North I-25 EIS

information. cooperation. transportation.

TRAFFIC NOISE AND VIBRATION IMPACT ASSESSMENT

October 2008

Prepared for:

Federal Highway Administration
Federal Transit Administration
Colorado Department of Transportation

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
Centennial, CO 80111

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 INTRODUCTION

The Colorado Department of Transportation (CDOT) is evaluating alternative sets of improvements to the transportation system in north-central Colorado through the North I-25 Environmental Impact Statement (EIS [CDOT, 2008]). The general region covered in the EIS (**Figure 1-1**) encompasses approximately 1,300 square miles. This regional study area generally is bounded by and includes U.S. Highway (US) 287, US85, State Highway (SH) 1 and US36. The distance from SH1 to US36 is approximately 60 miles and from US287 to US85 is approximately 20 miles.

The overall purpose for the EIS is to improve connectivity, functionality and capacity of transportation modes in the regional study area. The existing highways are becoming inadequate and will underserve the expected future traffic demand in the region. CDOT Project IM0253-179 through the EIS is examining several alternatives that would upgrade transportation infrastructure in this regional study area.

The purpose of the following analyses is to conclude whether noise or vibration levels at the properties (i.e., receivers) near the potential improvements may exceed applicable thresholds due to the project alternatives, according to CDOT, Federal Highway Administration (FHWA) or Federal Transit Administration (FTA) guidelines. This is important because there are many properties along the several study corridors which might be impacted by noise or vibration from the various alternatives.

The following document presents an overall analysis that was performed as part of the EIS to assess potential impacts to properties near the potential improvements from noise and vibration from road traffic. The noise and vibration impacts from potential rail transit improvements are described in a separate report (Harris, Miller, Miller & Hanson [HMMH], 2007).

1.1 PROJECT DESCRIPTION

The regional study area is large, so existing land uses bordering both existing and potential road corridors in the regional study area are variable. Many residences, businesses, and undeveloped spaces abut the various corridors of interest in the regional study area. Large portions of the regional study area are in agricultural uses; however, the regional study area has places developing rapidly and many more homes and businesses are expected along the study corridors in the future.

Residential areas are typically the land use most sensitive to noise or vibration impacts (**Chapter 2.1**) and there are many residences close to the road corridor of primary interest (I-25) examined within the EIS (**Figure 1-2**). Other sensitive land uses include parks, schools, some types of businesses, and hospitals.

Figure 1-1 North I-25 EIS Regional Study Area

Source: Felsburg Holt & Ullevig (FHU) project data, 2007.

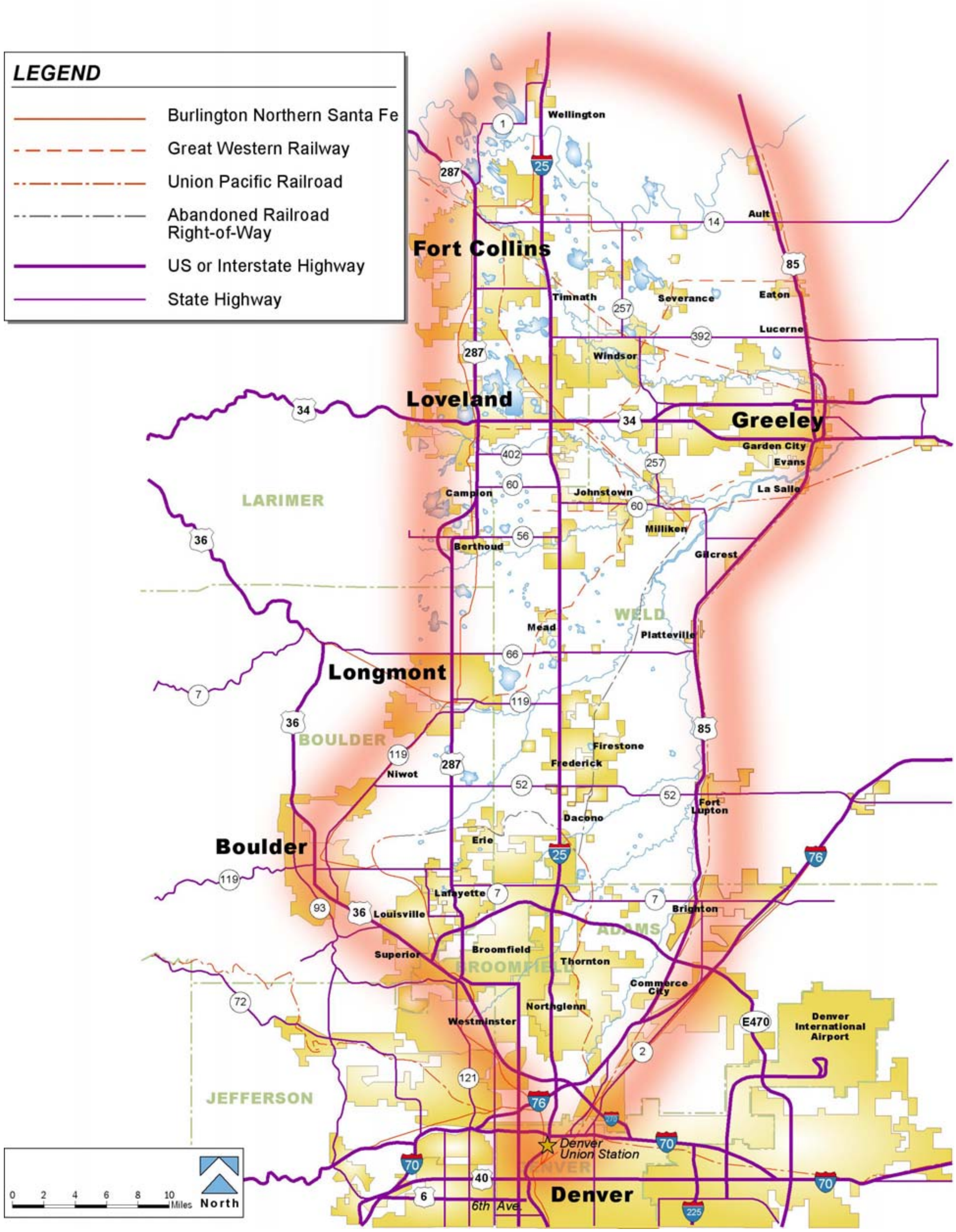
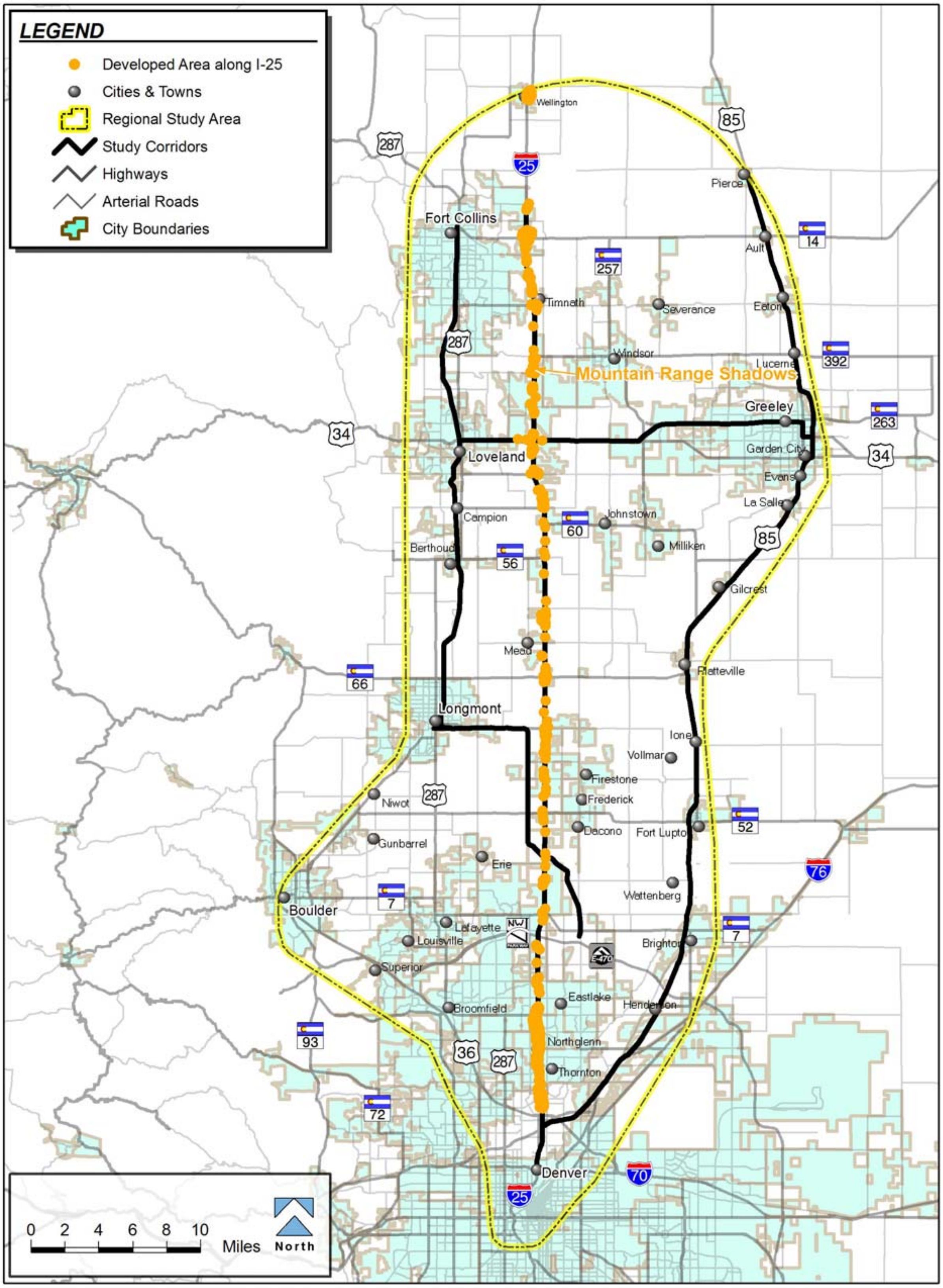


Figure 1-2 Noise Sensitive Areas along I-25

Source: FHU project data, 2007.



Three alternatives are being considered in the EIS, and each alternative was examined for potential noise or vibration impacts. The first alternative is the No-Action Alternative where no new road or rail improvements will be made as part of this project, though changes to the system may be made by other projects. Additionally, there are two action alternatives (Package A and Package B) consisting of comprehensive system-wide road/rail improvements to the regional study area. The alternatives are described in detail in the EIS document (CDOT, 2008). There is overlap of the road corridors targeted for improvement by the two action alternatives, especially the I-25 corridor, but each action alternative is a unique set of road and/or rail improvements.

1.2 BASICS OF SOUND

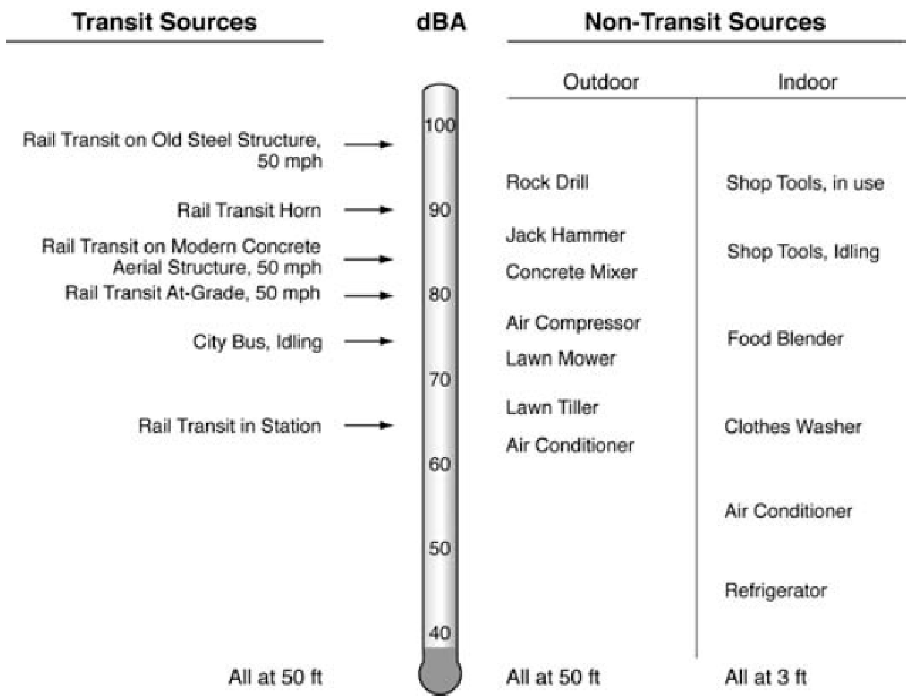
Sound is created when an object vibrates and radiates part of that energy as acoustic pressure or waves through a medium, such as air, water, or a solid. Noise is commonly defined as unwanted sound. Sound and noise have many characteristics that are important to consider, including loudness (energy intensity), frequency, and fluctuations over time.

Sound and noise intensities are measured in units of decibels (dB). The dB scale is logarithmic, not linear. To illustrate this, consider that two identical noise sources, each producing 60 dB, would produce 63 dB when added together. Likewise, a 10-dB increase in sound levels represents ten times as much sound energy. The human ear can accommodate a wide range of sound energy levels, with the maximum levels having more than a million times the sound energy of the minimum levels. Examples of common sound levels are shown in **Figure 1-3**.

The human ear is not equally receptive to all frequencies of sound-producing vibrations. Weighting of sound frequencies using the “A” scale is an adjustment of raw sound levels to approximate how the human ear would perceive a sound, mostly by reducing the contribution from low and extremely high frequencies by a specified amount (**Figure 1-4**). A-weighted sound levels are reported in dBA. Research has shown that most people do not notice a difference in loudness between sound levels of less than 3 dBA, which is a two-fold change in the sound energy. Most people relate a 10-dBA increase in sound levels to a doubling of sound loudness.

Noise often fluctuates over time because of the characteristics of the source. Traffic noise will fluctuate from changes in traffic volumes, vehicle types, and vehicle speeds. This fluctuation makes it difficult to describe noise through a single value. Nonetheless, FHWA, CDOT and FTA use the one-hour equivalent sound level (L_{eq}) as the metric for assessing traffic noise impacts. In simple terms, the L_{eq} is the “average” of the fluctuating noise levels over a time period, or put another way, the constant noise level that would produce the same amount of sound energy as the fluctuating noise level. FTA also uses the day-night sound level (L_{dn}), which is a 24-hour average sound level to which a 10-dBA penalty is added to sound that occurs at night (10 PM to 7 AM).

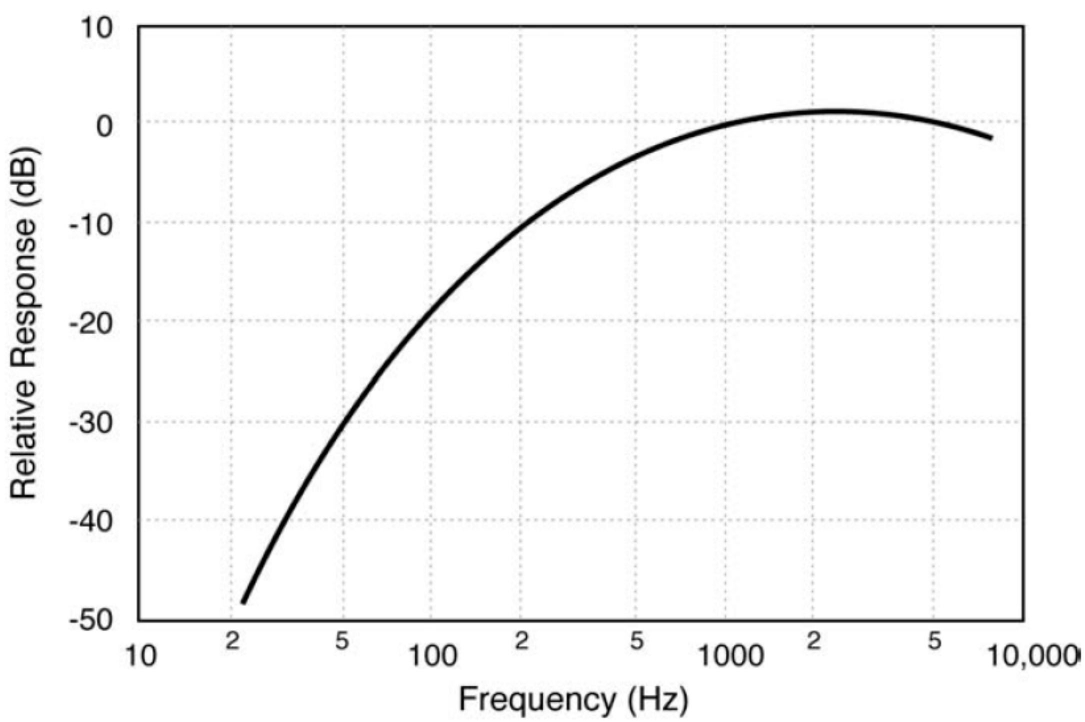
Figure 1-3 Typical Sound Levels



Source: FTA, 2006

Figure 1-4 Adjustments to Sound Levels by Sound Frequency for A-Weighting

Source: FTA, 2006



Sound levels decrease with distance from the source because of spreading, atmospheric absorption, interference from other objects and ground effects. "Hard" ground (such as asphalt) and "soft" ground (such as grass) affect sound transmission differently. “Hard” ground is more reflective and will produce louder sound levels farther from the source. Using traffic noise passing over “hard” ground as an example, either doubling the traffic volume or cutting the distance from the roadway in half could cause a 3-dBA increase in noise levels, which would be barely noticeable to most people.

On busy roads and highways, the loudest traffic noise generally occurs when the largest traffic volume can travel at the highest speed, which is not necessarily rush hour when traffic volume can be so high roads become congested and speeds slow. This noisiest traffic condition generally corresponds to Level of Service (LOS) C for a highway.

1.3 BASICS OF VIBRATION

Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position, and can be described in terms either of displacement, velocity or acceleration. Because human sensitivity to vibration typically corresponds best to the amplitude of vibration velocity within the low frequency range of most concern (roughly 5-100 Hertz), vibration velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion. PPV is normally used in monitoring blasting and other types of construction-generated vibration, because PPV is related to the stresses experienced by building components. PPV is less suitable for evaluating human response to vibration, which is better related to the average vibration amplitude. For ground-borne vibration from transit, the measure is usually in terms of the “smoothed” root mean square vibration velocity level in decibels (VdB). VdB is used in place of dB to avoid confusing vibration decibels with sound decibels.

Figure 1-5 illustrates typical ground-borne vibration levels for common sources. As shown, the range of interest is from approximately 50 VdB (imperceptible background vibration) to 100 VdB (threshold of damage). Although the threshold of human perception to vibration is approximately 65 VdB, annoyance is not usually significant unless the vibration exceeds 70 VdB.

1.4 ANALYSIS APPROACH

The overall purpose of the analyses was to conclude whether noise or vibration levels at any receivers near potential project improvements may exceed applicable impact thresholds from the project alternatives. If so, mitigation actions for the impacted receivers would be considered for the project design. The analyses examined:

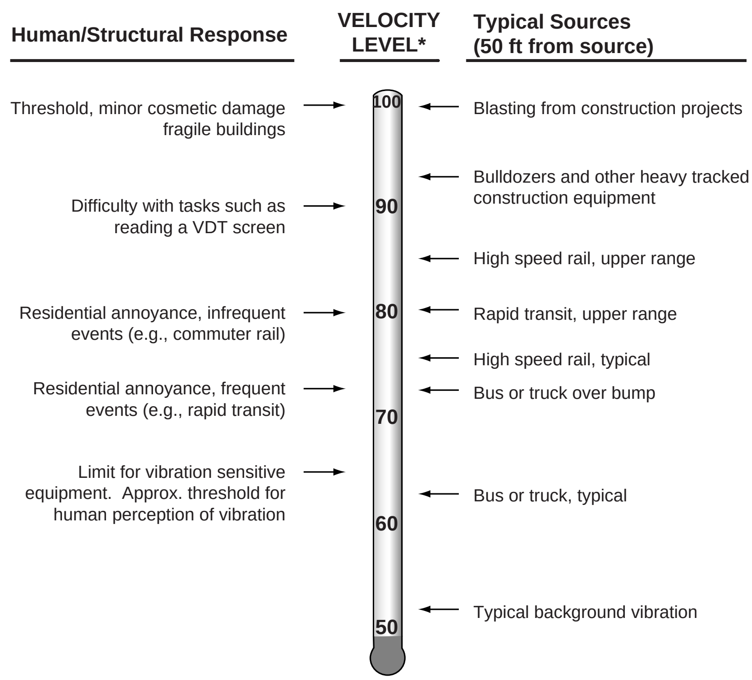
- roads that would be changed or newly built by the project or would have substantially different traffic volumes because of an alternative (see below)
- rail corridors that would be changed or built to accommodate the potential rail transit (HMMH, 2007)

- support features of the alternative (e.g., parking lots and stations)

The overall analysis was based on measurements of existing conditions and on modeling of both existing (2005) conditions and expected future (2030) conditions (**Chapter 2**). Current conditions and the three alternatives being considered in the EIS were examined. Currently, there are residences, motels, churches, parks and businesses near potential project roads, which are the most sensitive receivers to noise and vibration (**Figure 1-2**).

Figure 1-5 Typical Ground-Borne Vibration Levels

Source: FTA, 2006



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

A select number of measurements of existing noise were performed in the project area in 2004 and 2006 (**Chapter 3**). Computer modeling was used to examine existing and expected future conditions for numerous locations in the project area, focusing on potential impacts to the most sensitive receivers (**Chapters 3 and 4**). The resulting noise levels were compared to applicable criteria to assess for and identify impacted areas (**Chapter 4**). The efficacy of various mitigation measures for the impacted areas were evaluated and select mitigation measures were recommended, as appropriate (**Chapter 5**).

2.0 ANALYSIS METHODS

Noise and vibration impacts from automobile traffic were evaluated through a combination of measurements and computer modeling. The specific methods used for each part of the analysis are described below.

2.1 TRAFFIC NOISE METHODS

Because most of the roads of interest in the regional study area are state or federal highways, the appropriate noise impact criteria are state and federal highway noise guidelines. CDOT has the most restrictive requirements of this group. Therefore, traffic noise impacts are assessed by comparing the traffic noise level to the relevant CDOT Noise Abatement Criteria (NAC) (**Table 2-1**). For further comparison, typical noise levels are shown in **Figure 1-3**.

The CDOT NAC for residences and other Category B properties is an exterior L_{eq} of 66 dBA, and for commercial areas (Category C) is an exterior L_{eq} of 71 dBA. Under CDOT guidelines, equaling or exceeding the NAC is viewed as a noise impact and triggers an investigation of noise mitigation measures. A “substantial” noise increase is also a noise impact and leads to evaluation of traffic noise mitigation actions. A “substantial” noise increase is defined as the future noise level increasing by 10 dBA or more over existing levels.

Table 2-1 CDOT Noise Abatement Criteria

Land Use Category	CDOT NAC (L_{eq})	Description of Land Use Category
A	56 dBA (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks, or open spaces which are recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	66 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, playgrounds, active sports areas, and parks.
C	71 dBA (Exterior)	Developed lands, properties or activities not included in categories A and B above.
D	None	Undeveloped lands.
E	51 dBA (Interior)	Residences, motels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: CDOT, 2002

For the noise impact discussion, the “peak hour” refers to the highest traffic noise hour, which may or may not correspond to the hour of largest traffic volume. Traffic noise can decrease during rush hour due to lower vehicle speeds from overloaded and congested roads.

2.1.1 Traffic Noise Measurements

The traffic noise measurements used either a Svantek 945A Type 1 sound level meter calibrated at the site with a Norsonic 1251 calibrator or a Quest NoisePro DLX Type 2 meter. Measurements were made during meteorological conditions, including wind speed, that were acceptable according to FHWA guidance (FHWA, 1996). Measurements were performed in 2004 and 2006 (**Appendix A**).

The noise measurement equipment described above conforms to ANSI Standard S1.4 for Type 1 or Type 2 sound level meters. Calibrations, traceable to the U.S. National Institute of Standards and Technology (NIST) were done in the field before and after each set of measurements using acoustical calibrators. The measurement microphone was protected by a windscreen and supported on a tripod approximately 5 feet above the ground. The microphone was positioned to characterize the exposure of the site to the dominant noise sources in the area.

Noise level data from 24-hour continuous measurements (**Figure 2-1**) at three locations (**Chapter 3.1**) were used to guide the rest of the traffic noise measurement program. The traffic noise measurements were spread over a variety of locations in the project area. The 24-hour data tended to show morning and afternoon traffic noise peaks each day (**Figure 2-1**). The size and significance of these peaks varied according to the nature of the adjacent roads. It was concluded from these data that representative peak noise measurements could be taken during the afternoon hours and this approach was used for the rest of the traffic noise measurement program.

Short-term (10-minute) traffic noise measurements were performed in duplicate back to back in the afternoon at a number of locations (**Chapter 3.1**) to document existing ambient conditions in the project area. Traffic counts, including the number of large trucks, were collected when possible during the noise measurement periods (**Appendix A**); however, clear views of traffic were not always available from the measurement site. The results were also used to evaluate the performance of the computer models.

2.1.2 Traffic Noise Modeling Methods

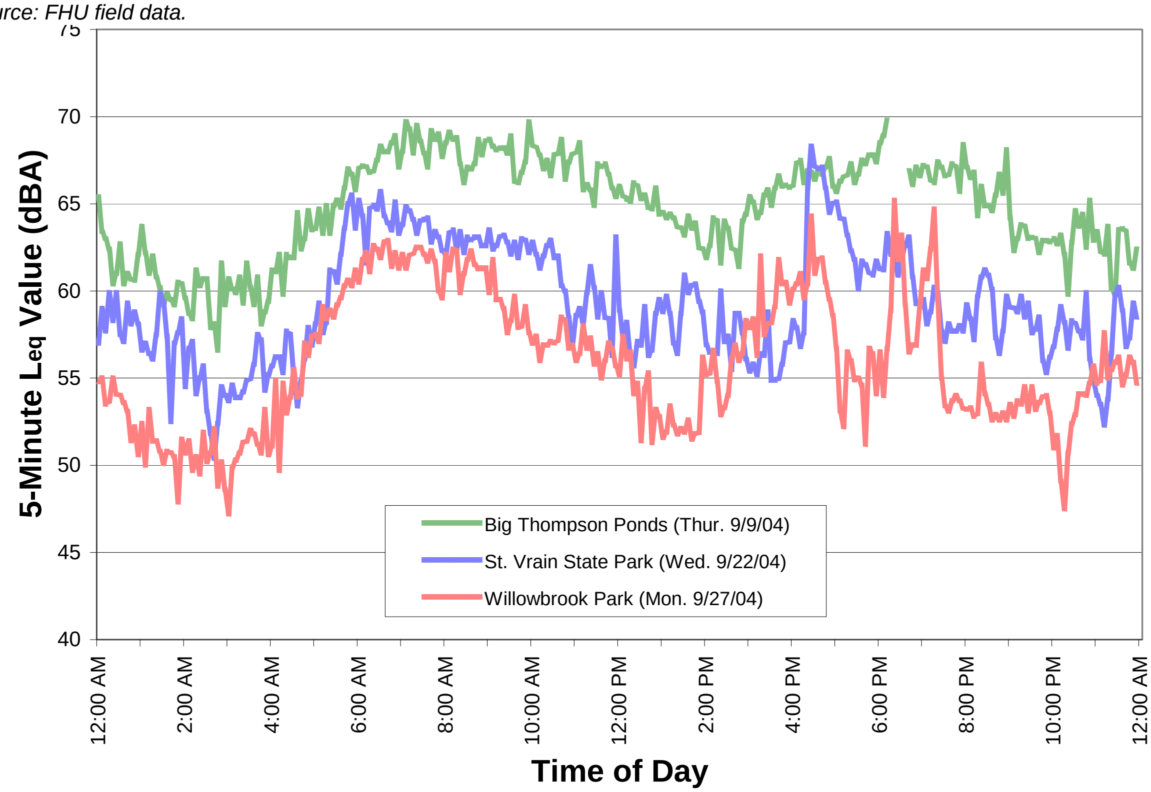
Three alternatives are being evaluated for this project. Depending on the alternative, some project area roads may be widened or realigned. Other changes, such as increased traffic volumes or increased traffic speeds, may lead to impacts from traffic. Packages A and B would make substantive changes to I-25, so it was important to assess I-25 noise. The important new noise sources or changed conditions that were the focus of the traffic noise modeling included:

- Road design in the I-25 corridor (Packages A and B)
- Traffic volumes and vehicle mixes on I-25 (all alternatives)
- New transit and maintenance facilities, parking lots, and access roads (Packages A and B)

Other noise sources were also considered but found not to be important. Small changes, such as addition of traffic control devices, do not require noise analysis.

Figure 2-1 24-Hour Traffic Noise Measurement Data

Source: FHU field data.



Outside the I-25 corridor, minor proposed changes to the project area roads that may affect noise or vibration conditions would be installation of queue jumps for buses at select intersections and addition of commuter/feeder bus traffic on the existing roads. The queue jumps would result in small changes to existing intersections and would not cause a substantive change in traffic noise, so the queue jumps are inconsequential for noise impacts. For new bus traffic, the loudest change on any project-area road would be adding six buses per hour (three buses in each direction), which is a trivial amount of traffic relative to the volumes that already would be on these roads. The additional bus traffic would not have a material effect on traffic noise levels, so bus traffic noise was inconsequential and did not need to be modeled. Therefore, project area road noise outside the I-25 corridor, such as US 85 and US 287, would not be materially changed and was not considered in the traffic noise models.

The new transit facilities and new access roads to these facilities were examined for noise impacts regardless of location within the regional study area because these new facilities might cause substantial noise changes at the local level.

To summarize, the traffic noise modeling analyses consisted of I-25 corridor traffic and the bus transit facilities. For clarity, the remaining discussion has been divided into I-25 traffic noise based on the FHWA/CDOT process and bus noise based on the FTA process.

2.1.2.1 HIGHWAY NOISE MODELING

Computer modeling was performed for both current conditions and the project alternatives for 2030. Modeling is used because day-to-day variations in traffic or weather conditions that affect noise levels cannot be captured or quantified by brief noise measurements alone, and because the future noise levels can not be measured now. In addition, the modeling can be used to evaluate many more locations than can reasonably be field measured. The modeling results represent typical average traffic conditions.

The traffic noise modeling software used for the analyses was FHWA's Traffic Noise Model (TNM) Version 2.5. The ultimate purpose of the models is to show whether traffic noise levels are high enough to impact neighboring properties, and subsequently whether noise mitigation should be provided for any such impacts within the project area.

The existing traffic conditions that were modeled included the 2005 road configurations and traffic volumes. The 2030 traffic conditions were modeled for each alternative (**Chapter 1.1**). Often, LOS C traffic conditions (1,600 vehicles per lane per hour) were modeled for I-25 because 2030 peak traffic volumes were often predicted to exceed LOS C capacities. The conditions examined for the smaller highways and arterial roads used the predicted afternoon peak traffic volumes.

TNM was used to calculate noise levels at more than 500 points up to 700 feet from a modeled roadway. This distance was identified as being sufficient to capture the receivers that could be impacted by the alternatives. In some cases, a single model point represented several nearby receivers/properties where traffic and geography were similar (e.g., one model point for a multi-unit apartment building), so the number of model "points" is not always the same as the number of "receivers." The modeled roadways were the roads that would be built or changed by the action alternatives of the EIS or were important local noise sources. The same model points were used in each model for consistency (**Appendix B**), unless a specific alternative removed a specific receiver.

The computer noise models require a considerable amount of input data regarding the geometry of the roadways as well as traffic volumes, vehicle mix and vehicle speeds. Detailed traffic studies were completed for the project (FHU, 2007) to provide traffic volumes. The existing road/street layout was mapped and used for both the existing and the No-Action Alternative models. The potential roadway additions and changes for each of the two action alternatives (**Chapter 1.1**) were each modeled to assess their possible noise impacts. In general, the following data were used in the models:

- Units–feet and miles per hour
- Current Roadway Alignments–XY coordinates from CAD files and aerial photographs
- Future Roadway Alignments–XY coordinates from CAD files
- Vehicle Speeds–ranged from 30-75 miles per hour (MPH), depending on road type
- Traffic Volumes–from traffic study (LOS C for I-25 when needed, afternoon peak hour for rest)
- Vehicle Mix–from noise measurement vehicle count data and CDOT traffic count data
- Elevations–from ground surface contours of the regional study area and preliminary road designs; model points were 5 feet above ground
- Structural and terrain barriers were used as needed to emulate the existing area; mitigation barriers were added where appropriate for the mitigation evaluations. Several

earth berms and traffic noise walls have been built along I-25 and these were included in the models.

2.1.2.2 BUS TRANSIT AND PARKING LOT NOISE ANALYSIS

Noise from I-25 traffic, including transit buses, is included in the highway noise analysis (**Chapter 2.1.2.1**). Therefore, the bus transit analysis examined only those new major off-highway facilities that would be added to support bus transit, i.e., bus stations/parking lots, maintenance shops and the associated new access roads. This transit analysis was based on the FTA process (FTA, 2006).

The FTA process is a three-tiered approach of escalating levels of analysis, the tier order being screening, general assessment, and detailed assessment. If a lower level of analysis indicates possible impacts, the next higher level of analysis is undertaken for confirmation. For this project, screening and general assessment were the tiers needed for the bus transit analysis. The FTA process is based on land use category (**Table 2-2**) and on comparison between existing and project-caused noise exposure (**Figure 2-2**).

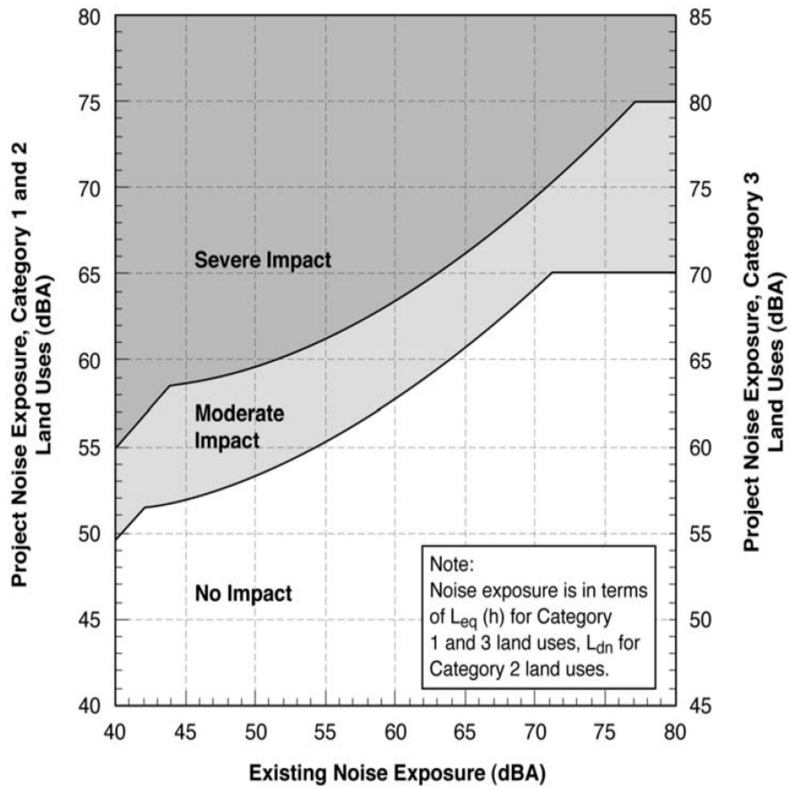
Table 2-2 FTA Land Use Categories and Transit Noise Impact Metrics

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

* $L_{eq}(h)=L_{eq}$ for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: FTA, 2006

Figure 2-2 Noise Impact Criteria for Transit Projects

Source: FTA, 2006



2.2 TRAFFIC VIBRATION METHODS

There are no federal or state requirements directed specifically to traffic-induced vibration. The studies that have been done to assess the impact of operational traffic-induced vibrations have shown that both measured and predicted traffic vibration levels are less than any known criteria for structural damage to buildings (FHWA, 1995). Often, normal indoor activities like closing doors have been shown to create greater levels of vibration in homes than highway traffic. Therefore, vibration from highway traffic is not a concern within the EIS and will not be examined further in this analysis.

Vibration from road construction could be a concern, if specific construction techniques such as pile driving or blasting are used. Issues with construction-generated vibrations would depend on these types of activities occurring close to vibration-sensitive locations. At present, it is not expected that these types of construction techniques would be necessary for the EIS alternatives, let alone occurring near sensitive properties. If such construction techniques are necessary at a specific location, the vibration concerns will be addressed during construction planning on a case-by-case basis and appropriate mitigation action taken for the specific situation. Therefore, vibration from road construction will not be examined further in this analysis.

3.0 AFFECTED ENVIRONMENT

The traffic noise conditions in the regional study area were assessed through a combination of measurements and modeling. Along I-25 between SH 1 and 136th Avenue, there are dispersed residential and business properties with some clusters of developed properties. The Mountain Range Shadows residential development located south of SH 392 (**Figure 1-2**) is one of the larger neighborhoods near I-25 outside the Denver area, while the majority of other developed properties are scattered throughout the northern project area. At the south end of the project area between 136th Avenue and US 36, there are numerous densely populated residential and business areas along both the east and west sides of I-25. The existing conditions for traffic noise are presented below.

3.1 TRAFFIC NOISE MEASUREMENTS

The short-term noise measurements described below are based in part on the findings from the preliminary 24-hour measurements that are intended to provide data on overall noise patterns (**Figure 2-1**). Short-term traffic noise measurements were performed at 13 of the 16 measurement locations (**Table 3-1**) in the afternoon in the project area to document existing ambient conditions. These locations (**Figure 3-1**) include residential, park, commercial and undeveloped areas along the project corridors that are under consideration for the EIS. Each location is also representative of other nearby properties that may have different land uses.

The results indicate that the existing traffic noise environment exceeds the applicable CDOT NAC at some locations in the project area (**Table 3-1**). These include many properties along I-25 (**Chapter 3.3**).

3.2 TRAFFIC NOISE VERIFICATION MODEL

As a check on noise model parameters, the traffic conditions observed during the noise measurements were used to construct a verification model. The intent is to check the accuracy of the calculated noise levels through a model that reflects the road alignment, traffic volumes and model receivers at the time of field measurement. A close match between model results and field measurements would ensure that the models are providing accurate noise results (CDOT, 2002).

The verification model covers the areas where noise level measurements were made (**Figure 3-1**). The model was constructed in TNM using the same approach as the alternatives models (**Chapter 2.2**).

The results are in close agreement, as the measured and modeled results differ by less than 3 dBA (**Table 3-2**). The results are acceptable according to the CDOT guidelines (CDOT, 2002) which require the variation in results to be no more than 3 dBA.

Table 3-1 Existing Traffic Noise Measurement Results

Location Number	Location Description	Land Use Category*	Measurement Period	CDOT NAC (dBA)*	Measured L_{eq} (dBA)
1	Fort Collins soccer fields	B	10 min.	66	69
2	Mountain Range Shadows neighborhood	B	10 min.	66	76
3	Johnson's Corner Campground	B	10 min.	66	74
4	Home along Weld County Road 46	B	10 min.	66	62
5	Coyote Run neighborhood	B	10 min.	66	57
6	Big Thompson Ponds State Wildlife Area	B	24 hours	66	69
7	St. Vrain State Park	B	24 hours	66	66
8	Willowbrook Park	B	24 hours	66	62
9	Businesses near SH 52	C	10 min.	71	66
10	Near SH 7 interchange	D	10 min.	None	50
11	Summit View Apartments (behind wall)	B	10 min.	66	62
12	Summit View Apartments (beside wall)	B	10 min.	66	72
13	Near former University of Phoenix (behind wall)	C	10 min.	71	62
14	Near former University of Phoenix (beside wall)	C	10 min.	71	67
15	Near Wagon Wheel park-n-Ride	D	10 min.	None	62
16	13000-block Grand Circle neighborhood	B	10 min.	66	66

** See Table 2-1.*
Source: FHU field data, 2004–2006.

Figure 3-1 Traffic Noise Measurement Locations and Results

Source: FHU field data, 2004-2007.

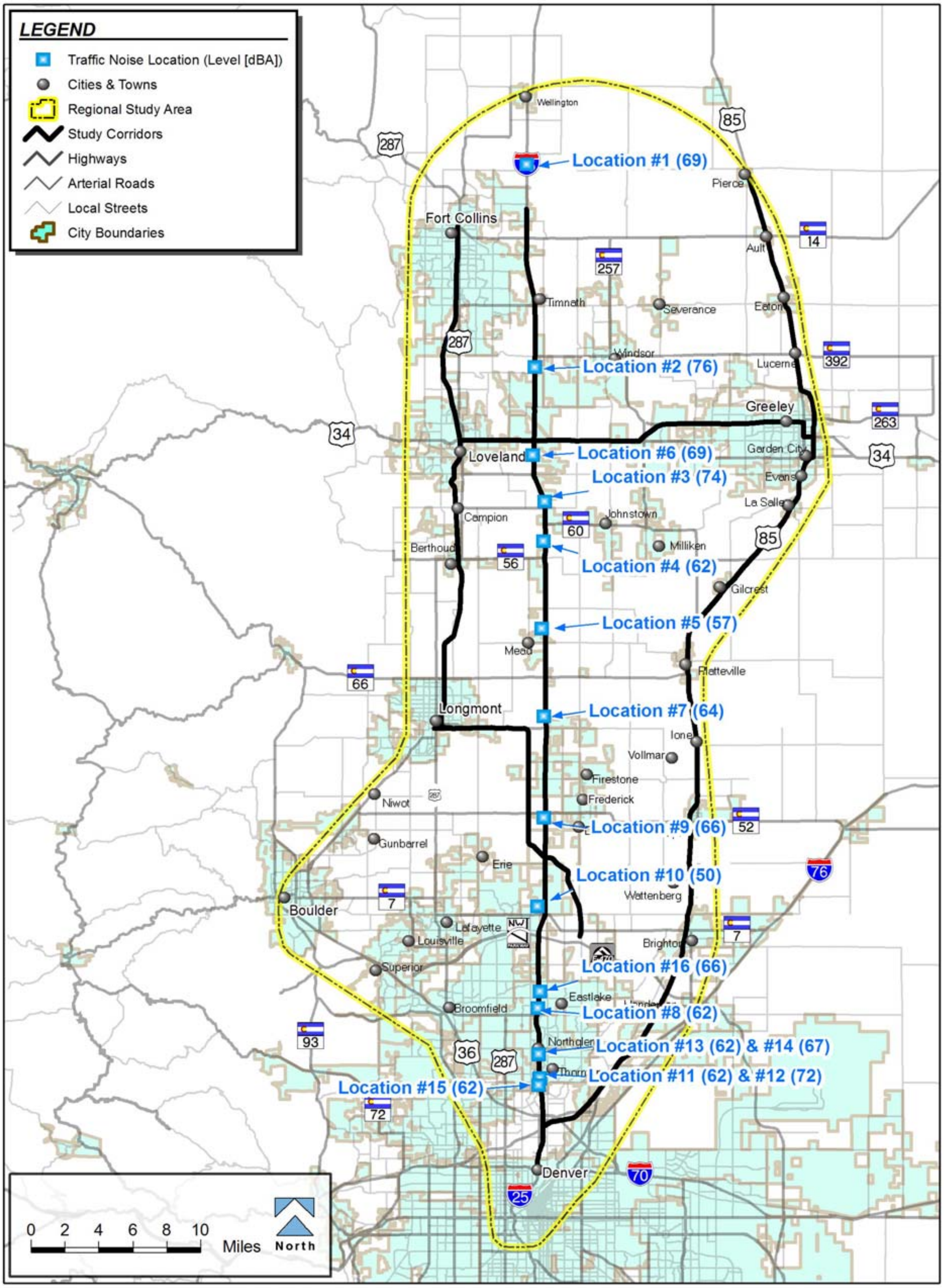


Table 3-2 Verification Noise Model Results

Source: FHU modeling results, 2006.

Location Number	Location	Measurement L_{eq} (dBA)	Verification Model Result (dBA)	Difference (dBA)
1	Fort Collins Soccer Fields	68.5	69.5	1.0
2	Mountain Range Shadows	76.3	77.2	0.9
3	Johnson's Corner Campground	74.2	75.0	0.8
4	Weld County Road 46	61.3	59.2	2.1
5	Coyote Run	56.8	55.0	1.8
11	Summit View Apartments (behind wall)	62.2	63.1	0.9
12	Summit View Apartments (without wall)	72.4	73.1	0.7
13	Near University of Phoenix (behind wall)	62.4	62.6	0.2
14	Near University of Phoenix (without wall)	67.2	69.7	2.5
15	Wagon Wheel park-n-Ride	61.8	64.2	2.4
16	13000-block Grand Circle	65.8	68.6	2.8

3.3 TRAFFIC NOISE MODEL RESULTS

Noise models were developed (**Chapter 2.1.2**) to evaluate existing conditions on a broader basis than allowed by the field measurements alone. The existing conditions models split the study corridor into manageable pieces that included the major existing roads that may be affected by the project (i.e., I-25 corridor), with existing (2005) traffic volumes and road layouts. More than 500 points were modeled for traffic noise (**Figure 1-2** and **Appendix B**). There are several existing noise barriers along I-25 (**Figure 3-2**) that were included in the models.

The calculated results for each model point is presented in **Appendix B**. Modeled points that represent 473 discrete receivers are calculated to have existing traffic noise levels above the respective NAC during the afternoon peak hour (**Table 3-3**). Of the 473 impacted receivers, 374 are Category B properties (residential) and 99 are Category C properties (commercial). The impacted areas are shown in **Figure 3-3**. Noise levels at 30 Category B model points currently are at or above 75 dBA (i.e., “severely” impacted [CDOT, 2002]).

Figure 3-2 Existing Noise Barriers along I-25

Source: FHU project data, 2007.

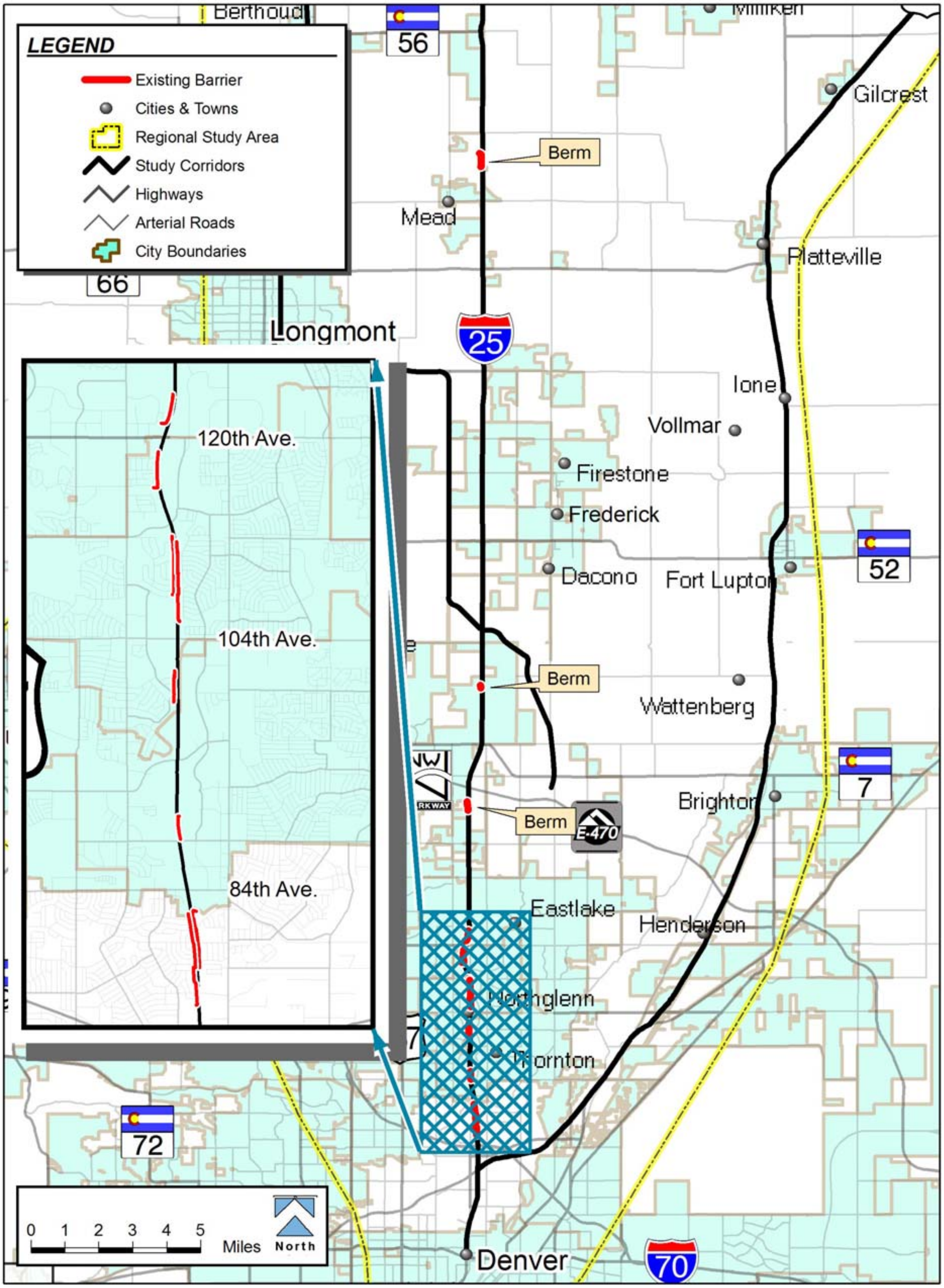


Figure 3-3 Impacted Receivers from Existing Conditions Traffic Noise Model

Source: FHU modeling results, 2007.

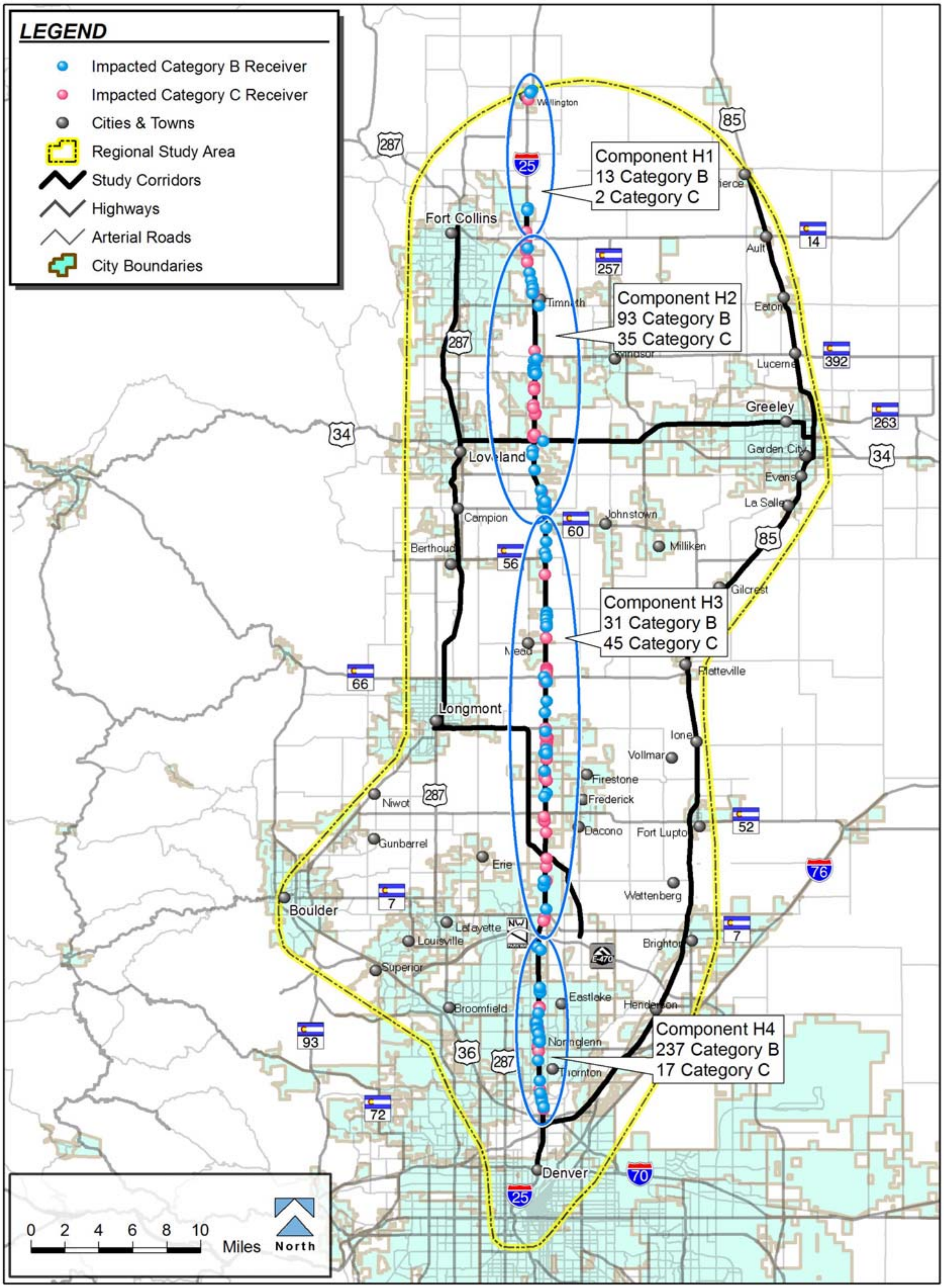


Table 3-3 Numbers of Properties Currently Impacted by Traffic Noise

Road Component	Number of Impacted Category B Receivers	Number of Impacted Category C Receivers
Between SH1 and SH14 (A-H1/B-H1)	13	2
Between SH14 and SH60 (A-H2/B-H2)	93	35
Between SH60 and E-470 (A-H3/B-H3)	31	45
Between E-470 and US36 (A-H4/B-H4)	237	17
Total Impacted Properties	**374**	**99**

Source: FHU modeling results, 2007.

I-25 traffic is the predominant noise source for the highway corridor (**Chapter 2.1.2.1**). The distance from I-25 to locations with traffic noise levels at the CDOT NACs varies along the length of the 60-mile-long I-25 corridor, mostly dependent on the terrain and I-25 traffic volumes. Generally, receivers within about 340 feet of I-25 are at least 66 dBA and within about 200 feet of I-25 are at least 71 dBA.

The existing conditions model results generally agreed with the measurement results in that several Category B areas currently meet or exceed the CDOT NAC and are therefore impacted by traffic noise.

4.0 ENVIRONMENTAL CONSEQUENCES

The alternatives being considered for the project were described in **Chapter 1.1**. The traffic noise modeling effort was conducted as described in **Chapter 2** to assess whether future noise levels near the project corridors for the alternatives would exceed relevant CDOT, FHWA or FTA thresholds. If so, mitigation measures to alleviate the predicted impacts were considered and evaluated following CDOT and FTA guidelines (**Chapter 5**).

Traffic noise models were developed as described in **Chapter 2.1** for each of the three alternatives. The models included the major project roads using predicted future (2030) traffic volumes and road layouts. The model noise results are tabulated in **Appendix B**.

4.1 NO-ACTION ALTERNATIVE 2030 RESULTS

Only potential impacts from road traffic are relevant for the No-Action Alternative; no changes to rail facilities will be made. As described in **Chapter 2.2**, traffic vibration is not a major concern. Therefore, only potential road traffic noise impacts are relevant for the No-Action Alternative and are discussed below.

The results for this alternative (**Figure 4-1**) were similar to the existing conditions results. The areas impacted under existing conditions were also impacted under this alternative. The traffic noise patterns were similar to existing conditions with the noise levels pushed out a bit farther from I-25 due to increased traffic volumes, so that the impacted areas were slightly larger overall. For the No-Action Alternative, it was calculated that 505 Category B receivers and 121 Category C receivers in the project area would be impacted by traffic noise (**Table 4-1**).

The residential areas predicted to be impacted were:

- Wellington East (Wellington)—16 receivers
- Mountain Range Shadows (Larimer County)—69 receivers
- Isolated/scattered homes along I-25 in CDOT Region 4 (Larimer and Weld Counties)—70 receivers
- Numerous neighborhoods abutting I-25 in CDOT Region 6 (Broomfield, Thornton, Westminster, Northglenn and Adams County)—350 receivers

In addition, Big Thompson Ponds State Wildlife Area, St. Vrain State Park, Willowbrook Park, Niver Creek Open Space, Civic Center Park, Adams 12 North Stadium, and part of Thorncreek Golf Course were predicted to have traffic noise levels above the CDOT NAC for Category B. No receivers were expected to experience a 10-dBA increase; the largest increase was predicted to be 6 dBA.

The farthest distance from a modeled road to a receiver impacted by traffic noise was approximately 400 feet from I-25. Noise levels at 85 Category B model points would be at or above the severe impact level of 75 dBA (CDOT, 2002).

Figure 4-1 Noise Impacted Areas for No-Action Alternative (Year 2030)

Source: FHU modeling results, 2007.

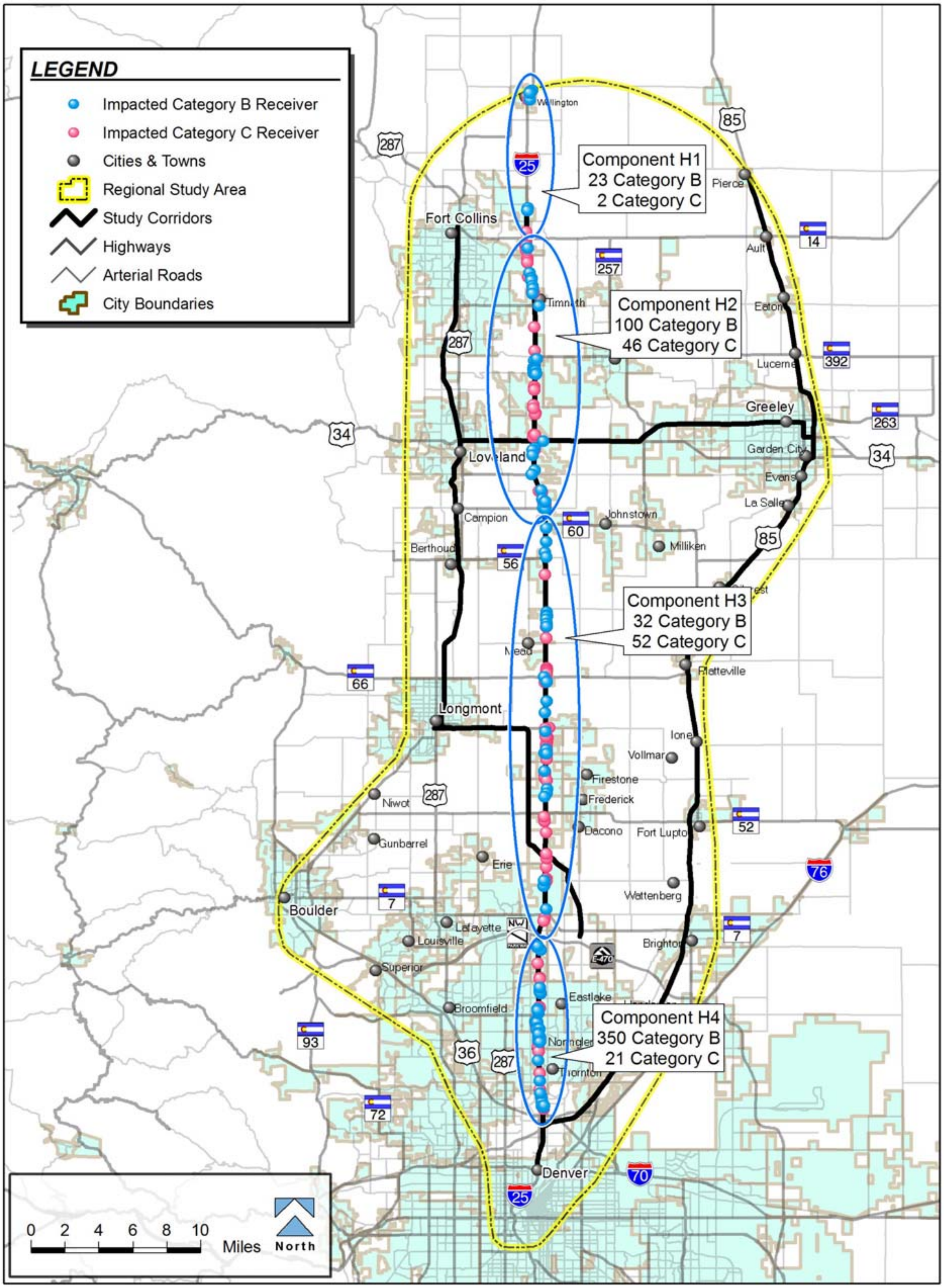


Table 4-1 Traffic Noise Impacts

Highway Component	Number of Noise-Impacted Receivers (Category B / Category C)			
	Existing	No-Action	Package A	Package B
A-H1 / B-H1 (SH1 to SH14)	13 / 2	23 / 2	23 / 2	23 / 2
A-H2 / B-H2 (SH14 to SH60)	93 / 35	100 / 46	96 / 48	97 / 49
A-H3 / B-H3 (SH60 to E-470)	31 / 45	32 / 52	41 / 50	41 / 51
A-H4 / B-H4 (E-470 to US36)	237 / 17	350 / 21	350 / 21	469 / 39
Total	**374 / 99**	**505 / 121**	**503 / 120**	**623 / 133**

Source: FHU modeling results, 2007.

4.2 PACKAGE A 2030 RESULTS

Both road and rail noise and vibration are relevant for Package A. Traffic noise is discussed below; rail noise and vibration are discussed in a separate report (HMMH, 2007). For clarity, this discussion has been divided into highway traffic noise based on the FHWA process and bus transit noise based on the FTA process. As described in **Chapter 2.2**, traffic vibration is not a major concern and is not discussed below.

4.2.1 Highway Noise

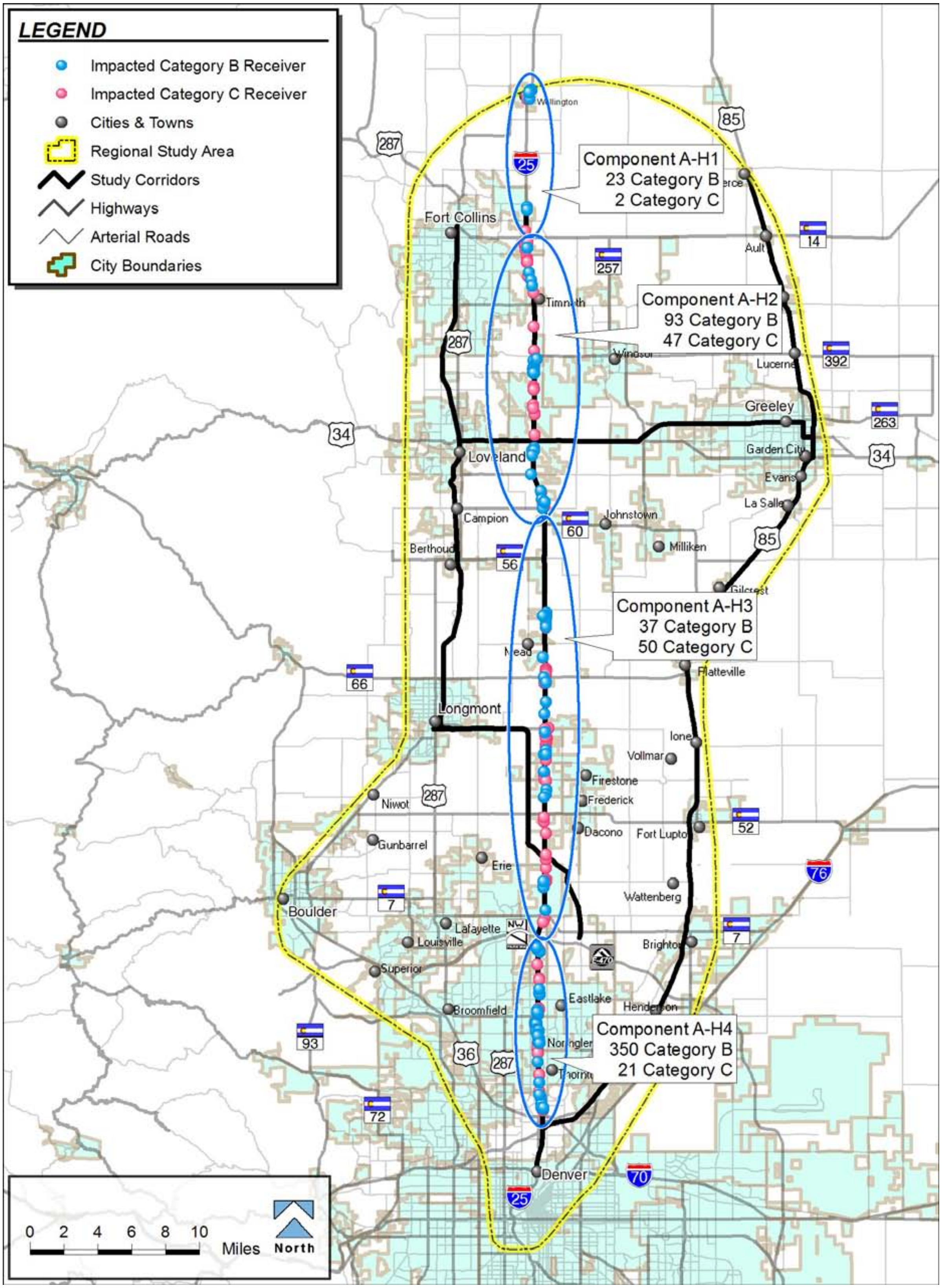
Package A results are 503 Category B receivers and 120 Category C receivers in the project area would be impacted by traffic noise (**Figure 4-2**), which represents three fewer receivers than the No-Action Alternative (**Table 4-1**). All of the impacted receivers were predicted to equal or exceed the NAC; none were predicted to increase by 10 dBA or more over existing conditions without first being impacted by reaching the relevant NAC.

Results for Package A share many similarities with the No-Action Alternative results for 2030. Even with the proposed roadway changes, many of the same receivers were predicted to be impacted. This is largely because both alternatives focus on the I-25 corridor. However, Package A was predicted to impact some different receivers due to wider roads and greater traffic volumes. A few of the receivers impacted under the No-Action Alternative would be removed under Package A, thereby reducing the number of impacted receivers in a few areas. Package A would impact the fewest traffic noise receivers of the alternatives partly because of this. The residential areas predicted to be impacted were:

- Wellington East (Wellington)—16 receivers (same as the No-Action Alternative)
- Mountain Range Shadows (Larimer County)—69 receivers (same as the No-Action Alternative)
- Margil Farms (Mead)—7 receivers (more than the No-Action Alternative)
- Singletree Estates (Mead)—2 receivers (more than the No-Action Alternative)

Figure 4-2 Noise Impacted Areas for Package A (Year 2030)

Source: FHU modeling results, 2007.



- Isolated/scattered homes along I-25 in Larimer and Weld Counties—59 receivers (fewer than the No-Action Alternative)
- Numerous neighborhoods and isolated receivers abutting I-25 in Broomfield, Thornton, Westminster, Northglenn and Adams County—350 receivers (same as the No-Action Alternative)

In addition, Big Thompson Ponds State Wildlife Area, St. Vrain State Park, Willowbrook Park, Niver Creek Open Space, Civic Center Park, Adams 12 North Stadium, and part of Thorncreek Golf Course were predicted to have traffic noise levels above the CDOT NAC for Category B.

The farthest distance from a modeled road to an impacted receiver was approximately 500 feet.

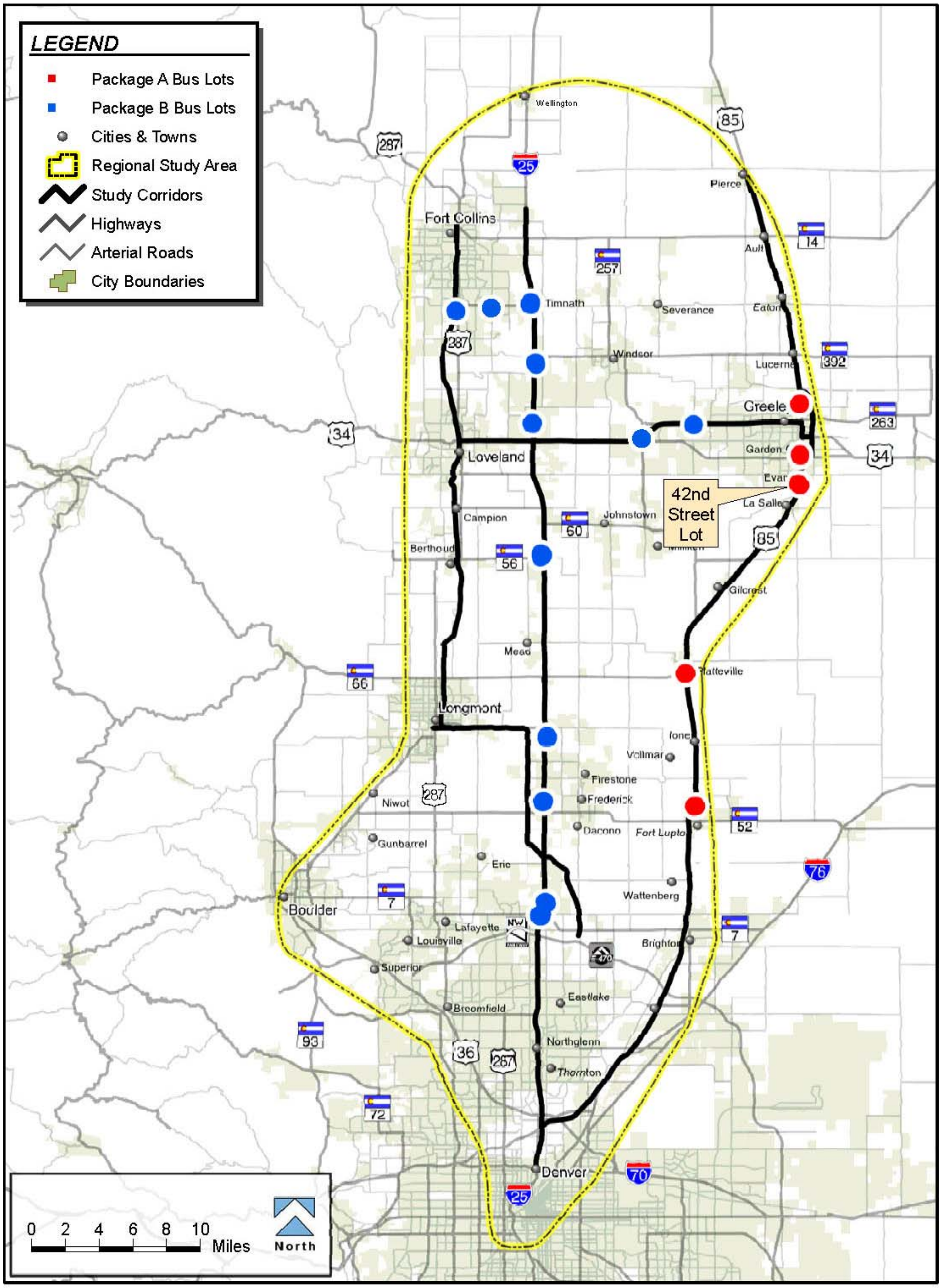
4.2.2 Commuter Bus Transit Noise

For Package A (Components A-T3 and A-T4), a total of five new parking lots for commuter bus passengers (**Figure 4-3**), two possible maintenance facilities and the associated access roads were evaluated for noise impacts following the FTA procedures (FTA, 2006). The FTA screening process was the first step in the evaluations and the results from the screening showed no potential noise impacts from any of the five commuter parking lots or four of the associated access roads. However, the screening showed an access road to the proposed Denver Street lot at US85 and 42nd Street in Evans (**Figure 4-3**) needed to be reviewed using the more detailed FTA general assessment procedures. The result from the general assessment was that the access road would not create a noise impact to the nearby homes.

The screening of the two possible maintenance facilities showed that no sensitive receivers were within the screening distance for the Greeley site, but four houses were right at the screening distance at the Fort Collins site. To be thorough, a general assessment was done for the Fort Collins site. The result from the general assessment was that the Fort Collins site would not create a noise impact to the nearby homes. Therefore, Package A commuter bus elements were found not to cause traffic noise impacts and no noise mitigation considerations were necessary.

Figure 4-3 Proposed Bus Transit Parking Lots for Packages A and B

Source: FHU project data, 2007.



4.3 PACKAGE B ALTERNATIVE 2030 RESULTS

Only potential impacts from road traffic are relevant for Package B; no changes to rail facilities will be made. As described in **Chapter 2.2**, traffic vibration is not a major concern. Therefore, only potential road traffic noise impacts are relevant for Package B and are discussed below. For clarity, this discussion has been divided into highway traffic noise based on the FHWA process and bus transit noise based on the FTA process.

4.3.1 Highway Noise

Package B results are 623 Category B receivers and 133 Category C receivers in the project area would be impacted by traffic noise (**Figure 4-4**), which represents 130 more receivers than the No-Action Alternative (**Table 4-1**). Of these, 755 were predicted to equal or exceed the NAC and one Category C receiver was predicted to increase by 10 dBA over existing conditions.

Results for Package B share some similarities to the No-Action Alternative results for 2030. Even with the proposed roadway changes, many of the same receivers were predicted to be impacted. This is largely because both alternatives focus on the I-25 corridor. However, Package B was predicted to impact more receivers due to wider roads and greater traffic volumes. More receivers along I-25 were predicted to be impacted primarily because of additional travel lanes. A few of the receivers impacted under the No-Action Alternative would be removed under Package B, thereby reducing the number of impacted receivers in a few areas. The residential areas predicted to be impacted were:

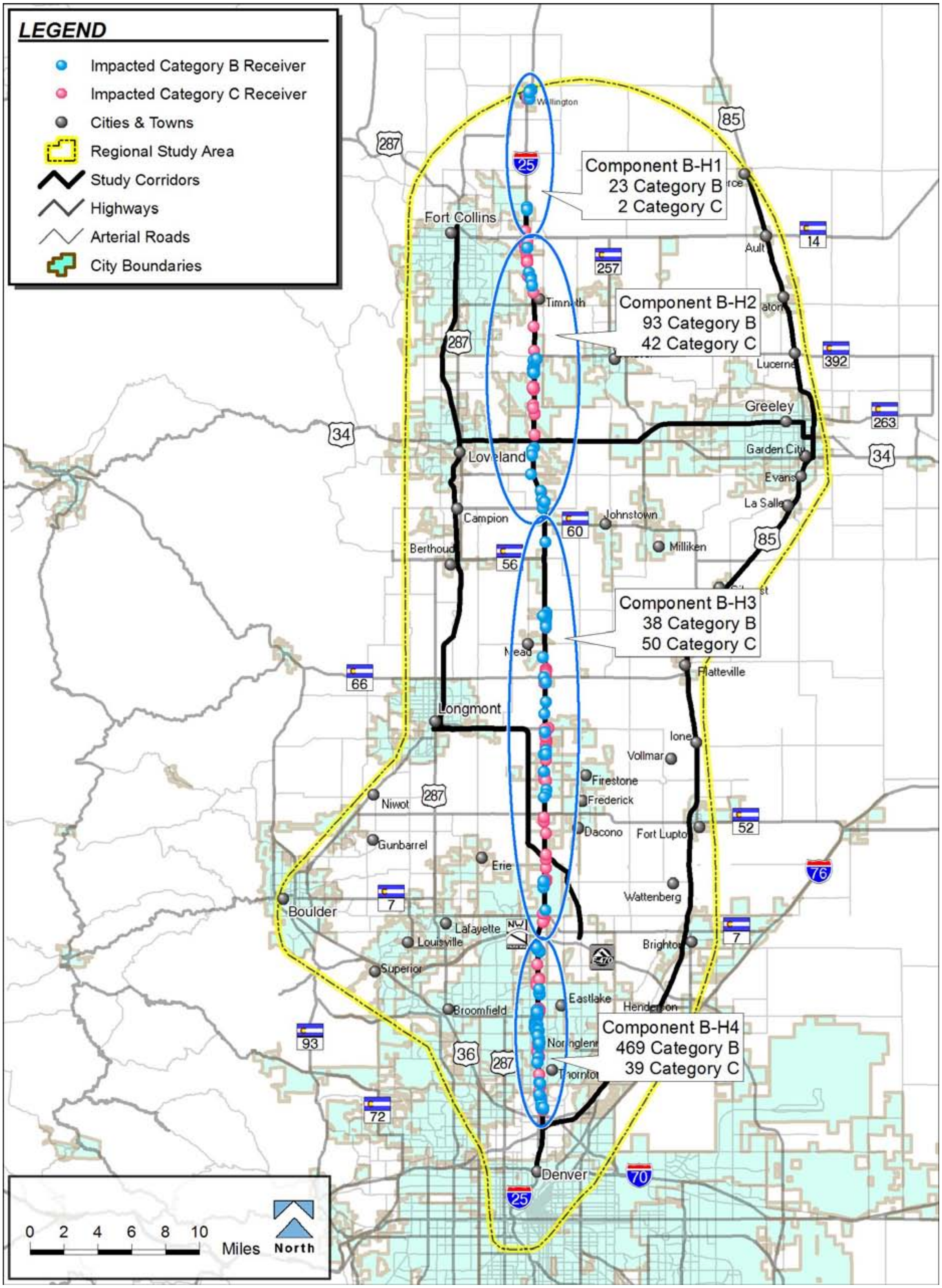
- Wellington East (Wellington)—16 receivers (same as the No-Action Alternative)
- Mountain Range Shadows (Larimer County)—69 receivers (same as the No-Action Alternative)
- Margil Farms (Mead)—7 receivers (more than the No-Action Alternative)
- Singletree Estates (Mead)—2 receivers (more than the No-Action Alternative)
- Isolated/scattered homes along I-25 in Larimer and Weld Counties—60 receivers (fewer than the No-Action Alternative)
- Numerous neighborhoods and isolated receivers abutting I-25 in Broomfield, Thornton, Westminster, Northglenn and Adams County—469 receivers (more than the No-Action Alternative)

In addition, Big Thompson Ponds State Wildlife Area, St. Vrain State Park, Willowbrook Park, Niver Creek Open Space, Civic Center Park, Adams 12 North Stadium, and part of Thorncreek Golf Course were predicted to have traffic noise levels above the CDOT NAC for Category B.

The farthest distance from a modeled road to a receiver impacted by traffic noise was approximately 525 feet from I-25.

Figure 4-4 Noise Impacted Areas for Package B (Year 2030)

Source: FHU modeling results, 2007.



Package B was predicted to impact the most receivers from traffic noise of all the alternatives. This was primarily because it results in the most vehicles traveling on the widest I-25 profile at the highest speeds and makes changes to I-25 in the heavily populated Denver metropolitan area.

4.3.2 Bus Rapid Transit Noise

For Package B (Components B-T1 and B-T2), a total of 12 possible sites for parking lots for bus rapid transit passengers (**Figure 4-3**), two possible maintenance facilities and the associated access roads were evaluated for noise impacts following the FTA procedures (FTA, 2006). The FTA screening process was the first step in the evaluations and the results from the screening were no potential noise impacts from any of the 12 parking lot locations or the associated access roads; adjacent buildings were beyond the perimeter distance where noise impacts could occur.

The screening of the two possible maintenance facilities showed that no sensitive receivers were within the screening distance for the Greeley site, but four houses were right at the screening distance at the Fort Collins site. To be thorough, a general assessment was done for the Fort Collins site. The result from the general assessment was that the Fort Collins site would not create a noise impact to the nearby homes. Therefore, Package B bus rapid transit elements were found not to cause traffic noise impacts, and no noise mitigation considerations were necessary.

4.4 SUMMARY OF TRAFFIC NOISE IMPACTS

A number of traffic noise impacts were predicted for each of the alternatives for 2030. The predicted impacts (without mitigation) are summarized in **Table 4.2**. The bus transit components were found not to cause noise impacts.

Table 4-2 Summary of Component Traffic Noise Impacts

Highway Component	Number of Noise-Impacted Receivers		
	No-Action	Package A	Package B
A-H1 / B-H1 (SH1 to SH14)	25	25	25
A-H2 / B-H2 (SH14 to SH60)	146	140	135
A-H3 / B-H3 (SH60 to E-470)	84	87	88
A-H4 / B-H4 (E-470 to US36)	371	371	508
Total	**626**	**623**	**756**

Source: FHU modeling results, 2007.

The order from fewest traffic noise impacts to most impacts for the alternatives would be Package A, the No-Action Alternative and Package B. The overall ranking of the alternatives must also consider the rail transit noise and vibration impacts (HMMH, 2007), which affects only Package A. Rail noise and vibration impacts affect an additional 194 receivers for Package A, giving it the most noise impacts when considering all travel modes.

4.5 CONSTRUCTION NOISE

Adjoining properties in the project area could be exposed to noise from construction activities from the action alternatives. Construction noise differs from traffic noise in several ways:

- Construction noise lasts only for the duration of the construction event, with most construction activities in noise-sensitive areas being conducted during hours that are least disturbing to adjacent and nearby residents.
- Construction activities generally are of a short-term nature and, depending on the nature of the construction operations, could last from seconds (e.g., a truck passing a receiver) to months (e.g., constructing a bridge).
- Construction noise is intermittent and depends on the type of operation, location, and function of the equipment, and the equipment usage cycle.

Construction noise is not assessed like operational traffic noise; there are no CDOT NACs for construction noise. Construction noise would be subject to relevant local regulations and ordinances, and any construction activities would be expected to comply with them.

Construction noise impacts will be minimized somewhat because the majority of the corridors do not abut residential areas. To address the temporary elevated noise levels that may be experienced during construction, standard mitigation measures shall be incorporated into construction contracts, where it is feasible to do so. These would include:

- Exhaust systems on equipment would be in good working order. Equipment would be maintained on a regular basis, and equipment may be subject to inspection by the project manager to ensure maintenance.
- Properly designed engine enclosures and intake silencers would be used where appropriate.
- New equipment would be subject to new product noise emission standards.
- Stationary equipment would be located as far from sensitive receivers as possible.
- Most construction activities in noise sensitive areas would be conducted during hours that are least disturbing to adjacent and nearby residents.

5.0 MITIGATION EVALUATION

The results from traffic noise analysis indicate that many receivers will be impacted by noise from each of the alternatives. Therefore, potential mitigation actions for the impacted areas under the action alternatives were investigated (CDOT, 2002; FHWA, 1995). Impacted areas are not guaranteed mitigation measures under the guidelines, but mitigation measures for the areas must be evaluated for feasibility and reasonableness.

Impacts from the alternatives affected multiple geographic areas and multiple land uses. Several types of mitigation were considered. Noise barriers are a common mitigation action and were evaluated, but other kinds of mitigation were also considered. The overall feasibility and reasonableness of noise abatement actions that provide a minimum acceptable mitigation benefit for the impacted receivers were evaluated and these actions were then either recommended or not.

For reasons described below, barriers appeared to be the only viable mitigation action and were the only mitigation evaluated through modeling. CDOT's goal for noise barrier benefits is a reduction of 10 dBA with a minimum reduction of 5 dBA.

5.1 EXISTING NOISE BARRIERS

There currently are several traffic noise barriers in the project area (**Figure 3-2**) primarily south of E-470. These barriers are comprised of both berms and walls. The walls consist of both older "first generation" CDOT wooden walls and newer masonry walls. The barriers were included in the traffic noise modeling for the EIS and the model results showed that the existing barriers are effective at reducing traffic noise to the homes behind the barriers.

There are two important considerations regarding these existing barriers: new construction from the project that would require removal of an existing barrier and the fate of deteriorating existing walls not touched by new construction. First, if any of the existing barriers must be removed for construction, the removed barrier would be replaced with an equivalent or better barrier as part of Package A or Package B. Second, the wooden CDOT barriers along I-25 are deteriorating and their long-term effectiveness is in doubt. Therefore, any of the CDOT wooden barriers remaining in the project corridor at the time of construction would be replaced, but only if Package B is the selected alternative. (Package B is the only alternative to include improvements near the wooden barriers.)

The details of a replacement barrier would be determined during final design of the construction element relevant to the barrier. It is important to understand that these barrier replacements would not be new noise mitigation actions because the old barriers are products of previous projects. Barrier replacement is considered to be the restoration of infrastructure disturbed by construction. Therefore, the feasibility and reasonableness of replacement barriers was not evaluated for this project.

5.2 EVALUATION OF NON-BARRIER MITIGATION

CDOT guidelines require the evaluation of several non-barrier mitigation options. For a variety of reasons that are described below, none of these options appear to be viable for the project alternatives.

Traffic management measures such as lane closures or reduced speeds could reduce noise but do not appear to be reasonable for the roads of primary interest to the project. One of the reasons for the road improvements in the regional study area is to enhance intraregional and interregional traffic flow. I-25 is a major regional and national highway and closing lanes would conflict with its purpose. While reducing vehicle speeds could reduce traffic noise, lower speeds would not be consistent with the function of an interstate highway.

Changes in horizontal alignments of the roads near the impacted receivers could reduce noise but have limited possibilities. This action would require snaking I-25 around current developed areas; however, removing some problematic curves from I-25 is one of the project goals. Also, many of the impacted Category B receivers are in areas that are developed on both sides of I-25, limiting possible horizontal realignments. Moving I-25 horizontally away from some impacted receivers could reduce traffic noise in those areas but could transfer the impacts to other neighboring areas or require disruptions of adjoining property uses. Wholesale relocation of I-25 from its current corridor would have profound cost, environmental and functional ramifications, so horizontal relocation of I-25 for noise reduction is not feasible or reasonable.

Changes in vertical alignments could reduce noise. Changes in vertical alignments were included for some parts of some alternatives in the project area. For example, the current elevation profiles would be reversed at the SH 56 and SH 402 interchanges with I-25. However, wholesale changes in corridor road elevations could have secondary impacts on connecting or adjoining roads that would not be reasonable or desirable. In summary, vertical elevation changes were evaluated, but vertical realignments just to reduce traffic noise were not practical.

Noise buffer zones could reduce noise. Some of the newer housing developments along I-25 include these, but many of the older residential areas do not. Often, the past development has been purposely near the roads for access, which left little or no space for a buffer. In many places, there generally is little available undeveloped land along the project roads that could be used for a noise buffer zone or a vegetative planting area that would provide substantial noise benefit.

Supplemental building insulation is an extraordinary abatement method that may be used when other mitigation measures are not practical. Some residences were calculated to be severely impacted by traffic noise (at least 75 dBA), so consideration of noise insulation measures may be justified. Insulation may be appropriate for some locations with residual impacts even with the recommended mitigation measures (**Chapter 5.5**); however, it is not appropriate to make a final determination or recommendation now given the uncertainties in the final designs and the desires of affected residents. Potential noise mitigation measures will need to be further evaluated during the Final EIS and project design to determine feasible and reasonable approaches.

Pavement types and surfaces can affect traffic noise. Research efforts to learn more about the long-term noise benefits of different pavement types and surface treatments are ongoing. Quieter pavement types would be preferred for the project when minimum requirements for safety, durability, and so on, are also met. However, this cannot be counted as a mitigation action under the noise reduction evaluation because it is not a “permanent” solution to tire noise.

5.3 TRAFFIC NOISE BARRIER EVALUATIONS

In addition to the existing barriers, noise barriers in some new areas may be appropriate for an alternative. To permit the evaluation of new noise barriers, computer models with barriers protecting the impacted areas were developed. Each potential barrier was assessed for effectiveness and feasibility. If the minimum parameters for an effective barrier were met and the barrier was feasible, the barrier was processed through a reasonability assessment according to CDOT guidance (CDOT, 2002). The reasonableness and feasibility of each barrier determined whether the barrier was recommended for the project.

The locations evaluated for new noise barriers are shown in **Figure 5-1**. In instances where only part of a neighborhood was impacted by traffic noise, barriers benefiting the entire neighborhood were evaluated for thoroughness. Each of these various barriers were assessed for feasibility and reasonableness (CDOT, 2002), and barrier recommendations were made based on these findings.

The typical barrier locations were on I-25 right-of-way (**Appendix C**). Off right-of-way locations for noise barriers were also evaluated where physical conditions warranted, as required by CDOT guidance (CDOT, 2002).

It is important to note that many materials can make effective noise barriers. The barriers could be either earth berms or constructed walls. Berms can be very effective but occupy considerably more space than comparable walls. Throughout the project area, the impacted receivers tend to be rather close to the project roads. This usually makes earth berms impractical or impossible choices for the noise barriers. Barriers more than 25 feet tall were not considered due to the impractical structural requirements. Barrier cost-effectiveness was based on an assumed cost of $30/square foot of barrier and compared to the CDOT upper threshold of $4,000/receiver/dB. The barrier results are summarized in **Table 5-1**.

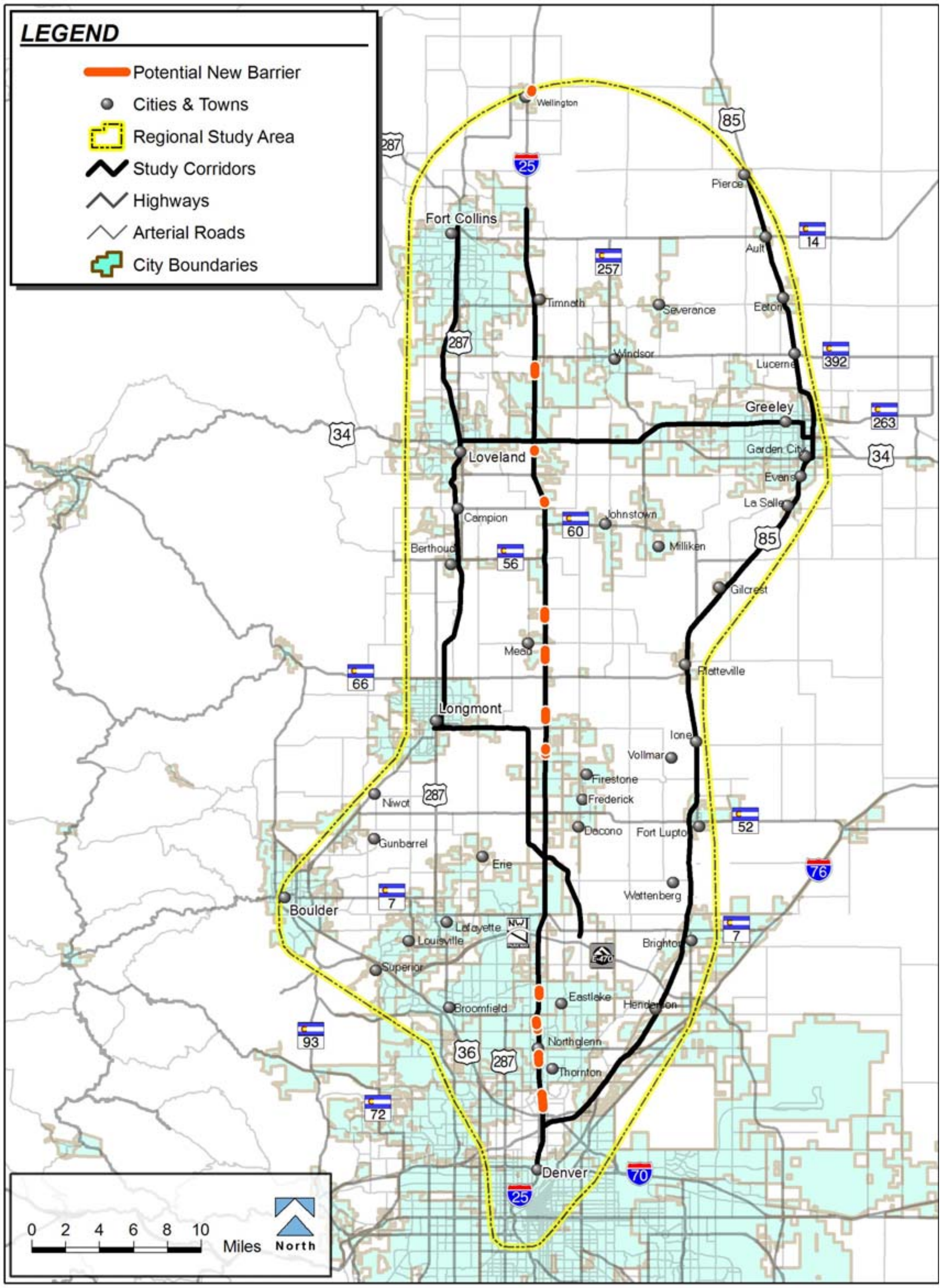
5.3.1 Wellington East

Wellington East is near the intersection of I-25 and SH1 (**Appendix C1**). There are a number of homes at Wellington East that are predicted to be impacted by traffic noise now and under all future alternatives. These homes are slightly below I-25 in elevation. A barrier extending along I-25 for 1000 feet (10-12 feet tall) was calculated to provide 3-12 dBA of noise reduction for about 25 homes. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for both action alternatives.

5.3.2 Mountain Range Shadows

The Mountain Range Shadows neighborhood is near the intersection of I-25 and Larimer County Road (LCR) 30 (**Appendix C2**). There are a number of homes at Mountain Range

Figure 5-1 Locations of Traffic Noise Mitigation Barriers Evaluated



Source: FHU modeling results, 2007.

Table 5-1 Traffic Noise Mitigation Barrier Summary

Noise Impacted Category B Area	Barrier Height (feet)	Barrier Length (feet)	Cost Analysis ($/receiver/dB)	Reduction (dBA)	Feasible?	Reasonable?	Recommended?	Comment
Components A-H1 / B-H1								
Wellington East	10-12	1000	1,900	3-12	Yes	Yes	Yes	Recommended for both action alternatives.
Components A-H2 / B-H2								
Mountain Range Shadows	12	2500	2,400	3-7	Yes	Yes	Yes	Recommended for both action alternatives.
Near LCR20E	14	470	18,000	0-11	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Johnsons Corner Campground	10	675	11,200	3-9	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Components A-H3 / B-H3								
Margil Farms	16	2200	7,000	3-6	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Singletree Estates	16	3200	41,000	3-5	Yes	No	No	Cost-benefit was calculated to be prohibitive.
St.Vrain State Park	14	2700	75,000	5	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Near WCR22	12	550	16,500	6	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Near WCR20.5	16	675	27,000	6	Yes	No	No	Cost-benefit was calculated to be prohibitive.
Components A-H4 / B-H4								
Thorncreek Village	14	1850	3,800	3-7	Yes	Yes	Yes	Recommended for Package B only
Stone Mountain Apts.	14	1300	1,300	3-10	Yes	Yes	Yes	Recommended for Package B only
Greens of Northglenn	10-12	600	1,100	3-8	Yes	Yes	Yes	Recommended for Package B only
Badding Reservoir extension	12	900	4,100	3-8	Yes	Yes	Yes	Recommended for Package B only
Brittany Ridge extension	12	1300	3,000	3-7	Yes	Yes	Yes	Recommended for Package B only
Isolated receiver #1 (Wellington)	10	720	31,000	7	Yes	No	No	An example of an isolated receiver. Cost-benefit was calculated to be prohibitive.
Isolated receiver #2 (SH 7)	8-12	550	24,000	7	Yes	No	No	An example of an isolated receiver. Cost-benefit was calculated to be prohibitive.

Source: FHU modeling results, 2007.

Shadows that are predicted to be impacted by traffic noise now and under all future alternatives. These homes are approximately even in elevation with I-25. A barrier extending along I-25 for 2500 feet (12 feet tall) was calculated to provide 3-7 dBA of noise reduction for about 50 homes. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for both action alternatives. This area may also benefit from an off right-of-way barrier (**Chapter 5.4.1**).

5.3.3 Larimer County Road 20E

A repair shop and campground are near the intersection of I-25 and LCR20E (**Appendix C3**) and are predicted to be impacted by traffic noise under all future alternatives. These properties are above I-25 in elevation. A barrier extending along I-25 for 470 feet (14 feet tall) was calculated to provide 0-11 dBA of noise reduction for these properties. This barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended.

5.3.4 Johnsons Corner Campground

There is a campground near the intersection of I-25 and LCR16 (**Appendix C4**) and several campsites are predicted to be impacted by traffic noise under existing conditions and all future alternatives. The campground is about even with I-25 in elevation. A barrier extending along the I-25 frontage road for 675 feet (10 feet tall) was calculated to provide 3-9 dBA of noise reduction for several campsites. This barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended.

5.3.5 Margil Farms

The Margil Farms neighborhood is near the intersection of I-25 and Weld County Road (WCR) 38 (**Appendix C5**). There are several homes at Margil Farms predicted to be impacted by traffic noise under Package A and Package B. These homes are slightly higher in elevation than I-25. A barrier extending along I-25 for 2200 feet (16 feet tall) was calculated to provide 3-6 dBA of noise reduction for about 25 homes. This barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended for either alternative. This area may benefit from an off right-of-way barrier (**Chapter 5.4.2**).

5.3.6 Singletree Estates

The Singletree Estates neighborhood is near the intersection of I-25 and WCR32 (**Appendix C6**). A couple of homes at Singletree Estates are predicted to be impacted by traffic noise under Package A and Package B. These homes are about even in elevation with I-25. A barrier extending along I-25 for 3200 feet (16 feet tall) was calculated to provide 3-5 dBA of noise reduction for about 10 homes. This barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended for either alternative. This area might benefit from an off right-of-way barrier (**Chapter 5.4.3**).

5.3.7 St.Vrain State Park

St. Vrain State Park is near the intersection of I-25 and SH119 (**Appendix C7**). Some parts of the park, including some campsites, are predicted to be impacted by traffic noise under existing conditions and all future alternatives. The park is about even in elevation with I-25.

A barrier extending along I-25 for 2700 feet (14 feet tall) was calculated to provide about 5 dBA of noise reduction for the affected areas. This barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended.

5.3.8 Weld County Road 22

There are two residences in an otherwise commercial area near I-25 and WCR22 (**Appendix C8**) predicted to be impacted by traffic noise under existing conditions and all future alternatives. The residences are slightly above I-25 in elevation. A barrier extending along I-25 for 550 feet (12 feet tall) was calculated to provide about 6 dBA of noise reduction. A barrier along the frontage road is not feasible because of the necessary gaps for driveways. The I-25 barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended.

5.3.9 Weld County Road 20.5

There are two residences in an otherwise commercial area near I-25 and WCR20.5 (**Appendix C8**) that are predicted to be impacted by traffic noise under existing conditions and all future alternatives. The residences are about even with I-25 in elevation. A barrier extending along I-25 for 675 feet (16 feet tall) would provide about 6 dBA of noise reduction. A barrier along the frontage road is not feasible because of the necessary gaps for driveways. The I-25 barrier is above the CDOT cost guideline (**Table 5-1**) and is not being recommended.

5.3.10 Thorncreek Village

Thorncreek Village is a multi-family housing neighborhood near I-25 and 130th Avenue in Thornton (**Appendix C9**). There are a number of homes at Thorncreek Village that are predicted to be impacted by traffic noise now and under all future alternatives. Only Package B will make any changes to I-25 in this area so only Package B was examined for a barrier. These homes are approximately even in elevation with I-25. A barrier extending along I-25 for 1850 feet (14 feet tall) would provide 3-7 dBA of noise reduction for about 30 homes. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for Package B only.

5.3.11 Stone Mountain Apartments

Stone Mountain is an apartment complex near I-25 and 116th Avenue in Thornton (**Appendix C10**). There are a number of buildings at Stone Mountain that are predicted to be impacted by traffic noise now and under all future alternatives. Only Package B will make any changes to I-25 in this area so only Package B was examined for a barrier. These homes are approximately even in elevation with I-25. A barrier extending along I-25 for 1300 feet (14 feet tall) would provide 3-10 dBA of noise reduction for about 70 units. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for Package B only.

5.3.12 Greens of Northglenn

The Greens of Northglenn is an apartment complex near I-25 and 112th Avenue in Northglenn (**Appendix C11**). There are a number of buildings at this complex that are predicted to be impacted by traffic noise now and under all future alternatives. Only Package B will make any changes to I-25 in this area so only Package B was examined for a barrier. These homes are slightly higher in elevation than I-25. A barrier extending along I-25 for 600 feet (10-12 feet tall) would provide 3-8 dBA of noise reduction for about 50 units. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for Package B only.

5.3.13 Badding Reservoir Extension

There is an existing noise wall near Badding Reservoir near I-25 and 99th Avenue in Northglenn (**Appendix C12**). There are several homes that are predicted to be impacted by traffic noise now and under all future alternatives. The existing barrier does not protect all of the homes in this neighborhood. Only Package B will make any changes to I-25 in this area so only Package B was examined for a barrier. These homes are slightly higher in elevation than I-25. A barrier extension along I-25 for 900 feet (12 feet tall) would provide 3-8 dBA of noise reduction for about 20 homes. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for Package B only.

5.3.14 Brittany Ridge Extension

There is an existing noise wall near the Brittany Ridge neighborhood near I-25 and 78th Avenue in Adams County (**Appendix C13**). There are several homes that are predicted to be impacted by traffic noise now and under all future alternatives. The existing barrier does not protect all of the homes in this neighborhood. Only Package B will make any changes to I-25 in this area so only Package B was examined for a barrier. These homes vary in elevation relative to I-25. A barrier extension along I-25 for 1300 feet (12 feet tall) would provide 3-7 dBA of noise reduction for about 30 homes. This barrier is below the CDOT cost guideline (**Table 5-1**) and is being recommended for Package B only. Ongoing development along I-25 in this area may affect this recommendation. Potential noise mitigation measures will need to be further evaluated during the Final EIS and project design to determine feasible and reasonable approaches.

5.3.15 Isolated Receivers

There are approximately 60 isolated Category B receivers in areas with dispersed development along the I-25 corridor that are predicted to exceed the NAC under the alternatives. These receivers are predominantly north of SH7. Mitigation measures for these sites were considered through some representative example sites described below. Generally, the length of the wall needed to cut meaningfully the line of sight to traffic for these single receivers invariably meant that the cost was prohibitive for the benefit produced (**Table 5-1**), which is typical for isolated receivers.

The first example isolated receiver was in Wellington near SH1 (**Appendix C1**). This home is about even with I-25 in elevation. A barrier extending along I-25 for 720 feet (10 feet tall) was calculated to provide 7 dBA of noise reduction but the cost-benefit was not reasonable (**Table 5.1**). An alternate barrier along the frontage road is not feasible because of the necessary gap for the driveway.

The second example isolated receiver was near SH7 (**Appendix C14**). This home is about even with I-25 in elevation. A barrier extending along I-25 for 550 feet (8-12 feet tall) would provide 7 dBA of noise reduction but the cost-benefit was not reasonable (**Table 5.1**). An alternate barrier along the frontage road is not feasible because of the necessary gap for the driveway.

No barriers are being recommended for impacted isolated receivers because they were found to be not feasible and reasonable.

5.3.16 Sports Facilities

There are sports facilities, including a high school stadium, part of a golf course and bike trails, which were classified as Category B receivers and were predicted to exceed the NAC under the alternatives. These facilities are so large and extend so far from the traffic causing the noise that barriers at the road right of way are not effective in reducing the traffic noise for the entire facility. It would take enormously long barriers to cut the line of sight to traffic for the entire facility and thereby effectively reduce noise. Each facility counts as a single receiver and faces the same challenges described in **Chapter 5.3.15** for isolated receivers. Therefore, barriers are not being recommended for these facilities.

5.3.17 Various Commercial Sites

Many commercial properties were described in **Chapter 4** that would exceed the Category C NAC. The properties tend to be in clusters of development but extend the entire length of the study corridor from SH1 to US36. The alternatives may require removal of some commercial buildings that otherwise could be impacted by noise. Noise mitigation barriers were considered for the impacted areas; however, businesses tend not to want noise barriers as they can obstruct advertising or site recognition and can cause site access problems. Normally, commercial area exterior property uses are not noise sensitive in the same way as a home. Typically, noise barriers are recommended for commercial areas only under extraordinary conditions, but no such conditions were observed for the affected properties. As is often the case with commercial areas, the mitigation costs were calculated to be excessive for the benefit that would be provided, as with isolated receivers (**Chapter 5.2.15**). Therefore, no barriers are recommended for any of the affected commercial areas.

5.4 OFF RIGHT OF WAY NOISE BARRIERS

The typical and often most desirable location for noise barriers is within the road right-of-way, for performance, cost and maintenance reasons (**Chapter 5.1.2**). However, for some of the areas predicted to be impacted by traffic noise for this study (**Chapter 4**), this barrier position may not always be ideal, usually for performance reasons because of topography. Therefore, in the interest of thoroughness, barriers that CDOT may provide through this project outside the road right-of-way were evaluated for impacted areas where this made sense. The areas that were evaluated were:

- Mountain Range Shadows
- Margil Farms
- Singletree Estates

5.4.1 Mountain Range Shadows

An alternate barrier location was examined for the Mountain Range Shadows neighborhood (**Appendix C2**). This alternate barrier has the advantage of blocking frontage road noise as well as I-25 noise, but has the disadvantages of being discontinuous to accommodate local streets and requiring more right-of-way. Nevertheless, this alternate barrier (2100 feet by 10-12 feet) was calculated to provide substantial noise reduction and to be below the CDOT cost guideline, so it is feasible and reasonable. Both of the barrier locations (**Appendix C2**) can be recommended. A determination would be made during final design as to which location is preferable.

5.4.2 Margil Farms

An alternate barrier location was examined for the Margil Farms neighborhood (**Appendix C5**). The original barrier (**Chapter 5.3.5**) was disadvantaged by the distance from I-25 to the homes and the elevation gain at the homes. An alternate barrier extending for 1300 feet (16 feet tall) near the homes would provide 3-7 dBA of noise reduction for about 20 homes. This barrier is also above the CDOT cost guideline and is not being recommended, either.

5.4.3 Singletree Estates

An alternate barrier location was considered for the Singletree Estates neighborhood (**Appendix C6**). The original barrier (**Chapter 5.3.6**) was disadvantaged by the distance from I-25 to the homes and the wide spacing of the impacted homes. An alternate barrier extending for 2200 feet (18 feet tall) near the homes would provide 6 dBA of noise reduction for about 5 homes. To be effective, this barrier would have to split the lots of the homes expected to benefit from the barrier (**Appendix C6**). Given that the barrier needs to be continuous to be effective, this would effectively make half the property inaccessible. This arrangement is not feasible so this alternate barrier is not recommended.

5.5 SUMMARY OF RECOMMENDED MITIGATION

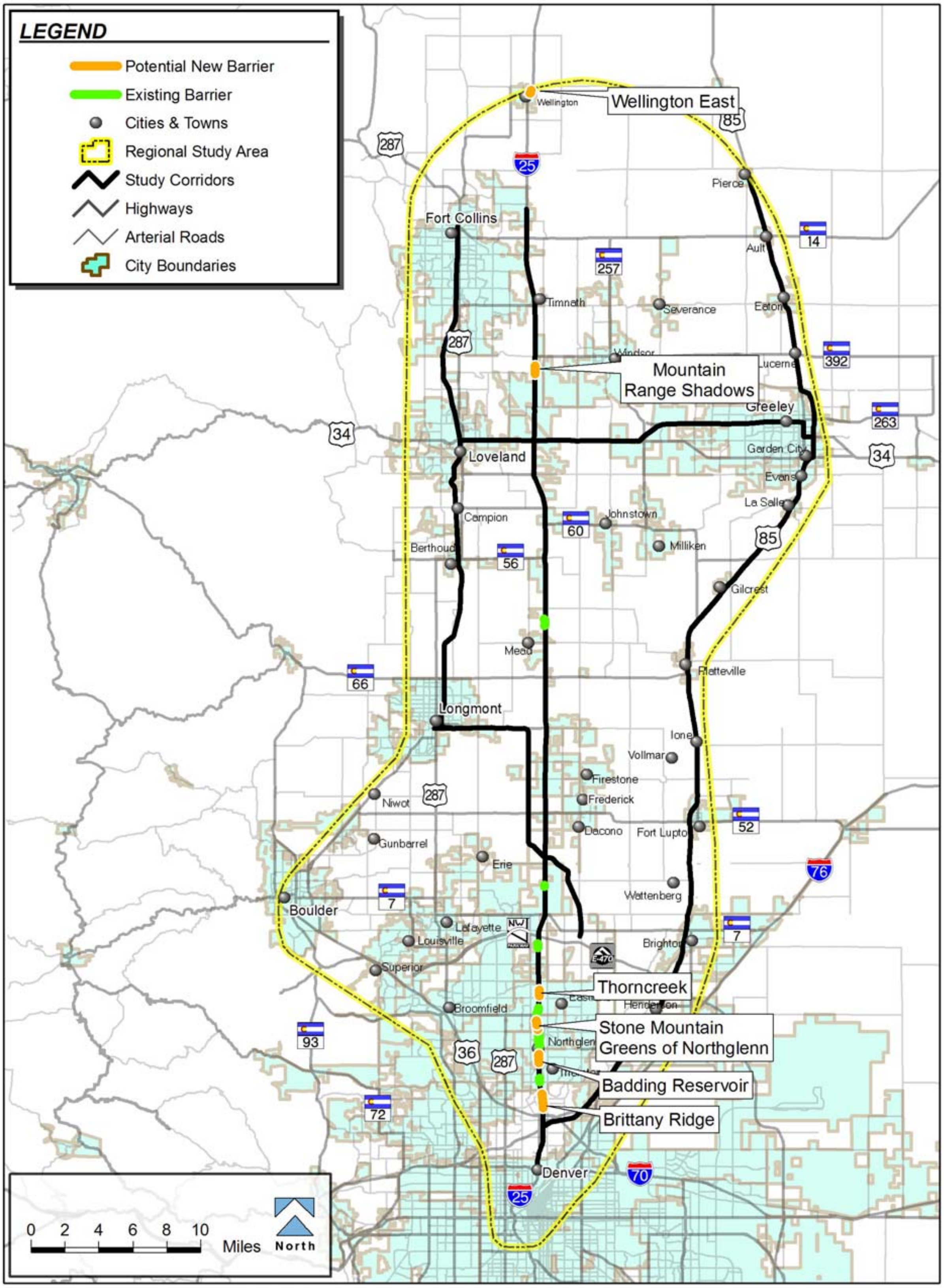
The recommendations provided above and summarized here were based on assumed specific project designs. If the final designs in the future differ from that assumed in these evaluations, corresponding adjustments to the mitigation evaluations may be required.

The overall traffic noise barrier findings are summarized in **Table 5-1**. The traffic noise reductions for each barrier were estimated. The recommendations are for construction of select barriers within the CDOT right of way. From the feasibility and reasonableness evaluations for the barriers, highway traffic noise barriers are recommended between traffic and receivers for the following locations (**Figure 5-2**):

- Wellington East for Package A and Package B
- Mountain Range Shadows for Package A and Package B
- Thorncreek Village for Package B
- Stone Mountain apartments for Package B

Figure 5-2 Locations of Recommended Traffic Noise Mitigation Barriers

Source: FHU modeling results, 2007.



- Greens of Northglenn apartments for Package B
- Badding Reservoir barrier extension for Package B
- Brittany Ridge barrier extension for Package B

5.6 IMPACTED RECEIVERS AFTER RECOMMENDED MITIGATION

For a noise or vibration mitigation action to be recommended, it must be both feasible and reasonable according to the evaluation guidelines. In many of the areas with traffic noise impacts, effective noise barriers were not feasible or the cost-benefit value for an effective barrier was prohibitive (**Table 5-1**). Therefore, not all impacted areas have been recommended for noise mitigation.

The recommended mitigation actions would serve to reduce traffic noise impacts for each of the EIS build alternatives (**Chapter 5.4**). The results differ between the alternatives for a number of reasons, including:

- Different road designs within the same alignment
- Different traffic volumes and speeds
- Different vertical road profiles

The recommended mitigation actions would not eliminate all of the calculated noise impacts; some noise impacts would remain. These remnant noise impacts are described below for each of the EIS alternatives.

5.6.1 No-Action Alternative

The No-Action Alternative does not include any new noise mitigation actions, so there would be no change in the traffic noise impacts (**Chapter 4.1**). The same 505 Category B receivers and 121 Category C receivers would still be impacted by traffic noise. Noise levels at 85 Category B model points would be at or above the severe impact level of 75 dBA (CDOT, 2002).

5.6.2 Package A

Package A would include several recommended noise mitigation actions north of SH7 within CDOT Region 4 (**Chapter 5.1.2**). The recommended mitigation measures would remove the traffic noise impacts from these receivers:

- Wellington East–16 Category B receivers
- Mountain Range Shadows–37 Category B receivers

An estimated 450 Category B receivers and 120 Category C receivers would still be impacted by traffic noise. It should be noted that noise levels at 18 Category B modeled locations would be at or above 75 dBA, 67 fewer locations than the No-Action Alternative. The added results for rail transit impacts can be found in the rail technical report (HMMH, 2007).

5.6.3 Package B

Package B would include several recommended noise mitigation actions (**Chapter 5.1.2**). The recommended mitigation measures would remove the traffic noise impact from these receivers:

- Wellington East–16 Category B receivers
- Mountain Range Shadows–37 Category B receivers
- Thorncreek Village–5 Category B receivers
- Stone Mountain Apartments–32 Category B receivers
- Greens of Northglenn–16 Category B receivers
- Badding Reservoir extension–9 Category B receivers
- Brittany Ridge extension–17 Category B receivers

An estimated 491 Category B receivers and 133 Category C receivers would still be impacted by traffic noise. It should be noted that noise levels at 17 Category B modeled locations would be at or above 75 dBA, 68 fewer locations than the No-Action Alternative.

6.0 REFERENCES

Colorado Department of Transportation. 2007. North I-25 Draft Environmental Impact Statement, September.

Colorado Department of Transportation. 2002. Noise Analysis and Abatement Guidelines, December.

Federal Highway Administration. 1995. Highway Traffic Noise Analysis and Abatement Policy and Guidance, June.

Federal Highway Administration. 1996. Measurement of Highway-Related Noise, May.

Federal Highway Administration. 2004. Procedures for Abatement of Highway Traffic Noise and Construction Noise. Code of Federal Regulations, Title 23, Part 772.

Federal Railroad Administration (FRA). 2006. Code of Federal Regulations, Chapter 49, Sections 222 and 229, August.

Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May.

Felsburg Holt & Ullevig. 2007. Traffic data for the North I-25 Front Range EIS, February.

Harris, Miller, Miller & Hanson (HMMH), 2007. North I-25 Environmental Impact Statement Rail Transit Noise and Vibration Technical Report. June.

APPENDIX A
NOISE MEASUREMENT DATA

THIS PAGE INTENTIONALLY LEFT BLANK

Environmental/Traffic Noise # 2014
(Dale)

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 8-25-04

Project #: 04-120

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N I25

Measurement by: dt

Calibration: 112.7 dBA

Post Check: 112.7 dBA

Start Time	Duration	Leq	Maximum	Minimum
1640	10/10 min	68.9/68.0 dBA	75.1/73.6 dBA	60.9/60.7 dBA

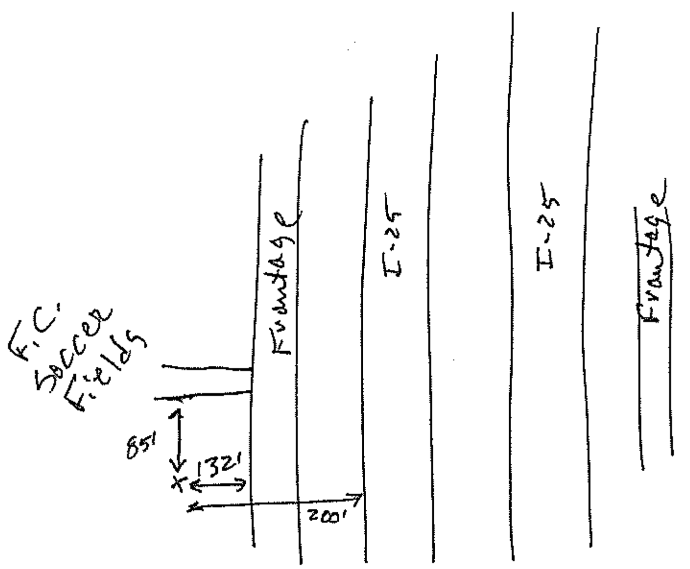
Avg/Max Wind	Wind Direction	R. Humidity
4/8 mph	SE	30 %

Temp. 82

I-25 Traffic Counts

	Cars	Med. Truck	Hvy. Truck
#1	50, 50, 50, 50, 50, 39 (289)	卌 卌 (10)	卌 卌 卌 III (18)
#2	50, 50, 50, 50, 50, 20 (270)	卌 IIII (9)	卌 卌 卌 卌 卌 卌 (30)

Site Diagram



File
@RDS1162
@RDS1163

utm
499910
4499057

28/9
68/10

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 8-25-04

Project #: 04-120

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N I25 EIS

Calibration: 112.7 dBA

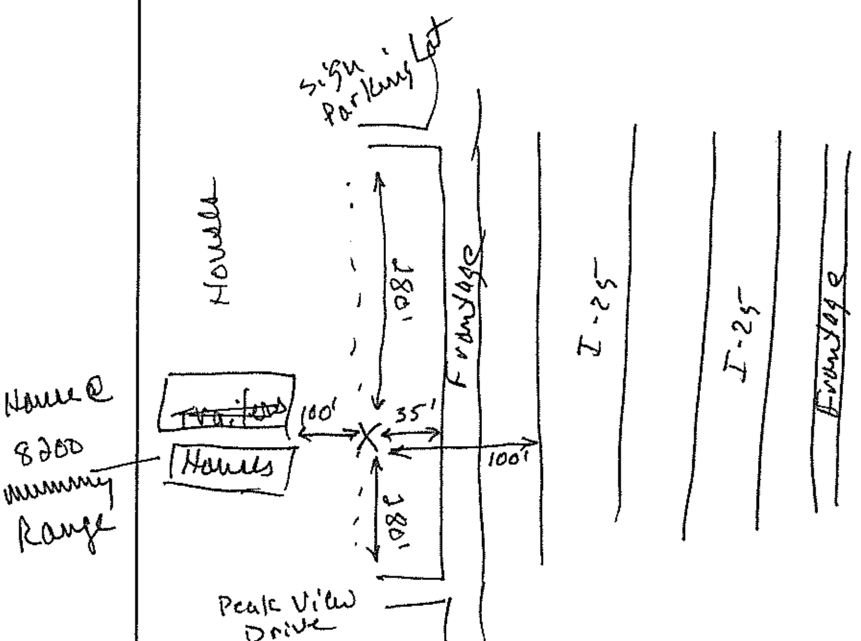
Measurement by: JT

Post Check: 112.6 dBA

Start Time	Duration	Leq	Maximum	Minimum
1740	10/10 min	75.9/76.7 dBA	82.5/83.0 dBA	67.9/70.0 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
1/5 mph	E	23 %	82

Site Diagram



Files
@RD51164
@RD51165

UTM
500687
4479756

Traffic Counts (425)

	Cars	Med. Truck	Hvy. Truck
#1	100, 100, 100, 100, 100, 100, 100, 70 — (770)	(17)	(35)
#2	100, 100, 100, 100, 100, 100, 100, 72 — (772)	(14)	(44)

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 9-1-04

Project #:

3

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N I-25 EIS

Measurement by: [illegible]

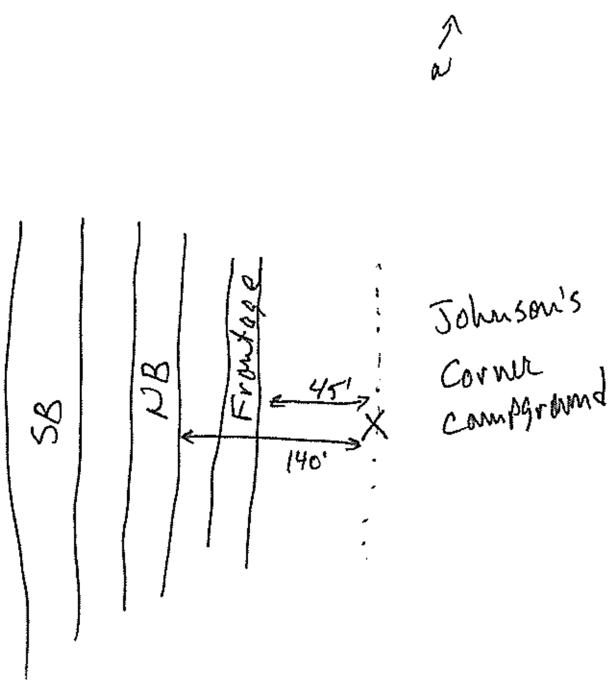
Calibration: 112.7 dBA

Post Check: 112.9 dBA

Start Time	Duration	Leq	Maximum	Minimum
1600	10/10 min	70.8 / 71.0 dBA	77.0/76.1 dBA	63.3 / 57.0 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
0/4 mph	SE	18 %	86

Site Diagram



File
@RDS1170
@RDS1171

UTM
501633
4466984

Traffic Counts

Cars	Med. Truck	Hvy. Truck
~~100 100 100~~ Too many to count	~~////\~~	~~tallies~~
100 in 1:29 →	1 (1)	/////\ (6)
100 in 1:22	(1)	(4)
100 in 1:31		(7)
100 in 1:14		(12)
100 in 1:17		(11)
100 in 1:05		(10)
100 in 1:27		8

100 + these

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Measurement repeat

Date: 9-13-06

Project #: 05-171

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N. I-25

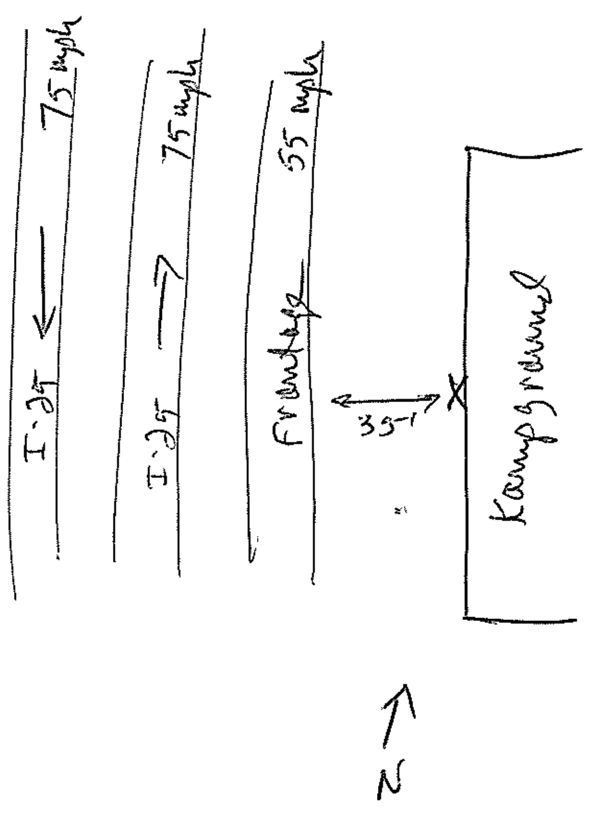
Measurement by: dt

Calibration: 112.8 dBA

Post Check: 112.7 dBA

Start Time	Duration	Leq	Maximum	Minimum
1635	10/10 min	74.0/74.3 dBA	80.1/82.3 dBA	65.6/66.4 dBA
Avg/Max Wind	**Wind Direction**	**R. Humidity**		
1 / 5 mph	S	15 %		
		Temp. 85		

Site Diagram



Traffic Counts

	Cars	Med. Truck	Hvy. Truck	
NB	50 50 50 50 50 50 50 50 50 7 (407)	(6)	(32)	#1
SB	50 50 50 50 50 50 50 50 50 26 (426)	(12)	(24)	#2
Frontage	(20)	(1)	(1)	#1
Frontage	(21)	(1)	(2)	#2

Data files: CRES26, CRES27

UTM Coords. 501593, 4467144

FELSBURG HOLT & ULLEVIG

engineering paths to transportation solutions

Date: 9-1-04

Project #:

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

4

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N I-25 G15

Calibration: 112.9 dBA

Measurement by: [illegible]

Post Check: 112.5 dBA

Start Time	Duration	Leq	Maximum	Minimum
1635	10/10 min	61.3/63.3 dBA	72.2/75.8 dBA	56.2/55.2 dBA

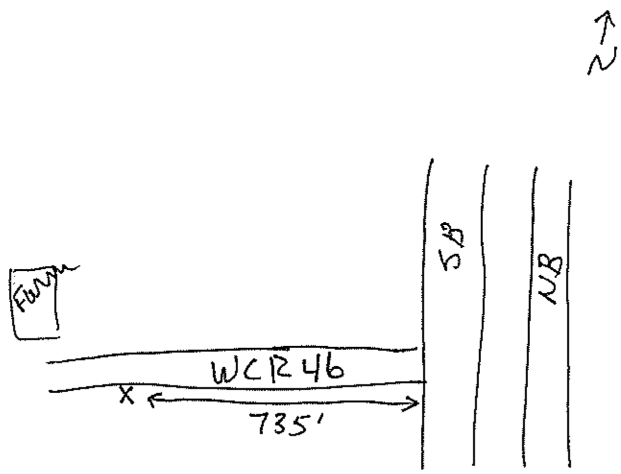
Avg/Max Wind	Wind Direction	R. Humidity	Temp.
1/6 mph	S	27 %	82

Traffic Counts (100 + three)

Cars	Med. Truck	Hvy. Truck
100 in 1:30		(9)
100 in 1:16		(4)
100 in 1:36		(14)
100 in 1:18		(9)
100 in 1:34		(6)
100 in 1:18		(9)

During 2nd run, combine drove by. Not horribly loud but it was there. Plus 2 cars.

Site Diagram



File
@RDS1172
@RDS1173

UTM
501488
4463155

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 9-1-04

Project #:

5

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N I25 EIS

Measurement by: dt

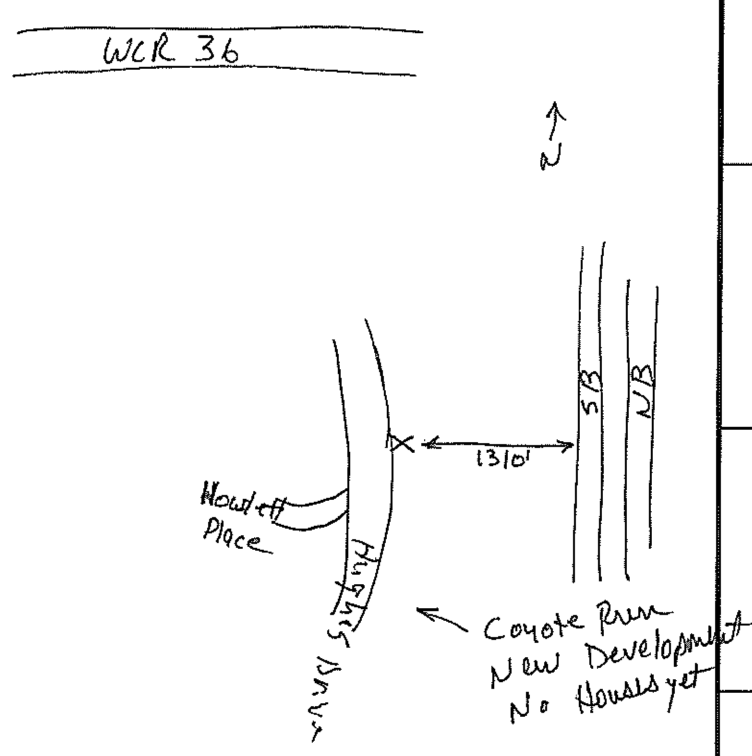
Calibration: 112.6 dBA

Post Check: 112.4 dBA

Start Time	Duration	Leq	Maximum	Minimum
1730	10/10 min	56.3/57.2 dBA	59.4/60.1 dBA	51.6/53.1 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
5/10 mph	SE	19 %	84

Site Diagram



File
@RDS1175
@RDS1176

UTM
501320
4454837

Traffic Counts

Cars	Med. Truck	Hvy. Truck
100 in 1:31		(9)
100 in 1:38		(5)
100 in 1:10		(5)
100 in 1:31		(9)
100 in 1:07		(4)
100 in 1:30		(11)
100 in 1:19		(9)

these are in addition to the 100.

436
3
1308

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 9-9-04
Project #: 04-120

6

Noise Measurement Worksheet

Meter: Spark 706 ~~SVAN 945A (SN 4884)~~
Project: N. I-25
Measurement by: dt

Calibration: 114.0 dBA
Post Check: 114.0 dBA

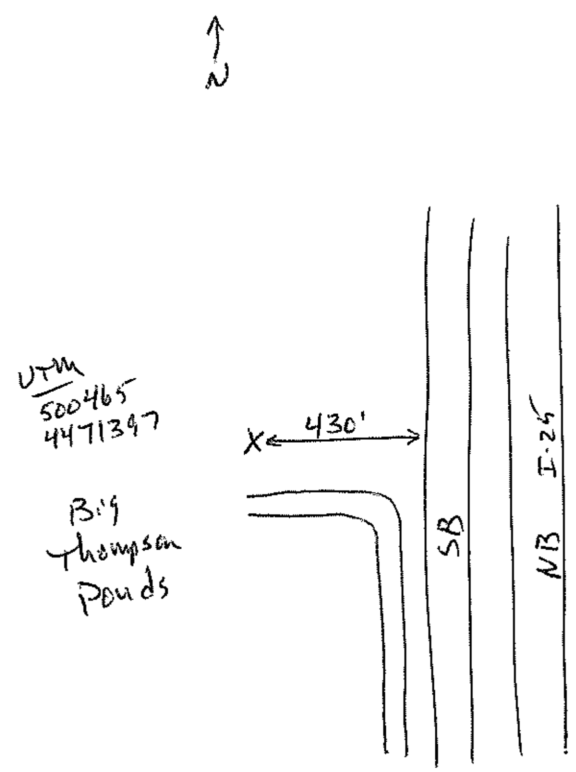
Start Time	Duration	Leq dBA	Maximum dBA	Minimum dBA
1835	24 hr			

Avg/Max Wind mph	Wind Direction	R. Humidity %

Temp.

Traffic Counts: Cars	Med. Truck	Hvy. Truck

Site Diagram



FELSBURG
HOLT &
ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 9-22-04
Project #: 04-120

7

Noise Measurement Worksheet

Meter: Spark 706 ~~SVAN 945A (SN 4884)~~

Project: N I-25

Measurement by: dt

Calibration: 114.0 dBA

Post Check: 113.8 dBA

Start Time	Duration	Leq dBA	Maximum dBA	Minimum dBA
1620	24 hrs			

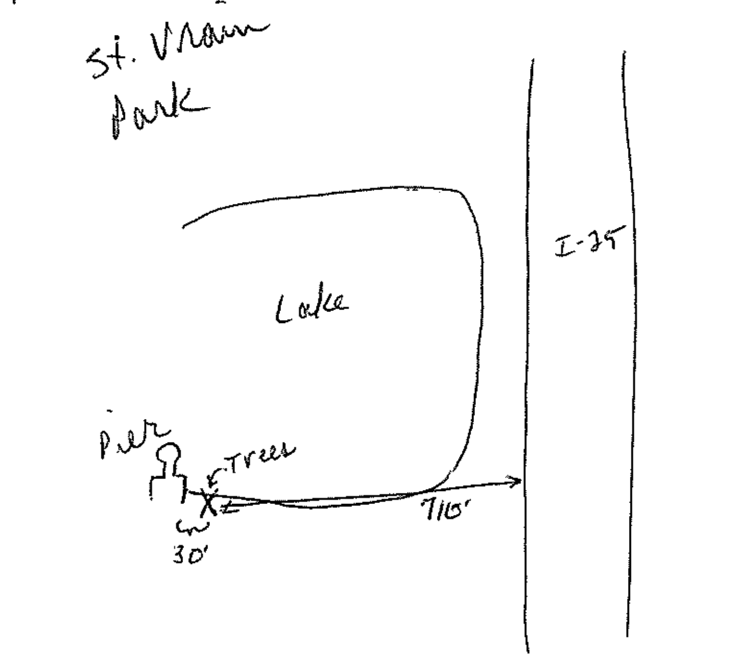
Avg/Max Wind mph	Wind Direction	R. Humidity %

Traffic Counts: Cars	Med. Truck	Hvy. Truck

Site Diagram

Temp.

Cool, breezy at start. From NE. At start. At end road was noticeably quieter and breeze was from the west.



UTM
501528
4446532

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111

Ph. 303.721.1440
Fax 303.721.0832

Date: 9-27-04

8

Project #: 04-120

Noise Measurement Worksheet

Meter: ~~SVAN 945A (SN 4884)~~ Spark 706

Project: N I-25 EIS

Calibration: 114.0 dBA

Measurement by: dt

Post Check: 105.1 (rained) dBA

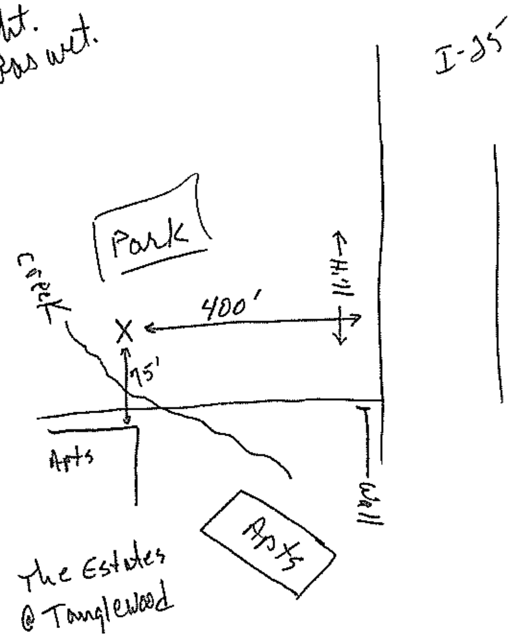
Start Time	Duration	Leq	Maximum	Minimum
1355	24 hrs +	/ dBA	/ dBA	/ dBA

Avg/Max Wind	Wind Direction	R. Humidity	Traffic Counts: Cars	Med. Truck	Hvy. Truck
/ mph		%			

Site Diagram Temp.

Willowbrook Park

Rained overnight. Foam was wet.



UTM
500966
4418709

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

(1)

Date: 8/17/06

Project #: 05-071

Noise Measurement Worksheet

Meter: Borrowed Meter SVAN 945A (SN 4884)

Project: I-25

Measurement by: Jordan Rud

Calibration: 115.8 dBA

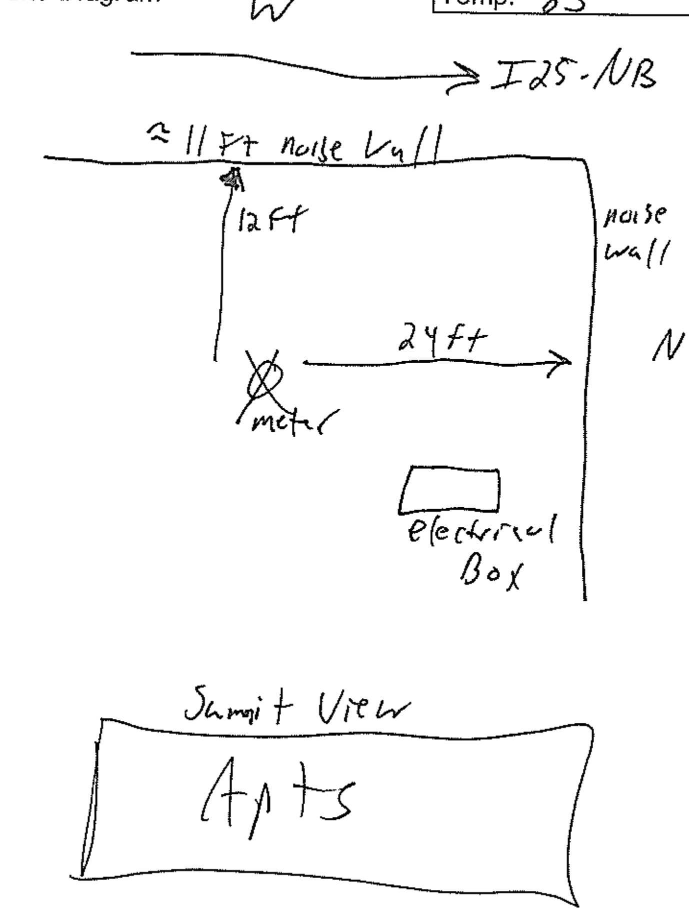
Post Check: 115.9 dBA

7:29 sirens

Start Time	Duration	Leq	Maximum	Minimum
3:55	10/10	63.1 / 61.4 dBA	71.7 / 67.9 dBA	56.3 / 57.0 dBA
Avg/Max Wind: 6 / 10 mph	Wind Direction: NW	R. Humidity: 28 %	Traffic Counts	

Site Diagram: W	Temp. 83	Cars	Med. Truck	Hvy. Truck
		NB 476	8	14
		SB 836	33	35

10 min count



Data files:	UTM Coords.
meas 1	0501094
meas 2	4412187

11/3/04

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

(2)

Date: 8/17/06

Project #: 05-071

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: I-25

Measurement by: Jordan Russell

Calibration: 112.8 dBA

Post Check: 112.5 dBA

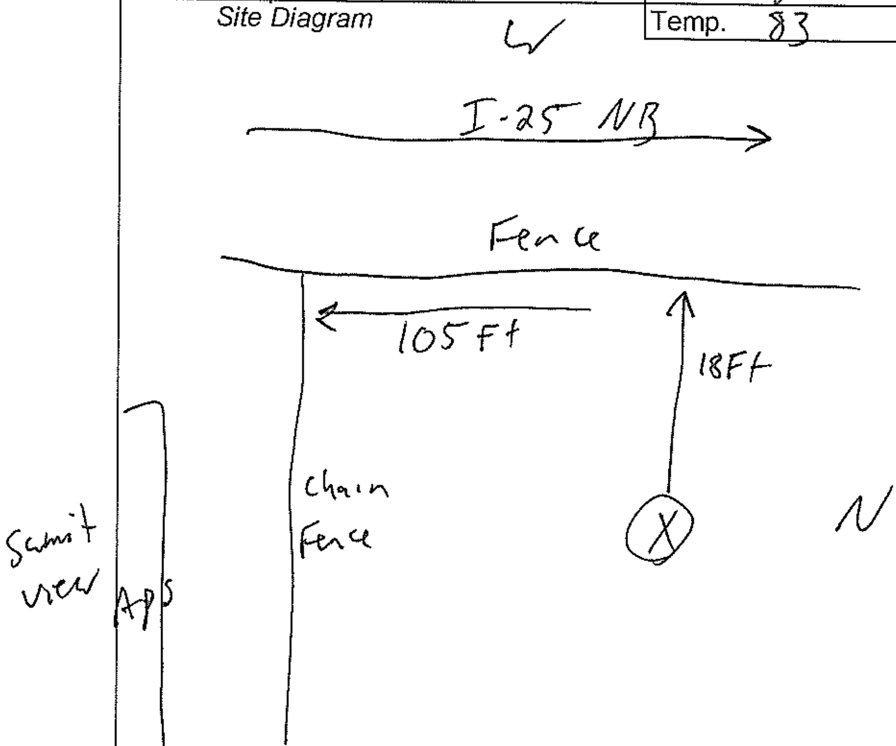
Start Time	Duration	Leq	Maximum	Minimum
3:55/	10/10	72.4 / 72.5 dBA	81.7 / 79.4 dBA	63.1 / 63.7 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
6 / 10 mph	NW	28 %	83

Traffic Counts (10 min cnt)

Cars	Med. Truck	Hvy. Truck
Same as other 476	8	14
836	33	35

Site Diagram



Data files:

UTM Coords.
0501102
4412247

1990
963
1027

(3)

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Date: 8/17/06

Project #: 05-071

Noise Measurement Worksheet

Meter: Borrowed SVAN 945A (SN 4884)

Project: I-25

Measurement by: Jordan Russ

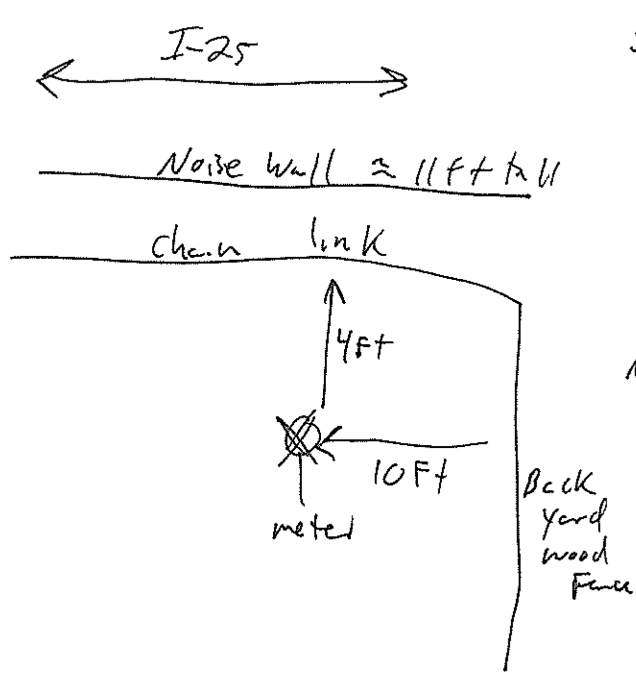
Calibration: 115.9 dBA

Post Check: 115.8 dBA

Start Time	Duration	Leq	Maximum	Minimum
5:10 /	10/10	62.8 / 61.9 dBA	74.1 / 69.7 dBA	56.7 / 54.9 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
2 / 14 mph	NW	22 %	93

Site Diagram



Traffic Counts

	Cars	Med. Truck	Hvy. Truck
SB	963	(30)	(31)
NB	1027	(25)	(18)

Data files: Meas 3, Meas 4

UTM Coords. 0501016, 4414465
13 S. UTM

11/3/04

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Date: 8/17/06

Project #: 05-071

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

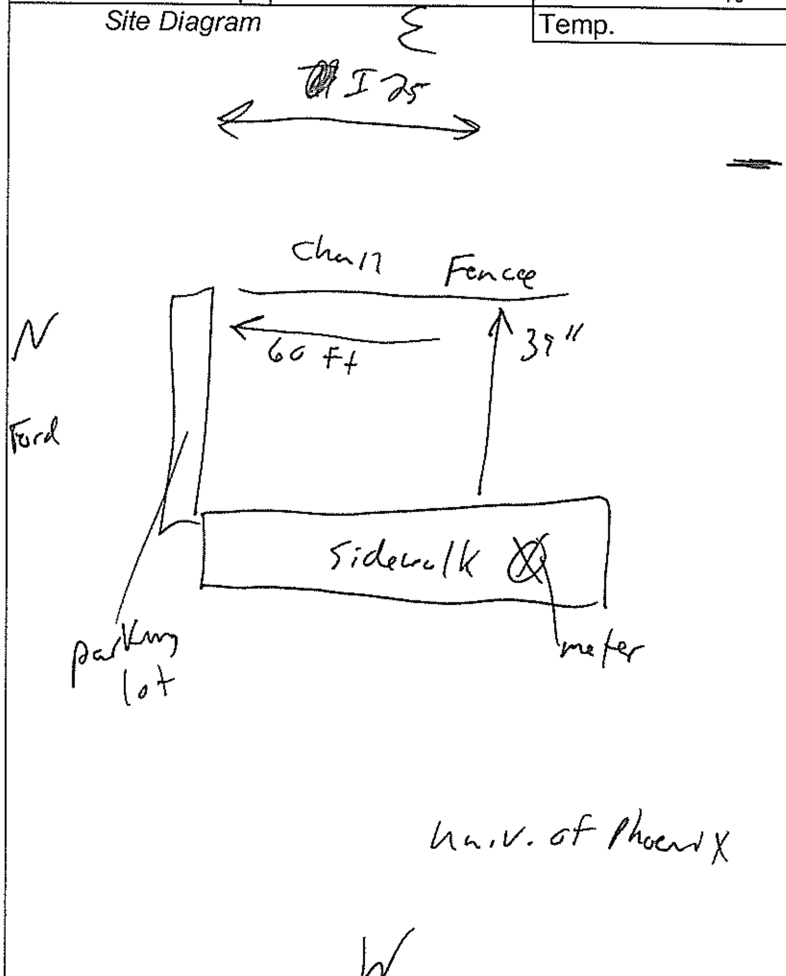
Project: I-25

Calibration: 112.7 dBA

Measurement by: Jordan Rudd

Post Check: 112.[illegible] dBA

Start Time	Duration	Leq	Maximum	Minimum	
5:10	10/10	67.5 / 66.9 dBA	74.4 / 73.1 dBA	60.3 / 61.1 dBA	
Avg/Max Wind	Wind Direction	R. Humidity	Traffic Counts		
/ mph		%	Cars	Med. Truck	Hvy. Truck
Site Diagram		Temp.	963	30	31
			1027	25	18



Data files:

UTM Coords.
0501015
4414557

11/3/04

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Date: 8/29/06
Project #: 05-071

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)
Project: I-25 Existing Noise (S. of 88th)
Measurement by: Dale / Jordan

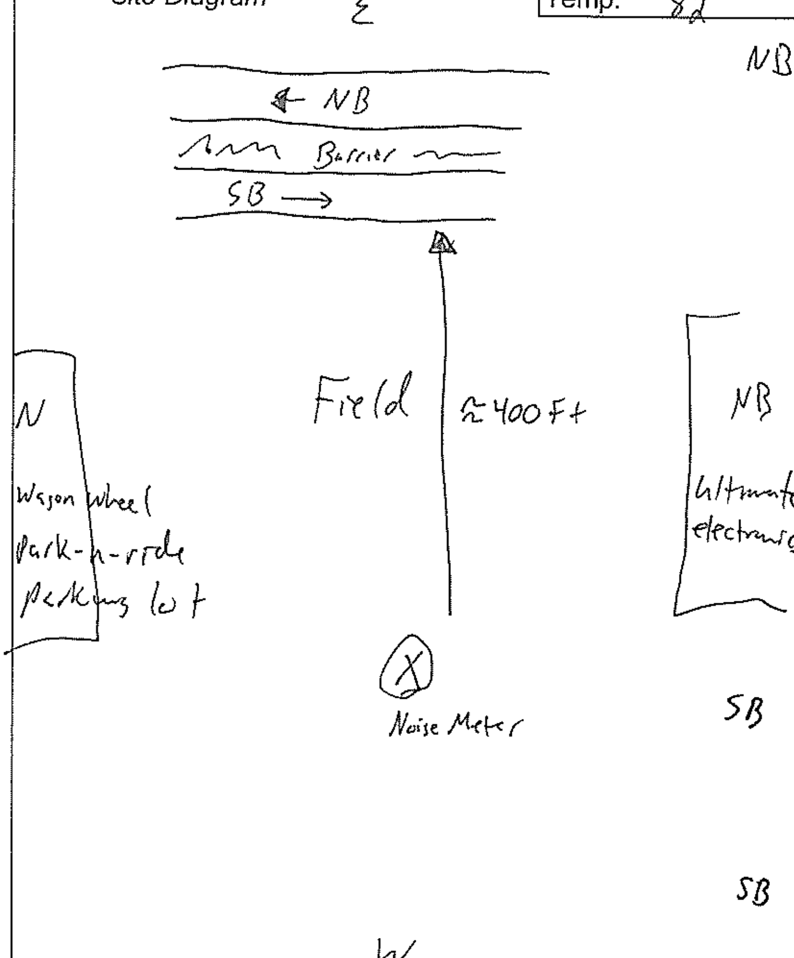
Calibration: 112.5 dBA
Post Check: 112.2 dBA

625
541
Siren 2

Start Time	Duration	Leq	Maximum	Minimum
1635	10/10	61.7 / 61.8 dBA	66.6 / 73.4 dBA	57.2 / 58.3 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
5 / 8 mph	NE	19 %	82

Site Diagram



Traffic Counts

	Cars	Med. Truck	Hvy. Truck
NB	933	13	38
NB	1012	26	26
SB	755	31	38
SB	863	26	43

Data files:
Res 15
Res 16

UTM Coords.
500994
4411571

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Date: 8/29/06

Project #: 05-071

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: I-25 (S of 136th) Grant Circle

Calibration: 112.7 dBA

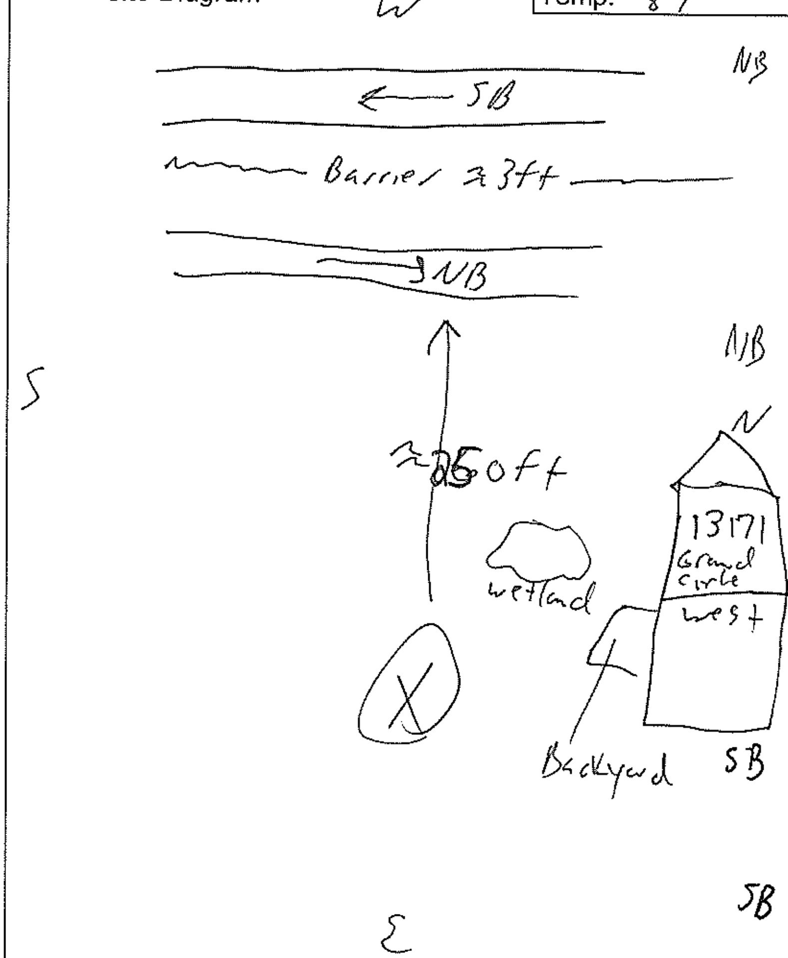
Measurement by: Dale/Dale

Post Check: 112.3 dBA

Start Time	Duration	Leq	Maximum	Minimum
17:30 /	10/10	66.4 / 65.2 dBA	71.9 / 70.8 dBA	60.0 / 57.4 dBA

Avg/Max Wind	Wind Direction	R. Humidity	Temp.
3 / 6 mph	SE	26 %	87

Site Diagram



Traffic Counts

	Cars	Med. Truck	Hvy. Truck
1	634	7	18
2	506	9	19
	600	13	35
	576	19	39

Data files: Mes 16, Mes 17

UTM Coords. 501117 / 4420511

#12

Envi / Noise filing 2014
Alle Teaslee 4/19
(match w/ others on file if possible)

FELSBURG HOLT & ULLEVIG
engineering paths to transportation solutions

6300 S. Syracuse, Suite 600
Centennial, CO 80111
Ph. 303.721.1440

Date: 4-18-07

Project #: 05-143

Noise Measurement Worksheet

Meter: SVAN 945A (SN 4884)

Project: N. I-25 — Calibration: 112.7 dBA

Measurement by: dt — Post Check: 112.3 dBA

SEL 87.8

Start Time	Duration	Leq	Maximum	Minimum
1700	20 min	57.0 / — dBA	70.6 / — dBA	51.6 / — dBA
Avg/Max Wind	**Wind Direction**	**R. Humidity**	**Traffic Counts**	
7 / 19 mph	SE	24 %		

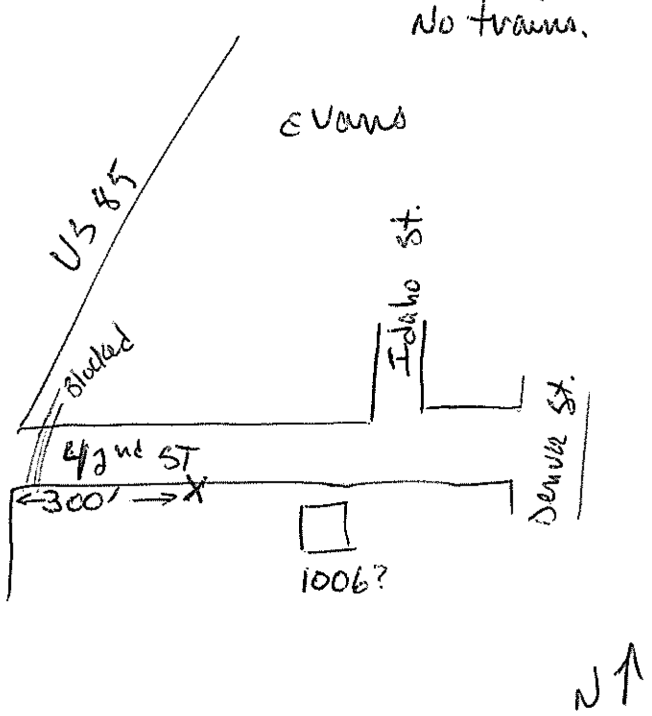
Cars	Med. Truck	Hvy. Truck
Not counted.		

Site Diagram

Temp. 70

Windy.

US 85 is closed to 2 lanes, construction. No trains.



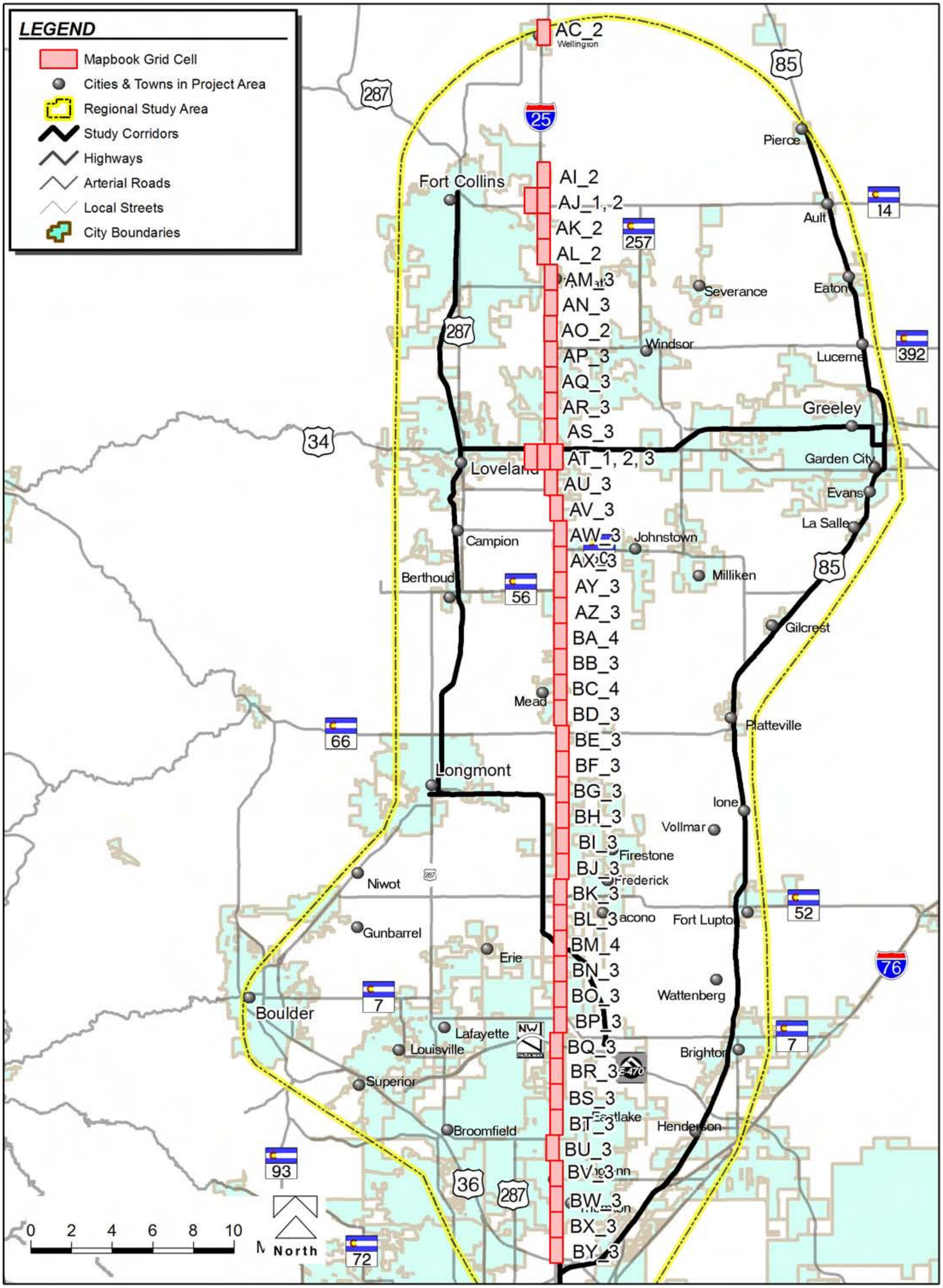
On Denver St., could not hear US85. Wind & slow traffic. Quieter than this one. 48-50 dBA.

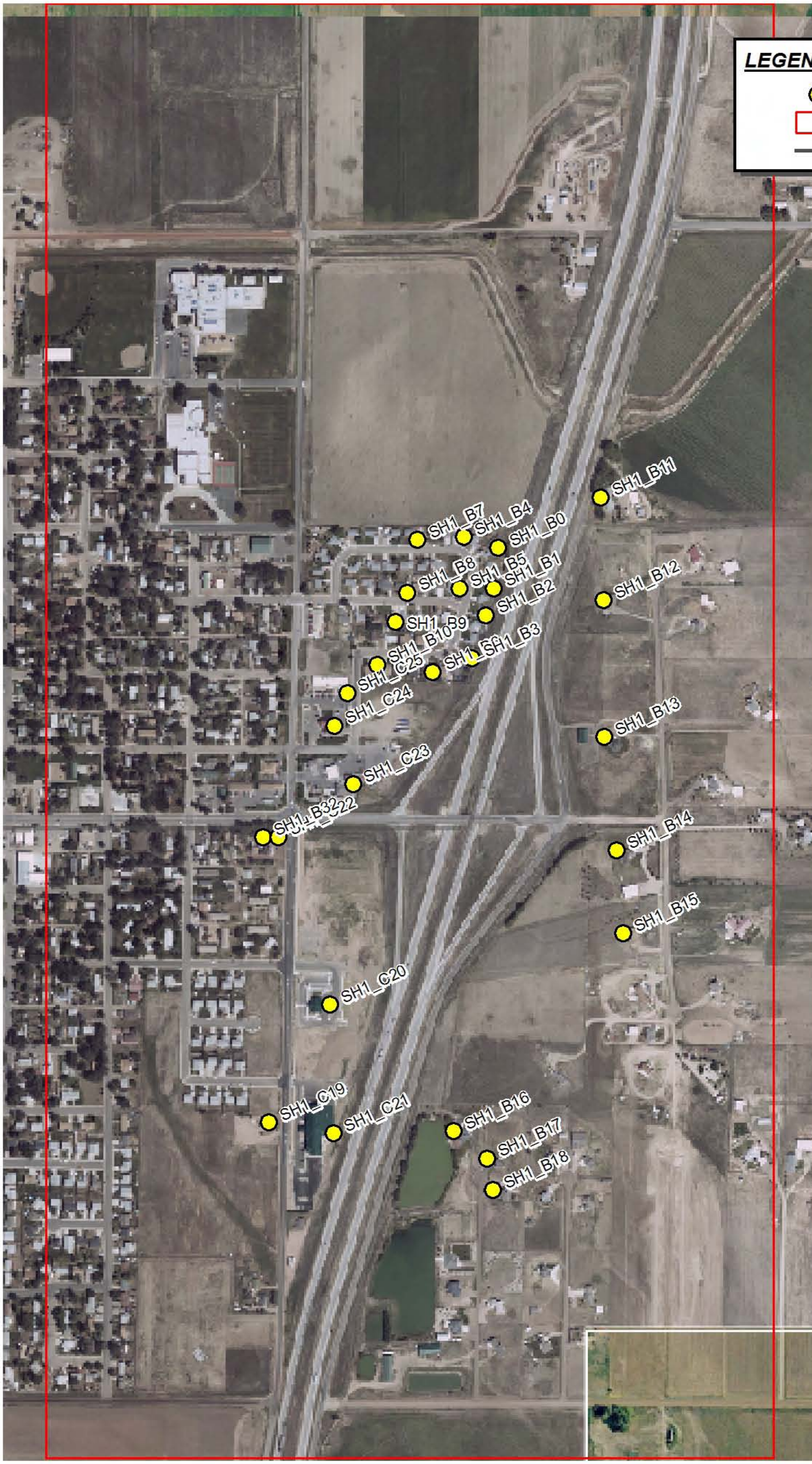
Data files: @RFS81

UTM Coords.

APPENDIX B
NOISE MODEL RECEIVERS AND RESULTS

THIS PAGE INTENTIONALLY LEFT BLANK


LEGEND
Mapbook Grid Cell
Cities & Towns in Project Area
Regional Study Area
Study Corridors
Highways
Arterial Roads
Local Streets
City Boundaries
AC_2
Wellington
AI_2
AJ_1, 2
AK_2
AL_2
AM_3
AN_3
AO_2
AP_3
AQ_3
AR_3
AS_3
AT_1, 2, 3
AU_3
AV_3
AW_3
AX_3
AY_3
AZ_3
BA_4
BB_3
BC_4
BD_3
BE_3
BF_3
BG_3
BH_3
BI_3
BJ_3
BK_3
BL_3
BM_4
BN_3
BO_3
BP_3
BQ_3
BR_3
BS_3
BT_3
BU_3
BV_3
BW_3
BX_3
BY_3
Fort Collins
Pierce
Ault
Severance
Eaton
Windsor
Lucerne
Greeley
Loveland
Garden City
Evans
La Salle
Campion
Johnstown
Milliken
Berthoud
Gilcrest
Mead
Platteville
Longmont
Ione
Vollmar
Firestone
Frederick
Niwot
Fort Lupton
Gunbarrel
Erie
Wattenberg
Boulder
Lafayette
Louisville
Brighton
Superior
Broomfield
Henderson
85
287
25
14
257
392
34
56
66
52
76
7
93
36
72
E-470
0 2 4 6 8 10
North



LEGEND

- Noise Model Receiver
- Mapbook Grid Cell
- Highways

North

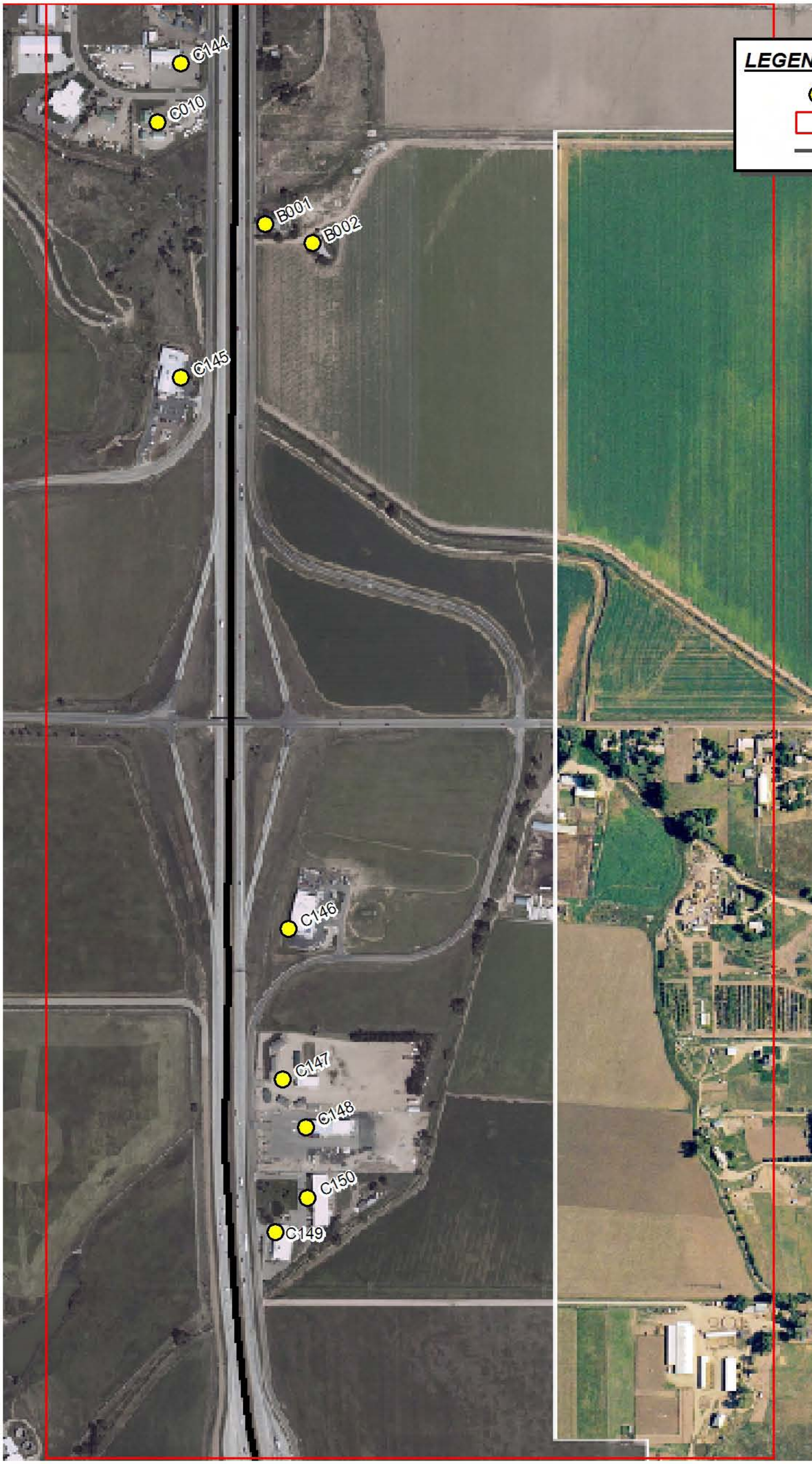
0 250 500 Feet

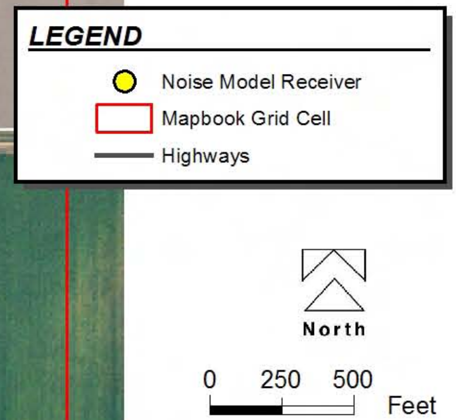
Grid Cell AC_2

Grid Cell AI_2

Grid Cell AJ_1

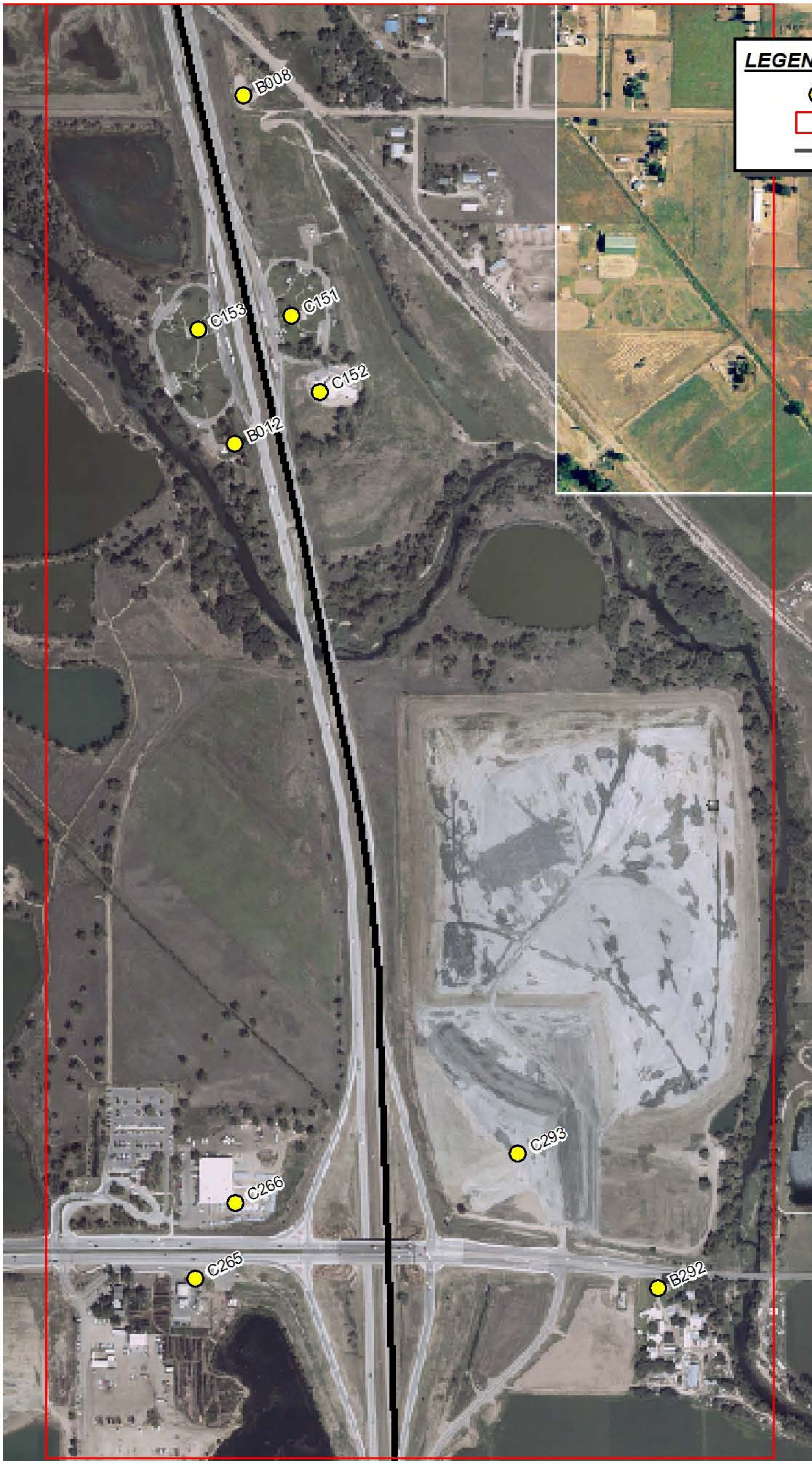
Grid Cell AJ_2

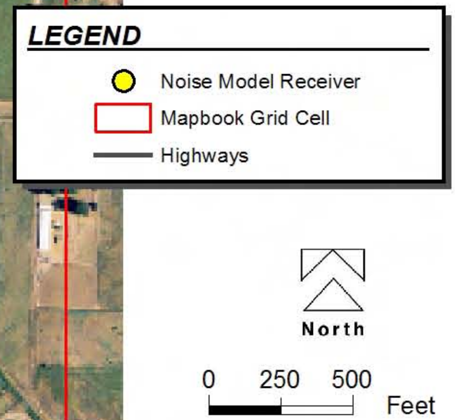




Grid Cell AK_2

Grid Cell AL_2





Grid Cell AM_3

Grid Cell AN_3

LEGEND

Noise Model Receiver

Mapbook Grid Cell

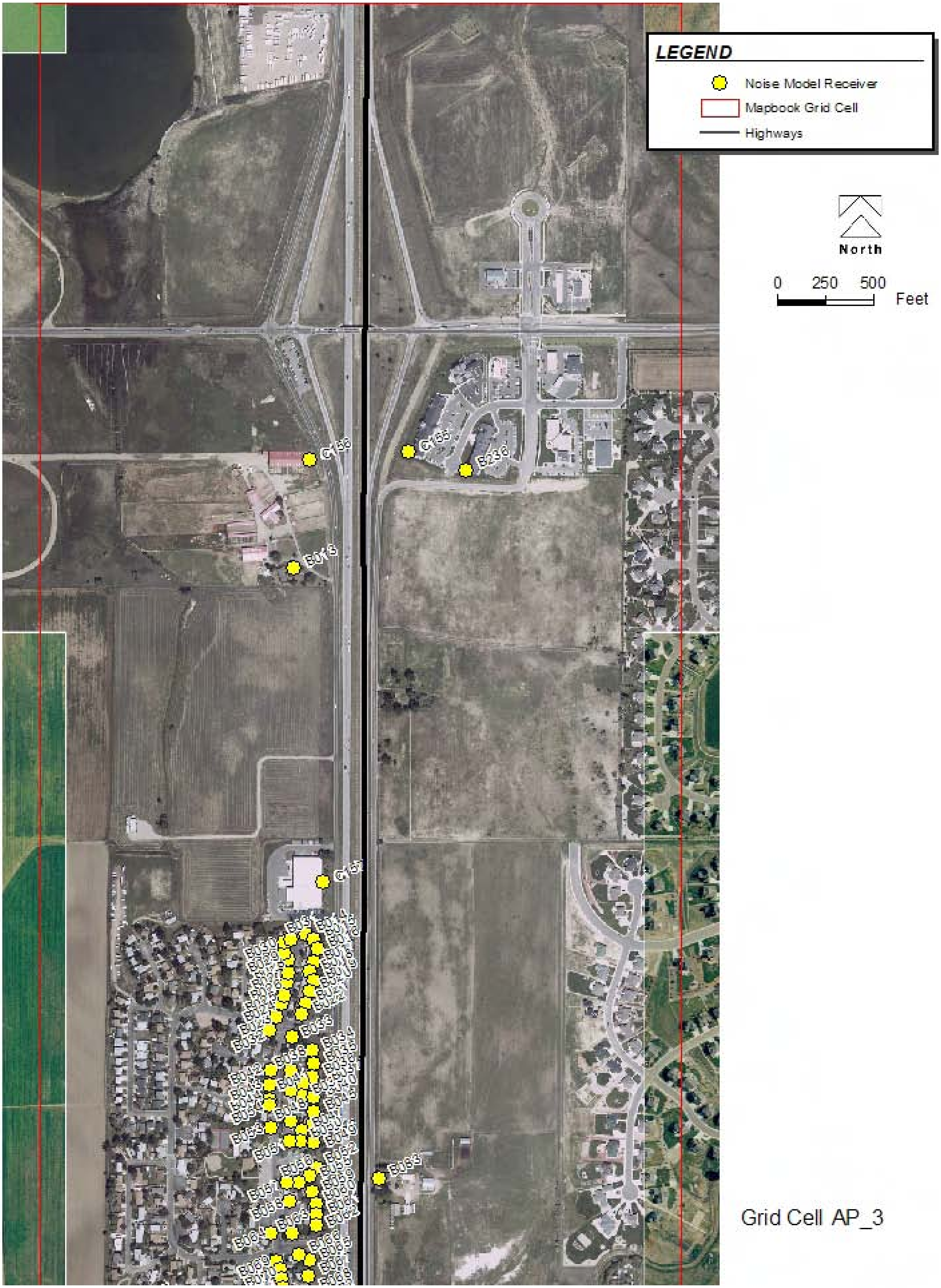
Highways

North

0 250 500

Feet

Grid Cell AO_2



Grid Cell AP_3

Grid Cell AQ_3

Grid Cell AR_3

LEGEND

Noise Model Receiver

Mapbook Grid Cell

Highways

North

0 250 500

Feet

Grid Cell AS_3

Grid Cell AT_1

LEGEND

Noise Model Receiver

Mapbook Grid Cell

Highways

North

0 250 500

Feet

Grid Cell AT_2

LEGEND

Noise Model Receiver

Mapbook Grid Cell

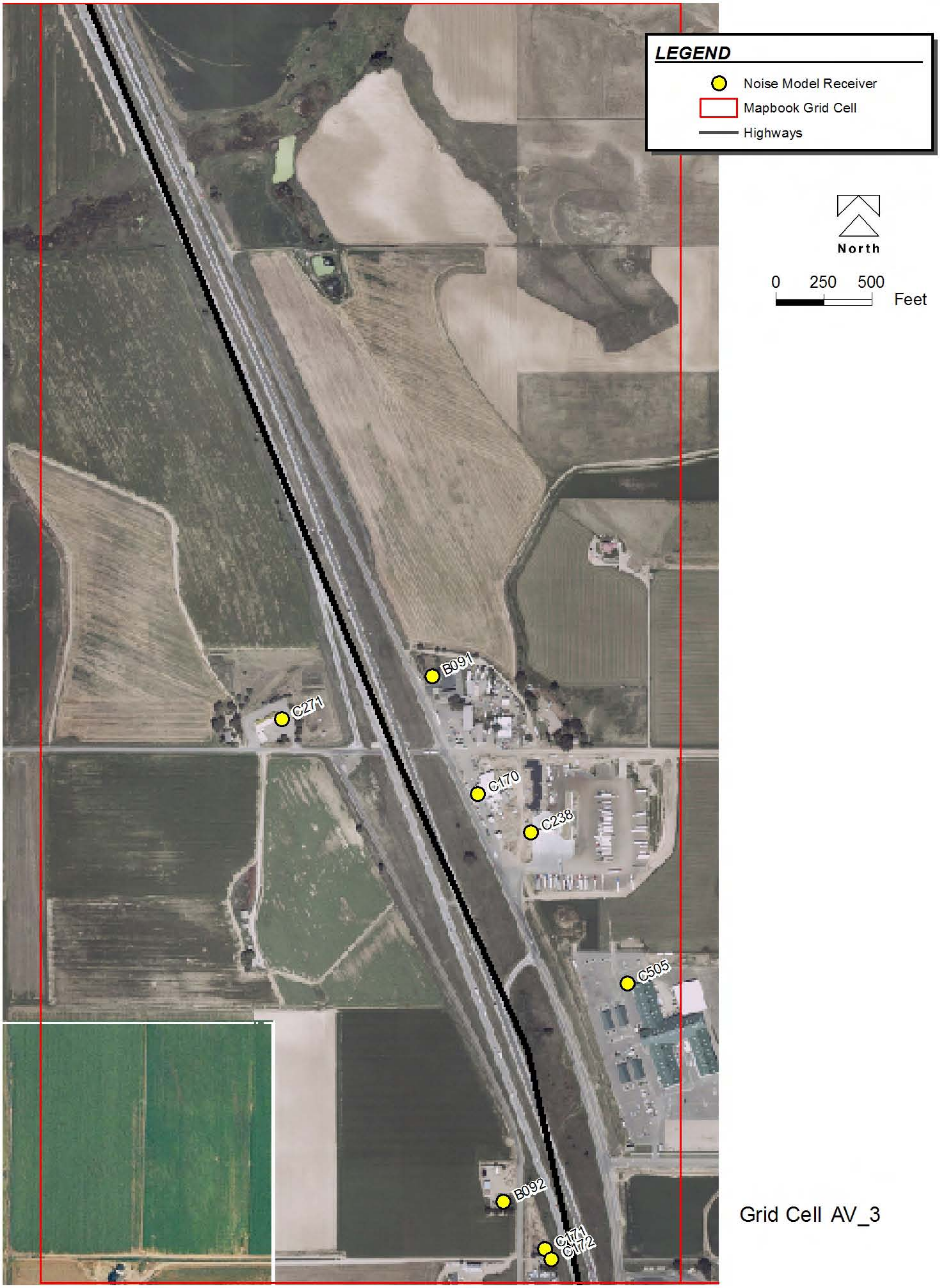
Highways

North

0 250 500 Feet

Grid Cell AT_3

Grid Cell AU_3



Grid Cell AV_3

Grid Cell AW_3

Grid Cell AX_3

LEGEND

Noise Model Receiver

Mapbook Grid Cell

Highways

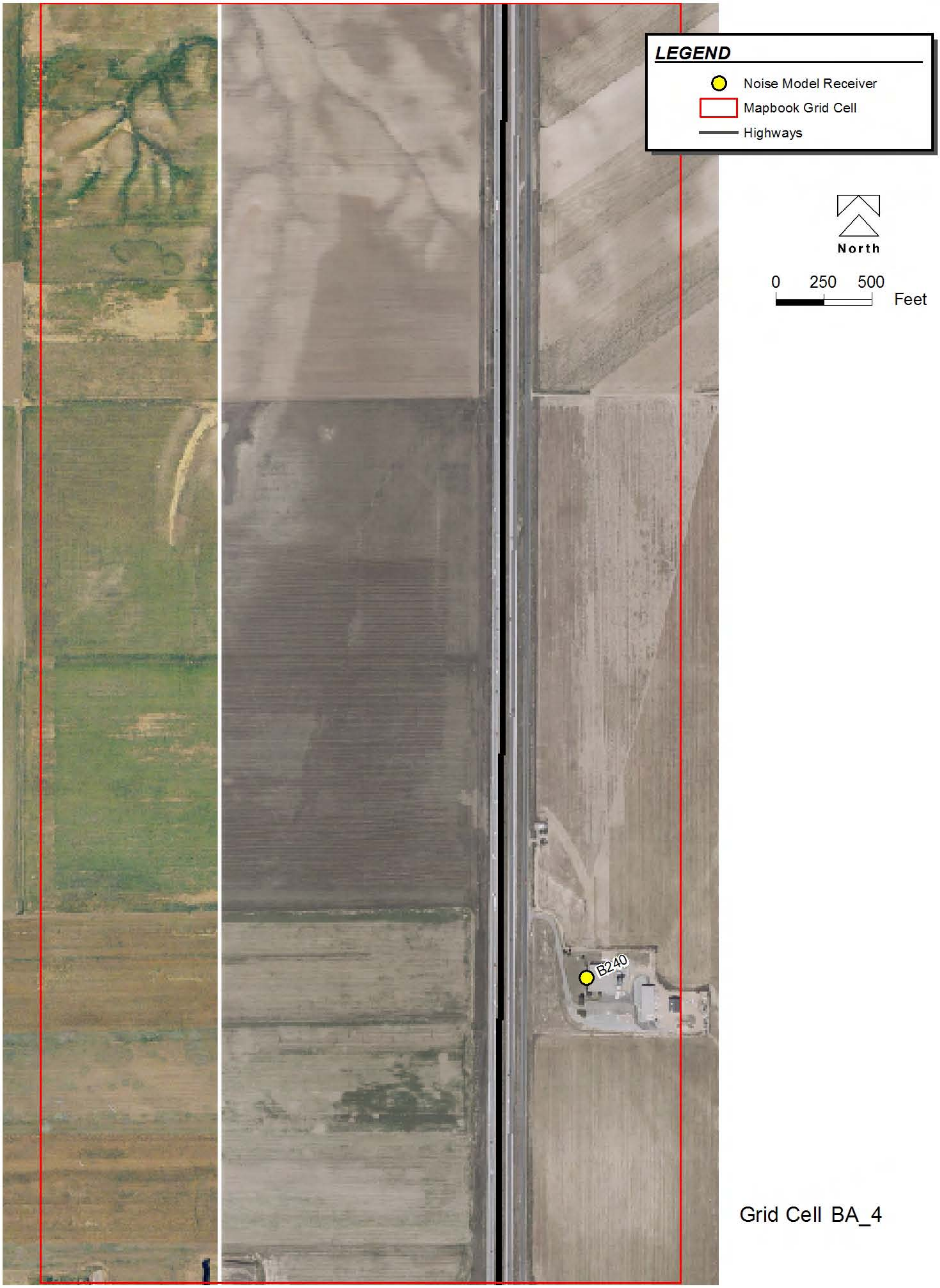
North

0 250 500

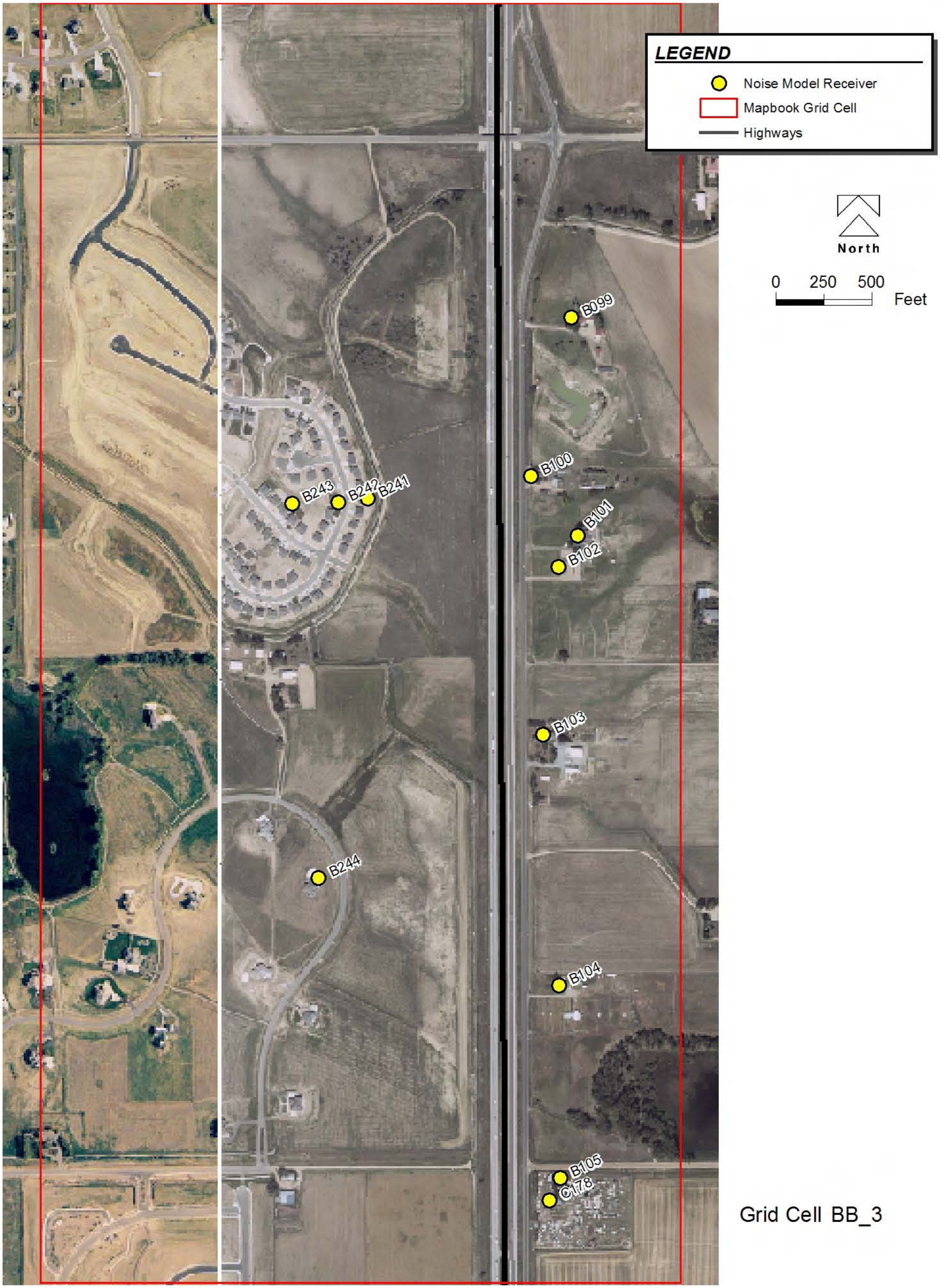
Feet

Grid Cell AY_3

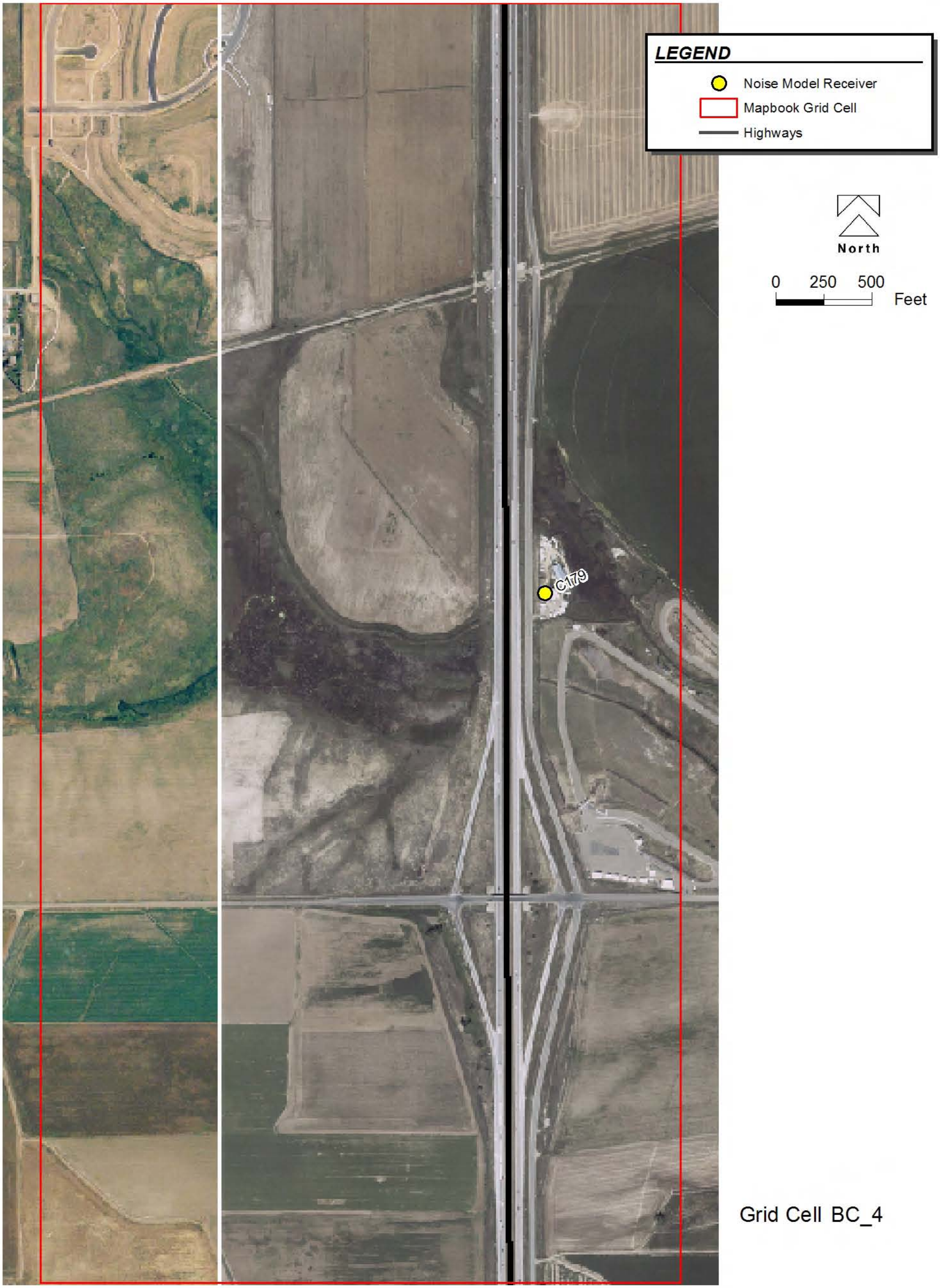
Grid Cell AZ_3



Grid Cell BA_4

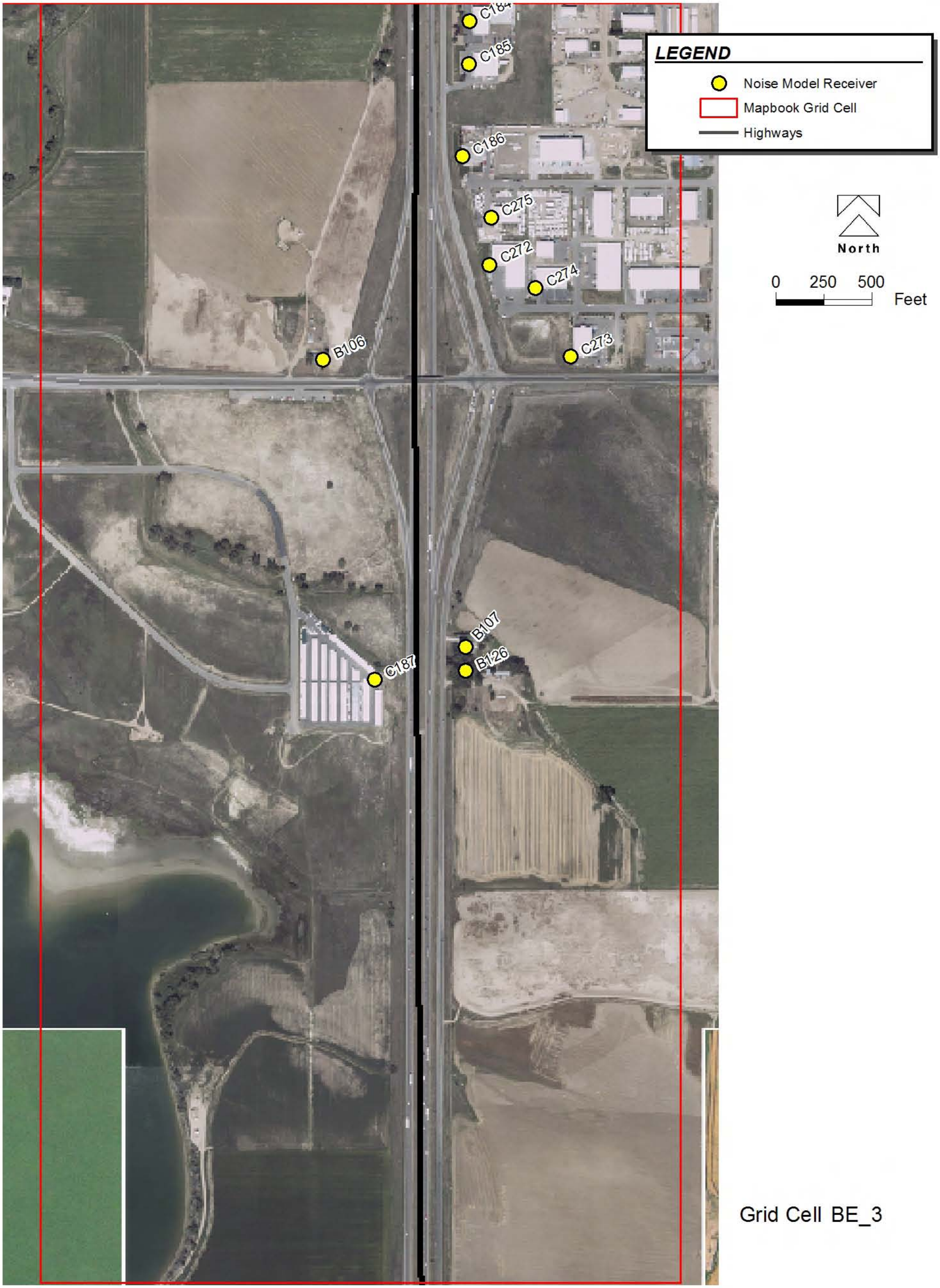


Grid Cell BB_3



Grid Cell BC_4

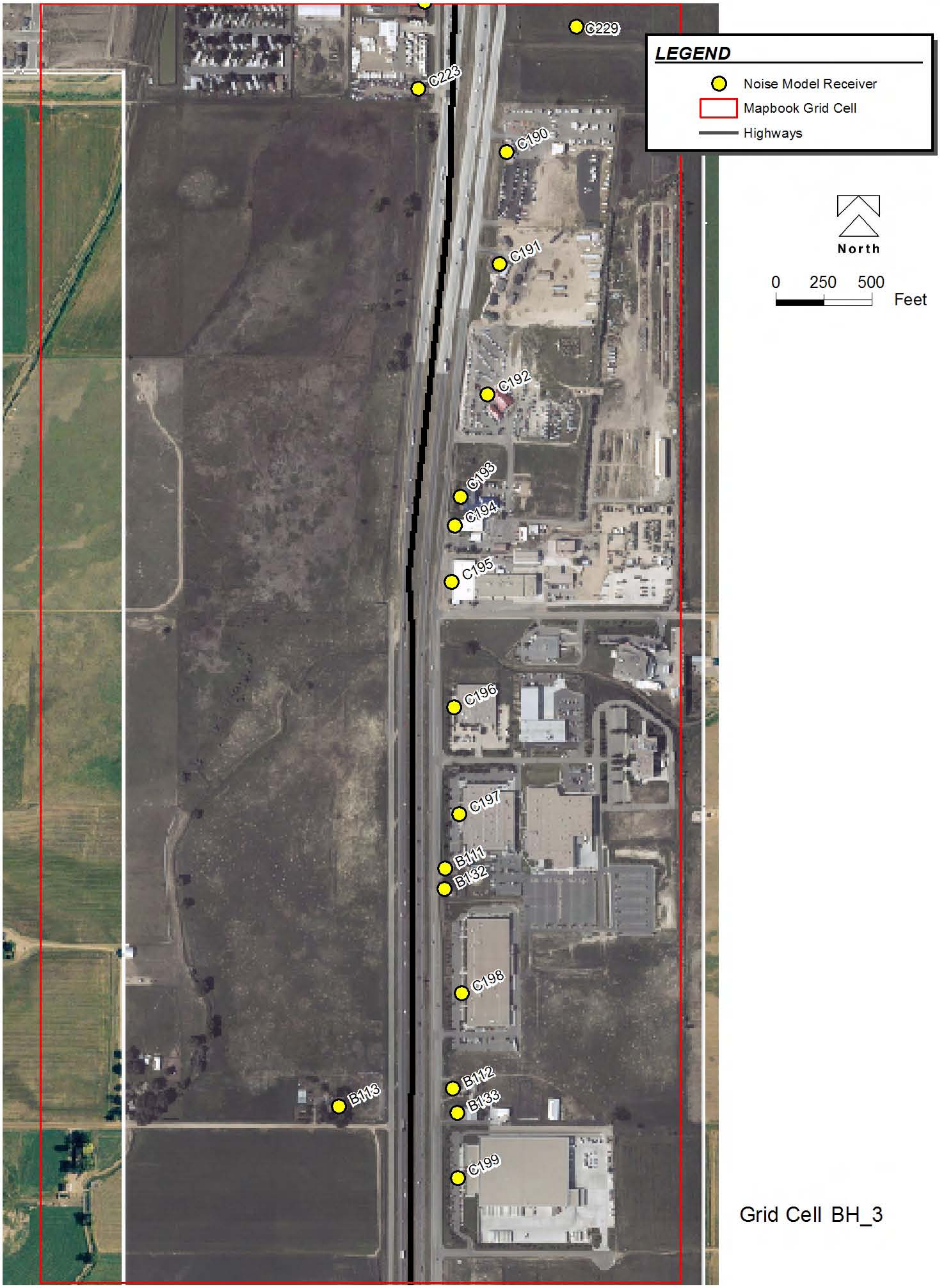
Grid Cell BD_3



Grid Cell BE_3

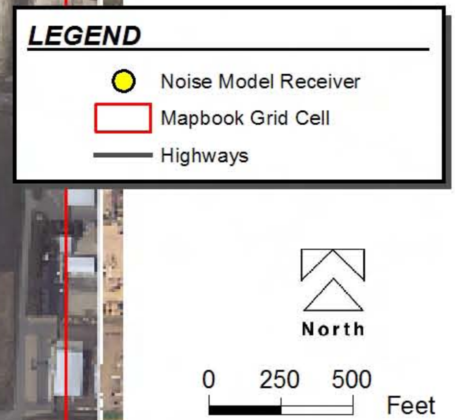
Grid Cell BF_3

Grid Cell BG_3

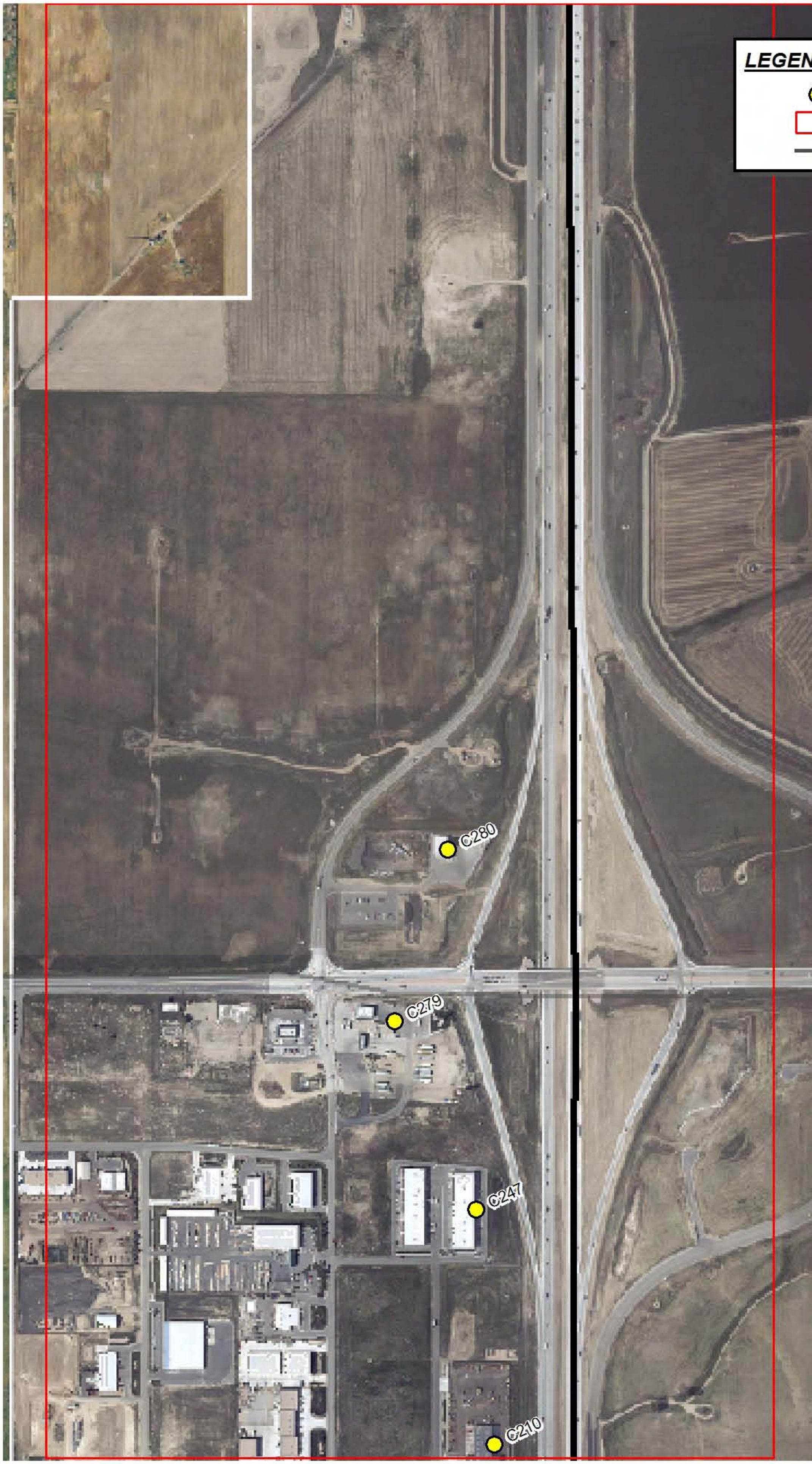


Grid Cell BH_3

Grid Cell BI_3



Grid Cell BJ_3



LEGEND

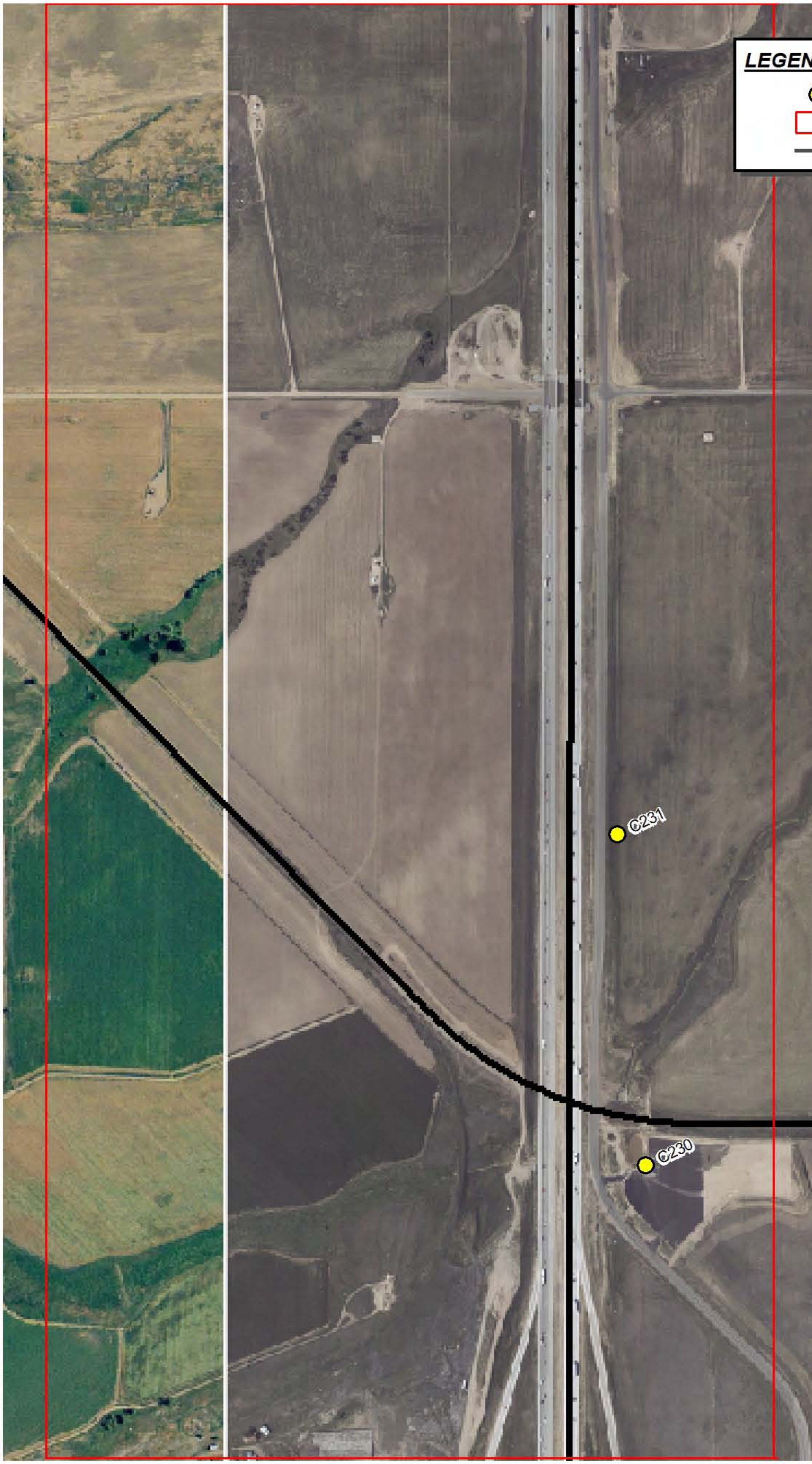
- Noise Model Receiver
- Mapbook Grid Cell
- Highways

North

0 250 500
Feet

Grid Cell BK_3

Grid Cell BL_3



LEGEND

Noise Model Receiver

Mapbook Grid Cell

Highways

North

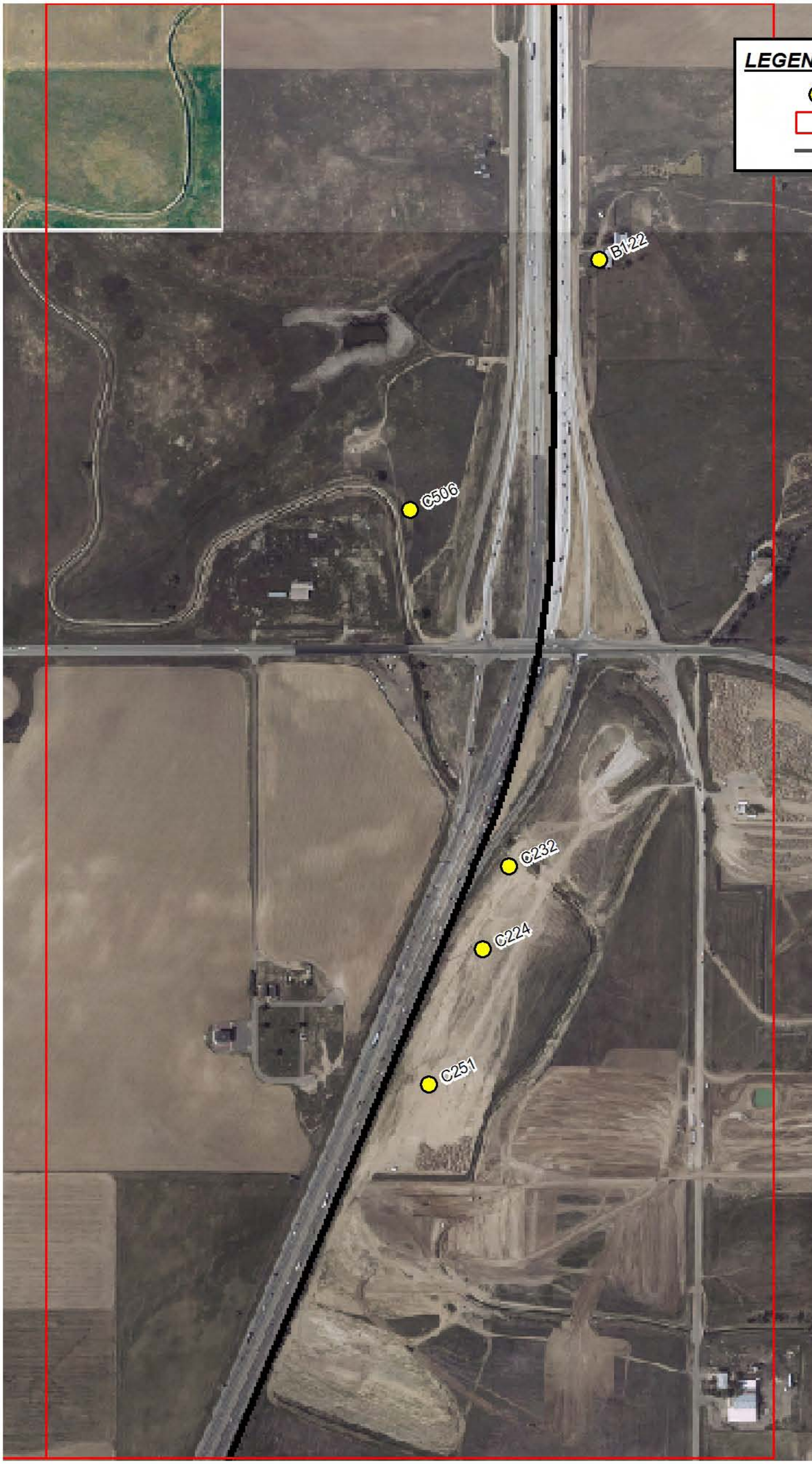
0 250 500

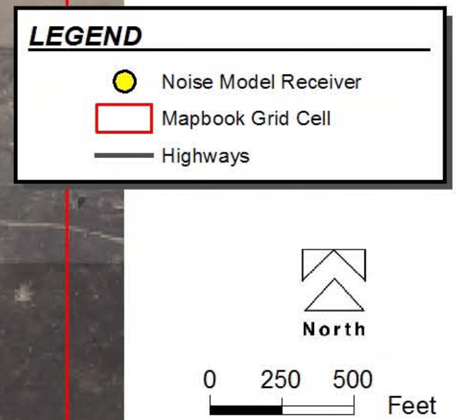
Feet

Grid Cell BM_4

Grid Cell BN_3

Grid Cell BO_3





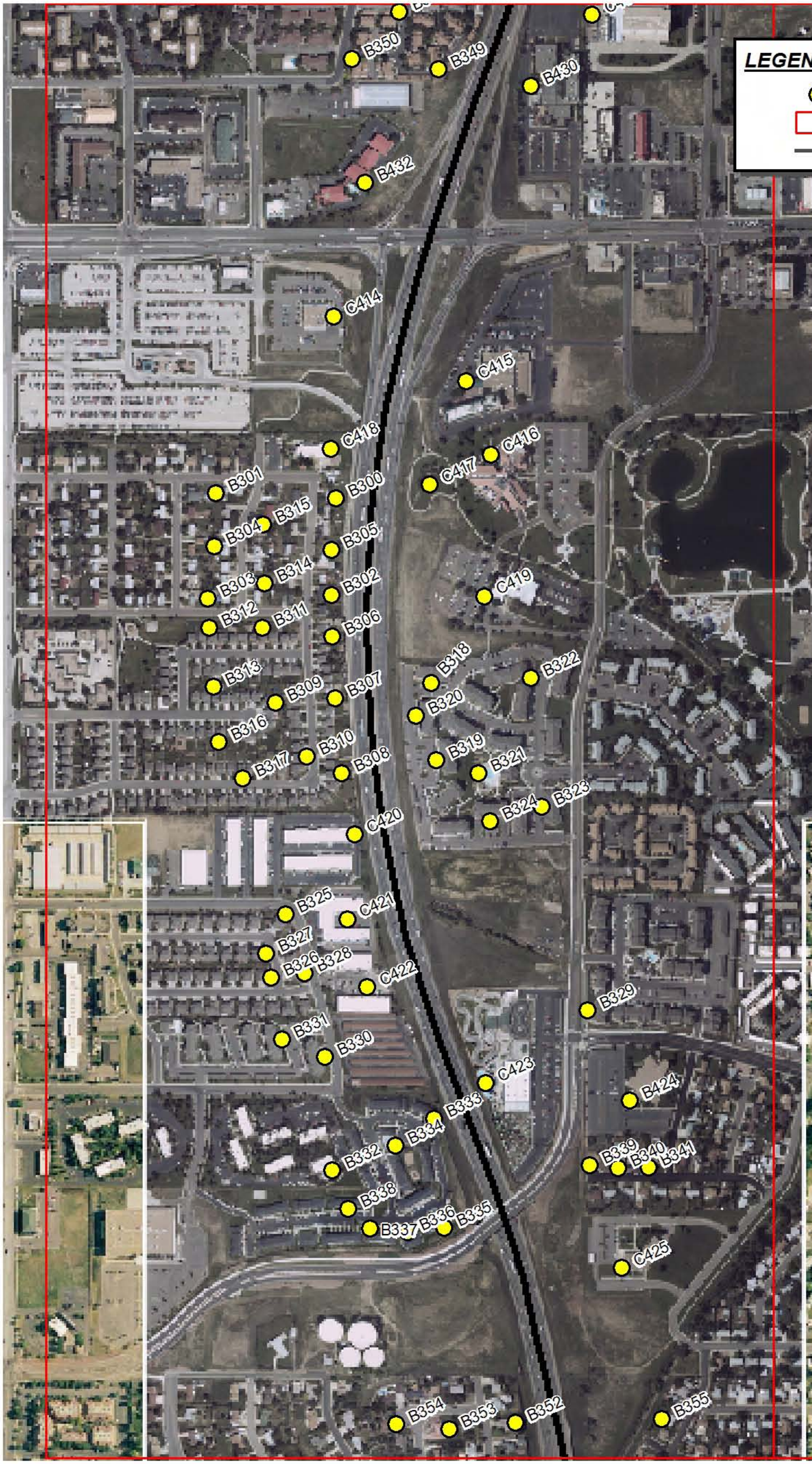
Grid Cell BP_3

Grid Cell BQ_3

Grid Cell BR_3

Grid Cell BS_3

Grid Cell BT_3



LEGEND

Noise Model Receiver

Mapbook Grid Cell

Highways

North

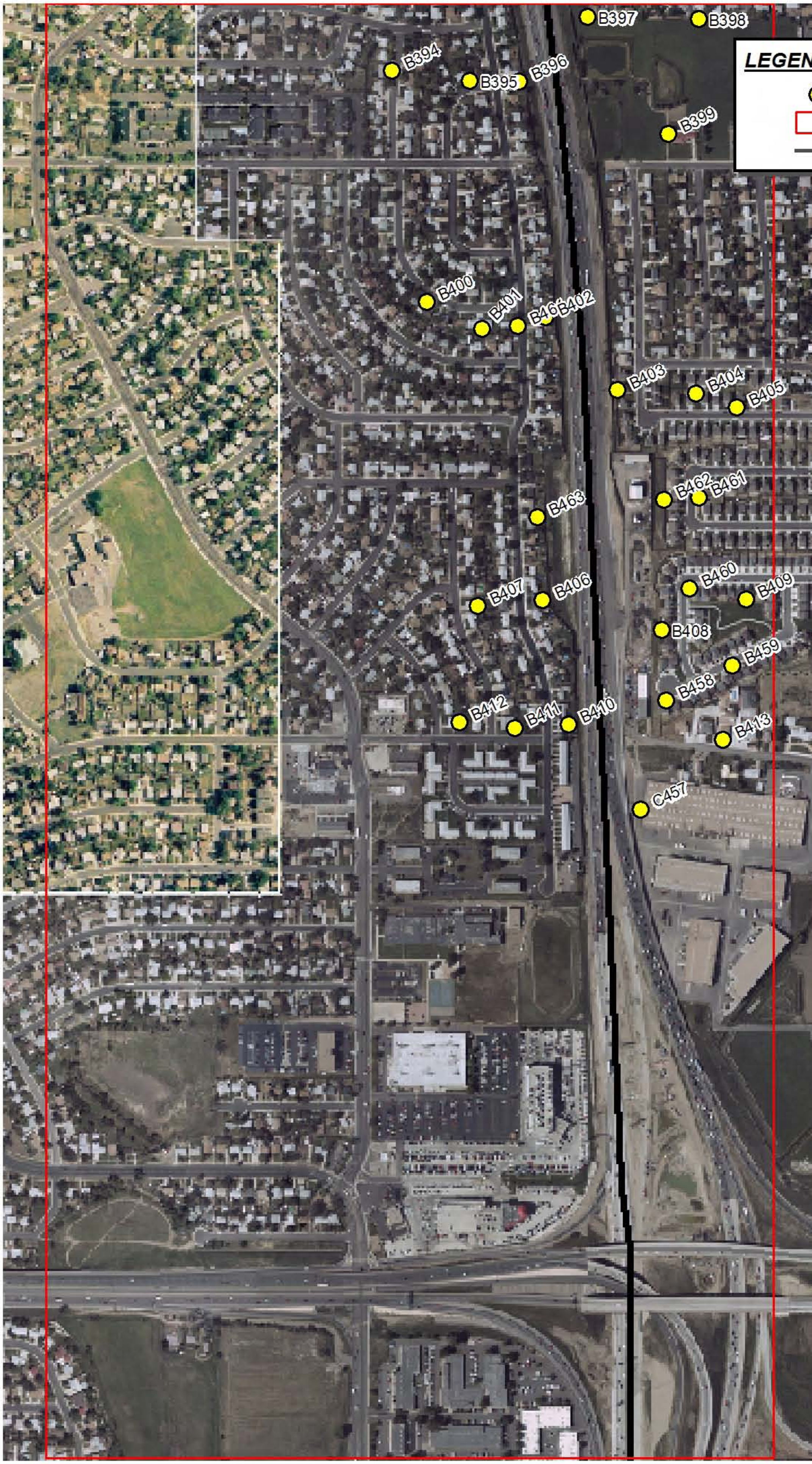
0 250 500 Feet

Grid Cell BU_3

Grid Cell BV_3

Grid Cell BW_3

Grid Cell BX_3



LEGEND

- Noise Model Receiver
- Mapbook Grid Cell
- Highways

North

0 250 500 Feet

Grid Cell BY_3

TNM Model Output Data (dBA)

Model Receiver	NAC	Existing	No Action	Package A	Package B
B001	66	76	79	81	82
B002	66	67	71	72	73
B003	66	69	72	70	72
B004	66	64	66	65	66
B005	66	64	67	65	67
B006	66	68	70	71	73
B007	66	70	73	74	75
B008	66	67	69		65
B012	66				
B013	66	69	71	68	67
B014	66	73	75	75	75
B015	66	75	77	76	77
B016	66	76	77	77	77
B017	66	75	77	76	77
B018	66	75	76	76	76
B019	66	75	77	76	77
B020	66	74	76	75	76
B021	66	73	75	75	75
B022	66	72	74	74	74
B023	66	66	68	68	69
B024	66	66	68	68	69
B025	66	66	67	68	69
B026	66	66	68	68	69
B027	66	66	68	68	69
B028	66	67	68	68	69
B029	66	67	69	69	70
B030	66	67	69	69	71
B031	66	66	68	68	69
B032	66	67	68	68	69
B033	66	70	72	72	73
B034	66	75	76	75	76

Model Receiver	NAC	Existing	No Action	Package A	Package B
B035	66	75	77	76	76
B036	66	75	76	75	76
B037	66	73	74	75	74
B038	66	70	72	72	72
B039	66	72	74	74	74
B040	66	75	77	76	76
B041	66	70	72	73	73
B042	66	67	68	69	70
B043	66	66	68	69	69
B044	66	67	69	70	71
B045	66	75	77	76	76
B046	66	75	76	75	75
B047	66	72	73	74	74
B048	66	70	71	72	72
B049	66	75	77	75	76
B050	66	72	73	73	74
B051	66	70	71	72	72
B052	66	75	77	75	75
B053	66	66	67	68	68
B054	66	67	68	70	70
B055	66	73	74	74	74
B056	66	71	72	72	72
B057	66	69	70	70	71
B058	66	69	70	70	72
B059	66	73	75	74	74
B060	66	74	75	75	76
B061	66	74	76	75	76
B062	66	73	75	74	76
B063	66	69	71	71	72
B064	66	65	67	66	67
B065	66	72	74	74	75
B066	66	70	72	71	72
B067	66	72	74	72	73

Model Receiver	NAC	Existing	No Action	Package A	Package B
B068	66	72	74	72	72
B069	66	67	68	68	69
B070	66	66	68	67	68
B071	66	66	68	67	68
B072	66	73	74	72	72
B073	66	74	75	72	72
B074	66	66	68	67	68
B075	66	67	68	68	69
B076	66	68	69	68	69
B077	66	74	75	72	72
B078	66	72	73	71	71
B079	66	67	68	69	69
B080	66	68	69	69	69
B081	66	67	69	68	69
B082	66	67	69	68	69
B083	66	78	80		
B084	66	70	71		
B085	66	71	72		
B086	66	66	68	67	67
B087	66	69	71	73	73
B088	71	69	71	75	
B089	66	64	65	70	
B090	66	74	76		
B091	66	71	73	69	
B092	66	73	74	75	75
B093	66	66	68	70	70
B094	66	72	74		
B095	66	74	76		
B096	66	73	75		74
B097	66	77	78		
B098	66	67	69		
B099	66	71	72	73	73
B100	66	76	78	78	77

Model Receiver	NAC	Existing	No Action	Package A	Package B
B101	66	66	68	68	68
B102	66	69	71	70	70
B103	66	74	75	75	75
B104	66	71	72	73	72
B105	66	71	73	74	74
B106	66	67	68	69	69
B107	66	71	75	75	75
B108	66	73	76	74	75
B109	66	70	72	71	71
B110	66	68	71	71	71
B111	66	77	79	79	79
B112	66	75	78	78	78
B113	66	68	71	70	70
B114	66	67	71	70	71
B115	66	65	68	68	68
B116	66	72	76	75	76
B117	66	69	75	75	75
B118	66	68	70	71	71
B119	66	73	76	76	76
B120	66	69	72	73	72
B121	66	67	70	72	72
B122	66	76	78	79	79
B123	66	65	67	67	69
B124	66	64	66	66	68
B125	66	67	69	69	71
B126	66	70	76	75	76
B127	66	62	64	68	
B128	66	67	68	72	72
B129	66	74	75	77	76
B130	66	74	76	77	76
B131	66	74	76	77	77
B132	66	77	79	79	79
B133	66	75	77	77	77

Model Receiver	NAC	Existing	No Action	Package A	Package B
B134	66	69	72	72	75
B135	66	68	71	71	74
B136	66	66	69	69	72
B137	66	64	68	68	70
B236	66	66	70	70	71
B237	66	64	66	67	69
B239	66	67	69	72	72
B240	66	64	65	67	67
B241	66	61	62	66	66
B242	66	60	61	63	63
B243	66	57	58	61	61
B244	66	55	56	58	58
B245	66	63	64	67	67
B246	66	59	60	63	62
B249	66	66	68	68	71
B250	66	67	69	70	70
B252	66	72	75	75	78
B255	66	60	64	66	66
B261	66	61	65	66	66
B267	66	64	66	65	65
B270	66	66	68	66	66
B285	66	54	57	60	60
B286	66	51	55	56	56
B287	66	52	55	57	58
B288	66	50	53	56	56
B292	66	66	69		
B294	66	61	64	62	63
B295	66	59	60	61	62
B296	66	59	60	64	65
B300	66	63	64	64	65
B301	66	55	57	57	58
B302	66	65	65	65	66
B303	66	54	55	55	56

Model Receiver	NAC	Existing	No Action	Package A	Package B
B304	66	54	55	55	56
B305	66	64	64	64	65
B306	66	65	66	66	67
B307	66	66	67	67	68
B308	66	66	67	67	68
B309	66	58	58	58	59
B310	66	61	62	62	62
B311	66	58	59	59	60
B312	66	54	55	55	56
B313	66	54	54	54	55
B314	66	58	59	59	60
B315	66	58	59	59	60
B316	66	57	57	57	57
B317	66	58	59	59	61
B318	66	69	70	70	73
B319	66	71	71	71	74
B320	66	75	75	75	76
B321	66	65	65	65	68
B322	66	61	61	61	63
B323	66	61	62	62	64
B324	66	64	65	65	67
B325	66	63	63	63	64
B326	66	60	60	60	62
B327	66	60	60	60	61
B328	66	64	64	64	66
B329	66	61	62	62	64
B330	66	64	64	64	66
B331	66	60	60	60	62
B332	66	59	60	60	63
B333	66	76	77	77	78
B334	66	67	68	68	71
B335	66	71	71	71	74
B336	66	66	66	66	69

Model Receiver	NAC	Existing	No Action	Package A	Package B
B337	66	63	63	63	65
B338	66	61	61	61	63
B339	66	65	66	66	68
B340	66	63	64	64	65
B341	66	61	61	61	63
B342	66	63	66	66	68
B343	66	63	66	66	68
B344	66	61	64	64	66
B345	66	61	64	64	65
B346	66	66	69	69	70
B347	66	60	63	63	65
B348	66	56	58	58	60
B349	66	62	65	65	66
B350	66	58	60	60	61
B351	66	59	62	62	63
B352	66	68	68	68	69
B353	66	63	64	64	65
B354	66	60	61	61	62
B355	66	61	62	62	62
B356	66	64	64	64	65
B357	66	66	66	66	67
B358	66	63	63	63	64
B359	66	59	59	59	60
B360	66	59	59	59	60
B361	66	58	58	58	59
B362	66	67	68	68	69
B363	66	63	63	63	64
B364	66	60	60	60	60
B365	66	66	66	66	67
B366	66	62	63	63	64
B367	66	58	58	58	60
B368	66	66	66	66	67
B369	66	61	62	62	64

Model Receiver	NAC	Existing	No Action	Package A	Package B
B370	66	59	59	59	61
B371	66	69	69	69	70
B372	66	58	59	59	60
B373	66	62	62	62	63
B374	66	65	65	65	67
B375	66	59	60	60	61
B376	66	57	57	57	58
B377	66	64	65	65	66
B378	66	57	58	58	59
B379	66	59	60	60	61
B380	66	60	62	62	62
B381	66	61	63	63	63
B382	66	64	64	64	66
B383	66	62	63	63	64
B384	66	62	63	63	64
B385	66	59	59	59	62
B386	66	71	72	72	75
B387	66	61	61	61	64
B388	66	62	64	64	65
B389	66	64	65	65	67
B390	66	68	69	69	69
B391	66	63	65	65	65
B392	66	58	59	59	60
B393	66	56	58	58	58
B394	66	58	59	59	59
B395	66	61	62	62	62
B396	66	69	70	70	71
B397	66	64	65	65	65
B398	66	57	58	58	58
B399	66	59	61	61	61
B400	66	55	57	57	57
B401	66	61	62	62	62
B402	66	66	67	67	67

Model Receiver	NAC	Existing	No Action	Package A	Package B
B403	66	63	64	64	65
B404	66	55	56	56	57
B405	66	55	56	56	56
B406	66	65	66	66	66
B407	66	59	61	61	61
B408	66	68	70	70	72
B409	66	59	61	61	61
B410	66	64	66	66	66
B411	66	60	61	61	62
B412	66	57	58	58	59
B413	66	63	64	64	65
B424	66	61	62	62	63
B430	66	70	72	72	74
B432	66	60	64	64	65
B444	66	61	61	61	62
B448	66	61	62	62	65
B449	66	66	66	66	67
B450	66	63	64	64	67
B455	66	68	69	69	72
B458	66	69	70	70	73
B459	66	62	63	63	64
B460	66	65	66	66	67
B461	66	59	60	60	61
B462	66	60	61	61	63
B463	66	62	64	64	63
B464	66	63	64	64	64
B465	66	65	65	65	69
B466	66	63	63	63	65
B467	66	65	66	66	67
B468	66	65	66	66	67
B469	66	62	62	62	63
B470	66	63	66	66	68
B471	66	63	64	64	65

Model Receiver	NAC	Existing	No Action	Package A	Package B
B472	66	67	68	68	69
B473	66	67	68	68	68
B502	66	57	59	62	62
B503	66	54	56	57	56
B504	66	56	58	58	58
C009	71	68	71	73	74
C010	71	69	71	73	74
C011	71	64	68	70	70
C138	71	71	75	72	73
C139	71	71	74	71	72
C140	71	77	79	78	78
C141	71	77	80	81	82
C142	71	72	75	76	77
C143	71	76	78	79	80
C144	71	72	75	77	77
C145	71	72	74	76	78
C146	71	69	72	73	74
C147	71	72	74	75	76
C148	71	68	70	71	74
C149	71	74	77	77	78
C150	71	68	70	71	74
C151	71				
C152	71	71	73	75	75
C153	71				
C154	71	73	75	75	77
C155	71	71	73	80	80
C156	71	69	70		
C157	71	77	79	78	78
C158	71	73	75	74	73
C159	71	74	75	75	74
C160	71	75	76	76	76
C161	71	72	73	73	74
C162	71	74	75	76	77

Model Receiver	NAC	Existing	No Action	Package A	Package B
C163	71	75	76	80	81
C164	71	75	76	69	70
C165	71	75	76	70	70
C166	71	75	76	69	69
C167	71	75	75	70	70
C168	71	73	75		
C169	71	65	67	73	
C170	71	73	74	71	71
C171	71	77	78	76	
C172	71	77	79	77	
C173	71	75	76	75	
C174	71	74	76	76	75
C175	71	69	70	74	74
C176	71	69	70	72	72
C177	71	72	74	74	
C178	71	73	75	75	75
C179	71	74	76	69	69
C180	71	74	75	77	76
C181	71	73	75	76	76
C182	71	74	75	77	76
C183	71	73	75	76	76
C184	71	72	73	76	75
C185	71	71	73	76	75
C186	71	72	75	77	77
C187	71	73	79	79	79
C188	71	72	74	74	74
C189	71	74	78	78	78
C190	71	72	75	76	
C191	71	72	76	76	77
C192	71	72	76	76	76
C193	71	74	77	77	77
C194	71	75	78	78	78
C195	71	76	79	79	79

Model Receiver	NAC	Existing	No Action	Package A	Package B
C196	71	74	76	76	76
C197	71	74	77	77	77
C198	71	72	76	76	76
C199	71	74	77	77	77
C200	71	73	75	75	75
C201	71	71	74	73	73
C202	71	68	70	70	70
C203	71	74	75	75	75
C204	71	72	74	74	74
C205	71	73	74	74	74
C206	71	74	76	75	75
C207	71	75	77	77	77
C208	71	74	76	75	76
C209	71	71	75	76	75
C210	71	75	77	78	78
C211	71	75	77	78	78
C212	71	75	77	78	78
C213	71	73	75	76	76
C214	71	70	73	74	74
C215	71	70	73	74	74
C216	71	70	73	74	74
C217	71	71	73	74	74
C218	71	71	74	75	75
C219	71	69	71	71	72
C220	71	71	73	73	74
C221	71	62	64	65	65
C222	71	73	74		
C223	71	74	78	78	78
C224	71	75	77	77	78
C225	71	69	71	73	72
C226	71	72	73	75	74
C227	71	71	72	74	73
C228	71	72	73	71	72

Model Receiver	NAC	Existing	No Action	Package A	Package B
C229	71	64	67	68	68
C230	71	72	74	75	75
C231	71	69	73	73	73
C232	71	73	75	80	82
C233	71	70	73	73	74
C234	71	68	70	70	72
C235	71	66	70	70	72
C238	71	67	68	65	65
C247	71	73	75	76	76
C248	71	70	72	72	75
C251	71	74	76	76	77
C253	71	65	69	68	68
C254	71	66	70	70	70
C256	71	63	67	68	68
C257	71	63	67	67	68
C258	71	65	68	68	68
C259	71	64	66	65	65
C260	71	64	68	67	67
C262	71	67	70	71	72
C263	71	63	68	69	69
C264	71	61	66	67	67
C265	71	64	67	67	66
C266	71	62	65	63	64
C268	71	66	67	65	65
C269	71	68	70	66	66
C271	71	69	71	67	67
C272	71	67	67	69	69
C273	71	63	64	64	64
C274	71	61	62	63	63
C275	71	66	67	69	69
C276	71	66	71	71	71
C277	71	67	70	70	70
C278	71	71	76	75	75

Model Receiver	NAC	Existing	No Action	Package A	Package B
C279	71	64	67	67	67
C280	71	64	67	67	67
C289	71	57	60	63	63
C290	71	56	60	66	66
C291	71	57	61	66	66
C293	71	60	63	65	65
C297	71	63	64	70	71
C298	71	64	65	69	70
C299	71	63	64	67	68
C414	71	64	66	66	67
C415	71	69	70	70	73
C416	71	64	65	65	67
C417	71	70	70	70	71
C418	71	64	65	65	67
C419	71	63	64	64	67
C420	71	77	77	77	79
C421	71	70	71	71	71
C422	71	70	70	70	71
C423	71	73	74	74	74
C425	71	65	65	65	66
C426	71	76	80	80	81
C427	71	75	78	78	79
C428	71	66	70	70	73
C429	71	67	70	70	73
C431	71	67	69	69	71
C433	71	73	74	74	75
C434	71	65	65	65	68
C435	71	71	72	72	75
C436	71	64	65	65	67
C437	71	65	67	67	67
C438	71	69	69	69	72
C439	71	73	74	74	75
C440	71	65	65	65	67

Model Receiver	NAC	Existing	No Action	Package A	Package B
C441	71	69	70	70	71
C442	71	70	70	70	70
C443	71	67	68	68	70
C445	71	64	66	66	67
C446	71	64	65	65	67
C447	71	65	65	65	67
C451	71	69	70	70	73
C452	71	62	63	63	66
C453	71	72	73	73	75
C454	71	62	64	64	66
C456	71	58	60	60	60
C457	71	71	72	72	71
C474	71	70	71	71	72
C500	71	63	64	69	69
C501	71	60	61	67	67
C505	71	63	64	65	65
C506	71	63	66	70	71
C507	71	68	69	67	67
C508	71	67	69	69	69
C509	71	66	67	68	68
SH1_B0	66	68	70	70	71
SH1_B1	66	69	72	72	72
SH1_B10	66	58	61	60	60
SH1_B11	66	70	72	72	72
SH1_B12	66	62	65	65	65
SH1_B13	66	58	61	61	61
SH1_B14	66	56	59	59	59
SH1_B15	66	55	58	59	59
SH1_B16	66	64	67	67	67
SH1_B17	66	61	63	63	64
SH1_B18	66	59	62	62	62
SH1_B2	66	71	73	74	74
SH1_B27	66	60	64	64	64

Model Receiver	NAC	Existing	No Action	Package A	Package B
SH1_B28	66	66	70	70	70
SH1_B3	66	71	74	74	74
SH1_B30	66	58	62	63	63
SH1_B31	66	72	76	76	76
SH1_B32	66	62			
SH1_B4	66	62	65	65	65
SH1_B5	66	64	67	67	67
SH1_B6	66	64	67	67	67
SH1_B7	66	58	60	61	61
SH1_B8	66	59	61	62	62
SH1_B9	66	58	61	61	61
SH1_C19	71	61	64	64	64
SH1_C20	71	64	67	67	68
SH1_C21	71	73	76	76	76
SH1_C22	71	62	65	65	65
SH1_C23	71	59	62	62	62
SH1_C24	71	56	59	59	59
SH1_C25	71	56	59	59	59

APPENDIX C
TRAFFIC NOISE MITIGATION BARRIERS

THIS PAGE INTENTIONALLY LEFT BLANK

Figure C1. Traffic Noise Barriers Evaluated

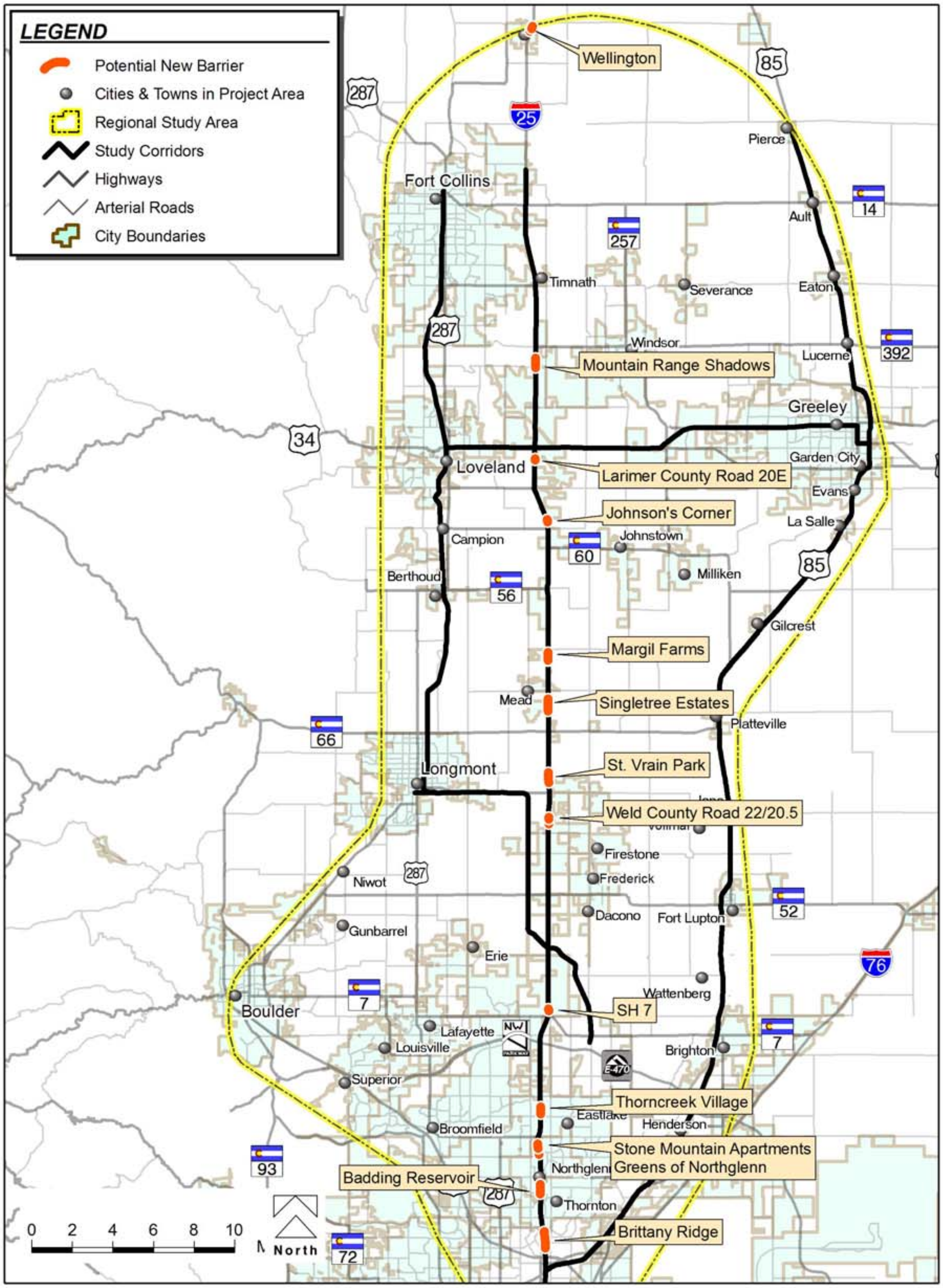


Figure C2. Barriers at Wellington

Figure C3. Barriers at Mountain Range Shadows

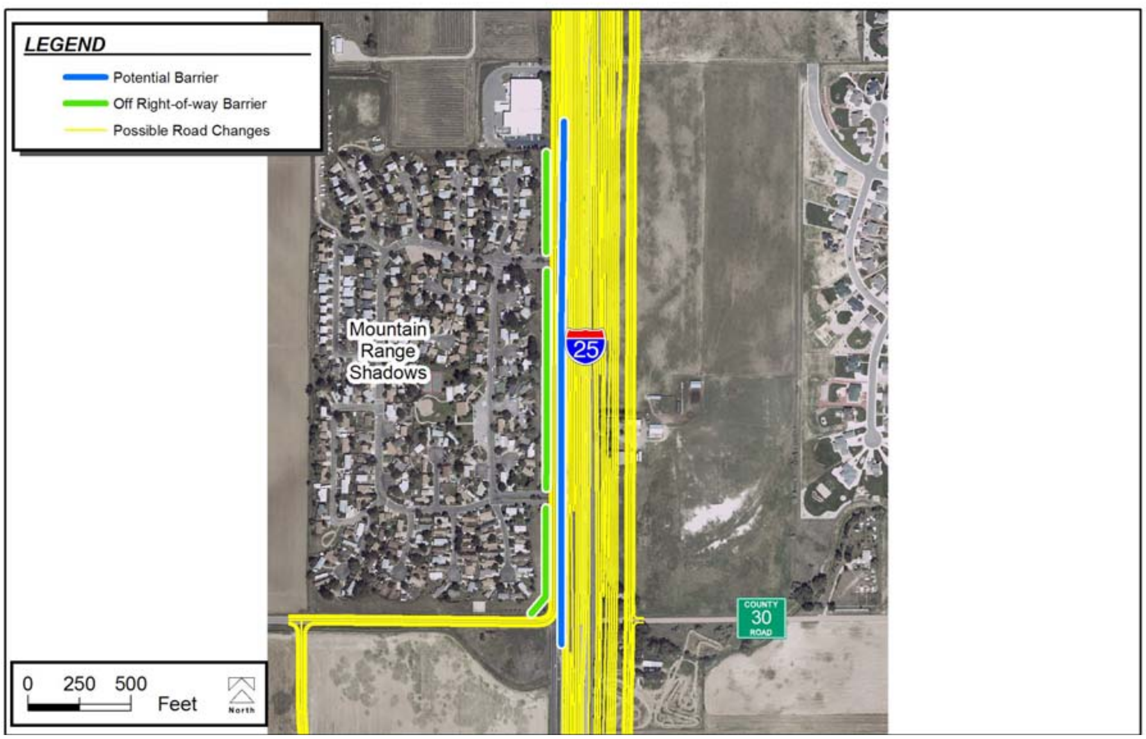


Figure C4. Barrier at Larimer County Road 20E

Figure C5. Barrier at Johnson's Corner

Figure C6. Barriers at Margil Farms

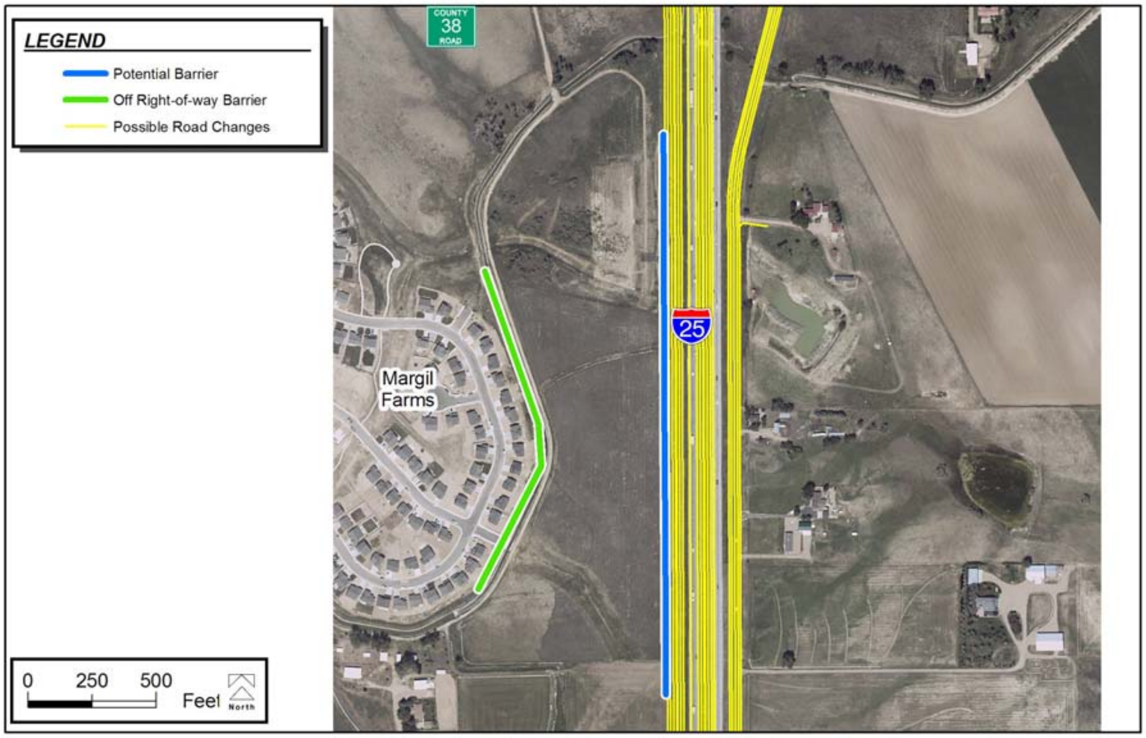


Figure C7. Barriers at Singletree Estates

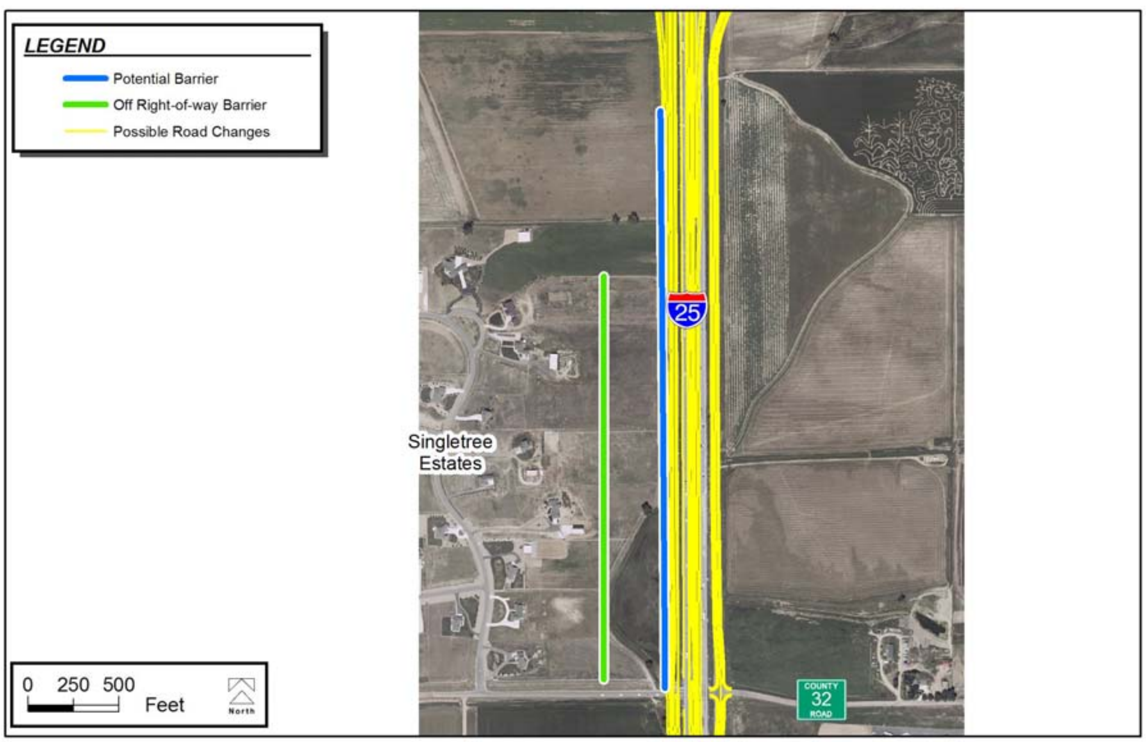


Figure C8. Barrier at St. Vrain State Park

Figure C9. Barriers Near Weld County Road 22/20.5

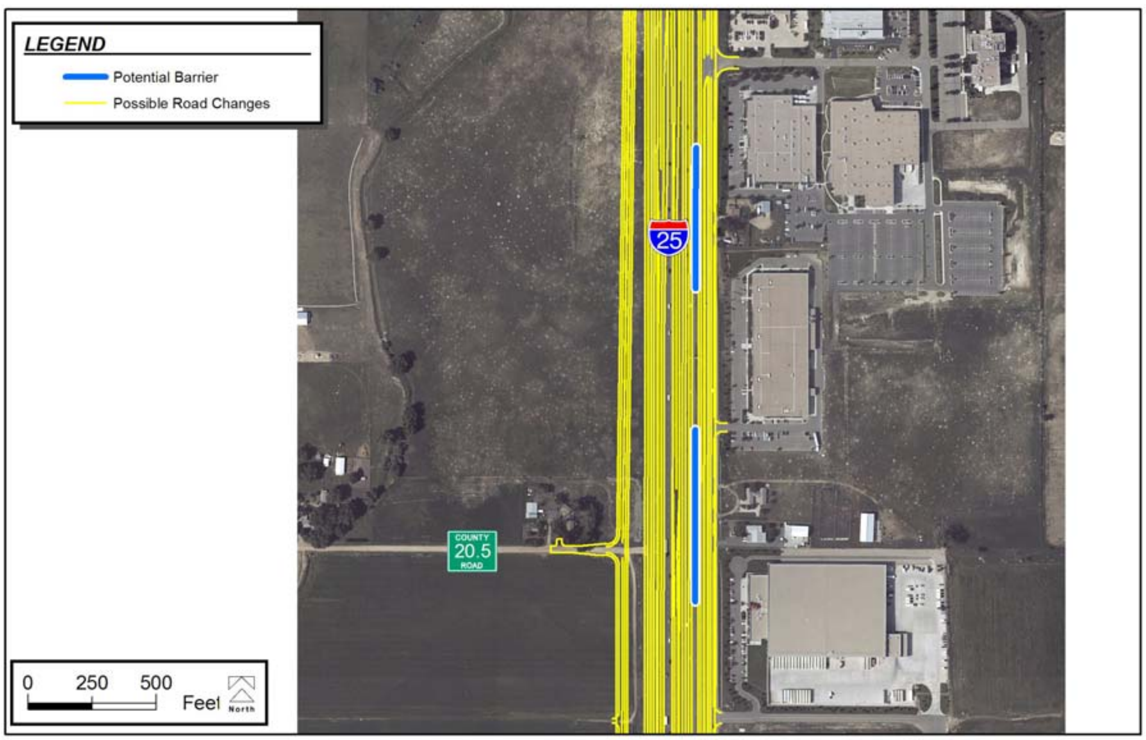


Figure C10. Barrier Near State Highway 7

Figure C11. Barrier at Thorncreek Village

Figure C12. Barrier at Stone Mountain Apartments

Figure C13. Barrier at Greens of Northglenn

Figure C14. Barrier Extension at Badding Reservoir

Figure C15. Barrier Extension at Brittany Ridge

APPENDIX D
BARRIER EVALUATION FORMS

THIS PAGE INTENTIONALLY LEFT BLANK

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: ***To complete this form refer to CDOT Noise Analysis Guidelines***

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Wellington East

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☑ YES ☐ NO 7-10 dBA: ☑ YES ☐ NO 5-7 dBA: ☐ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☑ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2. Average Build Noise Level	☑ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☑ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☐ More than 75%	☑ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☑ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

A 10-12 ft x 1000 ft wall was calculated to provide about 190 dBA of benefit. Front row receivers could receive more than 10 dBA. Cost was ~$1900 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☑ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☑ NO
4. Shall noise mitigation measures be provided? ☑ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This barrier at the NW quadrant of the I-25/SH1 interchange is recommended for the build alternatives.

Completed by: Dale Tischmak	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines* Wellington

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Isolated Receiver #1

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☑ More than $4000
2.	Average Build Noise Level	☑ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☑ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☑ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☑ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☑ NO

D. ADDITIONAL CONSIDERATIONS: For 4601 E. CR 64 in Wellington. A 10 x 720 ft barrier for a single home would provide ~7 dBA noise reduction. Cost would be about $31,000 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☑ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☑ NO
4. Shall noise mitigation measures be provided? ☐ YES ☑ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This was a project example for an isolated ~~[illegible]~~ receiver/farmhouse. The barrier is not reasonable and is not recommended. This example applies to other isolated receivers.

Completed by: [signature] **Date:** 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location Mountain Range Shadows

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? [x] YES [ ] NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: [ ] YES [ ] NO 7-10 dBA: [ ] YES [ ] NO 5-7 dBA: [x] YES [ ] NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? [ ] YES [x] NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	[x] Less than $3000	[ ] $3000-$3750	[ ] $3750-$4000	[ ] More than $4000
2. Average Build Noise Level	[x] 70 dBA or More	[ ] 66 - 70 dBA	[ ] 63 - 66 dBA	[ ] Less than 63 dBA
3. Impacted persons' desires	[ ] More than 75%	[ ] 50% - 75%	[ ] 25% - 50%	[ ] Less than 25%
4. Development Type (Category B*)	[x] More than 75%	[ ] 50% - 75%	[ ] 25% - 50%	[ ] Less than 25%
5. Development Existence (15 years or more)	[x] More than 75%	[ ] 50% - 75%	[ ] 25% - 50%	[ ] Less than 25%
6. Build Noise Level vs. Existing Noise Level	[ ] Greater than 10 dBA	[ ] 5 - 10 dBA	[x] 0 - 5 dBA	[ ] Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? [ ] YES [x] NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? [ ] YES [ ] NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? [ ] YES [ ] NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? [ ] YES [ ] NO
   b. Are private residences impacted by 75 dB(A) or more? [ ] YES [ ] NO

D. ADDITIONAL CONSIDERATIONS: This barrier is between the frontage road and I-25. A barrier between the homes and frontage road would also work. A barrier 12 x 2500 ft gave about 375 dBA of benefit. Cost was $2400 per.

E. DECISION:

1. Are noise mitigation measures feasible? [x] YES [ ] NO
2. Are noise mitigation measures reasonable? [x] YES [ ] NO
3. Is insulation of buildings both feasible and reasonable? [ ] YES [x] NO
4. Shall noise mitigation measures be provided? [x] YES [ ] NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This neighborhood is very loud and homes are close together. A barrier is recommended for the build alternatives.

Completed by:	Date:
[signature]	3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: LCR 30E

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☒ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☐ YES ☒ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☒ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☒ More than $4000
2. Average Build Noise Level	☒ 70 dBA or More	☒ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☐ More than 75%	☐ 50% - 75%	☒ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☒ 5 - 10 dBA	☐ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☒ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☒ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☒ NO

D. ADDITIONAL CONSIDERATIONS: This is for 648 N.E. Frontage Road @ Loveland. It is a campground behind a garage. A 14 x 470 ft wall provided 11 dBA benefit to the garage but less than 3 dBA to the campground. Was not effective for the Category B campground.

E. DECISION:

1. Are noise mitigation measures feasible? ☐ YES ☒ NO
2. Are noise mitigation measures reasonable? ☐ YES ☒ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☐ YES ☒ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

Cost was about $18,000 per and did not help the campground. Barrier is not recommended.

Completed by: Dale Tischmak	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

***Instructions:** To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Johnson Corner Campground

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO   7-10 dBA: ☒ YES ☐ NO   5-7 dBA: ☐ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☒ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☒ More than $4000
2. Average Build Noise Level	☒ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☒ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☒ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☒ NO

D. ADDITIONAL CONSIDERATIONS: For the JC RV Park in Johnstown. Front row sites are very loud. A 10x675 ft wall would provide 9 dBA benefit to front row sites and 3 dBA to most of rest of property. Site was treated as a motel and assigned 2 receivers. Cost was about $11,200 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☒ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☒ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☐ YES ☒ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This barrier was for a campground only. The barrier could substantially reduce noise to front row campsites, but the cost was high. This barrier is not being recommended.

Completed by: Dale Tischmak	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: ***To complete this form refer to CDOT Noise Analysis Guidelines***

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Margil Farms

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed?........ ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm?........ ☐ YES ☑ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)..	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☑ More than $4000
2.	Average Build Noise Level	☐ 70 dBA or More	☑ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more) .	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☑ Less than 25%
6.	Build Noise Level vs. Existing Noise Level .	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable?........ ☑ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings?........ ☐ YES ☑ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings?........ ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase?........ ☐ YES ☑ NO
   b. Are private residences impacted by 75 dB(A) or more?........ ☐ YES ☑ NO

D. ADDITIONAL CONSIDERATIONS: these homes were built ~2004. A 16 x 2200 ft wall was calculated to provide about .150 dBA of benefit. Cost was calculated to be ~$7,000 per. Wall is far from homes.

E. DECISION:

1. Are noise mitigation measures feasible?........ ☑ YES ☐ NO
2. Are noise mitigation measures reasonable?........ ☐ YES ☑ NO
3. Is insulation of buildings both feasible and reasonable?........ ☐ YES ☑ NO
4. Shall noise mitigation measures be provided?........ ☐ YES ☑ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

Homes are very recent and cost-benefit is too high. Barrier is not recommended.

Completed by: Dale Tischmak	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: ***To complete this form refer to CDOT Noise Analysis Guidelines***

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Singletree Estates

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☒ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☒ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☒ More than $4000
2. Average Build Noise Level	☐ 70 dBA or More	☐ 66 - 70 dBA	☒ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☒ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☒ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☒ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☒ NO

D. ADDITIONAL CONSIDERATIONS:

Homes are spread out and were built ~1999. A 16 x 3200 ft wall would provide ~40 dBA of benefit. Cost was about $41,000 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☒ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☒ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☐ YES ☒ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

Barrier is not recommended.

Completed by: [signature]	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: St. Vrain Park

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☒ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☒ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☒ More than $4000
2.	Average Build Noise Level	☒ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

This park was treated as Category B. Campsites close to I-25 are very loud. Counted as 3 receivers. A 14 x 2700 ft wall provided 15 dBA of benefit. About $75,000 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☒ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☒ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☐ YES ☒ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

An enormous wall would be needed relative to the benefit provided. Barrier is not recommended.

Completed by: [signature]	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: ***To complete this form refer to CDOT Noise Analysis Guidelines***

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: 2 homes near WCR 22

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☑ More than $4000
2.	Average Build Noise Level	☑ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☑ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☑ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☑ NO
   b. Are private residences impacted by 75 dB(A) or more? ☑ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS: Barrier was between I-25 & frontage road for 2 homes in a commercial area. Noise levels would be above 75 dBA. A 12 x 550 ft wall would provide 12 dBA of benefit. Cost would be about $16,500 per

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☑ NO
3. Is insulation of buildings both feasible and reasonable? ☑ YES ☐ NO
4. Shall noise mitigation measures be provided? ☑ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION The barrier is too costly for the benefit provided. The barrier is not recommended. However, the predicted noise levels exceed 75 dBA, so it is recommended that these two homes (9748 & 9762 Frontage Road) be evaluated for insulation upgrading.

Completed by:	Date:
[signature]	3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: 2 homes near WCR 2050

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed?.......... ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO   7-10 dBA: ☐ YES ☐ NO   5-7 dBA: ☒ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm?.......... ☐ YES ☒ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)..	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☒ More than $4000
2.	Average Build Noise Level..........	☒ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires..........	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)........	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level .	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable?.......... ☒ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings?.......... ☐ YES ☒ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings?.......... ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase?.......... ☐ YES ☒ NO
   b. Are private residences impacted by 75 dB(A) or more?.......... ☒ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS: Barrier was between I-25 & frontage road for 2 homes in a commercial area. Noise levels could be above 75 dBA. A 16 x 675 ft wall would provide 12 dBA of benefit. Cost would be about $27,000 per.

E. DECISION:

1. Are noise mitigation measures feasible?.......... ☒ YES ☐ NO
2. Are noise mitigation measures reasonable?.......... ☐ YES ☒ NO
3. Is insulation of buildings both feasible and reasonable?.......... ☒ YES ☐ NO
4. Shall noise mitigation measures be provided?.......... ☒ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

The barrier is too costly for the benefit provided. The barrier is not recommended. However, the predicted noise levels exceed 75 dBA, so it is recommended that these two homes (9518 & 9536 Frontage Road) be evaluated for insulation upgrading.

Completed by:	Date:
[signature]	3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

SH 7

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Isolated receiver #2

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☑ More than $4000
2. Average Build Noise Level	☑ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☑ YES ☐ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☑ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☑ NO
   b. Are private residences impacted by 75 dB(A) or more? ☑ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS: An 8-12 x 550 ft wall for a single home would provide ~7 dBA noise reduction. Cost would be about $24,000 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☐ YES ☑ NO
3. Is insulation of buildings both feasible and reasonable? ☑ YES ☐ NO
4. Shall noise mitigation measures be provided? ☐ YES ☑ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This was a project example for an isolated receiver/farmhouse. The barrier is not reasonable and is not recommended. This example applies to other isolated receivers.

Completed by: [signature]	Date: 3-22-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Thorncreek Village

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO   7-10 dBA: ☐ YES ☐ NO   5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☑ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level	☑ 70 dBA or More	both ☑ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☑ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☑ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

These are newly constructed tri-plexes in Thornton. A 14 x 1850 ft wall was calculated to provide about 200 dBA of benefit. Cost was about $3,800 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☑ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☑ NO
4. Shall noise mitigation measures be provided? ☑ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

These are brand new homes built adjacent to I-25. Even so, this barrier is being recommended for Package B only.

Completed by: Dale Tischmak	Date: 3-23-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

***Instructions:** To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Stone Mountain

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☑ YES ☐ NO 5-7 dBA: ☑ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☑ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2. Average Build Noise Level	☑ 70 dBA or More	both ☑ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☑ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☑ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

These apartments were built ~2000. A 14 x 1300 ft wall was calculated to provide about 420 dBA of benefit. Cost was about $1,300 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☑ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☑ NO
4. Shall noise mitigation measures be provided? ☑ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This barrier is recommended for Package B only.

Completed by: Dale Tischmak	Date: 3-23-07

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project # IM 0253-179	Project code (SA#)	STIP #	Project Location: Greens of Northglenn

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☒ YES ☐ NO 5-7 dBA: ☒ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☒ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☒ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level	☒ 70 dBA or More both	☒ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☒ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☒ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

These apartments were built in 1997. A 10-12 x 600 ft wall was calculated to provide about 170 dBA of benefit. Cost was ~ $1,100 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☒ YES ☐ NO
2. Are noise mitigation measures reasonable? ☒ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☒ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This barrier is recommended for Package B only.

Completed by: Dale Tischmak	Date: 3-23-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: ***To complete this form refer to CDOT Noise Analysis Guidelines***

Project #: IM 0253-179	Project code (SA#)	STIP #	Project Location: Badding Reservoir

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☑ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☑ YES ☐ NO 5-7 dBA: ☐ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☑ NO

B. REASONABLENESS:

		EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1.	Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☐ $3000-$3750	☑ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level	☑ 70 dBA or More	both ☑ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more)	☑ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☑ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☑ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

this would be a southern extension of an existing barrier west of I-25 near Badding Reservoir (98th Ave). A 12 x 900 ft extension would provide about 8.0 dBA of benefit. Cost would be about $4,100 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? ☑ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☑ NO
4. Shall noise mitigation measures be provided? ☑ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

this barrier extension is recommended for Package B only.

Completed by: Dale Tischmak	Date: 3-23-07

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

Instructions: *To complete this form refer to CDOT Noise Analysis Guidelines*

Project #: IM 0253-179	Project code (SA#)	STIP #	Project Location: Brittany Ridge

A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? ☒ YES ☐ NO
2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm?...
   10 dBA: ☐ YES ☐ NO 7-10 dBA: ☐ YES ☐ NO 5-7 dBA: ☐ YES ☐ NO
3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? ☐ YES ☐ NO

B. REASONABLENESS:

	EXTREMELY REASONABLE	REASONABLE	MARGINALLY REASONABLE	UNREASONABLE
1. Cost Benefit Index (per receiver per dBA)	☐ Less than $3000	☒ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2. Average Build Noise Level	☐ 70 dBA or More	☒ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3. Impacted persons' desires	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4. Development Type (Category B*)	☒ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5. Development Existence (15 years or more)	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☒ Less than 25%
6. Build Noise Level vs. Existing Noise Level	☐ Greater than 10 dBA	☐ 5 - 10 dBA	☒ 0 - 5 dBA	☐ Noise Level Decrease

***Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library**

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? ☐ YES ☒ NO
   If the answer to 1 is YES, then:
2. a. Does this project have noise impacts to public or non-profit buildings? ☐ YES ☐ NO
   b. If yes, is it reasonable and feasible to provide insulation for these buildings? ☐ YES ☐ NO
3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? ☐ YES ☐ NO
   b. Are private residences impacted by 75 dB(A) or more? ☐ YES ☐ NO

D. ADDITIONAL CONSIDERATIONS:

These homes have been built since 2000. This would be a southern extension of an existing barrier east of I-25 near 76th Ave. A 12 x 1300 ft barrier extension would provide about 150 dBA of benefit. Cost would be about $3000 per.

E. DECISION:

1. Are noise mitigation measures feasible? ☒ YES ☐ NO
2. Are noise mitigation measures reasonable? ☒ YES ☐ NO
3. Is insulation of buildings both feasible and reasonable? ☐ YES ☒ NO
4. Shall noise mitigation measures be provided? ☒ YES ☐ NO

F. DECISION DESCRIPTION AND JUSTIFICATION

This barrier extension is recommended for Package B only.

Completed by: [signature]	Date: 3-23-07

CDOT Form #1209 12/02