only outdoor areas are limited to a few benches along the sidewalk around the building (see attached photographs). After consulting with the center and MoDOT it was determined that these did not constitute an area of frequent human use. Actual use is infrequent and sporadic. Consequently, no analysis of impacts or abatement is required.
5. Ball fields at the **Fort Zumwalt North Middle School** are located west of the Sonderson Street overpass.
6. The **Highland Terrace Subdivision** is two streets of single-family residences, perpendicular to I-70.
7. While mostly commercial, two **isolated Main Street residences** are present (single-family).
8. Located between Route K (Main Street) and Woodlawn Avenue the **Terra Mariae Subdivision**, is a combination of single-family and multi-family residences north of I-70.
9. The **Falloncrest Townhouses** are located in the southeastern quadrant of the I-70/Woodlawn Overpass.
10. While the only project work west of the Woodlawn Avenue overpass is a westbound on-ramp to I-70 the residences on the north side of I-70 within the **Woodlawn/Sunset Subdivision** were evaluated.
11. Opposite NSA #10, on the south side of I-70, is variety of land uses located in the **Old Woodlawn Avenue area**.

Traffic noise level measurements were conducted at seven locations. The monitoring locations are representative of the sensitive receptors. The purpose of this data collection is primarily for model validation purposes. Existing measured noise levels adjacent to I-70 vary between 59.6 and 81.2 dBA.

The TNM input files were developed using the existing and proposed roadway geometry, surrounding terrain and building zones. Traffic counts, vehicle distribution and speeds were obtained from the design plans. Using the noise monitoring data, the accuracy of the TNM files were validated.

Due to their close proximity to I-70, many locations approach or exceed the Noise Abatement Criteria. The noise levels predicted during the existing condition and the Preferred Alternative are very similar. Based on the modeled traffic noise conditions, a traffic noise impact was identified for the following Noise Study Areas:

- Hilltop Manor Subdivision
- Fort Zumwalt North Middle School
- Highland Terrace Subdivision

- Terra Mariae Subdivision
- Woodlawn/Sunset Subdivision

For the Noise Study Areas that would experience a traffic noise impact, a barrier analysis was conducted. To be recommended for further consideration, a barrier must be both feasible and reasonable. *MoDOT* requires at least a 5 dBA insertion loss for a minimum of 67 percent of first-row, impacted receivers for noise abatement to be considered feasible. Several of the impacted Noise Study Areas were able to achieve the minimum feasibility requirements.

For the Noise Study Areas that could achieve the feasibility standard, barrier analysis was continued to investigate reasonableness. *MoDOT* defines reasonableness as the ability for noise barriers to achieve a maximum of 1,300 square feet per benefitted receptor and must provide a benefit of a minimum of 7 dBA for 67 percent of first-row receptors.

The only noise barrier that is both feasible and reasonable is in the Hilltop Manor subdivision. Several barrier iterations were considered. Noise Barrier Version 1 is a one piece I-70 barrier with partial coverage, Noise Barrier Version 2 is a three piece barrier along outer road and Noise Barrier Version 3 is two piece I-70 barrier with full coverage.

Only Version 2 is both feasible and reasonable. Final recommendations will be made after final design and the public involvement are complete.

Construction noise is not expected to be a substantial issue.

The project's exhibits are shown in **Appendix A**. **Figure 1** is a vicinity map for the I-70 (K) project. The locations of the Noise Study Areas are shown on **Figure 2**.



Final Noise Barrier Determination

The only noise barrier that is both feasible and reasonable is in the Hilltop Manor subdivision (Version 2).

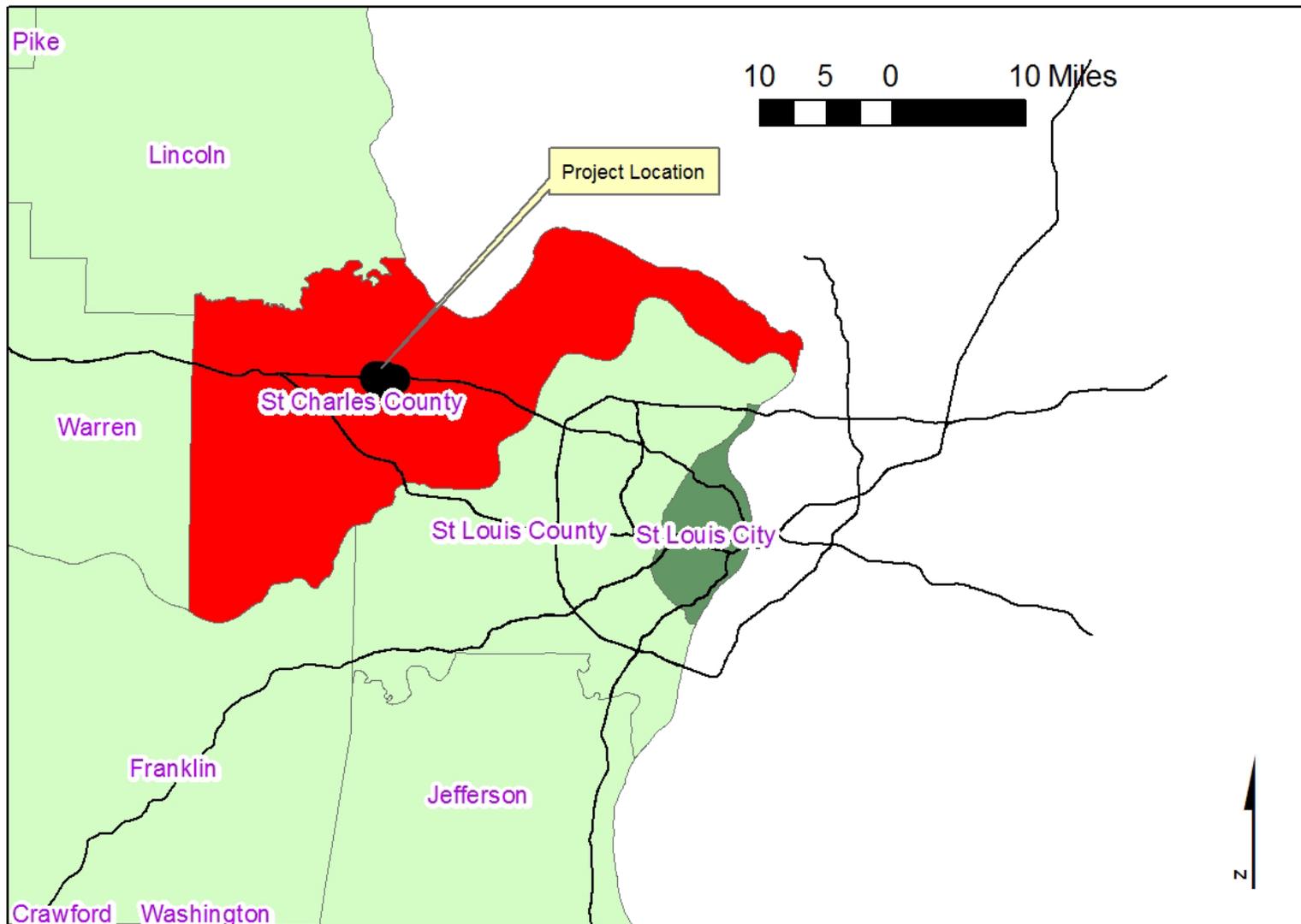
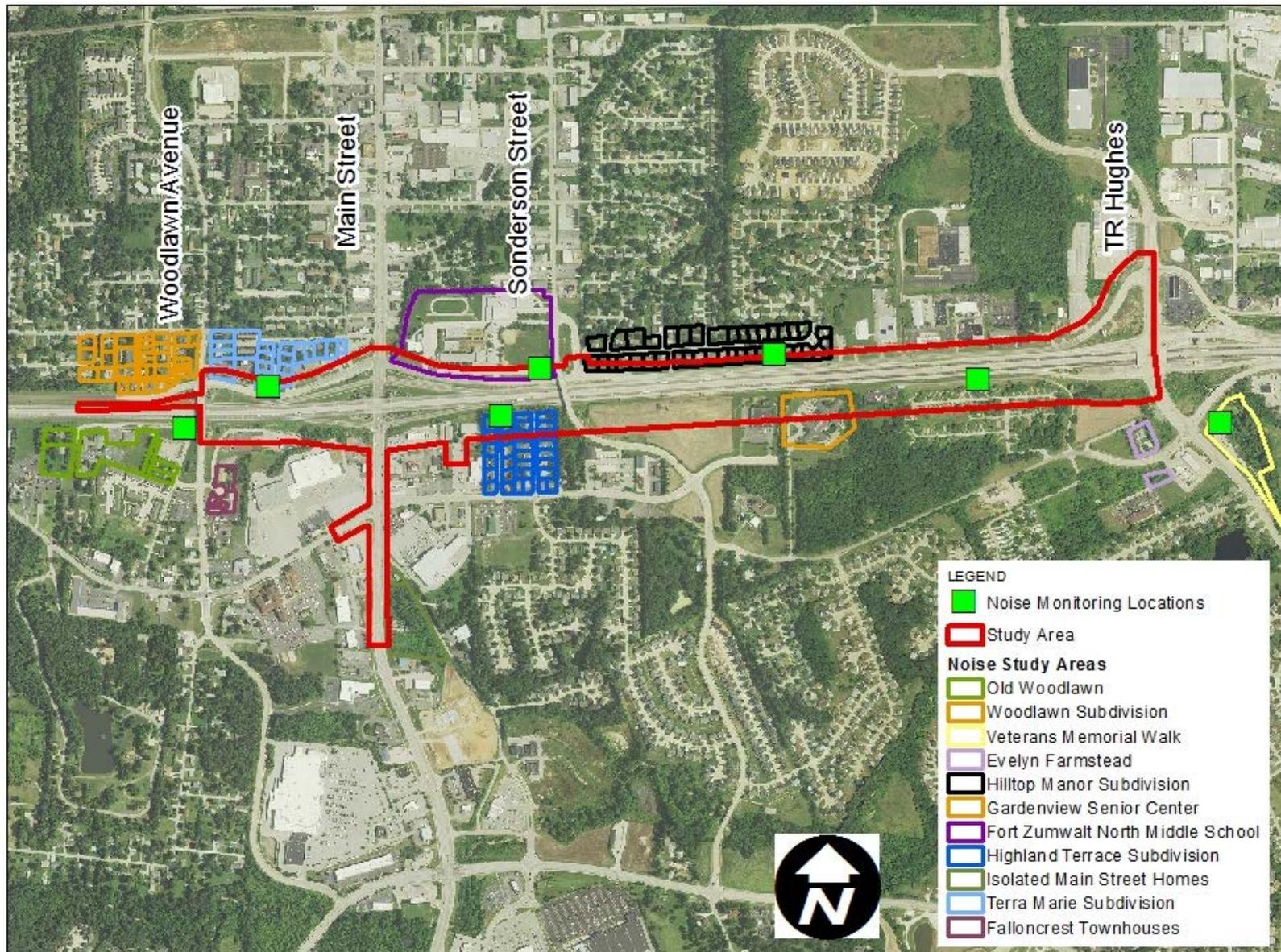


Figure 1
Vicinity Map
I-70 (K) Noise Study Report

Figure 2 - Noise Study Areas



B. Introduction

The purpose of this Noise Analysis Report (NAR) is to evaluate noise impacts and abatement for the I-70 and Route K project in St. Charles County, Missouri (see **Figure 1**).

The criteria for evaluating noise impacts that are used in this report are contained in Title 23 of the Code of Federal Regulations (CFR), Part 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise and in the MoDOT Engineering Policy Guide Section 127.13. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of the National Environmental Policy Act (NEPA).

The noise analysis included the following tasks:

1. Identification of noise sensitive areas and associated receptors (discrete or representative locations in an NSA for the land uses listed in 23 CFR 772) within 500 feet of the project;
2. Determination of existing sound levels at selected receptors to characterize the existing noise environment in the project area;
3. Determination of future sound levels with and without the project at the receptors;
4. Determination of impacted receptors;
5. Evaluation of noise abatement for impacted areas; and
6. Discussion of construction noise.

A total of 11 Noise Study Areas have been identified within 500 feet of I-70. The locations of the Noise Study Areas are shown on **Figure 2** and **Appendix A**. **Table 1** summarizes existing and future noise conditions.

| Noise Study Area | Total Number of TNM Modeling | Land Use | Activity Category (NAC) | Worst Hour Noise Levels - $L_{wq}(h)$, dBA | | | | |
|--------------------------------------|------------------------------|-------------------------|-------------------------|---|---------------------------------|------------------------------------|------------------------------------|--------------------------------|
| | | | | Existing Noise Levels (Minimum) | Existing Noise Levels (Maximum) | Future/Build Noise Level (Minimum) | Future/Build Noise Level (Maximum) | Average Increase over Existing |
| 1 - Veterans Walk Memorial | 2 | Public Space | C (67) | 58 | 61 | 61 | 64 | 3 |
| 2 - Evelyn Homestead | 1 | SF Residence | B (67) | 58 | 58 | 59 | 59 | 1 |
| 3 - Hilltop Manor Subdivision | 38 | SF Residence | B (67) | 63 | 76 | 64 | 76 | 1 |
| 4- Gardenview Senior Center | 3 | Medical Center | C (67) | 49 | 69 | 51 | 68 | 0 |
| 5 - Fort Zumwalt North Middle School | 6 | Recreation Area | C (67) | 58 | 72 | 59 | 72 | 0 |
| 6 - Highland Terrace Subdivision | 10 | SF Residence | B (67) | 64 | 74 | 66 | 76 | 1 |
| 7 - Isolated Main Street Residences | 2 | SF Residence | B (67) | 59 | 65 | 61 | 66 | 1 |
| 8 - Terra Mariae Subdivision | 20 | SF Residence | B (67) | 58 | 73 | 58 | 73 | 0 |
| 9 - Falloncrest Townhouse | 2 | MF Residences | B (67) | 58 | 60 | 59 | 61 | 1 |
| 10- Woodlawn Avenue Subdivision | 25 | SF Residence | B (67) | 50 | 70 | 52 | 70 | 0 |
| 11 - Old Woodlawn Avenue | 5 | SF Residence/Recreation | B (67) | 61 | 63 | 62 | 64 | 0 |

2

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The results of the traffic noise analysis are summarized in **Table B (Appendix B)**.

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The traffic data used for validation and existing/proposed conditions are contained in **Appendix C and D**.

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TNM Output are contained in **Appendix E**.

C. Project Description/Purpose and Need

1. Project Description

The Preferred Alternative for this project include the following elements:

- The conversion of the existing outer roadway system from Route K to TR Hughes Boulevard to a one-way outer roadway system.
- Access management improvements along Highway K from I-70 to Veterans Memorial Parkway (VMP) and improvements at the VMP/ Route K Intersection.
- Pedestrian facilities along Route K (under I-70) and bike accommodations along the outer road.
- A new south-bound outer road, from Route K to TR Hughes Boulevard Interchange. New slip ramps would also be provided on this segment.
- The Route K interchange will be modified. Two new west-bound slip ramps will be added. The east-bound slip ramp will be widened. To accommodate the traffic on the one-way outer roads, Texas U-Turns at the interchanges will allow vehicles to cross over the interstate and switch from one outer road to another.
- The TR Hughes interchange (a single point urban interchange-SPUI) will be lightly modified. A Texas U-turn will be added. A transition from the one-way to the two-way outer road system is also required. The traffic signals at East Terra Road and Sonderen Loop Road will be removed.

2. Project Purpose and Need

Purpose and Need refers to the transportation-related problems that a study is intended to address. The generation and evaluation of alternatives are conducted to develop the most appropriate solutions to the identified problems. In its very broadest sense, the goals and objectives associated with the I-70 (K) project can be defined as:

Congestion Mitigation - The City of O'Fallon has recognized the importance of maintaining their transportation infrastructure, and satisfying citizens' desire for smooth flowing traffic. Currently, there is unacceptable demands during peak commuter periods and on Saturdays. This results in excessive delays and congestion throughout the interchange and study corridor. The specific problems causing congestion are roadway segment and intersection delays and non-optimum intersection queueing.

Improve Local Access - As St. Charles County experienced a population explosion, with major growth centers established in the Cities of St. Charles, St. Peters, and O'Fallon, I-70 became one of the highest traveled interstate routes in the St. Louis Metropolitan Region. I-70 is an access controlled freeway constructed in the early 1960's. This facility is one of the primary east/west routes used for the shipment of goods and freight by truck in the United States. To account for these conditions, I-70 was been studied and upgraded by MoDOT to provide auxiliary lanes to maximize available vehicle storage. This project is an extension of that process.

Improve I-70 Interface - I-70 is the primary route providing access between St. Charles County and St. Louis County. Maintaining this connectivity is vital to any I-70 improvement.

Meet Driver Expectation - One of the objectives of this project is to try and provide a preferred alternative that better meets "driver expectations." Driver expectancy is typically defined as "a driver's readiness to respond to situations, events, and information in predictable and successful ways". A project that meets driver expectation will improve driver behavior, performance, and decision-making. The existing roadway configuration has many areas amenable to improvement.

Improvements in accordance with long-range planning - O'Fallon is actively evaluating the future of their community. It is vital that the improvement of I-70 is in accordance with the goals, standards and intentions of the community planning process.

D. Discussion of Noise Modeling

1. Fundamentals of Traffic Noise

Sound pressure can be measured in units of micro Newtons per square meter ($\mu\text{N}/\text{m}^2$) called micro Pascals (μPa). One μPa is approximately one-hundred-billionth of the normal atmospheric pressure. The pressure of a very loud sound may be 200,000,000 μPa , or 10,000,000 times the pressure of the weakest audible sound (20 μPa). Expressing sound levels in terms of μPa would be very cumbersome, however, because of this wide range. For this reason, sound pressure levels (SPL) are described in logarithmic units of ratios of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander G. Bell. In order to provide a finer resolution, a bel is subdivided into decibels (deci or tenth of a bel), abbreviated dB.

Unless otherwise stated, all sound levels reported are in A-weighted decibels (dBA). A-weighted sound level is defined as the level, in decibels, measured with a sound level meter having the metering characteristics and a frequency weighting specified in the American National Standards Institute Specification for Sound Level Meters, ANSI S 1.4 - 1983. The A-weighting de-emphasizes lower frequency sounds below 1000 hertz (1 kHz) and higher frequency sounds above 4 kHz. It emphasizes sounds between 1 kHz and 4 kHz. A-weighting is the measure most used for traffic and environmental noise throughout the world. Most community noise standards utilize A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

On the dBA scale, changes in noise levels are perceived as follows:

- A 3 dBA change is barely perceptible
- A 5 dBA change is readily perceptible
- A 10 dBA change is perceived as a doubling or halving of noise

The actual impact of noise is not a function of loudness alone. The time of day during which noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been used such as L_{10} (level that is exceeded 10 percent of the time), L_{50} (level that is exceeded 50 percent of the time), and L_{dn} (a 24-hr level that weights daytime and nighttime noise levels differently). The noise descriptor used for this study is the L_{eq} .

The L_{eq} is the equivalent steady state sound level which, during a stated period of time, would contain the same acoustical energy as the time-varying sound level during the same period. The $L_{eq}(h)$ is the energy-average of the A-weighted sound levels occurring during a one hour period, in decibels, i.e., a one hour L_{eq} .

From the source to the receptor, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise decreases with distance depends on the following important factors:

Geometric spreading from point and line sources

Sounds from a small localized source (approximating a “point” source) radiates uniformly outwards as it travels away from the source in a spherical pattern. The sound level decreases or drops-off at a rate of 6 dBA for each doubling of the distance (6 dBA/DD).

However, highway traffic noise is not a single, stationary point source of sound. The movement of the vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval.

Ground attenuation

Two site types are currently used in traffic noise models:

Hard Sites – These are sites with a reflective surface between the source and the receptor such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for these sites. Therefore, the change in noise levels with distance (drop-off rate) is simply the geometric spreading from the line source, or only 3 dBA/DD (compared to 6dBA/DD for a point source).

Soft Sites – These sites have an absorptive ground surface such as soft dirt, grass or scattered bushes and trees. An excess ground attenuation value of 1.5 dBA/DD is normally assumed. When added to the geometric spreading, this results in an overall drop-off rate of 4.5 dBA/DD for a line source (compared to 7.5 dBA/DD for a point source).

Atmospheric effects and refraction

Research has shown that atmospheric conditions can have a profound effect on noise levels. Shifts in wind speed and direction affect sound levels. Vertical air temperature gradients also affect sound levels. The noise analysis uses neutral conditions in accordance with FHWA requirements.

Shielding by natural and manmade features, noise barriers, diffraction, and reflection

Rigid barriers (such as noise barriers or buildings) have greater capacity for shielding or absorbing sound than do flexible barriers. Generally, for the greatest effect, the surface must be continuous with no gaps or spaces through which the sound can travel. For this reason, a line of trees, even dense trees, is generally not an effective noise barrier, while a solid wall is effective. Generally, barriers need to be extended along the road for a significant distance in order to provide the required amount of noise reduction.

2. Federal and State Policies and Procedures

The criteria for evaluating noise impacts that are used in this report are contained in Title 23 of the *Code of Federal Regulations (CFR), Part 772 – Procedures for Abatement of Highway Traffic Noise and Construction Noise* and MoDOT Standard Procedures 417-001 (SP) *Standard Procedure for Analysis and Abatement of Highway Traffic Noise*, dated June 2011.

The Categories B and C land use activity criterion in these documents applies to residences, churches, schools, recreation areas, and similar uses and is an hourly sound level that approaches or exceeds 67 dBA hourly equivalent sound level (L_{eq}). All of the sensitive receptors associated with this project are Category B or C activities.

Table 2 shows the Noise Abatement Criteria (NAC) used for determining the noise standard for specific land uses. MoDOT considers a traffic noise impact to occur if predicted

peak-hour traffic noise levels approach or exceed the NAC. MoDOT defines “approach” as noise levels within 1 dBA of the NAC, or 66 dBA for activity Category B/C.

In addition to the above-described sound level criterion, FHWA and MoDOT consider a traffic noise impact to occur if predicted sound levels "substantially" exceed existing noise levels. MoDOT policy states that a substantial increase occurs when future noise levels exceed existing noise levels by 15 dBA or more.

Table 2 – Noise Abatement Criteria

| Activity Category | Activity Criteria ¹ | | Evaluation Location | Activity Description |
|-------------------|--------------------------------|--------------------|---------------------|---|
| | L _{eq(h)} | L _{10(h)} | | |
| A | 57 | 60 | 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 ² | 67 | 70 | Exterior | Residential |
| C | 67 | 70 | 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 | 55 | 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 ² | 72 | 75 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F |
| F | - | - | - | Agriculture, 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 for development |

¹ The L_{eq(h)} and L_{10(h)} Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

² Includes undeveloped lands permitted for development for this activity category.

3. Study Methods and Procedures

In this noise analysis report, the existing configuration of I-70 and associated roadways are evaluated using onsite traffic noise level measurements and the FHWA Traffic Noise Model (TNM) Version 2.5. TNM is the most recent analytical method for traffic noise evaluation. The program is based upon reference energy emission levels for automobiles, medium trucks (2 axles), heavy trucks (3 or more axles), buses and motorcycles with consideration given to vehicle volume, speed, roadway configuration, distance to the receptor, and the acoustical characteristics of the site. TNM was developed to predict noise levels for both constant-flow and interrupted-flow traffic conditions. The model enables the user to account for the effects of different pavement types, graded roadways, and attenuation over/through rows of buildings and dense vegetation. TNM enables the user to input terrain elevation lines to account for shielding effects of natural terrain. The model also allows the user to specify various intervening ground types with different sound absorption qualities. The ground types available for use include soft and hard soil, snow-covered ground, water, and pavement.

In this study, traffic noise levels calculated by TNM were validated using onsite traffic noise level measurement data and concurrent traffic counts. Measurements were taken at 7 locations for 15-minutes to obtain a Leq value. Traffic along I-70 was counted during the measurement period by auto, medium trucks, and heavy trucks. To model the roadways, receptor and barrier locations and intervening topography within the project area, terrain information and roadway geometry data were obtained from the available construction plans. Measurement data is contained in **Appendix D**. The validation process is described in **Section E.3**.

Traffic data used for the assessment of existing and projected future noise exposure were the project's design traffic. For the purpose of performing this noise analysis, certain assumptions about traffic data were developed:

- Using data from the I-70 Improvements Project, trucks were assumed to be 8 percent of total traffic. The ratio of Heavy to Medium Trucks is assumed to be 80:20. Cars make up the balance of the traffic stream.
- On I-70, vehicle speed for automobiles, medium trucks, and heavy trucks is 65 miles per hour. Travel speeds on the freeway ramps is 55 miles per hour. The local road speed limits are 30 or 45 miles per hour.

The traffic data used for the Validation and Existing/Future conditions of the project are contained in **Appendix C**.

E. Impact Assessment

This section will summarize the land uses in the study area, provide the results of in-situ noise monitoring, discuss the model validation and present the prediction of noise impacts associated with the proposed improvements.

1. Existing Land Use/Noise Study Areas

A total of 11 Noise Study Areas have been identified within the vicinity of the I-70 (K) project. The location of these areas is shown on **Figure 2** and **Exhibit 1**.

Noise Study Area #1: The **Veterans Memorial Walk** is located in the southeastern quadrant of the Belleau Creek Road/Veterans Memorial Parkway. The Veterans Memorial Walk was dedicated in 2001 as a place to honor all U.S. soldiers, past and present. Two modeling receivers were used to represent the areas of frequent human use. Equivalent dwelling units will need to be used in the barrier analysis, if a traffic impact is predicted.

Noise Study Area #2: The **Evelyn Homestead** is a single home located at 8105 Veterans Memorial Parkway. A single modeling receiver was used to represent the areas of frequent human use. Noise barriers for single residences are rarely reasonable and feasible.

Noise Study Area #3: The **Hilltop Manor Subdivision** is a large collection of single-family residences on East Terra Lane, just north of Sonderson Street. A total of 38 modeling receivers (40 dwelling units) were used to represent these single-family homes. The front row receivers were placed in the backyard; the second row receivers in the frontyard.

Noise Study Area #4: The **Gardenview Senior Center** is located on the opposite side of I-70, from the Hilltop Manor Subdivision. It is a medical facility for senior citizens, which includes long-term accommodations for Alzheimer's patients. The only outdoor areas are limited to a few benches along the sidewalk around the building (see attached photographs). After consulting with the center and MoDOT it was determined that these did not constitute an area of frequent human use.



Typical views outside the Gardenview Senior Center

Actual use is infrequent and sporadic. Consequently, no analysis of impacts or abatement is required¹.

Noise Study Area #5: Ball fields at the **Fort Zumwalt North Middle School** are located south of the Sonderson Street overpass. Improvements at the site are limited to Chain Link fence backstops, dirt infields and rubber bases. Four modeling receivers were used to represent the various outdoor recreational areas. Equivalent dwelling units will need to be used in the barrier analysis, if a traffic need impact is predicted.

Noise Study Area #6: The **Highland Terrace Subdivision** is two streets of single-family residences, perpendicular to I-70. A total of 10 modeling receivers were used to represent these single-family homes. Three rows (11 dwelling units) were modeled.

Noise Study Area #7: The Preferred Alternative proposes access management improvements along Route K. While mostly commercial, two **isolated Main Street residences** are present (single-family).

Noise Study Area #8: Located between Route K (Main Street) and Woodlawn Avenue the **Terra Marie Subdivision**, is a combination of single-family and multi-family residences north of I-70. A total of 20 modeling receivers were used to represent these homes.

Noise Study Area #9: The **Falloncrest Townhouses** are located in the southeastern quadrant of the I-70/Woodlawn Overpass. These multi-family units are represented by 2 receivers. They represent 14 residential units.

Noise Study Area #10: The only project work associated with the Preferred Alternative west of the Woodlawn Avenue overpass is a westbound on-ramp to I-70. Adjacent to this is area are residences on the north side of I-70 within the **Woodlawn/Sunset Subdivision**. A total of 24 modeling receivers were used to represent these single-family homes.

Noise Study Area #11: Opposite NSA #10, on the south side of I-70, is the **Old Woodlawn Avenue area**. A variety of land uses are located within this NSA, including ballfields, single-family and multi-family residences.

Areas investigated and ultimately eliminated as Noise study areas include: the Belleau Lake Drive Subdivision (beyond 500 feet from the nearest project alteration). A single home at the eastern end of East Terra Lane (under conversion to business use). The Salvation Army complex at 7661 Veterans Memorial Parkway (beyond 500 feet from the nearest project alteration).

2. Measured Traffic Noise Levels

Short-term noise level measurements (15 minutes in duration) were conducted within the project area during August, 2015 in order to determine the existing traffic noise levels and verify the accuracy of the TNM noise model in predicting noise levels in the area. Measurement equipment included a Casella CEL noise monitor. This instrumentation complies with the requirements of

¹ Even if the benches were determined to be areas of frequent human use, noise barriers would not be reasonable and feasible. Modeling the conditions at the benches found that existing and future noise levels would exceed the Noise Abatement Criteria (NAC). Noise barriers would reduce noise levels sufficient to benefit these locations (insertion losses over 7 dBA). The optimum barrier was 17.5 feet tall/ 700 feet long. See **Appendix B**. The optimum barrier would total 12,250 square feet. In order to be a reasonable barrier, 10 dwelling units would be required. As primarily a medical center, the appropriate Land Use category is C (see **Table 2**). As a medical facility, use levels would need to be very high to justify 10 equivalent dwelling units. Since actual use is infrequent and sporadic, a noise barrier could not be considered reasonable.

the American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) for Type I (precision) sound-level equipment.

Traffic noise level measurements were conducted at a total of 7 locations. The monitoring locations are representative of the sensitive receptors adjacent to I-70. The purpose of this data collection is primarily for model validation purposes.

Existing measured noise levels adjacent to I-70 vary between 59.6 and 81.2 dBA. The results of the noise level measurements are summarized in **Table 3**.

3. Noise Model Validation

The TNM input files for existing conditions were developed using the existing roadway geometry, surrounding terrain and building zones. Measured traffic noise levels, concurrent traffic counts, and observed vehicle speeds obtained during the noise monitoring effort were used to evaluate the accuracy of the TNM program in estimating traffic noise exposure within the project area. **Table 3** is a summary of noise levels obtained during the traffic noise measurements and their comparison to levels predicted by the TNM program. The traffic counts during the noise monitoring are contained in **Appendix C**. The monitoring locations are shown on **Exhibit 1** in **Appendix A**.

From the data in **Table 3**, it is apparent that noise levels predicted by TNM are generally comparable to measured levels. The differences between measured and predicted noise levels are within the 3 dBA range. Therefore, no adjustments to the model would need to be made to estimate existing and future peak-hour traffic noise levels.

TABLE 3
Validation: Comparison of Measured and Predicted Traffic Noise Levels

| ID # | Description | Measured L _{eq} (dBA) | Predicted L _{eq} (dBA) | Difference (dBA) |
|------|--|-----------------------------------|------------------------------------|---------------------|
| A | Veterans Memorial Walkway (Picnic Bench) | 59.6 | 58.5 | -1.1 |
| B | Nicola Lane (Adjacent to I-70) | 81.2 | 80.9 | -0.3 |
| C | Hill Top Manor (first row) | 71.1 | 72.1 | 1.0 |
| D | Zumwalt Middle School Ball Fields | 70.9 | 70.2 | 0.7 |
| E | Plaza lane (at ROW fence) | 77.1 | 76.9 | -0.2 |
| F | Terra Marie (at School Street) | 74.9 | 72.8 | -2.1 |
| G | Crestview Lane (adjacent to I-70) | 75.1 | 74.4 | -0.7 |

4. Modeled Peak-Hour Noise Levels – Existing

Existing noise conditions were modeled with TNM to determine baseline conditions. A total of 114 modeling receivers within the 11 Noise Study Areas were modeled. The location of these areas is shown on **Figure 2** and **Exhibit 1**.

Traffic noise levels approaching or exceeding the NAC are predicted to occur at 5 of the 11 NSAs under the existing conditions.

The range of existing peak-hour traffic noise levels are summarized in **Table 4**.

The complete existing condition results are presented in **Table B-1 (Appendix B)**.

TABLE 4
Summary of Existing Peak-Hour Noise Levels (in dBA)

| Noise Study Area | Range of Existing Noise Levels (dBA) | Traffic Noise Levels Approaching or Exceeding the NAC? |
|-------------------------------------|--------------------------------------|--|
| 1 - Veterans Walk Memorial | 58 – 61 | No |
| 2 – Evelyen Farmstead | 58 – 58 | No |
| 3 – Hill Top Manor Subdivision | 63 – 76 | Yes |
| 4 – Gardenview Senior Center | 49 – 69 | N/A ² |
| 5 –Fort Zumwalt MS ballfields | 58 - 72 | Yes |
| 6 – Highland Terrace Subdivision | 64 – 74 | Yes |
| 7 – Isolated Main Street Residences | 59 – 65 | No |
| 8 – Terra Mariae Subdivision | 58 – 73 | Yes |
| 9 – Falloncrest Townhouses | 58 – 60 | No |
| 10 – Woodlawn/Sunset Subdivision | 50 – 70 | Yes |
| 11 – Old Woodlawn Avenue | 61 - 63 | No |

5. Modeled Peak-Hour Noise Levels – Preferred Alternative (2040)

Future conditions were modeled using the roadway conditions and traffic volumes for the preferred alternative for the year 2040. **Table 5** summarizes the 2040 traffic noise levels at the selected receiver locations. A total of 114 modeling receivers within the 11 Noise Study Areas were modeled. The location of these areas is shown on **Figure 2** and **Exhibit 1**.

Traffic noise impacts are predicted to occur at 5 of the 11 NSAs under the future conditions. The complete future condition results are presented in **Table B-1 (Appendix B)**.

Due to their close proximity to I-70, many locations approach or exceed the Noise Abatement Criteria. The noise levels predicted during the existing condition and the Preferred Alternative are very similar.

² Given the nature of the patients and the limited extent of outdoor areas, it was determined that there were no front row areas of Frequent Human Use at the Gardenview Senior Center. Consequently, no further analysis of impacts or abatement is required.

TABLE 5
Summary of Future Peak-Hour Noise Levels (in dBA)

| Noise Study Area | Range of Existing Noise Levels (dBA) | Traffic Noise Impact? |
|-------------------------------------|--------------------------------------|-----------------------|
| 1 - Veterans Walk Memorial | 61 – 64 | No |
| 2 – Evelyen Farmstead | 59 – 59 | No |
| 3 – Hill Top Manor Subdivision | 64 – 76 | Yes |
| 4 – Gardenview Senior Center | 51– 68 | N/A |
| 5 –Fort Zumwalt MS Ballfields | 59 – 72 | Yes |
| 6 – Highland Terrace Subdivision | 66 – 76 | Yes |
| 7 – Isolated Main Street Residences | 61 – 66 | No |
| 8 – Terra Mariae Subdivision | 58 – 73 | Yes |
| 9 – Falloncrest Townhouses | 59 – 61 | No |
| 10 – Woodlawn/Sunset Subdivision | 52 - 70 | Yes |
| 11 – Old Woodlawn Avenue | 62 - 64 | No |

Noise abatement was examined for those areas experiencing a traffic noise impact. See **Section F**.

F. Noise Abatement Measures

1. Potential Traffic Noise Abatement Measures

Potential traffic noise abatement measures which may be considered for the project include the following:

- Construction of noise barriers within the proposed right-of-way
- Modifying the proposed horizontal and/or vertical alignment of the roadway
- Acquisition of property to serve as a buffer zone to preempt development that would be adversely impacted by traffic noise
- Modifying speed limits
- Restricting truck traffic
- Noise insulation of public use or non-profit institutional structures, such as churches and public schools.

Of the above mitigation measures, the noise barrier option is usually the most practical, reasonable, and effective choice. Modification of roadway horizontal or vertical alignments for the purpose of noise reduction is typically practical only for new roadway projects. The project is the improvement of an existing facility. Significant changes to the roadway alignment or profile are neither necessary to accomplish the project's purpose and need nor consistent with the existing design. Since the sensitive receptors are already fairly close or adjacent to the highway, acquisition of private property to act as buffer zone would not be practical. Lowering speed limits or restricting truck traffic would be inconsistent with the project purpose. Public use or non-profit institutional structures, where noise insulation is effective, do not exist within the study area.

2. Barrier Analysis – Feasibility

For the receptors that would experience a traffic noise impact, a barrier analysis was conducted. To be recommended for further consideration, a barrier must be both feasible and reasonable. MoDOT defines feasibility as:

Feasibility is the ability to provide abatement in a given location considering the acoustic and engineering limitations of the site. Acoustic feasibility refers to noise abatement measure(s) ability to achieve the minimum noise reduction at impacted receptors. MoDOT requires at least a 5 dBA insertion loss for a minimum of 67 percent of first-row, impacted receivers for noise abatement to be considered feasible. Engineering feasibility refers primarily to physical constraints and other constructability constraints, such as topography, access, drainage, safety, maintenance, and presence of other noise sources. In general, if these factors are too extreme or cannot be accommodated in providing the minimum noise reduction, noise abatement will be deemed unfeasible. For reasons of safety (primarily wind load and clear space concerns), a noise wall's height is limited to 20 feet. This criterion alone cannot be used to consider noise abatement unreasonable.

The noise analysis identified the first row receivers and evaluated if a 20-foot noise barrier could achieve a 5 dBA insertion loss for 67 percent of the impacted first row receivers (approaching/ exceeding NAC) first row receivers.

The summary of the feasibility analysis is contained in **Table 6**. Four noise study areas were able to achieve the minimum feasibility requirements. The feasible barriers will be examined further, for reasonableness (see **Section F.3**). The complete feasibility analysis is contained in **Appendix B**.

TABLE 6
Feasibility Summary for Future Peak-Hour Noise Conditions

| Noise Study Area | First Row Impacted Receivers (Dwelling Units or equivalent) | Impacted First Row Receivers Receiving a 5 dBA Insertion Loss from a Maximum Height Barrier (20') | | Is a Noise Barrier Feasible? |
|--|---|---|------------|------------------------------|
| | | Number | Percentage | |
| 1 - Veterans Walk Memorial | No Traffic Noise Impacts | | | |
| 2 – Evelyen Farmstead | No Traffic Noise Impacts | | | |
| 3a – Hilltop Manor Subdivision (Version 1) | 23 | 2 | 9% | No |
| 3b – Hilltop Manor Subdivision (Version 2) | 23 | 23 | 100% | YES |
| 3c – Hilltop Manor Subdivision (Version 3) | 23 | 2 | 9% | No |
| 4 – Gardenview Senior Center | N/A - No Front Row Areas of Frequent Human Use | | | |
| 5 – Fort Zumwalt MS Ballfields | 6 | 3 | 75% | YES |
| 6 – Highland Terrace Subdivision | 4 | 4 | 100% | YES |
| 7 – Isolated Main Street Residences | No Traffic Noise Impacts | | | |
| 8 – Terra Mariae Subdivision | 3 | 1 | 33% | No |
| 9 – Falloncrest Townhouses | No Traffic Noise Impacts | | | |
| 10 – Woodlawn/Sunset Subdivision | 3 | 3 | 100% | Yes |
| 11 – Old Woodlawn Avenue | No Traffic Noise Impacts | | | |

3. Barrier Analysis – Reasonableness

For the receptors that could achieve the feasibility standard, barrier analysis was continued to investigate reasonableness. To be recommended for further consideration, a barrier must be both feasible and reasonable. MoDOT defines reasonableness as:

Noise abatement measures shall not exceed 1,300 square feet per benefitted receptor.

Noise abatement measures must provide a benefit of a minimum of 7 dBA for 67 percent of first-row receptors.

The reasonableness noise analysis identified the first row receivers and evaluated if a 20-foot noise barrier could achieve a 7 dBA insertion loss for first row receivers. If first row receivers could achieve the 7 dBA goal, the barrier would be optimized to determine if the 1,300 square foot limit could be achieved.

The summary of the reasonableness analysis is contained in **Table 7**. The complete reasonableness analysis is contained in **Appendix B**.

TABLE 7
Reasonableness Summary for Future Peak-Hour Noise Conditions

| Noise Study Area | Benefitted First Row Receivers with 20-foot (or Optimum) Noise Barriers | Square Feet of Barrier per Benefitted Receptor with 20-foot (or Optimum) Noise Barriers | Is a Noise Barrier Reasonable? |
|--|---|---|--------------------------------|
| 1 - Veterans Walk Memorial | No Traffic Noise Impacts | | |
| 2 - Evelyen Farmstead | No Traffic Noise Impacts | | |
| 3a - Hilltop Manor Subdivision (Version 1) | 0 of 23 (0%) | NA | No |
| 3b - Hilltop Manor Subdivision (Version 2) | 22 of 23 (96%) ³ | 1,120 square feet | YES |
| 3c - Hilltop Manor Subdivision (Version 3) | 0 of 23 (0%) | NA | No |
| 4 - Gardenview Senior Center | N/A - No Front Row Areas of Frequent Human Use | | |
| 5 - Fort Zumwalt MS ballfields | 3 of 4 (75%) | 2,572 | No |
| 6 - Highland Terrace Subdivision | 3 of 4 (75%) | 1,950 square feet | No |
| 7 - Isolated Main Street Residences | No Traffic Noise Impacts | | |
| 8 - Terra Mariae Subdivision | Not Feasible | | |
| 9 - Falloncrest Townhouses | No Traffic Noise Impacts | | |
| 10 - Woodlawn/Sunset Subdivision | 0 of 3 (0%) | NA | No |
| 11 - Old Woodlawn Avenue | No Traffic Noise Impacts | | |

Each of the remaining noise barrier assessments are summarized below:

Hilltop Manor Subdivision – Noise Barrier Feasible and Reasonable

The only noise barrier that is both feasible and reasonable exists in the Hilltop Manor subdivision. Several barrier iterations were considered. Noise Barrier Version 1 is a one piece I-70 barrier with partial coverage, Noise Barrier Version 2 is a three piece barrier along outer road and Noise Barrier Version 3 is two piece I-70 barrier with full coverage.

The barriers along I-70 (versions 1 and 3) were not reasonable (with the maximum 20-foot barrier). Both Versions were unable to achieve a 7 dBA insertion loss at any of the first row impacts receivers. Version 2 was able to achieve a 7 dBA insertion loss at all of the impacted first row receivers (with the maximum 20-foot barrier).

³ A uniform 12-foot barrier is used here. The barrier can be further optimized to reduce the cost per benefitted dwelling unit.

The optimization process was able to achieve a cost per benefitted dwelling unit under 1,300 square feet.

- Using a uniform 12-foot barrier benefits 22 of 23 first row dwelling units (96%). This barrier is 2,053 feet long, averaging 12 feet tall. This results in a barrier with 1,120 square foot of barrier per benefitted receiver.
- The QC team developed an optimized version that also benefits 22 of 23 first row dwelling units. This barrier is 2,028 feet long, averaging 10.89 feet tall. This results in a barrier with 1,004 square foot of barrier per benefitted receiver. This barrier varies from 6 to 14 feet tall. The western-most barrier is 11.24-feet tall. The center barrier is 10.28 feet tall. The eastern-most barrier is 11.48 feet tall.
- The maximum optimization occurs with a barrier that is 2,028 feet long with a height of 10.69 feet. This results in a barrier with 985 square foot of barrier per benefitted receiver.



Noise Barrier Analysis

The complete reasonability analysis is contained in **Appendix B**. Existing and Future noise levels for all Noise Study Areas are presented in a single table. Traffic noise impacts are highlighted in red. The barrier analysis for each impacted Noise Study Area is also summarized in individual tables in **Appendix B**.

Consequently, a reasonable barrier can be created along the outer road in the vicinity of the Hilltop Manor subdivision.

Fort Zumwalt Middle School Ballfields - Noise Barrier Feasible but Not Reasonable

As ballfields, there are no dwelling units. The equivalent receptors were calculated using one dwelling unit per 100 feet of road frontage. The roadway frontage is approximately 400-feet, therefore a total of four first-row equivalent receptors are assumed. With a 20-foot maximum barrier, 3 of 4 (75%) of these receivers achieve a 7 dBA insertion loss. The optimized version of this barrier averages 17 feet tall and 454 feet long. This results in a barrier with 2,572 square foot of barrier per benefitted receiver. Consequently, a reasonable barrier cannot be created.

Highland Terrace Subdivision - Noise Barrier Feasible but Not Reasonable

There are a total of three of the four (75%) first row dwelling units receive at least 7 dBA of insertion loss with a 800-foot long/20-foot tall barrier. The optimized version of this barrier is 700 feet long, averaging 11.14 feet tall. In addition to the three first row that receive at least 7 dBA, another receiver does as well. This results in a barrier with 1,950 square foot of barrier per benefitted receiver. Consequently, a reasonable barrier cannot be created.

Woodlawn/Sunset Subdivision - Noise Barrier Feasible but Not Reasonable

While all three first row dwelling units receive at least 5 dBA of insertion loss with a 20-foot tall barrier (therefore feasible) none receive 7 dBA of insertion loss. Consequently, a reasonable barrier cannot be created.

G. Undeveloped Lands

There is relatively little undeveloped land within the study area. **Exhibit 3** shows the areas of undeveloped properties. These areas are summarized below:

- Between 440 and 448 Vine Street – This is a vacant residential lot in the Hill Top Manor subdivision. *This lot was not as a Dwelling Unit in the barrier analysis. Given the age and nature of the neighborhood, construction of a new residence seems unlikely. Inclusion does not alter the results of the barrier analysis.*
- 702 Highland Drive - This is a vacant residential lot in the Highland Terrace subdivision. *This lot is added as a Dwelling Unit in the barrier analysis. The size of the lot makes the construction of a new residence unlikely. Inclusion does not alter the results of the barrier analysis.*
- Adjacent to 8355 Veterans Memorial Parkway and 711 Sonderson Street – This is an area currently in agriculture. Coordination with the City of O’Fallon determined that there are no approved development plans. The informal plans are to incorporate this area into O’Fallon and to develop the site as a commercial site.
- Along Nicola Drive – This is the former site of the Laclede Mobile Home Park. The site is completely closed. Coordination with the City of O’Fallon determined that there are no approved development plans of this site.
- Adjacent to the Evelyn Farmstead (Noise Study Area #2 – This is an agricultural area in the southwest quadrant of the TR Hughes interchange. Coordination with the City of O’Fallon determined that there are no approved development plans.



Typical view of the abandoned Laclede Mobile Home Park

H. Construction Noise

During the project construction phase, noise from construction activities would add to the noise environment in the immediate project area. The Noise Study Areas shown in **Exhibit 1** represent the land uses that may be potentially impacted by construction noise.

Activities involved in construction would generate noise levels, as indicated in **Table 8**, ranging from 82 to 86 dBA at a distance of 100 feet. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours. Construction noise impacts could result in annoyance or sleep disruption, if nighttime operations occur or if unusually noisy equipment is used. Construction operations will adhere to any local construction noise ordinances.

TABLE 8
Construction Equipment Noise

| Construction Phase | Loudest Equipment | Maximum Sound Level at 30 Meters (100 Feet) (dBA) |
|-----------------------|--------------------|---|
| Clearing and Grubbing | Bulldozer, backhoe | 83 dBA |
| Earthwork | Scraper, bulldozer | 85 dBA |
| Foundation | Backhoe, loader | 82 dBA |
| Base Preparation | Truck, bulldozer | 85 dBA |
| Paving | Paver, truck | 86 dBA |

Source: U.S. Department of Transportation, 1977.

Noise would also be generated during the construction phase by increased truck traffic on some local area roadways associated with transport of heavy materials and equipment. This noise increase would be of short duration and would occur primarily during daytime hours.

Although construction noise impacts would be temporary, the following standard measures are recommended to minimize such impacts.

- Whenever possible, limit operation of heavy equipment and other noisy procedures to the daylight hours.
- Install and maintain effective mufflers on equipment.
- Locate equipment and vehicle staging areas as far from residential areas as possible.
- Limit unnecessary idling of equipment.

I. Conclusions and Recommendations

The proposed improvement of I-70 will moderately increase the already high traffic noise levels. Many of the existing noise sensitive land uses experience traffic noise impacts.

A total of 11 Noise Study Areas were established to represent the sensitive land uses in the vicinity of the I-70 (K) project.

Traffic noise level measurements were conducted at seven locations. The monitoring locations are representative of the sensitive receptors. The purpose of this data collection is primarily for model validation purposes. Existing measured noise levels adjacent to I-70 vary between 59.6 and 81.2 dBA.

The TNM input files were developed using the existing and proposed roadway geometry, surrounding terrain and building zones. Traffic counts, vehicle distribution and speeds were obtained from the design plans. Using the noise monitoring data, the accuracy of the TNM files were validated.

Due to their close proximity to I-70, many locations approach or exceed the Noise Abatement Criteria. The noise levels predicted during the existing condition and the

Preferred Alternative are very similar. Based on the modeled traffic noise conditions, a traffic noise impact was identified for the following Noise Study Areas:

- Hilltop Manor Subdivision
- Fort Zumwalt North Middle School
- Highland Terrace Subdivision
- Terra Mariae Subdivision
- Woodlawn/Sunset Subdivision

For the Noise Study Areas that would experience a traffic noise impact, a barrier analysis was conducted. To be recommended for further consideration, a barrier must be both feasible and reasonable. *MoDOT* requires at least a 5 dBA insertion loss for a minimum of 67 percent of first-row, impacted receivers for noise abatement to be considered feasible. All of the Noise Study Areas were able to achieve the minimum feasibility requirements.

For the Noise Study Areas that could achieve the feasibility standard, barrier analysis was continued to investigate reasonableness. *MoDOT* defines reasonableness the ability for noise barriers to achieve a maximum of 1,300 square feet per benefitted receptor and must provide a benefit of a minimum of 7 dBA for 67 percent of first-row receptors.

The only noise barrier that is both feasible and reasonable exists in the Hilltop Manor subdivision. Several barrier iterations were considered. Noise Barrier Version 1 is a one piece I-70 barrier with partial coverage, Noise Barrier Version 2 is a three piece barrier along outer road and Noise Barrier Version 3 is two piece I-70 barrier with full coverage.

Only Version 2 is both feasible and reasonable. Final recommendations will be made after final design and the public involvement are complete.

Construction noise is not expected to be a substantial issue.



Final Noise Barrier Determination

The only noise barrier that is both feasible and reasonable exists in the Hilltop Manor subdivision (Version 2).

J. References

Code of Federal Regulations [CFR], Title 23 CFR Part 772 -- Procedures for Abatement of Highway Traffic Noise and Construction Noise. 1992.

Missouri Department of Transportation, Section 127.13 Noise from the Engineering Policy Guide. 2016.

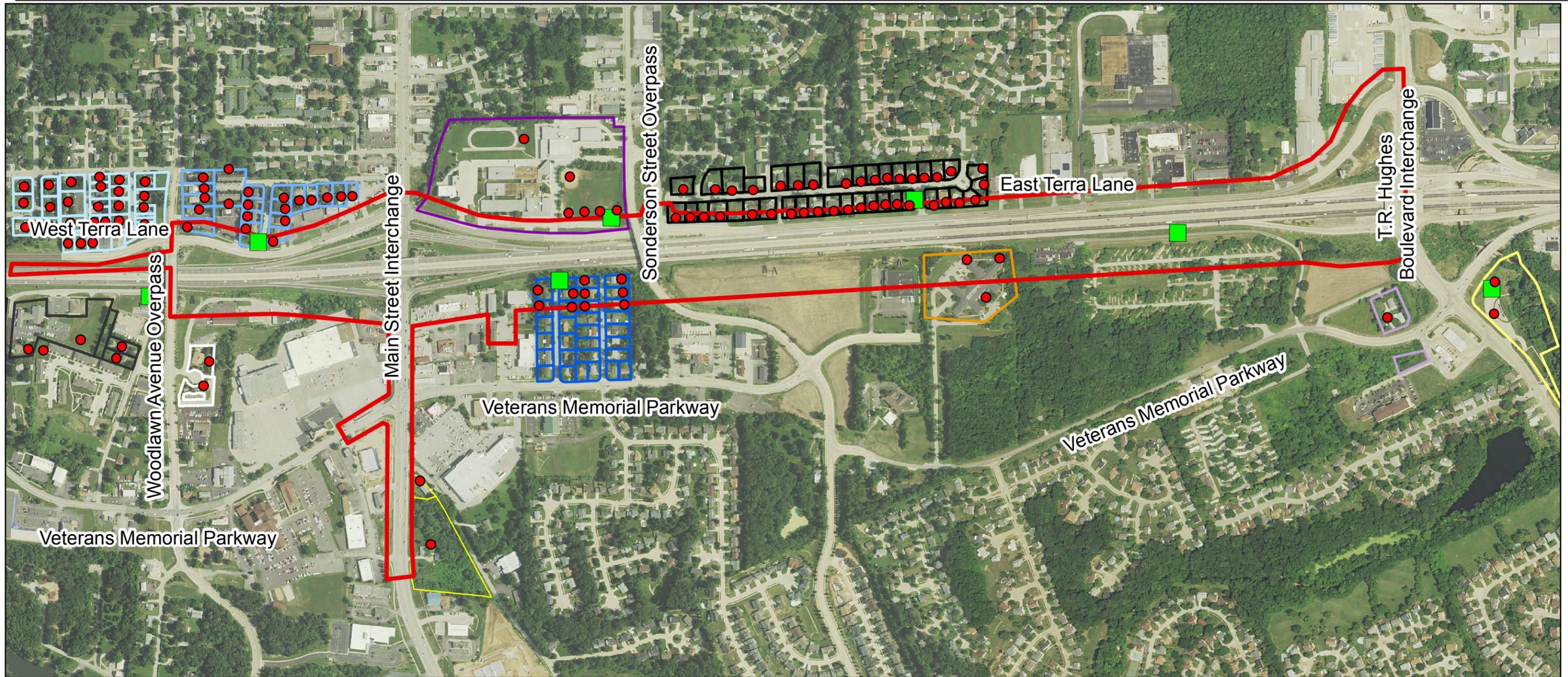
U.S. Department of Transportation. *Highway Construction Noise: Measurement, Prediction, and Mitigation*. 1977.

U.S. Department of Transportation, Federal Highway Administration. *FHWA Traffic Noise Model User's Guide*. Report No. FHWA-PD-96-009. Federal Highway Administration, Washington D.C., January 1998.

FHWA Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. Federal Highway Administration, Washington D.C., February 1998.

Technical Advisory T6640.8A -- Guidance for Preparing and Processing Environmental and Section 4(F) Documents. 1987.

Appendix A
Exhibits

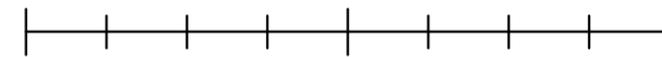


- Notes:
1. Area of interest subject to change.
 2. Dwelling Units/Equivalent Receptors shown in Appendix D.
 3. Individual TNM models constructed for each NSA.

- LEGEND
- Noise Receivers
 - Noise Monitoring Locations
 - ▭ Study Area
- Noise Study Areas**
- ▭ Old Woodlawn Avenue
 - ▭ Woodlawn/Sunset Subdivision
 - ▭ Veterans Memorial Walk
 - ▭ Evelyn Farmstead
 - ▭ Hilltop Manor Subdivision
 - ▭ Gardenview Senior Center
 - ▭ Fort Zumwalt North Middle School
 - ▭ Highland Terrace Subdivision
 - ▭ Isolated Main Street Homes
 - ▭ Terra Marie Subdivision
 - ▭ Falloncrest Townhouses



0 0.1 0.2 0.4 Miles



1 in = 600 ft

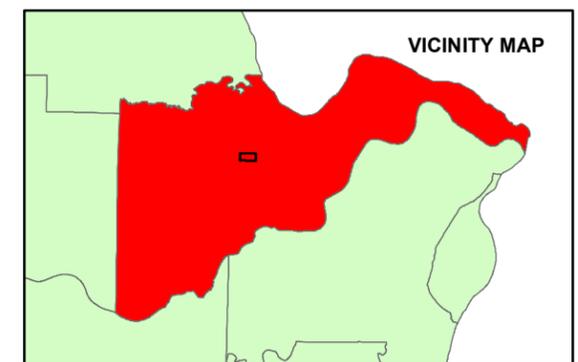
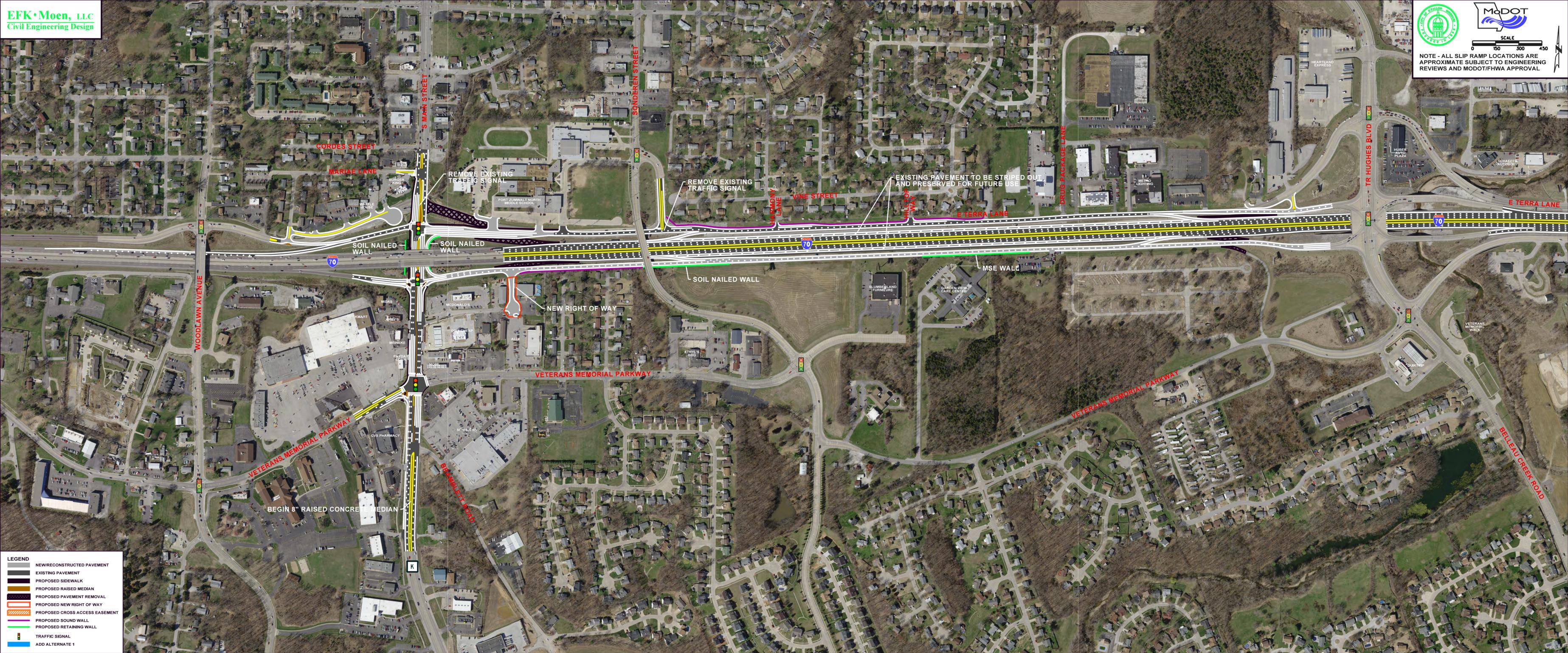
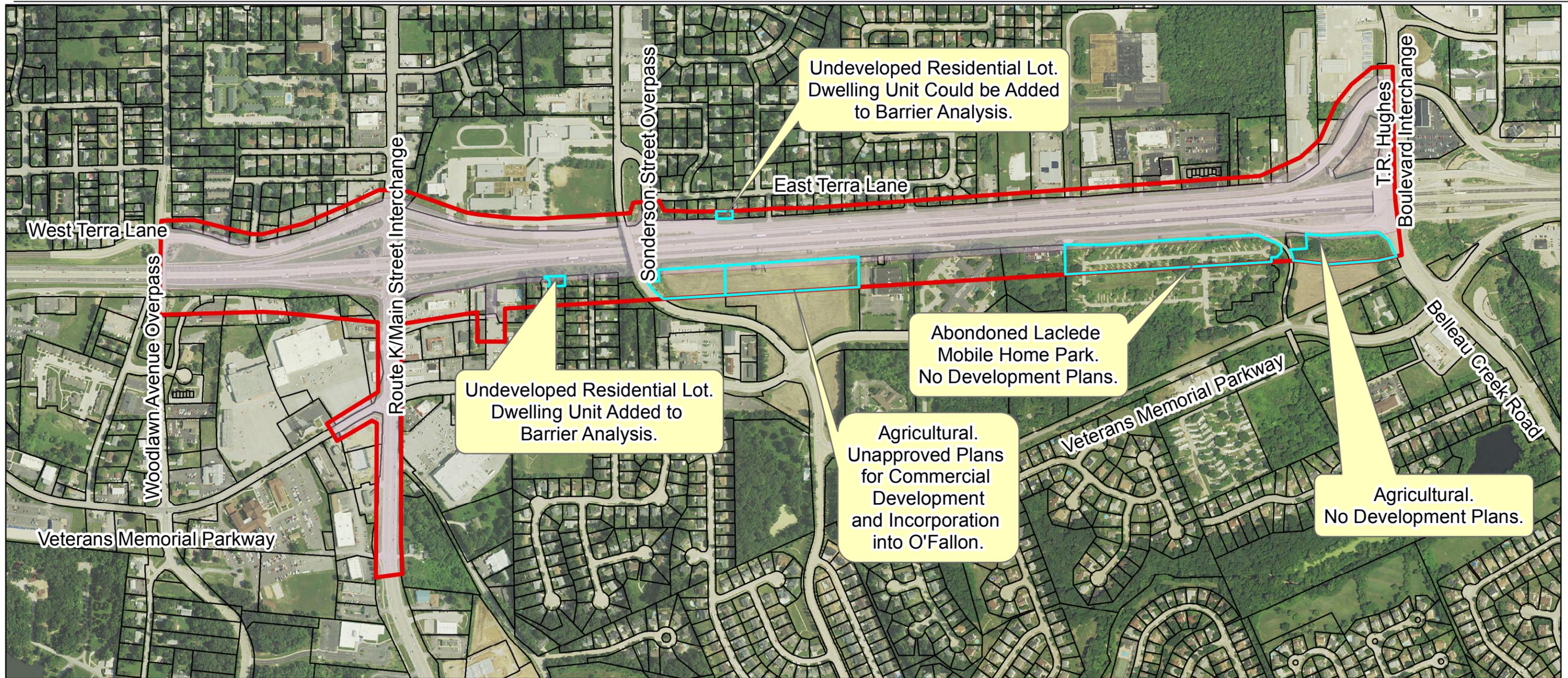


EXHIBIT 1
Noise Sensitive Land Uses and Modeling Receivers
I-70 (K) Categorical Exclusion





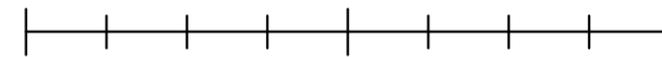
- LEGEND**
-  NEW/RECONSTRUCTED PAVEMENT
 -  EXISTING PAVEMENT
 -  PROPOSED SIDEWALK
 -  PROPOSED RAISED MEDIAN
 -  PROPOSED PAVEMENT REMOVAL
 -  PROPOSED NEW RIGHT OF WAY
 -  PROPOSED CROSS ACCESS EASEMENT
 -  PROPOSED SOUND WALL
 -  PROPOSED RETAINING WALL
 -  TRAFFIC SIGNAL
 -  ADD ALTERNATE 1



Notes:
 1.
 2.
 3.

LEGEND
 Study Area
 Construction Area
 Parcels

0 0.1 0.2 0.4 Miles



1 in = 600 ft

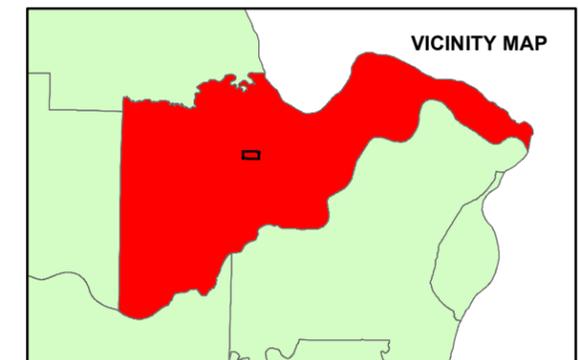


EXHIBIT 3
 Undeveloped Properties
 I-70 (K) Categorical Exclusion



Appendix B
Predicted Existing/Future Noise Levels

| Exhibit B-1. Predicted Existing/Future Noise Levels | | | | | | | | | | |
|---|------------|----------------------------|-----------------|-------------------------|---|--|--------------------------------|--------------------------------------|------------------------------------|----------------------------------|
| I-70 (K) Improvement Project | | | | | | | | | | |
| Noise Study Area | Receiver # | Address | Land Use | Activity Category (NAC) | Number of Dwelling Units / Equivalent Receptors | Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA | | | | |
| | | | | | | Existing Noise Level - PM Peak | Existing Noise Level - AM Peak | Existing Peak AM vs. Peak PM Volumes | Future/Build Noise Level - PM Peak | Increase over Existing (PM Peak) |
| 1 - Veterans Walk Memorial | 1 | Veterans Memorial Parkway | Public Space | C (67) | <i>ibid</i> | 57.7 | 57.5 | -0.2 | 60.7 | 3.0 |
| | 2 | Veterans Memorial Parkway | Public Space | C (67) | <i>ibid</i> | 60.7 | 60.6 | -0.1 | 64 | 3.3 |
| 2 - Evelyn Homestead | 1 | 8105 Veterans Memorial Pky | SF Residence | B (67) | 1 | 58.3 | 57.6 | -0.7 | 59.4 | 1.1 |
| 3 - Hilltop Manor Subdivision | 1 | 432 Vine Street | SF Residence | B (67) | 1 | 71.0 | 70.6 | -0.4 | 72.8 | 1.8 |
| | 2 | 436 Vine Street | Duplex | B (67) | 2 | 69.0 | 68.6 | -0.4 | 70.8 | 1.8 |
| | 3 | 438 Vine Street | SF Residence | B (67) | 1 | 68.3 | 67.9 | -0.4 | 70.2 | 1.9 |
| | 4 | 440 Vine Street | SF Residence | B (67) | 1 | 67.9 | 67.5 | -0.4 | 69.7 | 1.8 |
| | 5 | 448 Vine Street | SF Residence | B (67) | 1 | 69.4 | 69.0 | -0.4 | 70.7 | 1.3 |
| | 6 | 452 Vine Street | SF Residence | B (67) | 1 | 69.8 | 69.3 | -0.5 | 70.8 | 1.0 |
| | 7 | 502 Vine Street | SF Residence | B (67) | 1 | 75.1 | 74.7 | -0.4 | 75.9 | 0.8 |
| | 8 | 504 Vine Street | SF Residence | B (67) | 1 | 75.1 | 74.7 | -0.4 | 75.8 | 0.7 |
| | 9 | 506 Vine Street | SF Residence | B (67) | 1 | 75.3 | 74.9 | -0.4 | 76 | 0.7 |
| | 10 | 510 Vine Street | SF Residence | B (67) | 1 | 75.6 | 75.2 | -0.4 | 76.4 | 0.8 |
| | 11 | 514 Vine Street | Duplex | B (67) | 2 | 74.8 | 74.4 | -0.4 | 75.6 | 0.8 |
| | 12 | 606 Vine Street | SF Residence | B (67) | 1 | 74.7 | 74.3 | -0.4 | 75.6 | 0.9 |
| | 13 | 608 Vine Street | SF Residence | B (67) | 1 | 74.1 | 73.7 | -0.4 | 75 | 0.9 |
| | 14 | 610 Vine Street | SF Residence | B (67) | 1 | 73.8 | 73.4 | -0.4 | 74.7 | 0.9 |
| | 15 | 612 Vine Street | SF Residence | B (67) | 1 | 74.2 | 73.8 | -0.4 | 75 | 0.8 |
| | 16 | 603 Hilltop Way | SF Residence | B (67) | 1 | 75.1 | 74.7 | -0.4 | 75.9 | 0.8 |
| | 17 | 602 Hilltop Way | SF Residence | B (67) | 1 | 75.3 | 74.9 | -0.4 | 76.2 | 0.9 |
| | 18 | 704 Vine Street | SF Residence | B (67) | 1 | 74.5 | 74.1 | -0.4 | 75 | 0.5 |
| | 19 | 706 Vine Street | SF Residence | B (67) | 1 | 74.8 | 74.5 | -0.3 | 75.5 | 0.7 |
| | 20 | 708 Vine Street | SF Residence | B (67) | 1 | 75.3 | 74.9 | -0.4 | 75.7 | 0.4 |
| | 21 | 514 Duchesne Street | SF Residence | B (67) | 1 | 68.9 | 68.5 | -0.4 | 68.5 | -0.4 |
| | 22 | 512 Duchesne Street | SF Residence | B (67) | 1 | 65.2 | 64.8 | -0.4 | 64.7 | -0.5 |
| | 23 | 509 Duchesne Street | SF Residence | B (67) | 1 | 63.7 | 63.2 | -0.5 | 63.9 | 0.2 |
| | 24 | 703 Vine Street | SF Residence | B (67) | 1 | 64.1 | 63.7 | -0.4 | 64.3 | 0.2 |
| | 25 | 701 Vine Street | SF Residence | B (67) | 1 | 64.5 | 64.0 | -0.5 | 64.6 | 0.1 |
| | 26 | 615 Vine Street | SF Residence | B (67) | 1 | 64.6 | 64.1 | -0.5 | 64.9 | 0.3 |
| | 27 | 613 Vine Street | SF Residence | B (67) | 1 | 64.1 | 63.7 | -0.4 | 64.8 | 0.7 |
| | 28 | 611 Vine Street | SF Residence | B (67) | 1 | 64.2 | 63.7 | -0.5 | 64.7 | 0.5 |
| | 29 | 609 Vine Street | SF Residence | B (67) | 1 | 64.0 | 63.5 | -0.5 | 64.4 | 0.4 |
| | 30 | 607 Vine Street | SF Residence | B (67) | 1 | 63.6 | 63.2 | -0.4 | 64.1 | 0.5 |
| | 31 | 522 Lindenwood Avenue | SF Residence | B (67) | 1 | 64.7 | 64.2 | -0.5 | 65 | 0.3 |
| | 32 | 511 Vine Street | SF Residence | B (67) | 1 | 65.1 | 64.6 | -0.5 | 65.3 | 0.2 |
| | 33 | 507 Vine Street | SF Residence | B (67) | 1 | 64.8 | 64.3 | -0.5 | 64.6 | -0.2 |
| | 34 | 518 Harmony Lane | Duplex | B (67) | 2 | 63.5 | 62.9 | -0.6 | 64.1 | 0.6 |
| | 35 | 525 Harmony Lane | SF Residence | B (67) | 1 | 63.6 | 63.1 | -0.5 | 64.4 | 0.8 |
| | 36 | 441 Vine Street | SF Residence | B (67) | 1 | 65.6 | 65.1 | -0.5 | 66.2 | 0.6 |
| | 37 | 439 Vine Street | SF Residence | B (67) | 1 | 67.0 | 66.5 | -0.5 | 67.7 | 0.7 |
| | 38 | 435 Vine Street | SF Residence | B (67) | 1 | 67.0 | 66.5 | -0.5 | 67.9 | 0.9 |
| 4- Gardenview Senior Center | 1 | 700 Garden Path | Group Residence | C (67) | <i>ibid</i> | 69.0 | 68.1 | -0.9 | 68.1 | -0.9 |
| | 2 | 700 Garden Path | Group Residence | C (67) | <i>ibid</i> | 68.4 | 67.5 | -0.9 | 68.2 | -0.2 |
| | 3 | 700 Garden Path | Group Residence | C (67) | <i>ibid</i> | 49.8 | 49.2 | -0.6 | 50.5 | 0.7 |
| 5 - Fort Zumwalt North Middle School | 1 | 210 Virgil Street | Recreation Area | C (67) | 1 | 68.1 | 67.6 | -0.5 | 68.4 | 0.3 |
| | 2 | 210 Virgil Street | Recreation Area | C (67) | 1 | 70.9 | 70.4 | -0.5 | 70.7 | -0.2 |
| | 3 | 210 Virgil Street | Recreation Area | C (67) | 1 | 71.7 | 71.2 | -0.5 | 71.7 | 0.0 |
| | 4 | 210 Virgil Street | Recreation Area | C (67) | 1 | 70.6 | 70.2 | -0.4 | 70.8 | 0.2 |
| | 5 | 210 Virgil Street | Recreation Area | C (67) | 1 | 61.5 | 60.9 | -0.6 | 61.9 | 0.4 |
| | 6 | 210 Virgil Street | Recreation Area | C (67) | 1 | 57.8 | 57.9 | 0.1 | 58.6 | 0.8 |
| 6 - Highland Terrace Subdivision | 1 | 702 Plaza Drive | SF Residence | B (67) | 1 | 74.2 | 73.2 | -1.0 | 76 | 1.8 |
| | 2 | 701 Plaza Drive | SF Residence | B (67) | 1 | 74.0 | 73.1 | -0.9 | 75.8 | 1.8 |
| | 3 | 704 Highland Drive | SF Residence | B (67) | 1 | 69.6 | 68.8 | -0.8 | 71.1 | 1.5 |
| | 4 | 701 Highland Drive | SF Residence | B (67) | 1 | 72.7 | 72.1 | -0.6 | 73.5 | 0.8 |
| | 5 | 703 Highland Drive | SF Residence | B (67) | 1 | 67.6 | 67.0 | -0.6 | 69.3 | 1.7 |
| | 6 | 706 Highland Drive | SF Residence | B (67) | 1 | 66.0 | 65.3 | -0.7 | 67.5 | 1.5 |
| | 7 | 703 Plaza Drive | SF Residence | B (67) | 1 | 69.0 | 68.2 | -0.8 | 70.3 | 1.3 |
| | 8 | 704 Plaza Drive | SF Residence | B (67) | 1 | 69.2 | 68.4 | -0.8 | 70.6 | 1.4 |
| | 9 | 706 Plaza Drive | SF Residence | B (67) | 1 | 64.9 | 64.2 | -0.7 | 66.4 | 1.5 |
| | 10 | 705 Plaza Drive | SF Residence | B (67) | 1 | 65.6 | 64.9 | -0.7 | 66.9 | 1.3 |
| 7 - Isolated Main Street Residences | 1 | 815 Bramblett Road | SF Residence | B (67) | 1 | 64.7 | 64.6 | -0.1 | 65.6 | 0.9 |
| | 2 | 914 Highway K | SF Residence | B (67) | 1 | 59.6 | 59.4 | -0.2 | 60.6 | 1.0 |

| Exhibit B-1. Predicted Existing/Future Noise Levels | | | | | | | | | | |
|---|------------|-------------------------|------------------|-------------------------|---|---|--------------------------------|--------------------------------------|------------------------------------|----------------------------------|
| I-70 (K) Improvement Project | | | | | | | | | | |
| Noise Study Area | Receiver # | Address | Land Use | Activity Category (NAC) | Number of Dwelling Units / Equivalent Receptors | Future Worst Hour Noise Levels - L _{eq} (h), dBA | | | | |
| | | | | | | Existing Noise Level - PM Peak | Existing Noise Level - AM Peak | Existing Peak AM vs. Peak PM Volumes | Future/Build Noise Level - PM Peak | Increase over Existing (PM Peak) |
| 8 - Terra Mariae Subdivision | 1 | 112 Mariae Lane | SF Residence | B (67) | 1 | 67.0 | 67.1 | 0.1 | 67.3 | 0.3 |
| | 2 | 114 Mariae Lane | SF Residence | B (67) | 1 | 67.1 | 67.2 | 0.1 | 67.3 | 0.2 |
| | 3 | 116 Mariae Lane | SF Residence | B (67) | 1 | 66.7 | 66.9 | 0.2 | 66.9 | 0.2 |
| | 4 | 204 Mariae Lane | SF Residence | B (67) | 1 | 67.4 | 68.3 | 0.9 | 67.4 | 0.0 |
| | 5 | 206 Mariae Lane | SF Residence | B (67) | 1 | 66.9 | 68.4 | 1.5 | 66.9 | 0.0 |
| | 6 | 210 Mariae Lane | SF Residence | B (67) | 1 | 66.5 | 67.8 | 1.3 | 66.7 | 0.2 |
| | 7 | 610 School Street | SF Residence | B (67) | 1 | 67.0 | 68.5 | 1.5 | 67 | 0.0 |
| | 8 | 612 School Street | SF Residence | B (67) | 1 | 68.9 | 69.9 | 1.0 | 69 | 0.1 |
| | 9 | 614 School Street | SF Residence | B (67) | 1 | 72.7 | 73.1 | 0.4 | 72.8 | 0.1 |
| | 10 | 613 School Street | SF Residence | B (67) | 1 | 66.3 | 66.6 | 0.3 | 66.3 | 0.0 |
| | 11 | 611 School Street | SF Residence | B (67) | 1 | 60.8 | 61.1 | 0.3 | 60.8 | 0.0 |
| | 12 | 609 School Street | SF Residence | B (67) | 1 | 59.2 | 59.8 | 0.6 | 59.2 | 0.0 |
| | 13 | 607 School Street | SF Residence | B (67) | 1 | 58.7 | 59.9 | 1.2 | 58.6 | -0.1 |
| | 14 | 301 Mariae Lane | MF Residences | B (67) | 8 | 59.5 | 61.0 | 1.5 | 59.4 | -0.1 |
| | 15 | 301 Mariae Lane | MF Residences | B (67) | 8 | 60.0 | 60.7 | 0.7 | 60 | 0.0 |
| | 16 | 610 Woodlawn Avenue | SF Residence | B (67) | 1 | 64.0 | 64.1 | 0.1 | 64.1 | 0.1 |
| | 17 | 608 Woodlawn Avenue | SF Residence | B (67) | 1 | 62.3 | 62.7 | 0.4 | 62.3 | 0.0 |
| | 18 | 606 Woodlawn Avenue | SF Residence | B (67) | 1 | 60.8 | 61.4 | 0.6 | 60.8 | 0.0 |
| | 19 | 604 Woodlawn Avenue | SF Residence | B (67) | 1 | 58.9 | 59.7 | 0.8 | 58.9 | 0.0 |
| | 20 | 602 Woodlawn Avenue | SF Residence | B (67) | 1 | 57.7 | 58.1 | 0.4 | 57.7 | 0.0 |
| 9 - Falloncrest Townhouse | 1 | 339 J Mark Court | MF Residences | B (67) | 8 | 59.9 | 59.5 | -0.4 | 61.3 | 1.4 |
| | 2 | 330 J Mark Court | MF Residences | B (67) | 6 | 58.6 | 58.2 | -0.4 | 59.2 | 0.6 |
| 10 - Woodlawn/ Sunset Subdivision | 1 | 430 Hembrook Street | SF Residence | B (67) | 1 | 69.2 | 68.8 | -0.4 | 69.5 | 0.3 |
| | 2 | 432 Hembrook Street | SF Residence | B (67) | 1 | 69.7 | 69.2 | -0.5 | 70.0 | 0.3 |
| | 3 | 434 Hembrook Street | SF Residence | B (67) | 1 | 69.4 | 69.0 | -0.4 | 69.6 | 0.2 |
| | 4 | 618 O'Fallon Avenue | SF Residence | B (67) | 1 | 63.2 | 63.6 | 0.4 | 63.3 | 0.1 |
| | 5 | 615 O'Fallon Street | SF Residence | B (67) | 1 | 61.2 | 60.6 | -0.6 | 61.6 | 0.4 |
| | 6 | 431 Hembrook Street | SF Residence | B (67) | 1 | 59.6 | 59.2 | -0.4 | 59.9 | 0.3 |
| | 7 | 429 Hembrook Street | SF Residence | B (67) | 1 | 59.4 | 59.1 | -0.3 | 59.6 | 0.2 |
| | 8 | 430 Cordes Avenue | SF Residence | B (67) | 1 | 62.8 | 61.8 | -1.0 | 62.9 | 0.1 |
| | 9 | 611 Westhoff Street | SF Residence | B (67) | 1 | 56.4 | 55.2 | -1.2 | 56.8 | 0.4 |
| | 10 | 608 Westhoff Street | SF Residence | B (67) | 1 | 56.5 | 55.9 | -0.6 | 57.2 | 0.7 |
| | 11 | 609 O'Fallon Street | SF Residence | B (67) | 1 | 54.4 | 53.0 | -1.4 | 54.9 | 0.5 |
| | 12 | 612 O'Fallon Avenue | SF Residence | B (67) | 1 | 58.0 | 58.7 | 0.7 | 59.1 | 1.1 |
| | 13 | 606 O'Fallon Avenue | SF Residence | B (67) | 1 | 56.1 | 56.9 | 0.8 | 57.1 | 1.0 |
| | 14 | 414 Cordes Avenue | MF Residence | B (67) | 8 | 55.0 | 55.4 | 0.4 | 56.3 | 1.3 |
| | 15 | 605 O'Fallon Street | MF Residence | B (67) | 8 | 54.3 | 53.4 | -0.9 | 54.9 | 0.6 |
| | 16 | 606 Westhoff Street | SF Residence | B (67) | 1 | 54.8 | 53.6 | -1.2 | 55.3 | 0.5 |
| | 17 | 601 O'Fallon Street | SF Residence | B (67) | 1 | 53.5 | 52.8 | -0.7 | 54.2 | 0.7 |
| | 18 | 602 Westhoff Street | SF Residence | B (67) | 1 | 53.8 | 53.0 | -0.8 | 54.5 | 0.7 |
| | 19 | 430 Cordes Avenue | SF Residence | B (67) | 1 | 53.1 | 52.1 | -1.0 | 53.5 | 0.4 |
| | 20 | 444 Cordes Avenue | SF Residence | B (67) | 1 | 54.6 | 53.9 | -0.7 | 54.7 | 0.1 |
| | 21 | 608 Shady Lane | SF Residence | B (67) | 1 | 59.0 | 59.2 | 0.2 | 59.2 | 0.2 |
| | 22 | 437 Hembrook Street | SF Residence | B (67) | 1 | 64.4 | 64.9 | 0.5 | 64.5 | 0.1 |
| | 23 | 502 Cordes Avenue | SF Residence | B (67) | 1 | 51.9 | 50.4 | -1.5 | 52.1 | 0.2 |
| | 24 | 503 Danny Lane | SF Residence | B (67) | 1 | 55.4 | 54.3 | -1.1 | 55.6 | 0.2 |
| | 25 | 502 Danny Lane | SF Residence | B (67) | 1 | 62.9 | 62.3 | -0.6 | 63.0 | 0.1 |
| 11 - Old Woodlawn Avenue | 1 | 709 Crestview Drive | SFR & Playground | B (67) | tbd | 62.5 | 61.8 | -0.7 | 62.9 | 0.4 |
| | 2 | 709 Old Woodlawn Avenue | SF Residence | B (67) | 1 | 61.8 | 61.2 | -0.6 | 62.3 | 0.5 |
| | 3 | 707 Old Woodlawn Avenue | SF Residence | B (67) | 1 | 63.1 | 62.5 | -0.6 | 63.6 | 0.5 |
| | 4 | 709 Crestview Drive | Ballfields | C (67) | tbd | 62.8 | 62.2 | -0.6 | 63.2 | 0.4 |
| | 5 | Woodbury Place | MF Residences | B (67) | tbd | 62.2 | 61.6 | -0.6 | 62.7 | 0.5 |

| Exhibit B-2a. Barrier Analysis | | | | | | | | | | | | | | |
|--|--------------------------|-----------------------|----------------------|-----------------|--|---|-------------------------------------|--|---|---|---|--|---|---|
| Hill Top Manor NSA (North of I-70, between Sonderson and TR Hughes) | | | | | | | | | | | | | | |
| Noise Barrier Version 1 (One piece I-70 barrier with partial coverage) | | | | | | | | | | | | | | |
| Receiver I.D. | Number of Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | |
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonability Factor #1 | | Are Noise Barriers Reasonable? (Factors #2 & #3 Satisfied and #1 pending) |
| | | | | | | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Benefitted First Row Receiver (Y/N) | Insertion Loss with 20-foot High Noise Barrier | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Cost per Benefitted Receptor - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | |
| 1 | 1 | 432 Vine Street | Yes | Yes | No | No | 0.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 2 | 2 | 436 Vine Street | Yes | Yes | No | No | 0.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 3 | 1 | 438 Vine Street | Yes | Yes | No | No | 0.7 | No | N/A | N/A | N/A | N/A | N/A | |
| 4 | 1 | 440 Vine Street | Yes | Yes | No | No | 1.3 | No | N/A | N/A | N/A | N/A | N/A | |
| 5 | 1 | 448 Vine Street | Yes | Yes | No | No | 2.7 | No | N/A | N/A | N/A | N/A | N/A | |
| 6 | 1 | 452 Vine Street | Yes | Yes | No | No | 2.6 | No | N/A | N/A | N/A | N/A | N/A | |
| 7 | 1 | 502 Vine Street | Yes | Yes | No | No | 4.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 8 | 1 | 504 Vine Street | Yes | Yes | No | No | 4.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 9 | 1 | 506 Vine Street | Yes | Yes | No | No | 3.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 10 | 2 | 510 Vine Street | Yes | Yes | No | No | 3.9 | No | N/A | N/A | N/A | N/A | N/A | |
| 11 | 1 | 514 Vine Street | Yes | Yes | No | No | 4.6 | No | N/A | N/A | N/A | N/A | N/A | |
| 12 | 1 | 606 Vine Street | Yes | Yes | No | No | 4.9 | No | N/A | N/A | N/A | N/A | N/A | |
| 13 | 1 | 608 Vine Street | Yes | Yes | No | No | 4.8 | No | N/A | N/A | N/A | N/A | N/A | |
| 14 | 1 | 610 Vine Street | Yes | Yes | No | No | 4.8 | No | N/A | N/A | N/A | N/A | N/A | |
| 15 | 1 | 612 Vine Street | Yes | Yes | Yes | No | 5 | No | N/A | N/A | N/A | N/A | N/A | |
| 16 | 1 | 603 Hilltop Way | Yes | Yes | No | No | 4.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 17 | 1 | 602 Hilltop Way | Yes | Yes | No | No | 4.1 | No | N/A | N/A | N/A | N/A | N/A | |
| 18 | 1 | 704 Vine Street | Yes | Yes | No | No | 4.5 | No | N/A | N/A | N/A | N/A | N/A | |
| 19 | 1 | 706 Vine Street | Yes | Yes | No | No | 4.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 20 | 1 | 708 Vine Street | Yes | Yes | No | No | 3.7 | No | N/A | N/A | N/A | N/A | N/A | |
| 21 | 1 | 514 Duchesne Street | Yes | Yes | Yes | No | 5.5 | No | N/A | N/A | N/A | N/A | N/A | |
| 22 | 1 | 512 Duchesne Street | No | No | No | No | 4.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 23 | 1 | 509 Duchesne Street | No | No | No | No | 4.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 24 | 1 | 703 Vine Street | No | No | No | No | 4.4 | No | N/A | N/A | N/A | N/A | N/A | |
| 25 | 1 | 701 Vine Street | No | No | No | No | 4.6 | No | N/A | N/A | N/A | N/A | N/A | |
| 26 | 1 | 615 Vine Street | No | No | No | No | 4.7 | No | N/A | N/A | N/A | N/A | N/A | |
| 27 | 1 | 613 Vine Street | No | No | No | No | 4.8 | No | N/A | N/A | N/A | N/A | N/A | |
| 28 | 1 | 611 Vine Street | No | No | No | No | 4.6 | No | N/A | N/A | N/A | N/A | N/A | |
| 29 | 1 | 609 Vine Street | No | No | No | No | 4.1 | No | N/A | N/A | N/A | N/A | N/A | |
| 30 | 1 | 607 Vine Street | No | No | No | No | 3.8 | No | N/A | N/A | N/A | N/A | N/A | |
| 31 | 1 | 522 Lindenwood Avenue | No | No | No | No | 3.6 | No | N/A | N/A | N/A | N/A | N/A | |
| 32 | 1 | 511 Vine Street | No | No | No | No | 2.9 | No | N/A | N/A | N/A | N/A | N/A | |
| 33 | 1 | 507 Vine Street | No | No | No | No | 2.5 | No | N/A | N/A | N/A | N/A | N/A | |
| 34 | 2 | 518 Harmony Lane | No | No | No | No | 2.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 35 | 1 | 525 Harmony Lane | No | No | No | No | 2 | No | N/A | N/A | N/A | N/A | N/A | |
| 36 | 1 | 441 Vine Street | Yes | No | No | No | 2.2 | No | N/A | N/A | N/A | N/A | N/A | |
| 37 | 1 | 439 Vine Street | Yes | No | No | No | 1 | No | N/A | N/A | N/A | N/A | N/A | |
| 38 | 1 | 435 Vine Street | Yes | No | No | No | 1 | No | N/A | N/A | N/A | N/A | N/A | |
| 40 | | | 23 | 23 | 2 | | 0 | 0 | | | | | | |

Exhibit B-2b. Barrier Analysis

Hill Top Manor NSA (North of I-70, between Sonderson and TR Hughes)

Noise Barrier Version 2 (three piece barrier along outer road)

| Receiver I.D. | Number of Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | | |
|---------------|--------------------------|-----------------------|----------------------|-----------------|--|--|-------------------------------------|--|---|---|---|--|---|---|---|
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonability Factor #1 | Are Noise Barriers Reasonable? (Factors #2 & #3 Satisfied and #1 pending) | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with Optimum Noise Barriers | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of uniform 12-foot Noise Barrier | Number of Benefitted Receivers with a Uniform 12-foot Noise barrier | Cost per Benefitted Receptor - Uniform 12-foot Noise Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) |
| 1 | 1 | 432 Vine Street | Yes | Yes | Yes | Feasible 23 of 23 First Row, Impacted Dwelling Units experience a 5 dBA Insertion Loss (100%) | Yes | 9.4 | Yes 22 of 23 Benefitted (Front Row) Dwelling Units (96%) | Average Height - 12 feet | 22 | 1,120 | Yes | TBD | Reasonable With a Uniform 12-foot Noise Barrier. The barrier can be further optimized to reduce the cost per benefitted dwelling unit. |
| 2 | 2 | 436 Vine Street | Yes | Yes | Yes | | Yes | 8 | | | | | | | |
| 3 | 1 | 438 Vine Street | Yes | Yes | Yes | | Yes | 7.6 | | | | | | | |
| 4 | 1 | 440 Vine Street | Yes | Yes | Yes | | Yes | 7.2 | | | | | | | |
| 5 | 1 | 448 Vine Street | Yes | Yes | Yes | | Yes | 7.7 | | | | | | | |
| 6 | 1 | 452 Vine Street | Yes | Yes | Yes | | No | 6.7 | | | | | | | |
| 7 | 1 | 502 Vine Street | Yes | Yes | Yes | | Yes | 8.5 | | | | | | | |
| 8 | 1 | 504 Vine Street | Yes | Yes | Yes | | Yes | 10.1 | | | | | | | |
| 9 | 1 | 506 Vine Street | Yes | Yes | Yes | | Yes | 9.9 | | | | | | | |
| 10 | 1 | 510 Vine Street | Yes | Yes | Yes | | Yes | 10.3 | | | | | | | |
| 11 | 2 | 514 Vine Street | Yes | Yes | Yes | | Yes | 10.3 | | | | | | | |
| 12 | 1 | 606 Vine Street | Yes | Yes | Yes | | Yes | 10.9 | | | | | | | |
| 13 | 1 | 608 Vine Street | Yes | Yes | Yes | | Yes | 10.5 | | | | | | | |
| 14 | 1 | 610 Vine Street | Yes | Yes | Yes | | Yes | 10.2 | | | | | | | |
| 15 | 1 | 612 Vine Street | Yes | Yes | Yes | | Yes | 9.4 | | | | | | | |
| 16 | 1 | 603 Hilltop Way | Yes | Yes | Yes | | Yes | 7.7 | | | | | | | |
| 17 | 1 | 602 Hilltop Way | Yes | Yes | Yes | | Yes | 9.5 | | | | | | | |
| 18 | 1 | 704 Vine Street | Yes | Yes | Yes | | Yes | 10.1 | | | | | | | |
| 19 | 1 | 706 Vine Street | Yes | Yes | Yes | | Yes | 10.6 | | | | | | | |
| 20 | 1 | 708 Vine Street | Yes | Yes | Yes | | Yes | 9.8 | | | | | | | |
| 21 | 1 | 514 Duchesne Street | Yes | Yes | Yes | | Yes | 7.1 | | | | | | | |
| 22 | 1 | 512 Duchesne Street | No | No | No | | - | 2.7 | | | | | | | |
| 23 | 1 | 509 Duchesne Street | No | No | Yes | | - | 3.4 | | | | | | | |
| 24 | 1 | 703 Vine Street | No | No | Yes | | - | 3.2 | | | | | | | |
| 25 | 1 | 701 Vine Street | No | No | Yes | | - | 3.2 | | | | | | | |
| 26 | 1 | 615 Vine Street | No | No | Yes | | - | 3.6 | | | | | | | |
| 27 | 1 | 613 Vine Street | No | No | Yes | | - | 3.8 | | | | | | | |
| 28 | 1 | 611 Vine Street | No | No | Yes | | - | 4.1 | | | | | | | |
| 29 | 1 | 609 Vine Street | No | No | Yes | | - | 3.6 | | | | | | | |
| 30 | 1 | 607 Vine Street | No | No | Yes | | - | 3.2 | | | | | | | |
| 31 | 1 | 522 Lindenwood Avenue | No | No | Yes | | - | 3.3 | | | | | | | |
| 32 | 1 | 511 Vine Street | No | No | Yes | | - | 3.6 | | | | | | | |
| 33 | 1 | 507 Vine Street | No | No | Yes | | - | 4 | | | | | | | |
| 34 | 2 | 518 Harmony Lane | No | No | Yes | | - | 4.4 | | | | | | | |
| 35 | 1 | 525 Harmony Lane | No | No | Yes | | - | 5.3 | | | | | | | |
| 36 | 1 | 441 Vine Street | Yes | No | Yes | | - | 6.2 | | | | | | | |
| 37 | 1 | 439 Vine Street | Yes | No | Yes | | - | 6.7 | | | | | | | |
| 38 | 1 | 435 Vine Street | Yes | No | Yes | | - | 5.3 | | | | | | | |
| 41 | | | 23 | 23 | 40 | | 22 | 22 | | | | | | | |

Exhibit B-2c. Barrier Analysis

Hill Top Manor NSA (North of I-70, between Sonderson and TR Hughes)

Noise Barrier Version 3 (two piece I-70 barrier with full coverage)

| | | Feasibility Analysis | | | | | Reasonability Analysis | | | | | | | | |
|---------------|--------------------------|-----------------------|----------------|-----------------|--|---|-------------------------------------|---|---|---|---|--|---|---|---|
| Receiver I.D. | Number of Dwelling Units | Address | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | Are Noise Barriers Reasonable? (Factors #2 & #3 Satisfied and #1 pending) | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with 20-foot High Noise Barriers | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Cost per Benefitted Receptor - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) |
| 1 | 1 | 432 Vine Street | Yes | Yes | No | Not Feasible 2 of 23 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (9%) | No | 2.1 | Not Reasonable No Receivers Experience a 7 dBA Insertion Loss | N/A | N/A | N/A | N/A | No - This Noise Barrier is Not Reasonable | |
| 2 | 2 | 436 Vine Street | Yes | Yes | No | | No | 1.3 | | N/A | N/A | | | | N/A |
| 3 | 1 | 438 Vine Street | Yes | Yes | No | | No | 1.1 | | N/A | N/A | | | | N/A |
| 4 | 1 | 440 Vine Street | Yes | Yes | No | | No | 1.4 | | N/A | N/A | | | | N/A |
| 5 | 1 | 448 Vine Street | Yes | Yes | No | | No | 2.9 | | N/A | N/A | | | | N/A |
| 6 | 1 | 452 Vine Street | Yes | Yes | No | | No | 2.8 | | N/A | N/A | | | | N/A |
| 7 | 1 | 502 Vine Street | Yes | Yes | No | | No | 4.2 | | N/A | N/A | | | | N/A |
| 8 | 1 | 504 Vine Street | Yes | Yes | No | | No | 4.5 | | N/A | N/A | | | | N/A |
| 9 | 1 | 506 Vine Street | Yes | Yes | No | | No | 3.4 | | N/A | N/A | | | | N/A |
| 10 | 1 | 510 Vine Street | Yes | Yes | No | | No | 3.9 | | N/A | N/A | | | | N/A |
| 11 | 2 | 514 Vine Street | Yes | Yes | No | | No | 4.6 | | N/A | N/A | | | | N/A |
| 12 | 1 | 606 Vine Street | Yes | Yes | No | | No | 4.9 | | N/A | N/A | | | | N/A |
| 13 | 1 | 608 Vine Street | Yes | Yes | No | | No | 4.8 | | N/A | N/A | | | | N/A |
| 14 | 1 | 610 Vine Street | Yes | Yes | No | | No | 4.8 | | N/A | N/A | | | | N/A |
| 15 | 1 | 612 Vine Street | Yes | Yes | Yes | | No | 5 | | N/A | N/A | | | | N/A |
| 16 | 1 | 603 Hilltop Way | Yes | Yes | No | | No | 4.4 | | N/A | N/A | | | | N/A |
| 17 | 1 | 602 Hilltop Way | Yes | Yes | No | | No | 4.1 | | N/A | N/A | | | | N/A |
| 18 | 1 | 704 Vine Street | Yes | Yes | No | | No | 4.5 | | N/A | N/A | | | | N/A |
| 19 | 1 | 706 Vine Street | Yes | Yes | No | | No | 4.2 | | N/A | N/A | | | | N/A |
| 20 | 1 | 708 Vine Street | Yes | Yes | No | | No | 3.7 | | N/A | N/A | | | | N/A |
| 21 | 1 | 514 Duchesne Street | Yes | Yes | Yes | | No | 5.5 | | N/A | N/A | | | | N/A |
| 22 | 1 | 512 Duchesne Street | No | No | No | | No | 4.2 | | N/A | N/A | | | | N/A |
| 23 | 1 | 509 Duchesne Street | No | No | No | | No | 4.4 | | N/A | N/A | | | | N/A |
| 24 | 1 | 703 Vine Street | No | No | No | | No | 4.4 | | N/A | N/A | | | | N/A |
| 25 | 1 | 701 Vine Street | No | No | No | | No | 4.6 | | N/A | N/A | | | | N/A |
| 26 | 1 | 615 Vine Street | No | No | No | | No | 4.7 | | N/A | N/A | | | | N/A |
| 27 | 1 | 613 Vine Street | No | No | No | | No | 4.8 | | N/A | N/A | | | | N/A |
| 28 | 1 | 611 Vine Street | No | No | No | | No | 4.8 | | N/A | N/A | | | | N/A |
| 29 | 1 | 609 Vine Street | No | No | No | | No | 4.2 | | N/A | N/A | | | | N/A |
| 30 | 1 | 607 Vine Street | No | No | No | | No | 3.9 | | N/A | N/A | | | | N/A |
| 31 | 1 | 522 Lindenwood Avenue | No | No | No | | No | 3.8 | | N/A | N/A | | | | N/A |
| 32 | 1 | 511 Vine Street | No | No | No | | No | 3.5 | | N/A | N/A | | | | N/A |
| 33 | 1 | 507 Vine Street | No | No | No | | No | 3.2 | | N/A | N/A | | | | N/A |
| 34 | 2 | 518 Harmony Lane | No | No | No | | No | 2.8 | | N/A | N/A | | | | N/A |
| 35 | 1 | 525 Harmony Lane | No | No | No | | No | 2.6 | | N/A | N/A | | | | N/A |
| 36 | 1 | 441 Vine Street | Yes | No | No | | No | 2.8 | | N/A | N/A | | | | N/A |
| 37 | 1 | 439 Vine Street | Yes | No | No | | No | 3 | | N/A | N/A | | | | N/A |
| 38 | 1 | 435 Vine Street | Yes | No | No | | No | 2.6 | | N/A | N/A | | | | N/A |
| 41 | | | 23 | 23 | 2 | | 0 | 0 | | | | | | | |

| Exhibit B-2d. Barrier Analysis | | | | | | | | | | | | | | | |
|---|-------------------------------------|-----------------|----------------------|-----------------|--|--|-------------------------------------|--|---|---|--|----------------------|--------------------------------|---|---|
| Gardenview Senior Center NSA (South of I-70, between Sonderson and TR Hughes) | | | | | | | | | | | | | | | |
| One Noise Barrier along New Outer Road | | | | | | | | | | | | | | | |
| Receiver I.D. | Number of Equivalent Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | | |
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | Are Noise Barriers Reasonable? | | |
| | | | | | | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Benefitted First Row Receiver (Y/N) | Insertion Loss with 20-foot Noise Barriers | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receptors Required with the Optimum Noise barrier | | | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | |
| 1 | 4 | 700 Garden Path | Yes | Yes | Yes | Feasible 2 of 2 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (100%) | Yes | 7.5 | Yes Both First Row Receptors have at least 7 dBA of Insertion Loss (100%) | Average Height - 17.5 feet | 10 equivalent dwelling units would be required for a reasonable noise barrier. After consulting with the center and MoDOT it was determined that these did not constitute an area of frequent human use. | No | | N/A | Noise Barriers are Not Reasonable at this Location |
| 2 | 4 | 700 Garden Path | Yes | Yes | Yes | | Yes | 7.6 | | Total Length 700 feet | | | | | |
| 3 | 4 | 700 Garden Path | No | No | No | | - | 1.9 | | Total Area - 12,250 square feet | | | | | |
| 3 | | | 2 | 2 | 2 | 2 | | 2 | | | | | | | |

Exhibit B-2e. Barrier Analysis

Highland Terrace NSA (South of I-70, between Route K and Sonderson)

One Noise Barrier along New Outer Road

| | | | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | | | | | | | | | | | | |
|---------------|--------------------------|--------------------|----------------------|-----------------|--|--|-------------------------------------|--|---|---|---|--|---|--|---|-------------------------|---|---|---|-----|---|---|---|---|------------------------------|
| Receiver I.D. | Number of Dwelling Units | Address | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | Are Noise Barriers Reasonable? | | | | | | | | | | | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with Optimum Noise Barriers | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Square Feet of Barrier per Benefitted Receptor - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) | | | | | | | | | | |
| 1 | 1 | 702 Plaza Drive | Yes | Yes | Yes | Feasible 4 of 4 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (100%) | Yes | 8.5 | Yes | Average Height - 11.14 feet | 4 | 1,950 | No | N/A | Noise Barriers are NOT Reasonable at this Location | | | | | | | | | | |
| 2 | 1 | 701 Plaza Drive | Yes | Yes | Yes | | Yes | 10.7 | | | | | | 3 of 4 First Row Receivers have at least 7 dBA of Insertion Loss (75%) | | Total Length - 700 feet | | | | N/A | | | | | |
| 3 | 1 | 704 Highland Drive | Yes | Yes | Yes | | Yes | 7.2 | | | | | | | | | | | | - | - | - | - | - | N/A |
| 4 | 1 | 701 Highland Drive | Yes | Yes | Yes | | No | 4.6 | | | | | | | | | | | | | | | | | Total Square Footage - 7,800 |
| 5 | 1 | 703 Highland Drive | Yes | No | No | | - | 3.1 | - | - | - | - | - | N/A | | | | | | | | | | | |
| 6 | 1 | 706 Highland Drive | Yes | No | Yes | | - | 5.4 | | | | | | - | | - | - | - | - | N/A | | | | | |
| 7 | 1 | 703 Plaza Drive | Yes | No | Yes | | - | 7 | - | - | - | - | - | | | | | | | N/A | | | | | |
| 8 | 1 | 704 Plaza Drive | Yes | No | Yes | | - | 5.4 | | | | | | - | | - | - | - | - | N/A | | | | | |
| 9 | 1 | 706 Plaza Drive | Yes | No | Yes | | - | 4.5 | - | - | - | - | - | | | | | | | N/A | | | | | |
| 10 | 1 | 705 Plaza Drive | Yes | No | Yes | | - | 5.2 | | | | | | | | | | | | N/A | | | | | |
| 10 | | | 10 | 4 | 9 | | 3 | 4 | | | | | | | | | | | | | | | | | |

Exhibit B-2f. Barrier Analysis

Fort Zumbolt Middle School Ballfields NSA (North of I-70, between Route K and Sonderson)

One Noise Barrier along New Outer Road

| Receiver I.D. | Number of Equivalent Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | Are Noise Barriers Reasonable? | |
|---------------|-------------------------------------|-------------------|----------------------|-----------------|--|---|-------------------------------------|---|---|---|---|--|---|--------------------------------|---|
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with a Optimum Noise Barrier | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Cost per Benefitted Receptor - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receptor (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) |
| 1 | 1 | 210 Virgil Street | Yes | Yes | No | Feasible 3 of 4 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (75%) | No | 3.3 | Yes 3 of 4 Front Row Receivers have at least 7 dBA of Insertion Loss (75%) | Average Height - 17 feet Total Length - 454 feet Total Area - 7,715 square feet | 3 | 2,572 | No | N/A | Noise Barriers are Not Reasonable at this Location |
| 2 | 1 | 210 Virgil Street | Yes | Yes | Yes | | Yes | 7 | | | | | | N/A | |
| 3 | 1 | 210 Virgil Street | Yes | Yes | Yes | | Yes | 7.5 | | | | | | N/A | |
| 4 | 1 | 210 Virgil Street | Yes | Yes | Yes | | Yes | 8 | | | | | | N/A | |
| 5 | 1 | 210 Virgil Street | No | No | No | | | 2.5 | | | | | | N/A | |
| 6 | 1 | 210 Virgil Street | No | No | No | | - | 0.4 | | | | | | N/A | |
| 6 | 6 | | 2 | 2 | 2 | | 1 | 1 | | | | | | | |

* As ballfields, there are no dwelling units. The equivalent receptors were calculated using 1 DU per 100 feet of road frontage. The roadway frontage is approximately 400-feet, therefore each represents 1 equivalent receptor.

| Exhibit B-2g. Barrier Analysis | | | | | | | | | | | | | | | |
|--|--------------------------|---------------------|----------------------|-----------------|--|---|-------------------------------------|--|---|---|---|--|---|--------------------------------|---|
| Terra Marie NSA (North of I-70, between Woodlawn and Route K) | | | | | | | | | | | | | | | |
| Two Noise Barriers: One along Outer Road and One along I-70 WB On-Ramp @ Route K | | | | | | | | | | | | | | | |
| Receiver I.D. | Number of Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | | |
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | Are Noise Barriers Reasonable? | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with Optimum Noise Barriers | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Cost per Benefitted Receiver - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receiver (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) |
| 1 | 1 | 112 Mariae Lane | Yes | No | No | Not Feasible 1 of 3 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (33%) | - | 0.3 | No One Front Row Receiver has at least 7 dBA of Insertion Loss (33%) | Average Height - 17.9 feet | 1 | 13,780 | No | | N/A |
| 2 | 1 | 114 Mariae Lane | Yes | No | No | | - | 0.4 | | | | | | N/A | |
| 3 | 1 | 116 Mariae Lane | Yes | No | No | | - | 0.6 | | | | | | N/A | |
| 4 | 1 | 204 Mariae Lane | Yes | No | No | | - | 1 | | | | | | N/A | |
| 5 | 1 | 206 Mariae Lane | Yes | No | No | | - | 1.3 | | | | | | N/A | |
| 6 | 1 | 210 Mariae Lane | Yes | No | No | | - | 1.5 | | | | | | N/A | |
| 7 | 1 | 610 School Street | Yes | No | No | | - | 1.4 | | | | | | N/A | |
| 8 | 1 | 612 School Street | Yes | No | Yes | | - | 2 | | | | | | N/A | |
| 9 | 1 | 614 School Street | Yes | Yes | No | | No | 3.3 | | | | | | N/A | |
| 10 | 1 | 613 School Street | Yes | Yes | Yes | | Yes | 7 | | | | | | N/A | |
| 11 | 1 | 611 School Street | No | No | No | | - | 4.2 | | N/A | | | | | |
| 12 | 1 | 609 School Street | No | No | No | | - | 2.3 | | N/A | | | | | |
| 13 | 1 | 607 School Street | No | No | No | | - | 1.9 | | N/A | | | | | |
| 14 | 8 | 301 Mariae Lane | No | No | No | | - | 0.5 | | N/A | | | | | |
| 15 | 8 | 301 Mariae Lane | No | No | No | | - | 1.8 | | N/A | | | | | |
| 16 | 1 | 610 Woodlawn Avenue | No | Yes | No | | No | 0.7 | | N/A | | | | | |
| 17 | 1 | 608 Woodlawn Avenue | No | No | No | | - | 1.8 | | N/A | | | | | |
| 18 | 1 | 606 Woodlawn Avenue | No | No | No | | - | 1.8 | | N/A | | | | | |
| 19 | 1 | 604 Woodlawn Avenue | No | No | No | | - | 1.1 | | N/A | | | | | |
| 20 | 1 | 602 Woodlawn Avenue | No | No | No | | - | 0.5 | | N/A | | | | | |
| 20 | | | 10 | 3 | 2 | 3 | 1 | | | | | | | | |

Exhibit B-2h. Barrier Analysis

Woodlawn Avenue Subdivision NSA (North of I-70, west of Woodlawn Avenue)

One Noise Barrier at the Top of the I-70 Embankment

| Receiver I.D. | Number of Dwelling Units | Address | Feasibility Analysis | | | | Reasonability Analysis | | | | | | | Are Noise Barriers Reasonable? | |
|---------------|--------------------------|---------------------|----------------------|-----------------|--|---|-------------------------------------|--|---|---|---|--|---|--------------------------------|---|
| | | | Impacted (Y/N) | First Row (Y/N) | 5 dBA Insertion Loss with 20-foot High Barrier (Y/N) | Are Noise Barriers Feasible? (67% of First Row, Impacted Receivers with 5 dBA Insertion Loss) | Reasonability Factor #3 | | | Reasonability Factor #2 | | | Reasonable Factor #1 | | |
| | | | | | | | Benefitted First Row Receiver (Y/N) | Insertion Loss with 20-foot High Noise Barrier | Reasonable Factor #3 - 67% of Benefitted (First Row) Receivers have an Insertion Loss of at least 7 dBA (Y/N) | Square Footage of Optimum Noise Barrier | Number of Benefitted Receivers with Optimum Noise barrier | Cost per Benefitted Receiver - Optimum Barrier | Reasonable Factor #2 - Noise Barriers do not Exceed 1,300 square feet per Benefitted Receiver (Y/N) | | Reasonable Factor #1 - Viewpoints of Benefitted Receivers (Y/N) |
| 1 | 1 | 430 Hembrook Street | Yes | Yes | Yes | Feasible 3 of 3 First Row, Impacted Receivers experience a 5 dBA Insertion Loss (100%) | No | 5.5 | Not Reasonable No Receivers Experience a 7 dBA Insertion Loss | N/A | N/A | N/A | N/A | N/A | No This Noise Barrier is Not Reasonable |
| 2 | 1 | 432 Hembrook Street | Yes | Yes | Yes | | No | 6 | | N/A | N/A | | | N/A | |
| 3 | 1 | 434 Hembrook Street | Yes | Yes | Yes | | No | 5.9 | | N/A | N/A | | | N/A | |
| 4 | 1 | 618 O'Fallon Avenue | No | No | No | | No | 1 | | N/A | N/A | | | N/A | |
| 5 | 1 | 615 O'Fallon Street | No | No | No | | No | 3.6 | | N/A | N/A | | | N/A | |
| 6 | 1 | 431 Hembrook Street | No | No | No | | No | 3.3 | | N/A | N/A | | | N/A | |
| 7 | 1 | 429 Hembrook Street | No | No | No | | No | 4.1 | | N/A | N/A | | | N/A | |
| 8 | 1 | 430 Cordes Avenue | No | No | Yes | | No | 5.8 | | N/A | N/A | | | N/A | |
| 9 | 1 | 611 Westhoff Street | No | No | No | | No | 3.9 | | N/A | N/A | | | N/A | |
| 10 | 1 | 608 Westhoff Street | No | No | No | | No | 2.9 | | N/A | N/A | | | N/A | |
| 11 | 1 | 609 O'Fallon Street | No | No | No | | No | 1.8 | | N/A | N/A | | | N/A | |
| 12 | 1 | 612 O'Fallon Avenue | No | No | No | | No | 0.3 | | N/A | N/A | | | N/A | |
| 13 | 1 | 606 O'Fallon Avenue | No | No | No | | No | 0 | | N/A | N/A | | | N/A | |
| 14 | 8 | 414 Cordes Avenue | No | No | No | | No | -0.1 | | N/A | N/A | | | N/A | |
| 15 | 8 | 605 O'Fallon Street | No | No | No | | No | 2 | | N/A | N/A | | | N/A | |
| 16 | 1 | 606 Westhoff Street | No | No | No | | No | 2.2 | | N/A | N/A | | | N/A | |
| 17 | 1 | 601 O'Fallon Street | No | No | No | | No | 1.5 | | N/A | N/A | | | N/A | |
| 18 | 1 | 602 Westhoff Street | No | No | No | | No | 2 | | N/A | N/A | | | N/A | |
| 19 | 1 | 430 Cordes Avenue | No | No | No | | No | 2.8 | | N/A | N/A | | | N/A | |
| 20 | 1 | 444 Cordes Avenue | No | No | No | | No | 3.5 | | N/A | N/A | | | N/A | |
| 21 | 1 | 608 Shady Lane | No | No | No | | No | 4.5 | | N/A | N/A | | | N/A | |
| 22 | 1 | 437 Hembrook Street | No | No | No | | No | 4.7 | | N/A | N/A | | | N/A | |
| 23 | 1 | 502 Cordes Avenue | No | No | No | | No | 1.2 | | N/A | N/A | | | N/A | |
| 24 | 1 | 503 Danny Lane | No | No | No | | No | 2 | | N/A | N/A | | | N/A | |
| 25 | 1 | 502 Danny Lane | No | No | No | | No | 3.7 | | N/A | N/A | | | N/A | |
| 39 | | | 24 | 21 | 2 | | 0 | 0 | | | | | | | |

Appendix C
Traffic Data for Validation, Existing
and Proposed Conditions

Table C-1. Traffic Data for Verification Runs

Traffic Counts from Monitoring

| Road Type | Segment/File Name | Number of Lanes | 15-Minute Counts | | | Observed Speed (mph) | Hourly Volumes - TNM Inputs | | |
|---|------------------------------|-----------------|------------------|---------------|--------------|----------------------|-----------------------------|------------------------|-----------------------|
| | | | Auto | Medium Trucks | Heavy Trucks | | Autos per Lane | Medium Trucks per Lane | Heavy Trucks per Lane |
| Monitoring Location A - Veterans Memorial Walk | | | | | | | | | |
| I-70 | Westbound | 4 | 723 | 15 | 97 | 65 mph | 723 | 15 | 97 |
| I-70 | Eastbound | 3 | 662 | 9 | 74 | 65 mph | 883 | 12 | 99 |
| Local | Vets Mem Pkwy EB @ TR Hughes | 1 | 35 | 3 | 0 | 45 mph | 140 | 12 | 0 |
| Local | Vets Mem Pkwy WB @ TR Hughes | 1 | 36 | 2 | 0 | 45 mph | 144 | 8 | 0 |
| Local | TR Hughes NB | 1 | 150 | 3 | 1 | 45 mph | 600 | 12 | 4 |
| Local | TR Hughes SB | 1 | 153 | 2 | 1 | 45 mph | 612 | 8 | 4 |
| I-70 Ramps | TR Hughes to I70 EB | 1 | 221 | 3 | 25 | 55 mph | 884 | 12 | 100 |
| I-70 Ramps | I70 EB to TR Hughes | 1 | 198 | 1 | 20 | 55 mph | 792 | 4 | 80 |
| Monitoring Location B - Nicola Drive (near Evelyn Homestead) | | | | | | | | | |
| I-70 | Westbound | 4 | 325 | 8 | 33 | 65 mph | 325 | 8 | 33 |
| I-70 | Eastbound | 4 | 425 | 7 | 44 | 65 mph | 425 | 7 | 44 |
| Monitoring Location C - Hilltop Manor Subdivision | | | | | | | | | |
| I-70 | Westbound | 4 | 723 | 15 | 97 | 65 mph | 723 | 15 | 97 |
| I-70 | Eastbound | 4 | 882 | 12 | 98 | 65 mph | 882 | 12 | 98 |
| Local | E Terra EB to TR Hughes | 1 | 19 | 2 | 0 | 45 mph | 76 | 8 | 0 |
| Local | E Terra WB to Sonderson | 1 | 21 | 1 | 0 | 45 mph | 84 | 4 | 0 |
| Monitoring Location D - Fort Zumwalt Middle School (ball fields) | | | | | | | | | |
| I-70 | Westbound | 4 | 652 | 8 | 30 | 65 mph | 652 | 8 | 30 |
| I-70 | Eastbound | 4 | 677 | 10 | 39 | 65 mph | 677 | 10 | 39 |
| Local | E Terra EB to TR Hughes | 1 | 40 | 2 | 0 | 45 mph | 160 | 8 | 0 |
| Local | E Terra WB to Sonderson | 1 | 38 | 1 | 0 | 45 mph | 152 | 4 | 0 |
| Local | Sonderson Loop NB | 1 | 12 | 1 | 1 | 30 mph | 48 | 4 | 4 |
| Local | Sonderson Loop SB | 1 | 15 | 1 | 1 | 30 mph | 60 | 4 | 4 |
| Local | Sonderson NB | 1 | 37 | 2 | 2 | 30 mph | 148 | 8 | 8 |
| Local | Sonderson SB | 1 | 67 | 2 | 2 | 30 mph | 268 | 8 | 8 |
| Monitoring Location E - Homes at Plaza Lane (Highland Terrace Subdivision) | | | | | | | | | |
| I-70 | Westbound | 4 | 648 | 12 | 42 | 65 mph | 648 | 12 | 42 |
| I-70 | Eastbound | 3 | 496 | 8 | 30 | 65 mph | 661 | 11 | 40 |
| I-70 Ramps | K to I70 EB | 1 | 166 | 4 | 10 | 30 mph | 664 | 16 | 40 |
| Monitoring Location F - School Street (Terra Marie Subdivision) | | | | | | | | | |
| I-70 | Westbound | 3 | 512 | 18 | 101 | 65 mph | 683 | 24 | 135 |
| I-70 | Eastbound | 3 | 540 | 20 | 100 | 65 mph | 720 | 27 | 133 |
| I-70 Ramps | K to I70 WB | 1 | 105 | 3 | 0 | 55 mph | 420 | 12 | 0 |
| Local | W Terra EB | 1 | 50 | 3 | 0 | 30 mph | 200 | 12 | 0 |
| Local | W Terra WB | 1 | 55 | 3 | 0 | 30 mph | 220 | 12 | 0 |
| Monitoring Location G - Crestview Drive (Old Woodlawn Subdivision) | | | | | | | | | |
| I-70 | Westbound | 3 | 334 | 3 | 40 | 65 mph | 445 | 4 | 53 |
| I-70 | Eastbound | 3 | 301 | 5 | 44 | 65 mph | 401 | 7 | 59 |
| Local | Woodlawn SB | 1 | 41 | 1 | 1 | 30 mph | 164 | 4 | 4 |
| Local | Woodlawn NB | 1 | 39 | 1 | 1 | 30 mph | 156 | 4 | 4 |
| Local | Crestview Drive | 1 | 0 | 0 | 0 | 30 mph | 0 | 0 | 0 |

Table C-2a. Traffic Data for Existing Conditions
2015 AM Peak Hour

| Road Type | Segment/File Name | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed (mph) |
|------------|------------------------------|-----------------|------------------------|-------|--------|---------------|--------|--------------|--------|-------------|
| | | | | % | Volume | % | Volume | % | Volume | |
| I-70 | Westbound (E of TR Hughes) | 4 | 2,850 | 92.0% | 2,622 | 1.6% | 46 | 6.4% | 182 | 65 mph |
| I-70 | Eastbound (E of TR Hughes) | 3 | 5,175 | 92.0% | 4,761 | 1.6% | 83 | 6.4% | 331 | 65 mph |
| I-70 | Westbound (K to TR Hughes) | 4 | 2,760 | 92.0% | 2,539 | 1.6% | 44 | 6.4% | 177 | 65 mph |
| I-70 | Eastbound (K to TR Hughes) | 4 | 4,760 | 92.0% | 4,379 | 1.6% | 76 | 6.4% | 305 | 65 mph |
| I-70 | Westbound (West of K) | 3 | 2,480 | 92.0% | 2,282 | 1.6% | 40 | 6.4% | 159 | 65 mph |
| I-70 | Eastbound (West of K) | 3 | 4,165 | 92.0% | 3,832 | 1.6% | 67 | 6.4% | 267 | 65 mph |
| Local | E Terra EB Lt to TR Hughes | 1 | 30 | 98.0% | 29 | 1.0% | 0 | 1.0% | 0 | 45 mph |
| Local | E Terra EB Thru | 1 | 130 | 98.0% | 127 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | E Terra EB | 1 | 355 | 98.0% | 348 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | E Terra WB LT to K SB | 1 | 95 | 98.0% | 93 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | E Terra WB | 1 | 310 | 98.0% | 304 | 1.0% | 3 | 1.0% | 3 | 45 mph |
| I-70 Ramps | I70 EB to K | 1 | 430 | 92.0% | 396 | 1.6% | 7 | 6.4% | 28 | 55 mph |
| I-70 Ramps | I70 EB to TR Hughes NB RT | 1 | 285 | 92.0% | 262 | 1.6% | 5 | 6.4% | 18 | 55 mph |
| I-70 Ramps | I70 EB to TR Hughes SB | 1 | 350 | 92.0% | 322 | 1.6% | 6 | 6.4% | 22 | 55 mph |
| I-70 Ramps | I70 EB to K EB LT | 1 | 205 | 92.0% | 189 | 1.6% | 3 | 6.4% | 13 | 55 mph |
| I-70 Ramps | I70 EB to K EB RT | 1 | 225 | 92.0% | 207 | 1.6% | 4 | 6.4% | 14 | 55 mph |
| I-70 Ramps | I70 WB to K | 1 | 910 | 92.0% | 837 | 1.6% | 15 | 6.4% | 58 | 55 mph |
| I-70 Ramps | I70 WB to SB K LT | 1 | 660 | 92.0% | 607 | 1.6% | 11 | 6.4% | 42 | 55 mph |
| I-70 Ramps | I70 WB to SB K RT | 1 | 125 | 92.0% | 115 | 1.6% | 2 | 6.4% | 8 | 55 mph |
| I-70 Ramps | I70 WB to SB K RT1 | 1 | 125 | 92.0% | 115 | 1.6% | 2 | 6.4% | 8 | 55 mph |
| Local | K NB LT | 1 | 793 | 98.0% | 777 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K NB RT | 1 | 793 | 98.0% | 777 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K SB LT | 1 | 755 | 98.0% | 740 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K SB RT to W Terra WB | 1 | 60 | 98.0% | 59 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | K SB RT | 1 | 755 | 98.0% | 740 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| I-70 Ramps | K to I70 WB | 1 | 370 | 92.0% | 340 | 1.6% | 6 | 6.4% | 24 | 30 mph |
| Local | Sonderson Loop NB | 1 | 105 | 98.0% | 103 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | Sonderson Loop SB | 1 | 95 | 98.0% | 93 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | Sonderson NB | 1 | 210 | 98.0% | 206 | 1.0% | 2 | 1.0% | 2 | 30 mph |
| Local | Sonderson SB | 1 | 365 | 98.0% | 358 | 1.0% | 4 | 1.0% | 4 | 30 mph |
| Local | TR Hughes NB RT | 1 | 440 | 98.0% | 431 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| I-70 Ramps | TR Hughes NB to I70 WB RT | 1 | 335 | 92.0% | 308 | 1.6% | 5 | 6.4% | 21 | 55 mph |
| Local | TR Hughes NB | 1 | 440 | 98.0% | 431 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | TR Hughes SB CTR-LT | 1 | 632 | 98.0% | 619 | 1.0% | 6 | 1.0% | 6 | 45 mph |
| Local | TR Hughes SB RT | 1 | 632 | 98.0% | 619 | 1.0% | 6 | 1.0% | 6 | 45 mph |
| I-70 Ramps | TR Hughes SB to I70 WB | 1 | 335 | 92.0% | 308 | 1.6% | 5 | 6.4% | 21 | 55 mph |
| Local | W Terra EB RT | 1 | 105 | 98.0% | 103 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | W Terra EB Thru | 1 | 165 | 98.0% | 162 | 1.0% | 2 | 1.0% | 2 | 45 mph |
| Local | W Terra EB | 1 | 360 | 98.0% | 353 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | W Terra WB LT | 1 | 55 | 98.0% | 54 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | Vets Mem Pkwy EB @ TR Hughes | 1 | 405 | 98.0% | 397 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | Vets Mem Pkwy WB @ TR Hughes | 1 | 215 | 98.0% | 211 | 1.0% | 2 | 1.0% | 2 | 45 mph |
| Local | W Terra WB | 1 | 260 | 98.0% | 255 | 1.0% | 3 | 1.0% | 3 | 45 mph |
| Local | Woodlawn SB | 1 | 375 | 98.0% | 368 | 1.0% | 4 | 1.0% | 4 | 30 mph |
| Local | Woodlawn NB | 1 | 380 | 98.0% | 372 | 1.0% | 4 | 1.0% | 4 | 30 mph |

Table C-2b. Traffic Data for Existing Conditions
2015 PM Peak Hour

| Road Type | Segment/File Name | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed (mph) |
|------------|------------------------------|-----------------|------------------------|-------|--------|---------------|--------|--------------|--------|-------------|
| | | | | % | Volume | % | Volume | % | Volume | |
| I-70 | Westbound (E of TR Hughes) | 4 | 6,095 | 92.0% | 5,607 | 1.6% | 98 | 6.4% | 390 | 65 mph |
| I-70 | Eastbound (E of TR Hughes) | 3 | 3,645 | 92.0% | 3,353 | 1.6% | 58 | 6.4% | 233 | 65 mph |
| I-70 | Westbound (K to TR Hughes) | 4 | 5,155 | 92.0% | 4,743 | 1.6% | 82 | 6.4% | 330 | 65 mph |
| I-70 | Eastbound (K to TR Hughes) | 4 | 3,560 | 92.0% | 3,275 | 1.6% | 57 | 6.4% | 228 | 65 mph |
| I-70 | Westbound (West of K) | 3 | 4,615 | 92.0% | 4,246 | 1.6% | 74 | 6.4% | 295 | 65 mph |
| I-70 | Eastbound (West of K) | 3 | 3,250 | 92.0% | 2,990 | 1.6% | 52 | 6.4% | 208 | 65 mph |
| Local | E Terra EB Lt to TR Hughes | 1 | 30 | 98.0% | 29 | 1.0% | 0 | 1.0% | 0 | 45 mph |
| Local | E Terra EB Thru | 1 | 130 | 98.0% | 127 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | E Terra EB | 1 | 355 | 98.0% | 348 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | E Terra WB LT to K SB | 1 | 95 | 98.0% | 93 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | E Terra WB | 1 | 310 | 98.0% | 304 | 1.0% | 3 | 1.0% | 3 | 45 mph |
| I-70 Ramps | I70 EB to K | 1 | 430 | 92.0% | 396 | 1.6% | 7 | 6.4% | 28 | 55 mph |
| I-70 Ramps | I70 EB to TR Hughes NB RT | 1 | 285 | 92.0% | 262 | 1.6% | 5 | 6.4% | 18 | 55 mph |
| I-70 Ramps | I70 EB to TR Hughes SB | 1 | 350 | 92.0% | 322 | 1.6% | 6 | 6.4% | 22 | 55 mph |
| I-70 Ramps | I70 EB to K EB LT | 1 | 205 | 92.0% | 189 | 1.6% | 3 | 6.4% | 13 | 55 mph |
| I-70 Ramps | I70 EB to K EB RT | 1 | 225 | 92.0% | 207 | 1.6% | 4 | 6.4% | 14 | 55 mph |
| I-70 Ramps | I70 WB to K | 1 | 910 | 92.0% | 837 | 1.6% | 15 | 6.4% | 58 | 55 mph |
| I-70 Ramps | I70 WB to SB K LT | 1 | 660 | 92.0% | 607 | 1.6% | 11 | 6.4% | 42 | 55 mph |
| I-70 Ramps | I70 WB to SB K RT | 1 | 125 | 92.0% | 115 | 1.6% | 2 | 6.4% | 8 | 55 mph |
| I-70 Ramps | I70 WB to SB K RT1 | 1 | 125 | 92.0% | 115 | 1.6% | 2 | 6.4% | 8 | 55 mph |
| Local | K NB LT | 1 | 793 | 98.0% | 777 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K NB RT | 1 | 793 | 98.0% | 777 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K SB LT | 1 | 755 | 98.0% | 740 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| Local | K SB RT to W Terra WB | 1 | 60 | 98.0% | 59 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | K SB RT | 1 | 755 | 98.0% | 740 | 1.0% | 8 | 1.0% | 8 | 30 mph |
| I-70 Ramps | K to I70 WB | 1 | 370 | 92.0% | 340 | 1.6% | 6 | 6.4% | 24 | 30 mph |
| Local | Sonderson Loop NB | 1 | 105 | 98.0% | 103 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | Sonderson Loop SB | 1 | 95 | 98.0% | 93 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | Sonderson NB | 1 | 210 | 98.0% | 206 | 1.0% | 2 | 1.0% | 2 | 30 mph |
| Local | Sonderson SB | 1 | 365 | 98.0% | 358 | 1.0% | 4 | 1.0% | 4 | 30 mph |
| Local | TR Hughes NB RT | 1 | 440 | 98.0% | 431 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| I-70 Ramps | TR Hughes NB to I70 WB RT | 1 | 335 | 92.0% | 308 | 1.6% | 5 | 6.4% | 21 | 55 mph |
| Local | TR Hughes NB | 1 | 440 | 98.0% | 431 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | TR Hughes SB CTR-LT | 1 | 632 | 98.0% | 619 | 1.0% | 6 | 1.0% | 6 | 45 mph |
| Local | TR Hughes SB RT | 1 | 632 | 98.0% | 619 | 1.0% | 6 | 1.0% | 6 | 45 mph |
| I-70 Ramps | TR Hughes SB to I70 WB | 1 | 335 | 92.0% | 308 | 1.6% | 5 | 6.4% | 21 | 55 mph |
| Local | W Terra EB RT | 1 | 105 | 98.0% | 103 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | W Terra EB Thru | 1 | 165 | 98.0% | 162 | 1.0% | 2 | 1.0% | 2 | 45 mph |
| Local | W Terra EB | 1 | 360 | 98.0% | 353 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | W Terra WB LT | 1 | 55 | 98.0% | 54 | 1.0% | 1 | 1.0% | 1 | 45 mph |
| Local | Vets Mem Pkwy EB @ TR Hughes | 1 | 405 | 98.0% | 397 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | Vets Mem Pkwy WB @ TR Hughes | 1 | 215 | 98.0% | 211 | 1.0% | 2 | 1.0% | 2 | 45 mph |
| Local | W Terra WB | 1 | 260 | 98.0% | 255 | 1.0% | 3 | 1.0% | 3 | 45 mph |
| Local | Woodlawn SB | 1 | 375 | 98.0% | 368 | 1.0% | 4 | 1.0% | 4 | 30 mph |
| Local | Woodlawn NB | 1 | 380 | 98.0% | 372 | 1.0% | 4 | 1.0% | 4 | 30 mph |

Table C-3. Traffic Data for Build Conditions - Preferred Alternative
2040 PM Peak Hour

| Road Type | Segment/File Name | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed (mph) |
|------------|--------------------------------|-----------------|------------------------|------|--------|---------------|--------|--------------|--------|-------------|
| | | | | % | Volume | % | Volume | % | Volume | |
| I-70 | Westbound (E of TR Hughes) | 4 | 7,340 | 92% | 6,753 | 1.6% | 117 | 6.4% | 470 | 65 mph |
| I-70 | Eastbound (E of TR Hughes) | 3 | 4,340 | 92% | 3,993 | 1.6% | 69 | 6.4% | 278 | 65 mph |
| I-70 | Westbound (K to TR Hughes) | 4 | 4,625 | 92% | 4,255 | 1.6% | 74 | 6.4% | 296 | 65 mph |
| I-70 | Eastbound (K to TR Hughes) | 4 | 2,725 | 92% | 2,507 | 1.6% | 44 | 6.4% | 174 | 65 mph |
| I-70 | Westbound (West of K) | 3 | 5,630 | 92% | 5,180 | 1.6% | 90 | 6.4% | 360 | 65 mph |
| I-70 | Eastbound (West of K) | 3 | 3,750 | 92% | 3,450 | 1.6% | 60 | 6.4% | 240 | 65 mph |
| Local | Veterans Memorial EB | 1 | 460 | 98% | 451 | 1.0% | 5 | 1.0% | 5 | 45 mph |
| Local | Veterans Memorial WB | 1 | 270 | 98% | 265 | 1.0% | 3 | 1.0% | 3 | 45 mph |
| I-70 Ramps | I-70 WB to TR Hughes | 2 | 1,435 | 92% | 1,320 | 1.6% | 23 | 6.4% | 92 | 55 mph |
| I-70 Ramps | TR Hughes to I-70 EB | 2 | 990 | 92% | 911 | 1.6% | 16 | 6.4% | 63 | 55 mph |
| Local | TR Hughes SB (north of I-70) | 2 | 1,015 | 92% | 934 | 1.6% | 16 | 6.4% | 65 | 55 mph |
| Local | TR Hughes NB (north of I-70) | 2 | 1,055 | 92% | 971 | 1.6% | 17 | 6.4% | 68 | 55 mph |
| Local | TR Hughes SB (south of I-70) | 2 | 1,455 | 92% | 1,339 | 1.6% | 23 | 6.4% | 93 | 55 mph |
| Local | TR Hughes NB (south of I-70) | 2 | 880 | 92% | 810 | 1.6% | 14 | 6.4% | 56 | 55 mph |
| I-70 Ramps | N. Outer Road at TR Hughes | 1 | 670 | 92% | 616 | 1.6% | 11 | 6.4% | 43 | 45 mph |
| I-70 Ramps | I-70 WB to North Outer Road | 1 | 1,280 | 92% | 1,178 | 1.6% | 20 | 6.4% | 82 | 45 mph |
| I-70 Ramps | North Outer Road to I-70 WB | 2 | 465 | 92% | 428 | 1.6% | 7 | 6.4% | 30 | 55 mph |
| I-70 Ramps | N. Outer Rd (at Sonderson) | 2 | 1,610 | 92% | 1,481 | 1.6% | 26 | 6.4% | 103 | 55 mph |
| I-70 Ramps | North Outer Road (at K) | 2 | 1,520 | 92% | 1,398 | 1.6% | 24 | 6.4% | 97 | 55 mph |
| Local | Sonderson Loop NB | 1 | 125 | 98% | 123 | 1.0% | 1 | 1.0% | 1 | 30 mph |
| Local | Sonderson Loop SB | 1 | 230 | 98% | 225 | 1.0% | 2 | 1.0% | 2 | 30 mph |
| Local | Sonderson NB | 1 | 310 | 98% | 304 | 1.0% | 3 | 1.0% | 3 | 30 mph |
| Local | Sonderson SB | 1 | 540 | 98% | 529 | 1.0% | 5 | 1.0% | 5 | 30 mph |
| I-70 Ramps | K to South Outer Road | 2 | 1,375 | 92% | 1,265 | 1.6% | 22 | 6.4% | 88 | 55 mph |
| I-70 Ramps | South Outer Road (after TT) | 2 | 1,715 | 92% | 1,578 | 1.6% | 27 | 6.4% | 110 | 55 mph |
| I-70 Ramps | South Outer Rd (after offramp) | 2 | 2,440 | 92% | 2,245 | 1.6% | 39 | 6.4% | 156 | 55 mph |
| I-70 Ramps | South Outer Rd (after onramp) | 2 | 1,040 | 92% | 957 | 1.6% | 17 | 6.4% | 67 | 55 mph |
| I-70 Ramps | I-70 EB to South Outer Road | 2 | 725 | 92% | 667 | 1.6% | 12 | 6.4% | 46 | 55 mph |
| I-70 Ramps | S. Outer Road at TR Hughes | 2 | 885 | 92% | 814 | 1.6% | 14 | 6.4% | 57 | 55 mph |
| Local | Texas Turnaround at K | 1 | 340 | 92% | 313 | 1.6% | 5 | 6.4% | 22 | 45 mph |
| Local | K NB (south of I-70) | 2-3 | 1,865 | 98% | 1,828 | 1.0% | 19 | 1.0% | 19 | 45 mph |
| Local | K SB (south of I-70) | 2-3 | 2,005 | 98% | 1,965 | 1.0% | 20 | 1.0% | 20 | 45 mph |
| Local | K NB (north of I-70 to Terra) | 2-3 | 1,365 | 98% | 1,338 | 1.0% | 14 | 1.0% | 14 | 45 mph |
| Local | K SB (north of I-70 to Terra) | 2-3 | 1,920 | 98% | 1,882 | 1.0% | 19 | 1.0% | 19 | 45 mph |
| Local | K NB (north of Terra) | 2-3 | 1,185 | 98% | 1,161 | 1.0% | 12 | 1.0% | 12 | 45 mph |
| Local | K SB (north of Terra) | 2-3 | 1,165 | 98% | 1,142 | 1.0% | 12 | 1.0% | 12 | 45 mph |
| I-70 Ramps | W Terra WB to I-70 WB | 1 | 540 | 92% | 497 | 1.6% | 9 | 6.4% | 35 | 55 mph |
| Local | Terra WB-East of Woodlawn | 1 | 405 | 98% | 397 | 1.0% | 4 | 1.0% | 4 | 45 mph |
| Local | Vets Mem Pkwy EB @ TR Hughes | 1 | 460 | 98% | 451 | 1.0% | 5 | 1.0% | 5 | 45 mph |
| Local | Terra EB-West of Woodlawn | 1 | 520 | 98% | 510 | 1.0% | 5 | 1.0% | 5 | 45 mph |
| Local | Terra WB-west of Woodlawn | 1 | 600 | 98% | 588 | 1.0% | 6 | 1.0% | 6 | 45 mph |
| Local | Woodlawn SB | 1 | 535 | 98% | 524 | 1.0% | 5 | 1.0% | 5 | 30 mph |
| Local | Woodlawn NB | 1 | 515 | 98% | 505 | 1.0% | 5 | 1.0% | 5 | 30 mph |

Appendix D
Traffic Monitoring Data

Traffic Noise Level Measurement Data

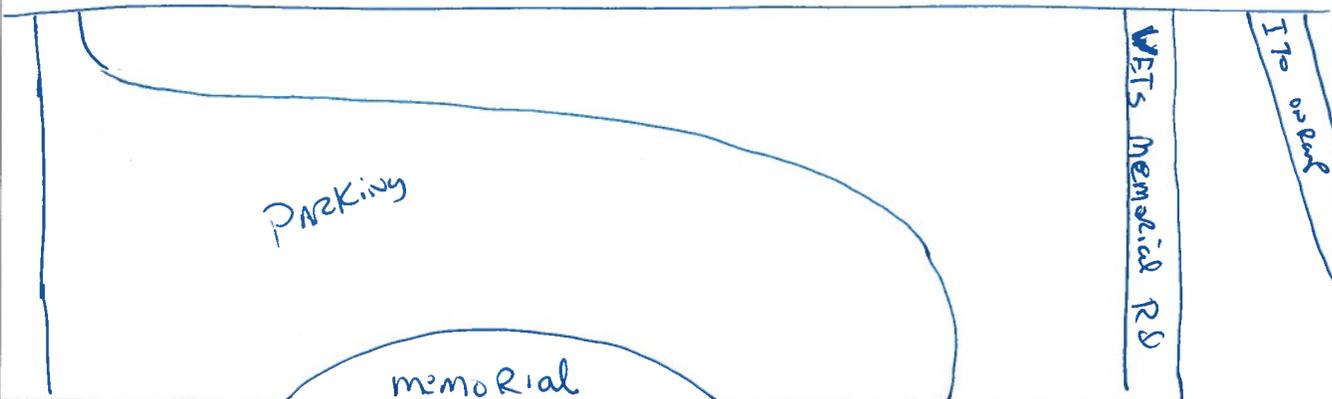
Date: 4 August 2015 Project: I-70 (K)
 Monitoring Location: A: Memorial Walk
 Equipment: CASSELLA CEL
 Weather: Temp. 87° Wind Conditions 10 mph Humidity 80%

| Measurement Start Time | Duration | Leq | Lmin | Lmax | Traffic Counts | | | | | | |
|------------------------|----------|------|------|------|----------------|-------|---------------|-------|--------------|-------|-----------------------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB | |
| 12:20 12:35 | 15 | 59.6 | 53.5 | 78.2 | 150 | 153 | 3 | 2 | 1 | 2 | Belleau Creek Rd (45) |
| | | | | | 35 | 36 | 3 | 2 | 0 | 0 | VET MEM ROAD (45) |
| | | | | | 221 | - | 3 | - | 25 | - | I-70 on ramp (55) |
| | | | | | 662 | - | 9 | - | 74 | - | I-70 (65) |

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



VETS MEM RD



Data by: RLM

Traffic Noise Level Measurement Data

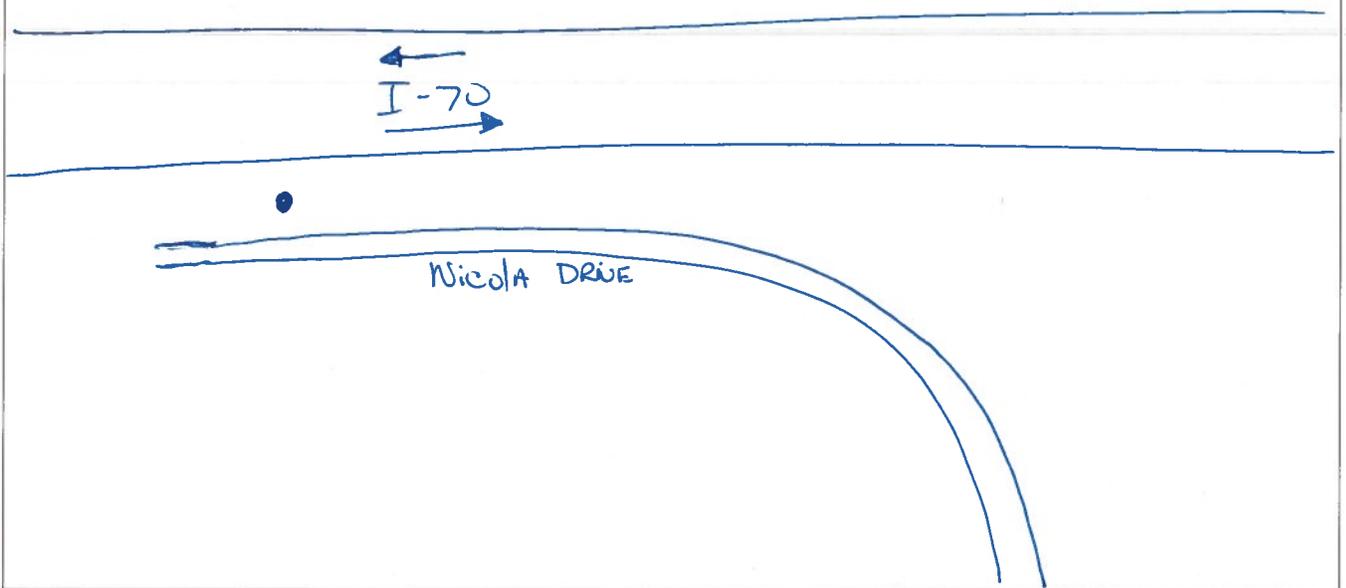
| | |
|--|-------------------------|
| Date: <u>5 August 2015</u> | Project: <u>I-70(K)</u> |
| Monitoring Location: <u>B: Nicola Drive</u> | |
| Equipment: <u>CASSELLA CAS</u> | |
| Weather: Temp. <u>35°</u> Wind Conditions <u>—</u> Humidity <u>30%</u> | |

| Measurement Start Time | Duration | L _{eq} | L _{min} | L _{max} | Traffic Counts | | | | | |
|------------------------|----------|-----------------|------------------|------------------|----------------|-------|---------------|-------|--------------|-------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB |
| 3:15 3:30 | 15 | 81.2 | 71.4 | 97.0 | 425 | 325 | 7 | 8 | 44 | 33 |

I-70

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):

Metro Lighting



Data by: RCM

Traffic Noise Level Measurement Data

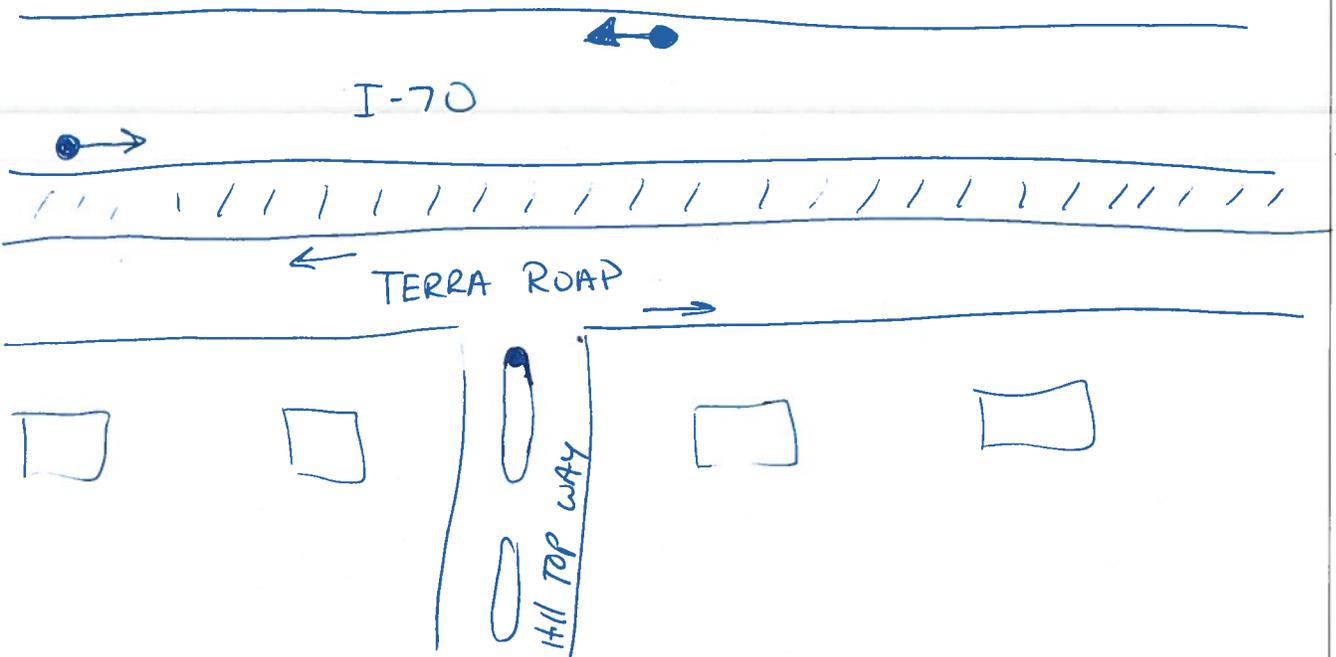
| | |
|--|--------------------------|
| Date: <u>4 August 2015</u> | Project: <u>I-70 (K)</u> |
| Monitoring Location: <u>C: Hill Top Way</u> | |
| Equipment: <u>CASSELLA CAS</u> | |
| Weather: Temp. <u>87°</u> Wind Conditions <u>7 mph</u> Humidity <u>80%</u> | |

| Measurement Start Time | Duration | L _{eq} | L _{min} | L _{max} | Traffic Counts | | | | | |
|------------------------|----------|-----------------|------------------|------------------|----------------|-------|---------------|-------|--------------|-------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB |
| 1:50 2:05 | 15 min | 71.1 | 63.4 | 77.6 | 19 | 21 | 2 | 1 | ∅ | ∅ |
| | | | | | 882 | 723 | 12 | 15 | 98 | 97 |

TERRA ROAD

I-70

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



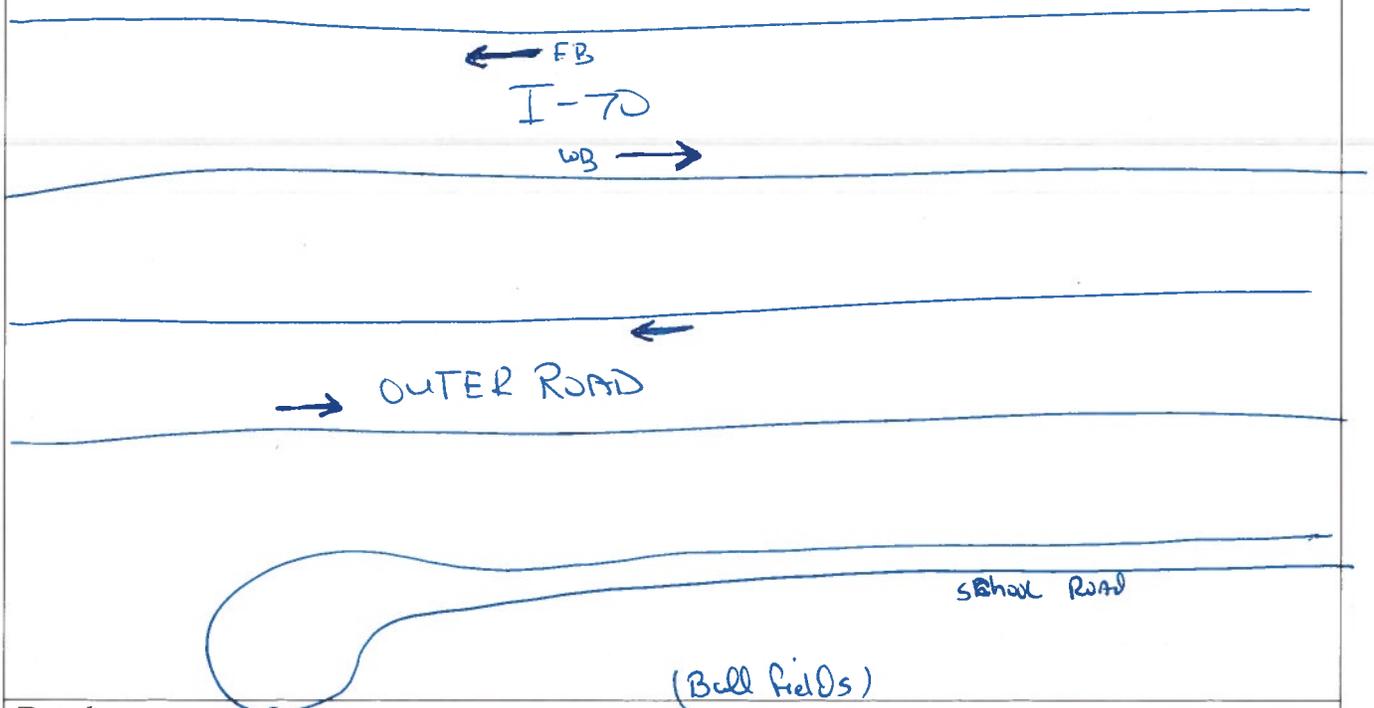
Data by: RM

Traffic Noise Level Measurement Data

| | |
|--|--------------------------|
| Date: <u>4 August 15</u> | Project: <u>I-70 (K)</u> |
| Monitoring Location: <u>D: Fort Zumwalt middle school Ball fields</u> | |
| Equipment: <u>CASSELL CES</u> | |
| Weather: Temp. <u>85°</u> Wind Conditions <u>7 mph</u> Humidity <u>30%</u> | |

| Measurement Start Time | Duration | L _{eq} | L _{min} | L _{max} | Traffic Counts | | | | | | |
|------------------------|----------|-----------------|------------------|------------------|----------------|-------|---------------|-------|--------------|-------|-----------------------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB | |
| 4:05 4:20 | 15 | 70.9 | 63.7 | 77.6 | 677 | 652 | 10 | 8 | 39 | 30 | I-70 (65) |
| | | | | | 40 | 38 | 2 | 1 | 0 | 0 | OUTER ROAD (45) |

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



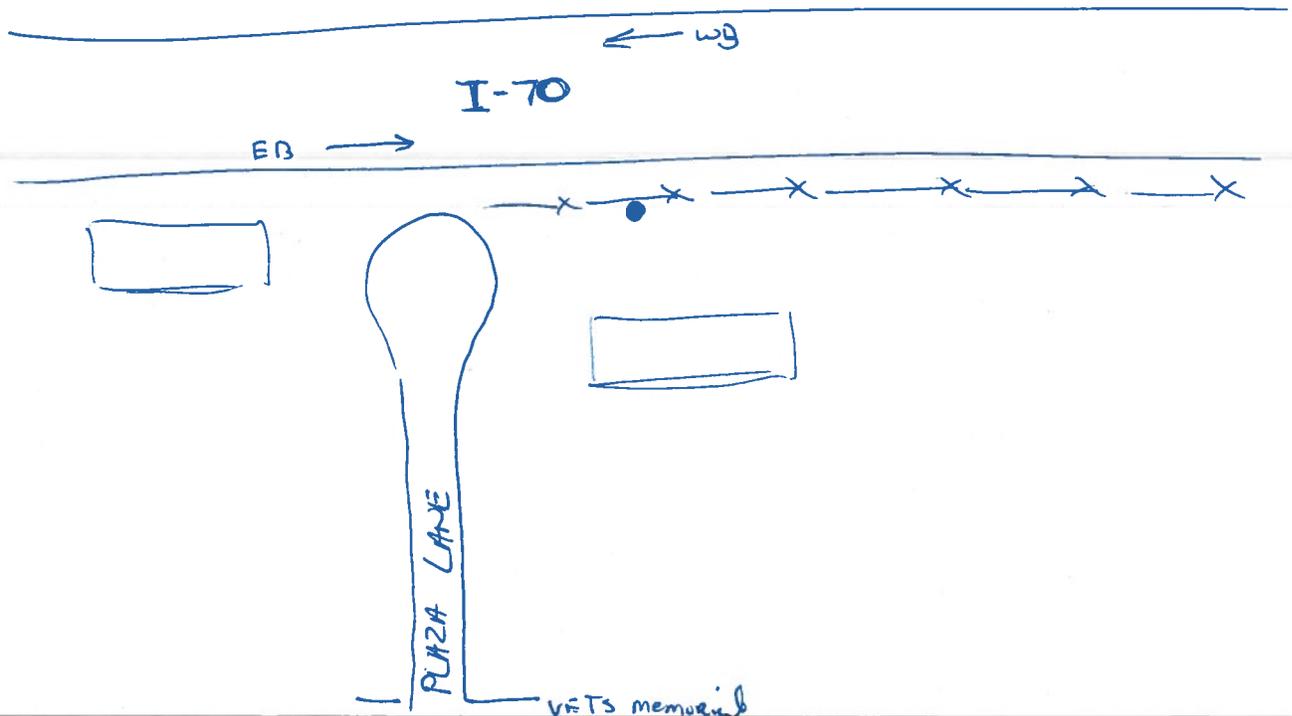
Data by: RJM

Traffic Noise Level Measurement Data

| | |
|--|--------------------------|
| Date: <u>4 AUGUST 2015</u> | Project: <u>I-70 (K)</u> |
| Monitoring Location: <u>E: PLAZA LANE</u> | |
| Equipment: <u>CASSELLA CAS</u> | |
| Weather: Temp. <u>85°</u> Wind Conditions <u>7 mph</u> Humidity <u>80%</u> | |

| Measurement Start Time | Duration | Leq | Lmin | Lmax | Traffic Counts | | | | | |
|------------------------|----------|------|------|------|----------------|-------|---------------|-------|--------------|-------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB |
| 3:05 3:20 | 15 | 77.1 | 71.3 | 83.3 | 662 | 648 | 12 | 12 | 40 | 42 |

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



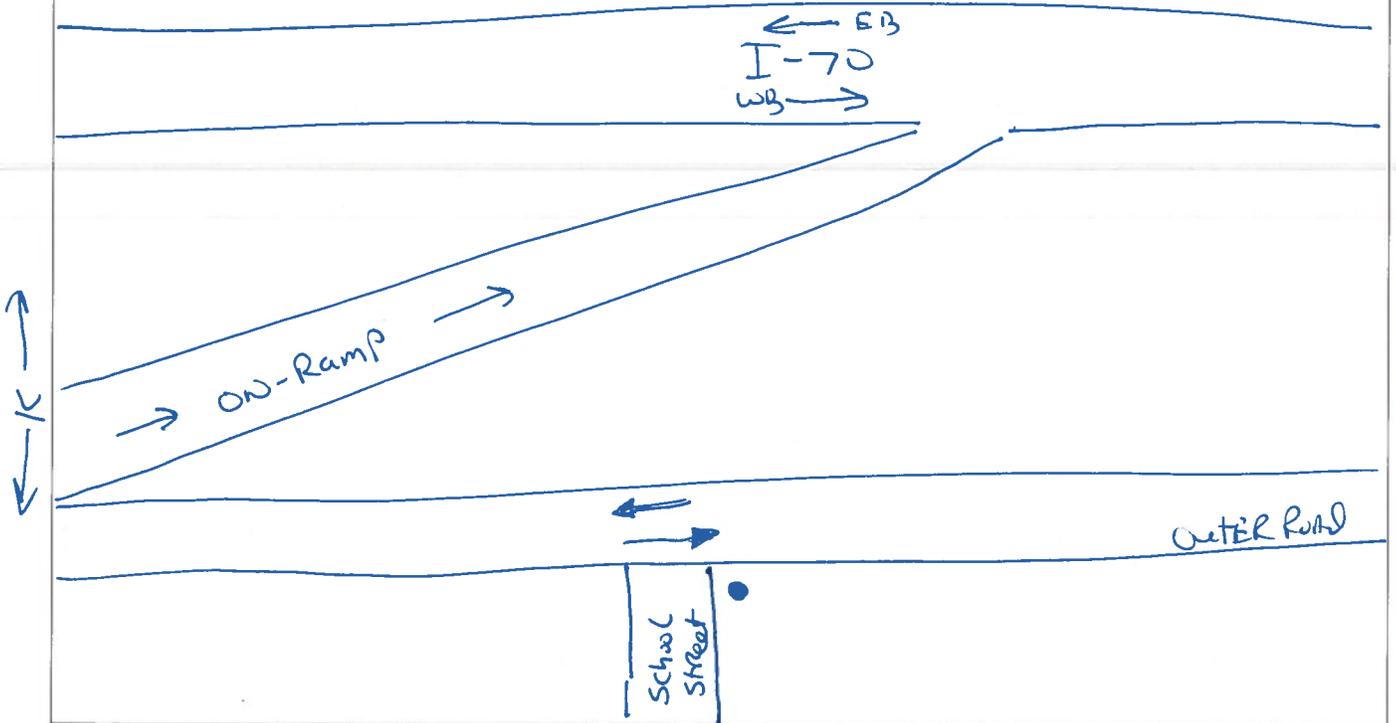
Data by: Rum

Traffic Noise Level Measurement Data

| | |
|--|--------------------------|
| Date: <u>5 August 2015</u> | Project: <u>I-70 (K)</u> |
| Monitoring Location: <u>F: School STREET (TERRA MARIE)</u> | |
| Equipment: <u>CASSELLA CAS</u> | |
| Weather: Temp. <u>81°</u> Wind Conditions <u>5 mph</u> Humidity <u>75%</u> | |

| Measurement Start Time | Duration | L _{eq} | L _{min} | L _{max} | Traffic Counts | | | | | | |
|------------------------|----------|-----------------|------------------|------------------|----------------|-------|---------------|-------|--------------|-------|------------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB | |
| 10:15 10:30 | 15 | 74.9 | 67.5 | 89.1 | 540 | 512 | 20 | 18 | 101 | 100 | I-70 |
| | | | | | 105 | - | 3 | - | - | - | ON-Ramp |
| | | | | | 50 | 55 | 3 | 3 | - | - | OUTER ROAD |

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



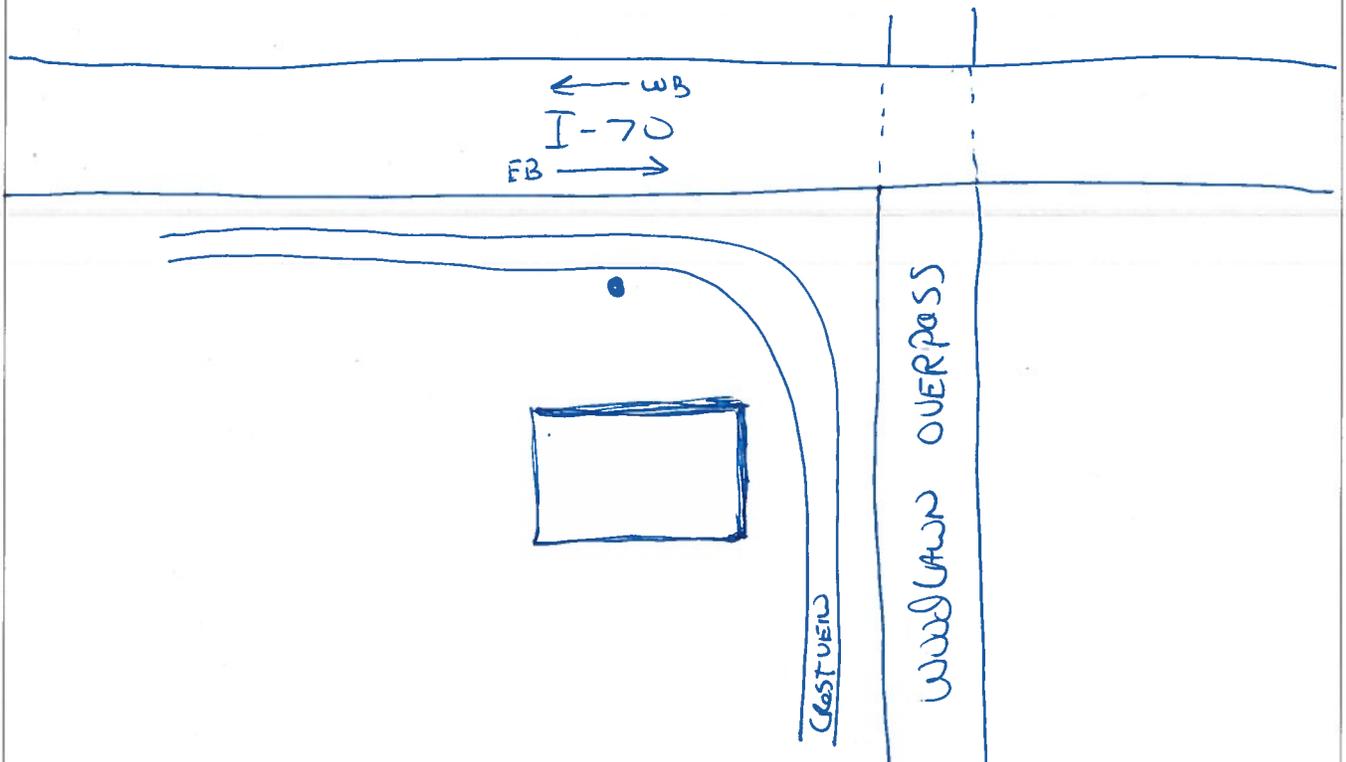
Data by: RLM

Traffic Noise Level Measurement Data

| | |
|--|--------------------------|
| Date: <u>5 August 15</u> | Project: <u>I-70 (K)</u> |
| Monitoring Location: <u>G: CRESTVIEW DRIVE</u> | |
| Equipment: <u>CASSELLA CAS</u> | |
| Weather: Temp. <u>78°</u> Wind Conditions <u>5 mph</u> Humidity <u>70%</u> | |

| Measurement Start Time | Duration | L _{eq} | L _{min} | L _{max} | Traffic Counts | | | | | |
|------------------------|----------|-----------------|------------------|------------------|----------------|-------|---------------|-------|--------------|-------|
| | | | | | Autos | | Medium Trucks | | Heavy Trucks | |
| | | | | | NB/EB | SB/WB | NB/EB | SB/WB | NB/EB | SB/WB |
| 9:30 9:45 | 15 | 75.0 | 66.3 | 81.4 | 301 | 334 | 5 | 3 | 44 | 40 |

Notes (site characteristics, pertinent distances, elevations, traffic speed, other):



Data by: ELM

Appendix E
TNM Output Files