Noise Impact and Abatement Analysis

PREPARED FOR: Dirk Draper / CH2M HILL

PREPARED BY: Michael Hankard / Hankard Environmental Inc.

COPIES: John Henry, Jeff Cerjan/Hankard Environmental

PROJECT: US 24 West Corridor Environmental Assessment

DATE: March 11, 2010

EXECUTIVE SUMMARY

A noise impact study was conducted for the US 24 West Corridor Project Environmental Assessment. The project is located between Interstate 25 and Manitou Springs, in Colorado Springs, Colorado. US 24 is currently a four lane arterial with at-grade intersections. The Proposed Action will grade separate two intersections and provide an overpass at another location. Additional lanes will be built between I-25 and west of 31st Street along with other safety and utility improvements throughout the Corridor. A noise analysis is required by Federal Highway Administration (FHWA) and National Environmental Policy Act (NEPA) regulations, and was conducted according to the FHWA-approved Colorado Department of Transportation (CDOT) *Noise Analysis and Abatement Guidelines*.

The noise analysis consisted of measuring existing highway noise levels, predicting year 2035 noise levels under the conditions expected to exist given the implementation of the Proposed Action (i.e. revised roadway alignment and elevation, and 2035 traffic volumes and speeds), assessing "noise impact" according to CDOT guidelines, and assessing the "feasibility and reasonableness" of providing noise abatement for impacted areas.

Noise levels were measured at eight locations continuously for one week. Loudest-hour of the day noise levels in 2007 range from 61 to 73 dBA across the eight locations. The lowest levels were measured at the more distant locations and locations where line of sight to the highway is blocked by buildings or terrain. The loudest levels were measured at residences located approximately 100 feet from US 24 and having a clear line of sight to the highway. Noise levels at 5 out of the 8 locations exceed CDOT's 66 dBA Noise Abatement Criteria for residences.

An acoustic model of the study area was constructed using the FHWA's Traffic Noise Model (TNM, version 2.5). The model took into account the existing location and elevation of US 24 and all associated frontage roads and ramps, as well as the effect on noise propagation of distance, terrain, and buildings. The model was "validated" by predicting noise levels at the measurement locations using the traffic volumes, speeds, and truck percentages that were present during the measurements. Thus, if the model accurately represents noise from traffic, the predicted and measured noise levels should agree. The difference between the measured and predicted noise levels ranged from -1.4 dBA to +2.5 dBA. The average of the differences was 0.6 dBA. This is within the range of accuracy of TNM, which is generally considered to be ±3 dBA.

The validated TNM model was used to predict noise levels that will exist under existing conditions, the Proposed Action in the Design Year (2035), and the No Action alternative in the design year. Noise levels were predicted at each residence, businesses, park/trail, school and church located within approximately 500 to 1,000 feet of the US 24 West Corridor, and along major cross-streets and Colorado Avenue where improvements are being proposed. The predicted noise levels for the Proposed Action were compared to CDOT's Noise Abatement Criteria, which are 66 dBA for residences, motels/hotels, parks, etc., and 71 dBA for businesses. Locations where predicted noise levels equal or exceed the criteria are considered "impacted" by noise under CDOT guidelines, as are locations where 2035 noise levels are predicted to exceed existing noise levels by 10 dBA or more. The predicted loudest hour noise levels under the Proposed Action range from 50 to 70 dBA at the residences located in the study area. Impact is predicted to occur at 30 residences, one hotel, one City park, one child development center, and two businesses.

The "feasibility and reasonableness" of providing noise abatement (reduction) measures was analyzed at each impacted area according to CDOT guidelines. Noise mitigation was found to be infeasible or unreasonable at the two impacted businesses, the impacted hotel, the child development center, and at 6 of the 30 impacted residences due to issues such as having direct access to adjacent roads, no active outdoor use, noise reduction unattainable, or cost. Six noise walls are proposed to protect the remaining impacted residences, at the locations shown in Figure E-1 and are recorded on the Noise Abatement Determination Worksheets compiled in Appendix E. The walls are predicted to benefit 247 residences at a cost of approximately $3,500,000 (based on the unit cost of $30 per square foot).

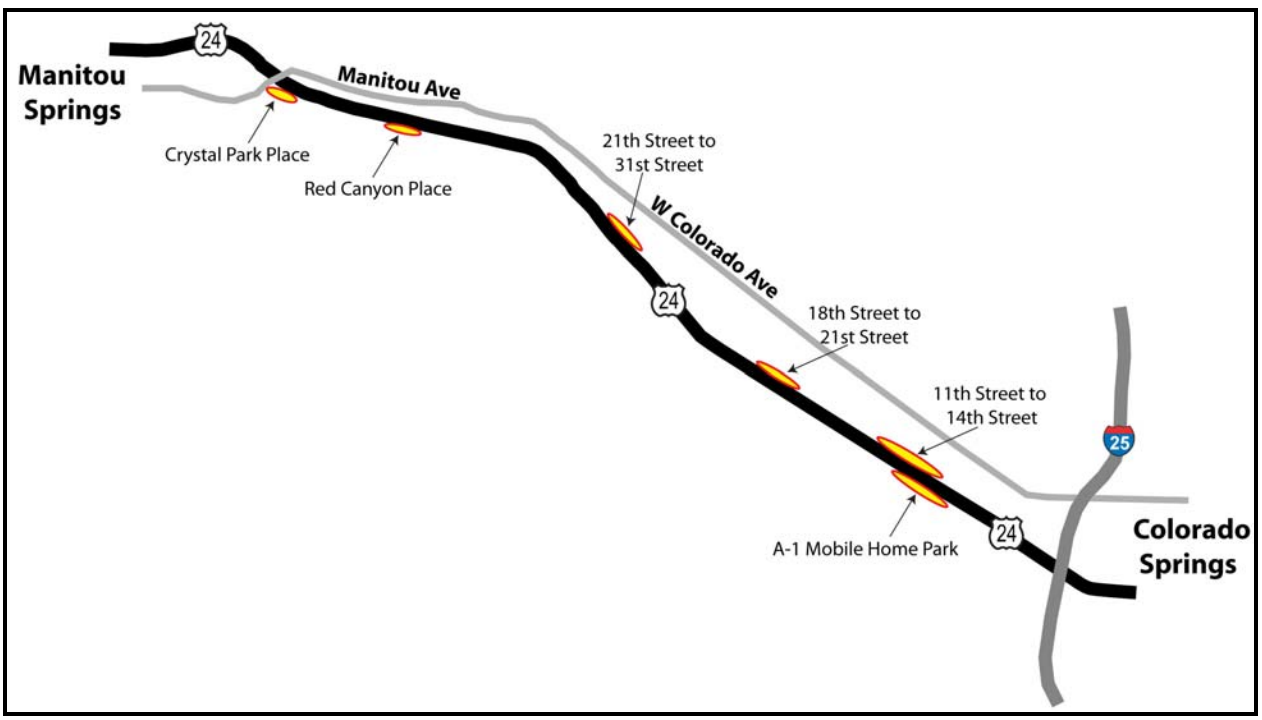


Figure E-1: Proposed Noise Wall Locations

1.0 INTRODUCTION

This report describes the noise impact and abatement analysis conducted for the US 24 West Corridor Project Environmental Assessment (EA). The project is located between Interstate 25 in Colorado Springs and Manitou Springs, Colorado, as shown in Figure 1-1. The noise analysis was conducted according to the Colorado Department of Transportation's (CDOT) *Noise Analysis and Abatement Guidelines* (December 2002). The analysis consisted of the following main elements:

- Measurement of existing noise levels in the residential neighborhoods adjacent to the project
- Validation of the Traffic Noise Model (TNM) of the site using measured noise levels
- Prediction (using TNM) of noise levels that will exist at nearby residences and businesses under the Proposed Action
- Comparison of predicted noise levels to CDOT's Noise Abatement Criteria (NAC)
- Assessment of the "feasibility and reasonableness" of providing noise abatement (walls) for residences where predicted noise levels equal or exceed the NAC

This report is organized into the following sections:

Section 2.0 – CDOT Noise Analysis Guidelines

Section 3.0 – Measured Noise Levels

Section 4.0 – Traffic Noise Model Procedures and Input Data

Section 5.0 – Predicted Noise Levels and Noise Impact

Section 6.0 – Noise Mitigation

Section 7.0 – No Action Alternative

Section 8.0 – Construction Noise Impacts

The following information is provided in the appendices:

Appendix A - Relevant noise terminology

Appendix B - TNM input data

Appendix C - Predicted noise levels at individual locations under existing and Proposed Action conditions

Appendix D - Predicted noise level reductions from proposed walls at individual locations

Appendix E - CDOT Noise Abatement Determination forms

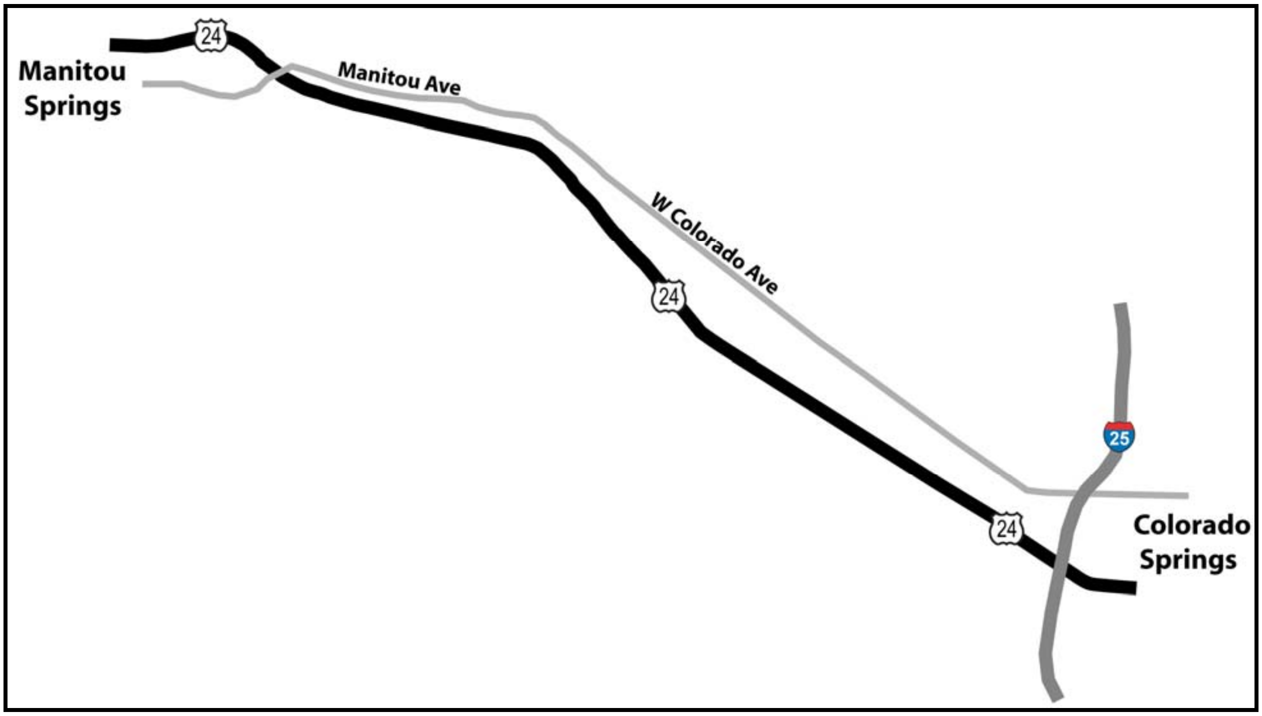


Figure 1-1: Project Location

2.0 CDOT NOISE ANALYSIS GUIDELINES

The noise analysis for the US 24 West Corridor Project Environmental Assessment was conducted according to Colorado Department of Transportation (CDOT) noise guidelines, which are set forth in the document entitled *CDOT Noise Analysis and Abatement Guidelines*, *December 1, 2002*. The CDOT noise guidelines are consistent with those of the Federal Highway Administration (23 CFR 772), and have been approved by the FHWA for use on Federal-aid projects in Colorado. CDOT's guidelines establish noise abatement criteria and design requirements for noise mitigation. The guidelines state that noise mitigation should be considered for any receptor or group of receptors where predicted traffic noise levels, using design-year traffic volumes and roadway conditions, equal or exceed CDOT's Noise Abatement Criteria (NAC), which are shown in Table 2-1. The guidelines also state that noise mitigation should be considered for any receptors where predicted noise levels for design-year conditions are greater than existing noise levels by 10 dBA or more.

TABLE 2-1: CDOT NOISE ABATEMENT CRITERIA		
Activity Category	L_{eq} (1), (2) (dBA)	Description of Activity Category
A	56 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	71 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	51 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

(1) Hourly A-weighted equivalent level for the noisiest hour of the day in the design year
(2) CDOT noise impact criteria are 1 dBA lower (more stringent) than FHWA values in 23 CFR 772, to identify noise levels that "approach" the FHWA criteria.

To be included in a project, a proposed noise mitigation measure must first be found to be "feasible". A summary of CDOT's feasibility criteria is as follows:

- The proposed mitigation measure must be predicted to achieve at least 5 dBA of noise reduction at front row receptors, with 10 dBA being a goal to be achieved where feasible.
- The proposed mitigation measure must not create any "fatal flaw" safety or maintenance issues such as reduced sight distances, shadowing of ice-prone areas, and interference with snow/debris removal.
- For barriers, it must be possible to construct the barrier in a continuous manner, as gaps in barriers, e.g. for driveways, significantly degrade their performance.

If a mitigation measure is found to be feasible, it is then analyzed for its "reasonableness". A summary of the reasonableness criteria is as follows:

- The cost benefit of the proposed measure should not exceed $4,000 per dB of reduction per benefited receptor.
- The predicted design year noise levels should equal or exceed the Noise Abatement Criteria shown in Table 2-1, above.
- At least 50% of the affected properties should support the proposed measure.
- Land use in the affected area should be at least 50% Category B (refer to Table 2-1).
- At least 50% of the residences under study should be at least 15 years old.
- The predicted design year noise levels should exceed existing levels by at least 5 to 10 dBA.

3.0 MEASURED NOISE LEVELS

Noise levels were measured for approximately one week at eight residences representative of the neighborhoods adjacent to US 24 within the study area. Noise levels were measured at Measurement Locations 1 through 4 during the week of November 9 through 15, 2007, and at Measurement Locations 5 through 8 during the week of November 16 through 23, 2007.

Selection of Noise Measurement Locations

A reconnaissance of the US 24 West Corridor study area was performed to identify the noise-sensitive receptors located within approximately 1,000 feet of the highway. Noise sensitive receptors generally include residences, hotels and motels, churches, schools, and parks. Eight measurement locations were chosen as representative of the residences located within the project's study area. The general location of the eight noise measurement locations is shown in Figure 2-1. A description of each measurement location is provided in Table 3-1. An aerial view and photograph of each location is provided in Figures 3-2 through 3-9.

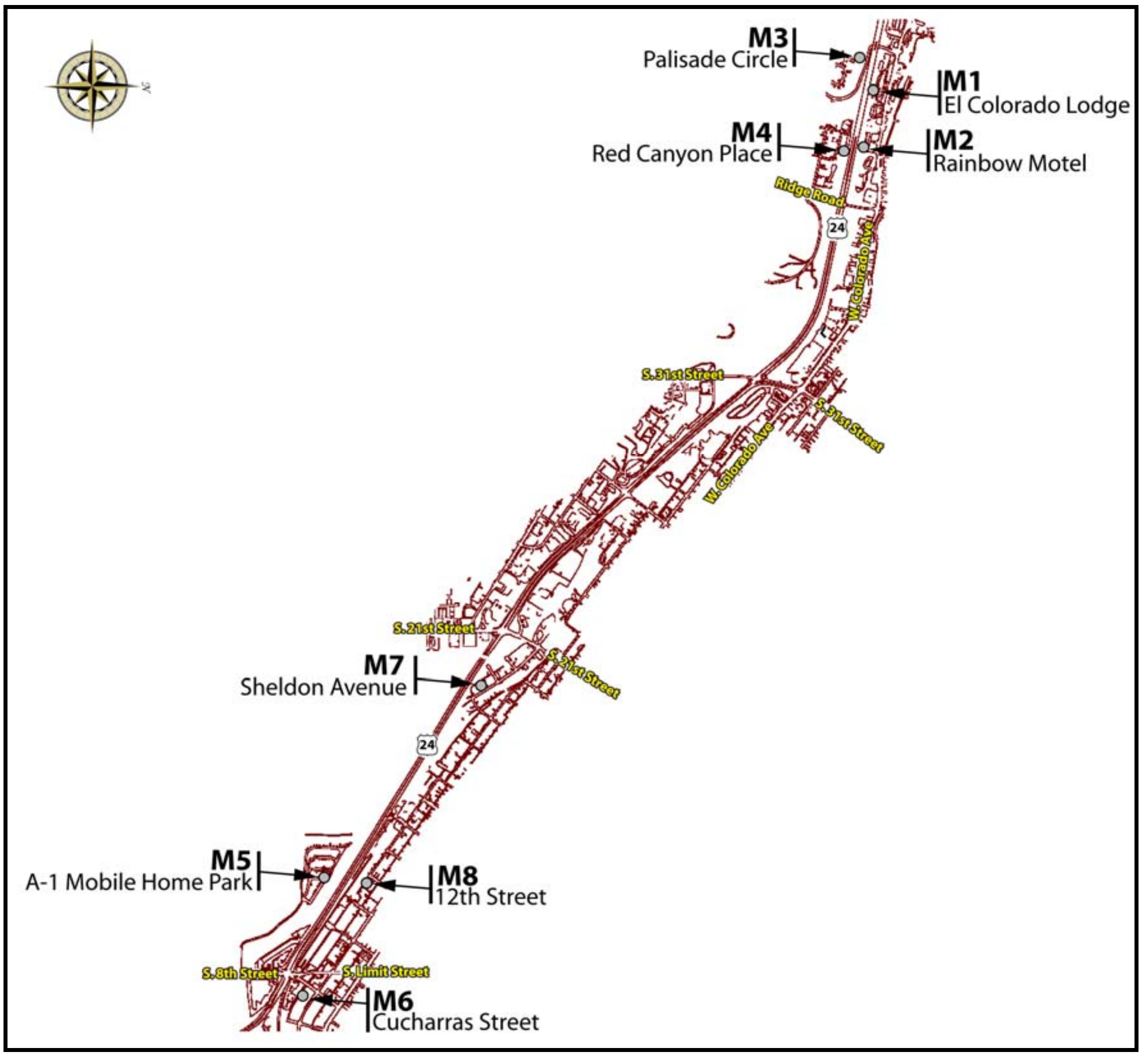


Figure 3-1: Noise Measurement Locations

TABLE 3-1: DESCRIPTION OF NOISE MEASUREMENT LOCATIONS

Site	Location	Description
M1	El Colorado Lodge	• Closest measurement location to US 24 • Located approximately 100 feet north and 30 feet below centerline of US 24, between hotel pool (non-operational) and US 24 embankment • Partial line of site with westbound right lane of US 24, and no direct line of sight to any other lanes
M2	Rainbow Motel	• Located approximately 140 feet north and 15 feet below centerline of US 24, and beside brick hotel wall • Direct line of sight with closest lane of traffic (through sparse vegetation)
M3	Palisade Circle	• Located approximately 200 feet south and 70 feet above centerline of US 24, and in the back yard of a residence that sits on a bluff overlooking US 24 • Direct line of sight to all of US 24 to the west, but line of sight to east blocked by terrain
M4	Red Canyon Place	• Located approximately 140 feet south of and level with centerline of US 24, and on the back porch of a residence (porch is about 5 feet above the ground) • Direct line of sight to all of US 24 • Reflections off of condo needs to be accounted for
M5	A-1 Mobile Home Park	• Located approximately 300 feet south of and level with centerline of US 24, and in the front yard of a residence • Line of sight to US 24 blocked partially by trailers and van
M6	Cucharras Street	• Furthest measurement location from US 24 • Located approximately 340 feet north of and 20 feet above centerline of US 24, and in the back yard of a residence • Line of sight to US 24 is blocked by a large commercial building
M7	Sheldon Avenue	• Located approximately 215 feet south of and level with centerline of US 24, and in the back yard of a residence • Direct line of sight to all of US 24
M8	12th Street	• Located approximately 290 feet north of and 20 feet above centerline of US 24, and in the back yard of a residence • Line of sight to US 24 blocked by a six foot tall metal fence

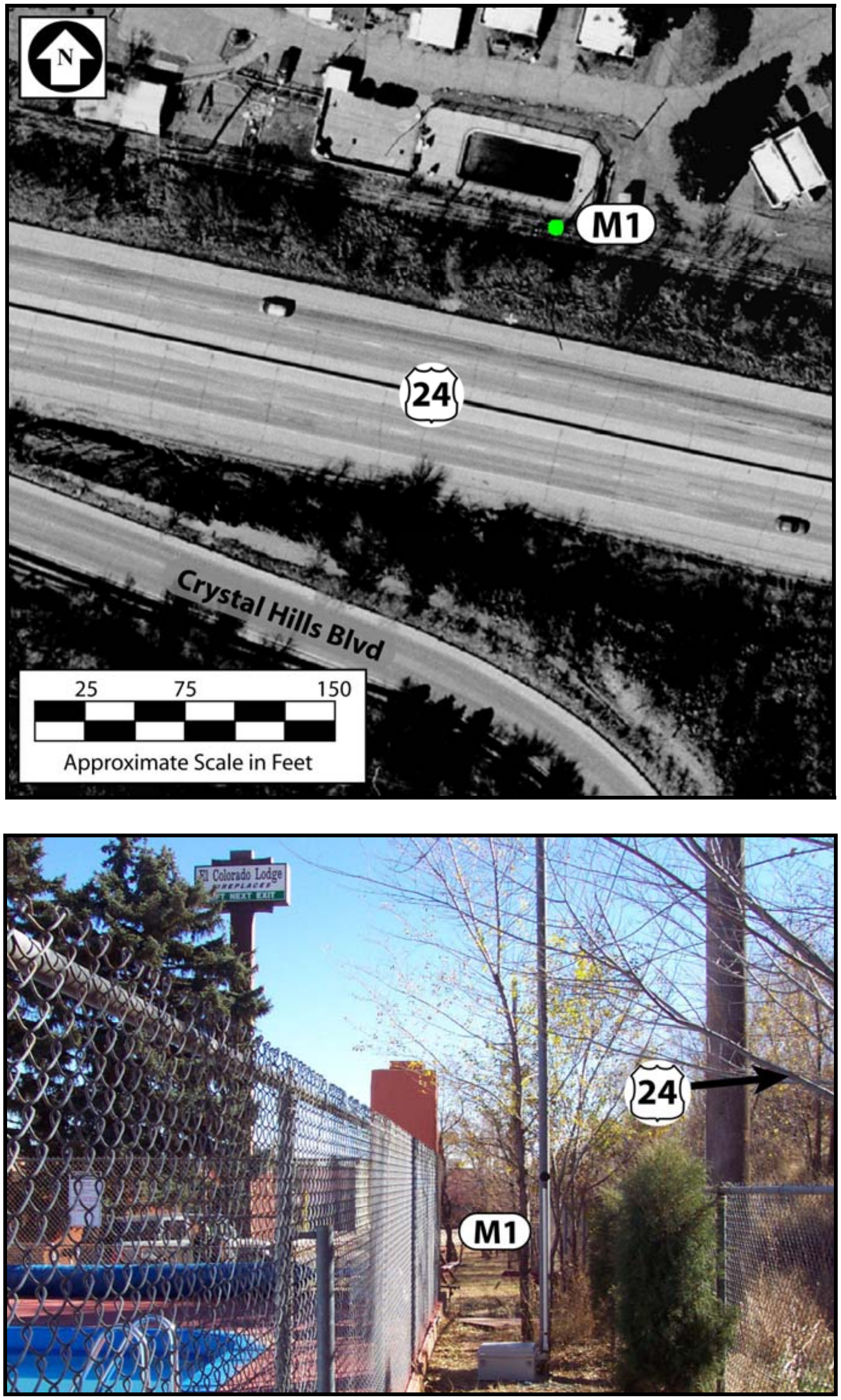
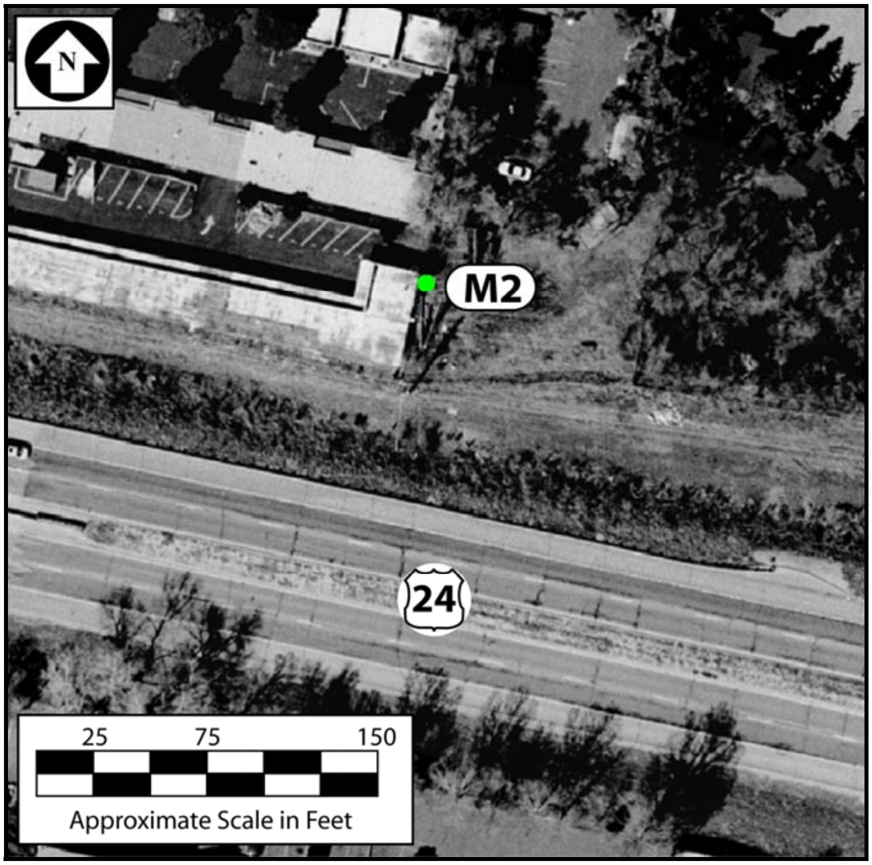


Figure 3-2: Aerial View and Photograph of M1 – El Colorado Lodge



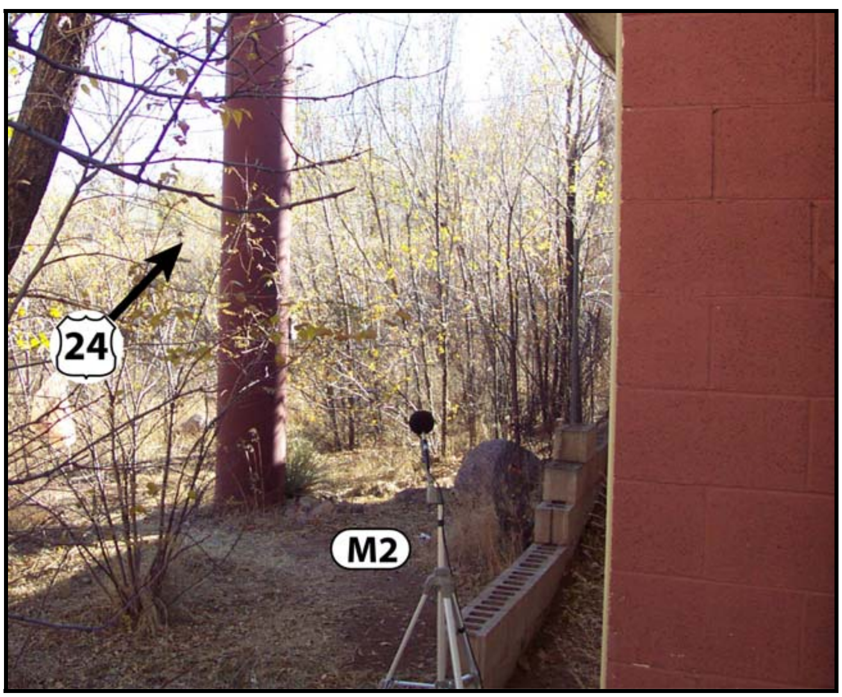
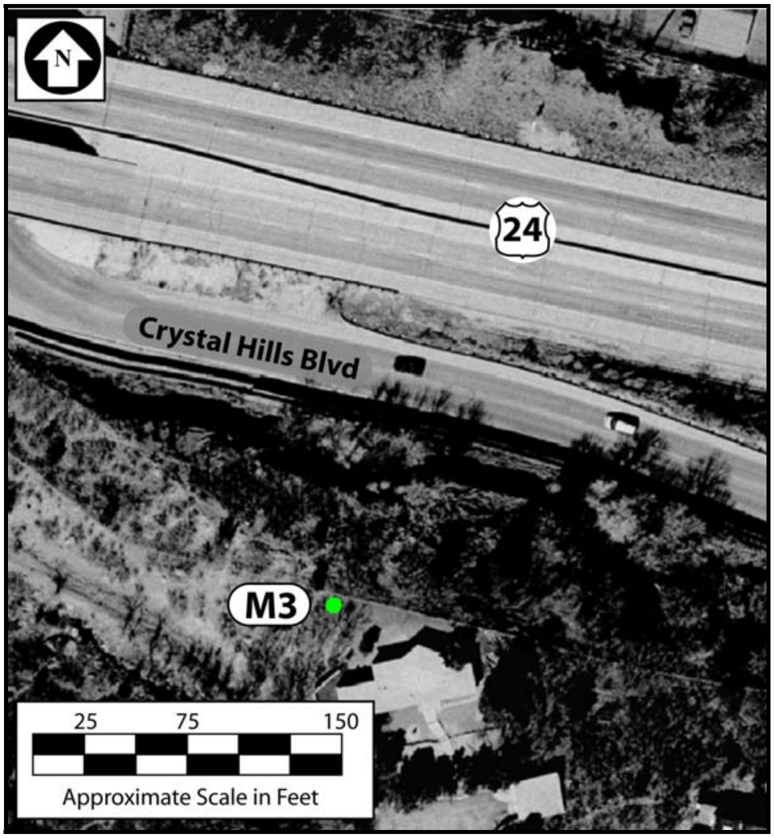


Figure 3-3: Aerial View and Photograph of M2 – Rainbow Motel



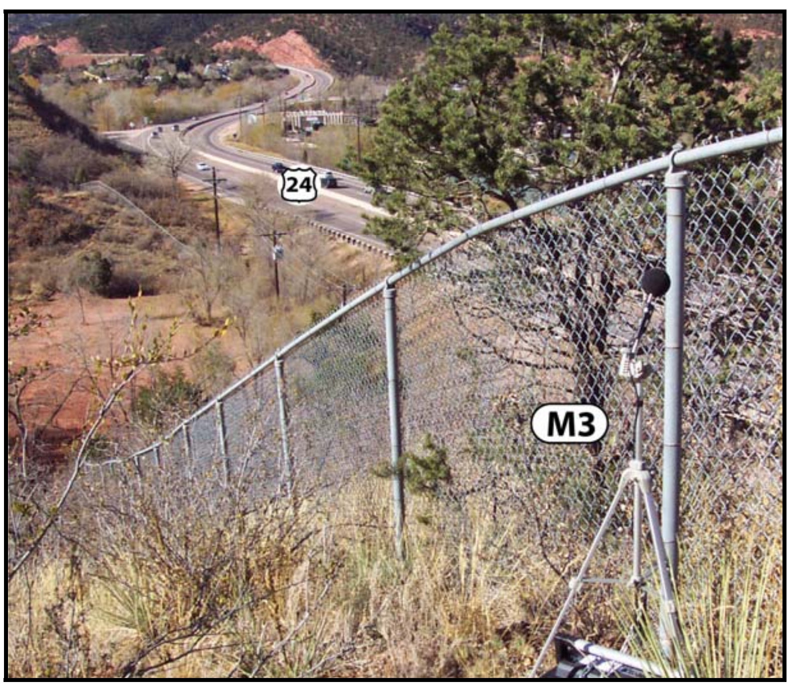


Figure 3-4: Aerial View and Photograph of M3 – Palisade Circle

Figure 3-5: Aerial View and Photograph of M4 – Red Canyon Place

Figure 3-6: Aerial View and Photograph of M5 – A-1 Mobile Home Park

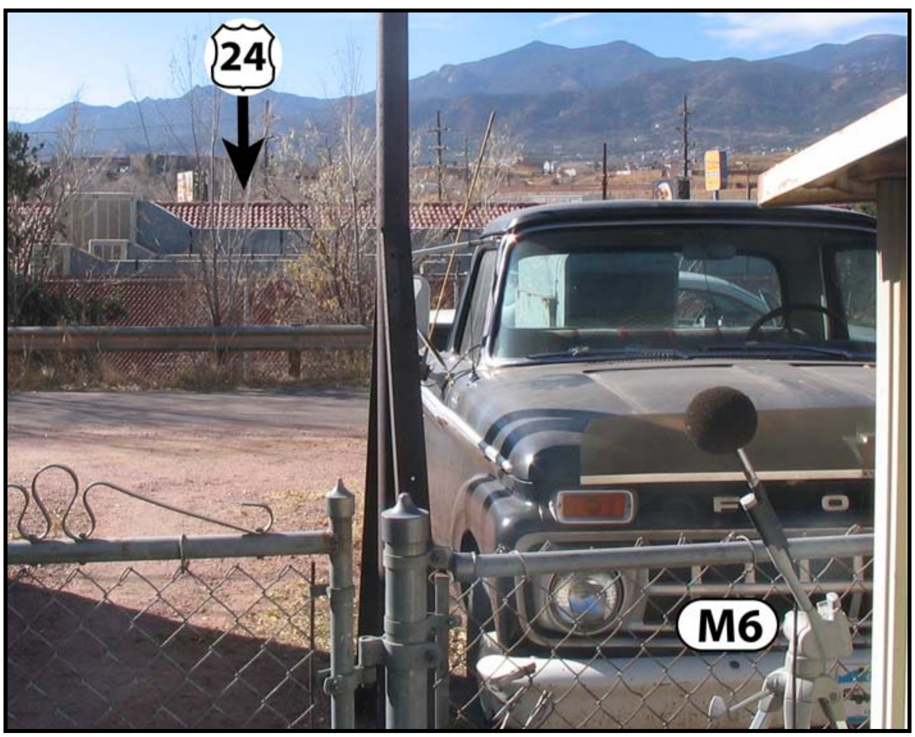


Figure 3-7: Aerial View and Photograph of M6 – Cucharras Street

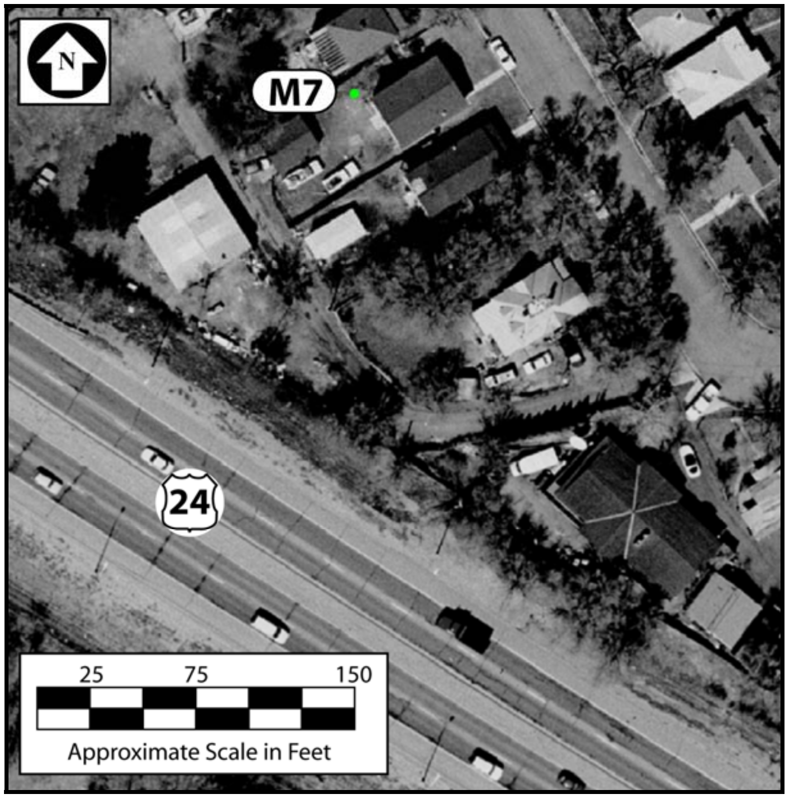


Figure 3-8: Aerial View and Photograph of M7 – Sheldon Avenue

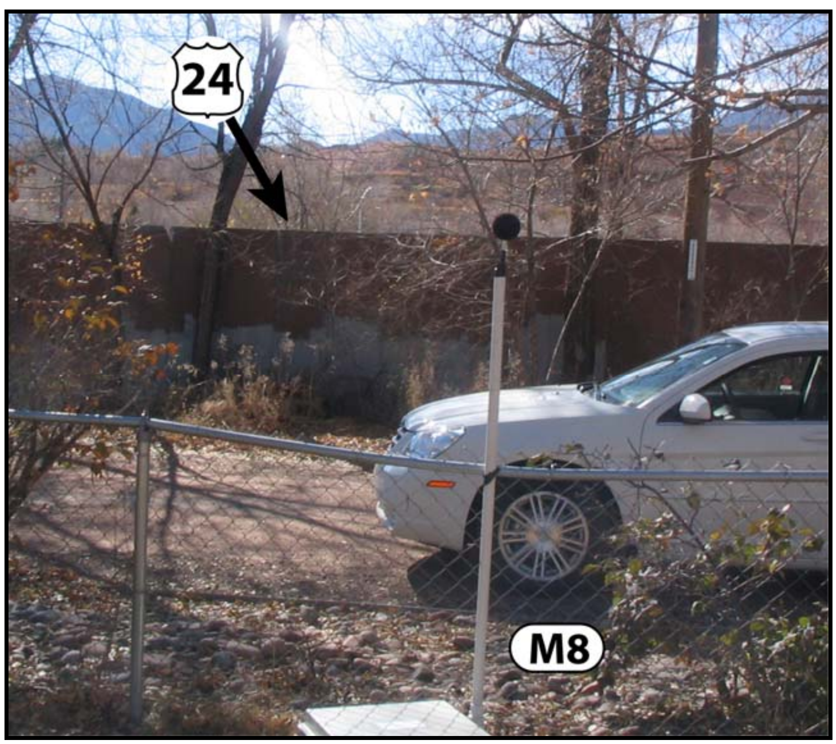


Figure 3-9: Aerial View and Photograph of M8 – 12th Street

Noise Level Measurement Results

In general, existing sound levels in the Corridor are controlled by traffic on US 24. The average, maximum, and minimum, L_{eq} sound levels at each site are in Table 3-2. Plots showing the L_{eq} versus time are provided in Figures 3-10 and 3-11. The loudest noise levels were measured at M4, where one-hour levels regularly exceed 70 dBA. One-hour noise levels regularly equal or exceed CDOT's 66 dBA NAC for residences only at M3, M4. One-hour noise levels equal or exceed 66 dBA at least once (other than obvious extraneous events) at M1, M3, M4, and M5. A brief description of the sound levels at each measurement site is provided below.

M1: El Colorado Lodge - The sound levels measured at this location are shown in Figure 3-10. The levels generally range from 45 to 65 dBA. The typical peak hour level is 64 dBA. The lowest level measured was 42 dBA on November 12, 2007 at 12:00 a.m.

M2: Rainbow Motel - The sound levels measured at this location are shown in Figure 3-10. Vandals removed the microphone on November 11th, hence the reduced amount of data. The measured sound levels generally range from 51 – 65 dBA. The typical peak hour level is 65 dBA. The lowest level measured was 49 dBA on November 11, 2007 at 4:00 a.m.

M3: Palisade Circle - The sound levels measured at this location are shown in Figure 3-10. The levels are extremely consistent, and range from a daily minimum of 53 dBA to a daily maximum of 68 dBA. The lowest level measured was 52 dBA on November 15, 2007 at 3 a.m.

M4: Red Canyon Place - The sound levels measured at this location are shown in Figure 3-10. The levels are extremely consistent, and range from a daily minimum of approximately 60 dBA to a daily maximum of 73 dBA. The lowest level measured was 57 dBA on November 11, 2007 at 4 a.m.

M5: A-1 Mobile Home Park - The sound levels measured at this location are shown in Figure 3-11. Excluding the Thanksgiving holiday, the levels generally range from 48 to 63 dBA. The lowest level measured was 40 dBA. Two noteworthy events show on the graph for M5. The first is a period when sound levels were particularly low, which occurred at 3 a.m. on November 21, 2007. Normally this would be considered an outlier (bad data) and discarded, however the event was measured on the other monitors at the same time. It is believed that these levels are real, and are the result of lower traffic during the Thanksgiving holiday. The other event is a period when sound levels were particularly high (over 10 dBA higher than any other measured value at this site), which occurred between 12:00 and 1:00 p.m. on November 21, 2007. This event was not measured on other monitors, and is likely a local event such as a vehicle idling near the sound level meter.

M6: Cucharras Street - The sound levels measured at this location are shown in Figure 3-11. Excluding the Thanksgiving holiday, the levels generally range from 47 to 57 dBA. The lowest level measured was 40 dBA on November 21, 2007 at 3 a.m. The levels here are relatively low, because there is a large commercial building that blocks line of sight to the highway.

M7: Sheldon Avenue - The sound levels measured at this location are shown in Figure 3-11. Excluding the Thanksgiving holiday, the levels here are extremely consistent. Daily levels range from a minimum of approximately 50 dBA to a maximum of approximately 62 dBA. The lowest level measured was 44 dBA on November 21, 2007 at 3 a.m.

M8: 12th Street - The sound levels measured at this location are shown in Figure 3-11. Excluding the Thanksgiving holiday, the levels generally range from 48 to 60 dBA. The lowest level measured was 41 dBA on November 21, 2007 at 3 a.m.

TABLE 3-2: MEASURED NOISE LEVELS

Location	Minimum Noise Level (One-hour L_{eq}, dBA)	Average Noise Level (One-hour L_{eq}, dBA)	Maximum Noise Level (One-hour L_{eq}, dBA)
M1	42	60	66
M2	49	62	65
M3	52	65	68
M4	57	69	73
M5	48	60	66
M6	45	52	61
M7	48	57	62
M8	48	55	62

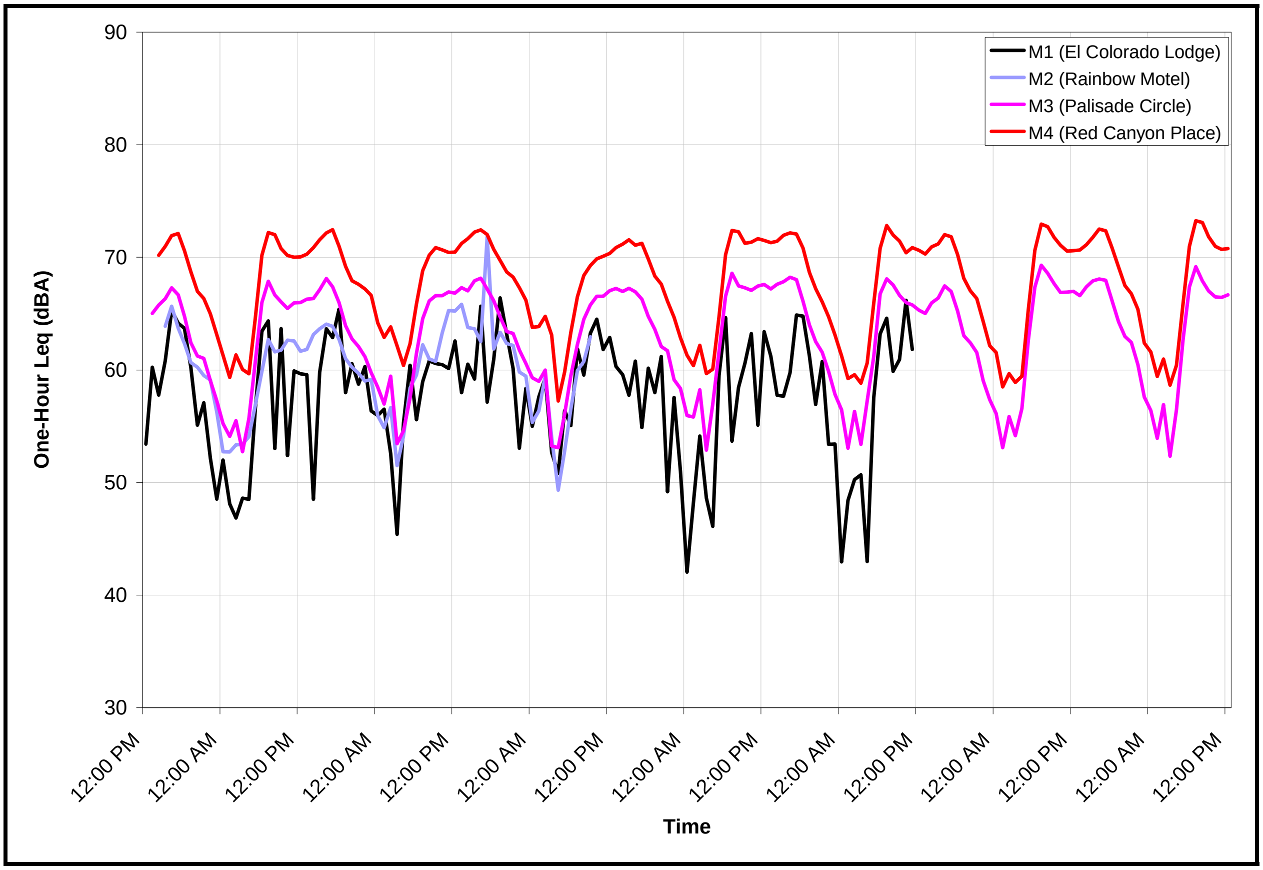


Figure 3-10: Measured Week-Long Noise Levels M1-M4

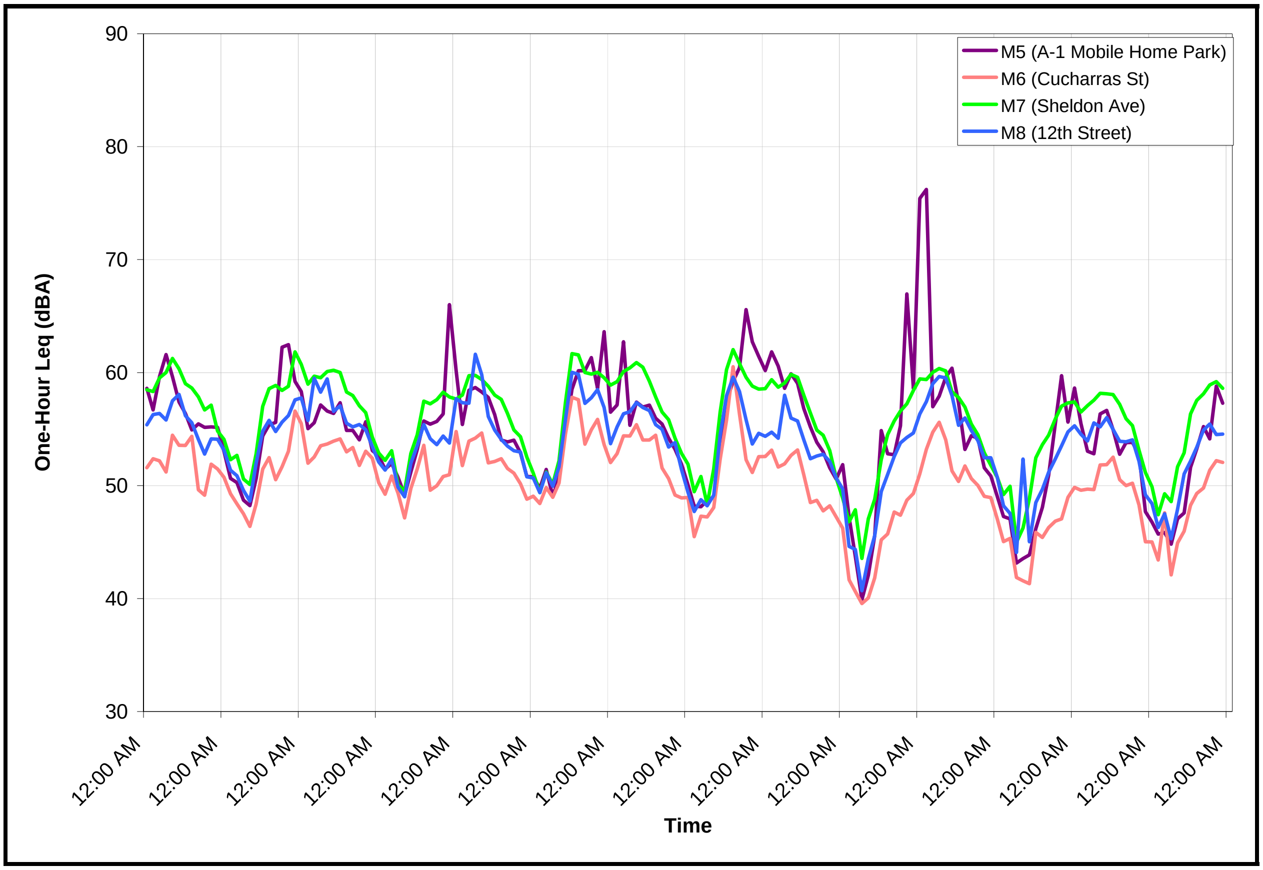


Figure 3-11: Measured Week-Long Noise Levels M5-M8

Noise Measurement Equipment

An integrating-type sound level meter meeting American National Standards Institute Type I or II specifications was deployed at each location. The meters were configured to continuously record the A-weighted, 15-minute equivalent level (L_{eq}). The sound level meters were calibrated within the past year by an accredited laboratory, and field calibrations verified that the accuracy of the noise meters remained within ±0.2 dB. Four different sound level meters were used on this project. Three were Larson Davis Model 820s, and one was a Norsonics Type 114. The meters were placed in weatherproof housings, and the microphones were mounted outside the housings on a tripod. The microphones were positioned 5 feet above the ground, and fitted with windscreens.

4.0 TRAFFIC NOISE MODELING PROCEDURES AND INPUT DATA

The Federal Highway Administration's (FHWA) Traffic Noise Model (TNM, version 2.5) was used to predict existing and 2035 traffic noise levels within the study area. TNM was also used to predict the reduction in noise that will be provided by proposed noise barriers. TNM calculates the hourly, A-weighted L_{eq} at a receptor location given the noise emission level of automobiles, medium, and heavy trucks; the volume and speed of each of these vehicle types on each roadway of interest; the relative location of all roadways, receptors, and terrain features (i.e., natural and man-made barriers); and the type of terrain that exists between each receptor and each roadway. A TNM model of the entire corridor was created using the following input data and settings:

- Emission Factors: Standard, built-in TNM emission factors were used (REMELs)
- Ground Type: Default ground type was set to "lawn"
- Temperature and Relative Humidity: Default
- Roadways: One TNM "roadway" element was used to model each direction of US 24 and each direction of I-25. One TNM roadway element was used to model all ramps, frontage roads, major cross streets, as well as Colorado Avenue. Roadway widths were modeled as built or proposed. Roadway locations and elevations were taken from CAD files provided by CH2M Hill.
- Existing Traffic: Existing traffic volumes on US 24 were taken from Exhibit 2-1 of the traffic report prepared for this project. Existing traffic volumes on I-25 were taken from the I-25 EA. Existing traffic volumes on cross streets and Colorado Avenue were provided by CH2M Hill. US 24 truck percentages were provided by CH2M Hill, and range from 0.7 to 1.9% (these are total truck percentages, and we assigned ½ of the percentage to medium trucks and ½ to heavy trucks). On I-25, we assumed truck percentages of 4% medium and 5% heavy. Posted speeds were used on US 24, which range from 35 mph near I-25 to 50 mph west of Ridge Road. A speed of 60 mph was used on I-25. A speed of 35 mph was used on all cross streets and on Colorado Avenue. Tables listing the traffic volumes used to model existing noise conditions are provided in Appendix B.
- Design-year Traffic: 2035 traffic volumes on US 24 (including ramps and frontage roads) were taken from Exhibit 4-5 of the traffic report prepared for this project (2035 Refined Expressway Alternative Forecast). 2025 traffic volumes on I-25 were taken from the I-25 EA (while not 2035, these volumes are adequate for the purposes of this study). 2035 traffic volumes on cross streets and Colorado Avenue were provided by CH2M Hill. US 24 truck percentages were provided by CH2M Hill, and range from 0.7 to 1.9% (these are total truck percentages, and we assigned ½ of the percentage to medium trucks and ½ to heavy trucks). On I-25, we assumed truck percentages of 4% medium and 5% heavy. The proposed posted speed of 45 mph was used on all segments of US 24. A speed of 60 mph was used on I-25. A speed of 35 mph was used on all cross streets and on Colorado Avenue. Tables listing the traffic volumes used to model 2035 noise conditions are provided in Appendix B.

- Receivers: One TNM "receiver" was placed at each residence, business, park, and trail located within approximately 500 feet of US 24. In addition, most of the residences located between 500 and 1,000 feet from US 24 were modeled. Finally, residences located adjacent to cross streets and along Colorado Avenue where improvements are proposed were modeled. A height of 5 feet above the ground was used for all receivers. The location of receptors was determined using scaled aerial photographs, and their elevations were determined using contour maps (2-foot increments). Table 4-1 lists the number of living units associated with the multi-tenant residential buildings located at the west end of the study area.

TABLE 4-1: MULTI-UNIT RESIDENCES IN AREA H

Receptor	Number of units
H-R33	4
H-R35	8
H-R50	4
H-R59	6

- Barriers: All major commercial buildings were modeled as barriers.

- Terrain Lines: The small valley formed by Fountain Creek was modeled using three terrain lines (south bank, center, north bank). Ridges on the south side of US 24 were also modeled.

TNM Validation

Noise levels were measured at 8 locations, as discussed above. For the purposes of TNM validation, noise levels were measured for one hour at each location, and during the measurements the volume, truck percentage, and speed of traffic traveling in both directions of US 24 were tabulated. The measurement locations and traffic data were entered into the TNM model of existing conditions created using the data discussed above. Table 4-2 shows the measurement date and time, the measured noise level at each location, the predicted noise level, and the difference between the two. The differences are all less than 3 dBA, which is the generally accepted accuracy of highway noise studies.

TABLE 4-2: TNM VALIDATION USING MEASURED TRAFFIC VOLUMES

Location	Measurement Date and Time	Measured Noise Level (dBA)	Predicted Noise Level (dBA)	Predicted-Measured Noise Level (dBA)
M1	November 8, 2007 2:30 PM	60.4	60.4	0.0
M2	November 8, 2007 2:30 PM	64.0	62.6	-1.4
M3	November 8, 2007 2:30 PM	66.0	67.7	1.7
M4	November 8, 2007 2:30 PM	70.4	69.0	-1.4
M5	November 23, 2007 1:45 PM	58.0	60.5	2.5
M6	November 23, 2007 1:45 PM	52.4	54.2	1.8
M7	November 23, 2007 1:45 PM	58.5	59.9	1.4
M8	November 23, 2007 1:45 PM	54.1	54.1	0.0

A description of the modeling procedures and validation results at each location is as follows:

M1: The model of M1 includes the nearby hotel represented as a barrier. With this element in the model the difference between the predicted and measured noise levels is within the desired range.

M2, **M3**, **M4**: The models of M2, M3 and M4 are straightforward, as there are no significant barriers of any kind. As a result the difference between the predicted and measured noise levels is within the desired range.

M5: The model of M5 includes the nearby mobile homes represented as barriers. With these elements in the model the difference between the predicted and measured noise levels is within the desired range.

M6: The model of M6 includes a nearby residential structure and a large commercial structure represented as barriers. With these elements in the model the difference between the predicted and measured noise levels is within the desired range.

M7: The model of M7 includes three residential structures (house and sheds) represented as barriers. With these elements in the model the difference between the predicted and measured noise levels is within the desired range.

M8: The model of M8 includes a tall metal fence represented as a barrier. With this element in the model the difference between the predicted and measured noise levels is within the desired range.

5.0 PREDICTED NOISE LEVELS AND NOISE IMPACT

Noise levels were predicted at each Category B and C receiver (refer to Table 2-1) located within approximately 500 feet of US 24, and at most of the residences located between 500 and 1,000 feet from US 24. In addition, noise levels were predicted at the receivers adjacent to cross streets and along Colorado Avenue where improvements are proposed.

Noise levels were predicted using the validated TNM (v2.5) model of the site. Noise levels were predicted for existing conditions, including the existing alignment and elevation of the roadways, existing structures, and Level of Service C traffic conditions. The model was also used to predict noise levels for the Proposed Action, including the proposed alignment and elevation of the roadways, existing structures minus those that would need to be removed to make way for the proposed improvements, and design-year Level of Service C traffic conditions.

The predicted noise levels were compared to CDOT's Noise Abatement Criteria (Table 2-1) to determine which receivers are "impacted" by noise from the proposed project. As described in Section 2.0, a home or business located within the project study area is considered impacted by noise under CDOT guidelines when either of two conditions exists:

1. When loudest hour noise levels under the Proposed Action are predicted to equal or exceed CDOT's 66 dBA Noise Abatement Criterion for Category B receivers (residences, hotel/motels, and parks) or 71 dBA for Category C receivers (commercial)
2. When loudest hour noise levels under the Proposed Action are predicted to exceed existing noise levels by 10 dBA or more.

For the purposes of the noise analysis, the US 24 West Corridor was broken down into the 11 areas shown in Figure 5-1. The areas are divided by US 24, and by cross streets such as 8th Street, 21st Street, 31st Street, etc. A summary of the predicted noise levels is provided in Table 5-1 (predicted noise levels at each receptor location are provided in Appendix C). A few comments on the results are as follows:

- Predicted noise levels under the Proposed Action range from 57 to 71 dBA at front-row receptors
- The predicted increase in noise levels between existing and Proposed Action conditions ranges from -1 to 4 dBA
    - The decrease is due to change in sight line and a decrease in speed
    - Increases are due to increased traffic volume, the addition of frontage roads close to residences, and the elevation of the highway
- A total of 30 residences have predicted noise levels of 66 dBA or greater under the Proposed Action

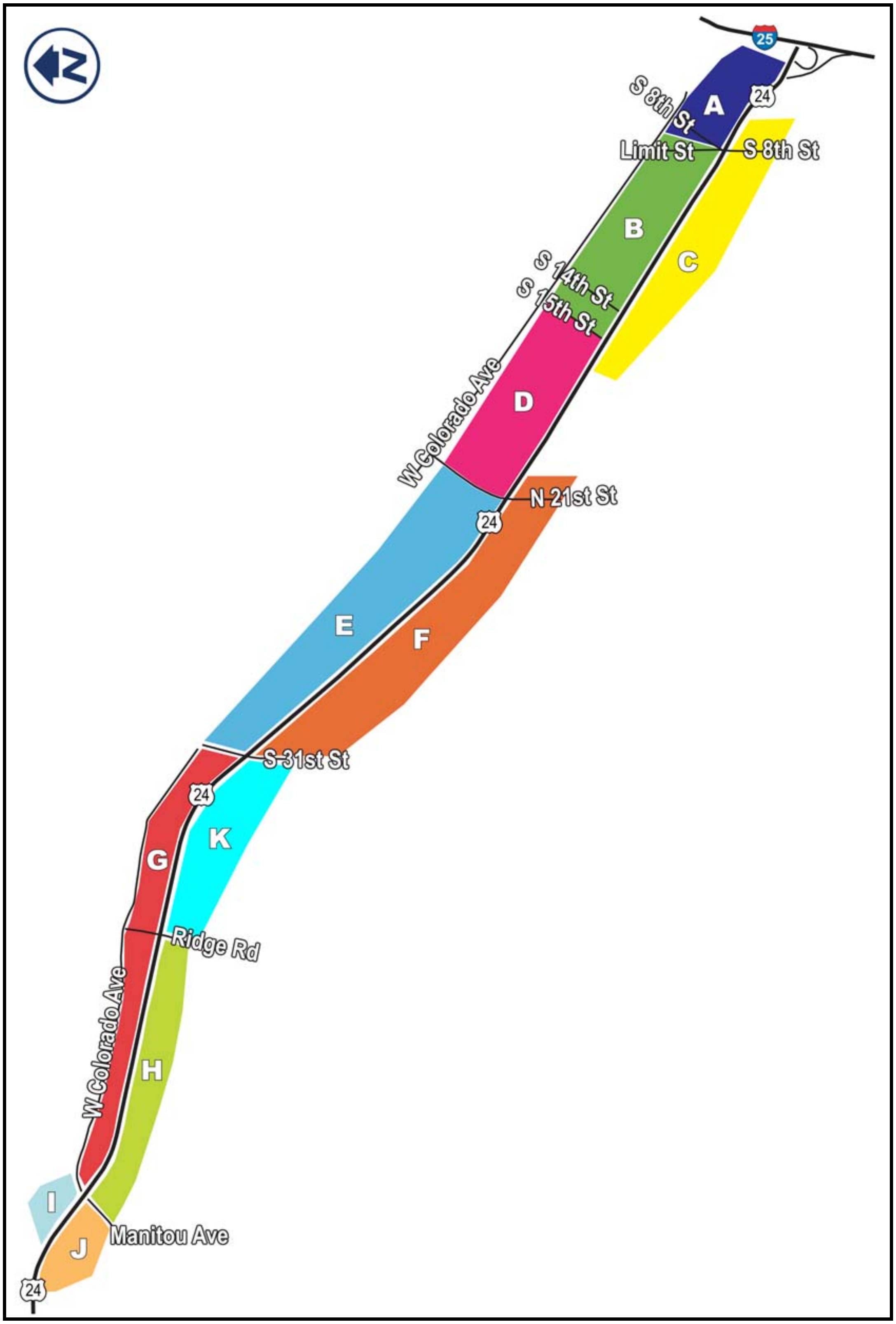


Figure 5-1: Breakdown of Study Area For Noise Analysis

TABLE 5-1: SUMMARY OF NOISE IMPACT ASSESSMENT AT RESIDENCES

Area	Distance From Front Row to Center of US 24 (feet)	Average Existing One-Hour Noise Level (dBA)	Average Proposed Action One-Hour Noise Level (dBA)	Average One-Hour Noise Level Increase (dBA)	Number of Residences Where One-Hour Noise Level is Greater Than 66 dBA	Maximum Proposed Action One-Hour Noise Level (dBA)	Noise Impact?
A	475	61	64	3	2	67	Yes
B	275	57	60	3	3	67	Yes
C	275	60	62	2	1	66	Yes
D	125	55	58	3	1	66	Yes
E	250	55	60	5	2	67	Yes
F	275	52	56	4	2	67	Yes
G	100	61	61	0	0	64	No
H	150	60	62	2	21	70	Yes
I	350	55	56	1	0	57	No
J	175	58	60	2	0	65	No

Note: Area K is not listed because there are no residences.

NOISE IMPACTS PER AREA

The following sections describe the noise impacts in each of the analysis areas. In the figures provided for each area, a receptor is shown with a red mark if the predicted noise level under the Proposed Action is 66 dBA or greater for a residence, park or trail, or 71 dBA or greater for a business. Mitigation for impacted receptors is described in Section 6.0.

Area A

As shown in Figure 5-2, Area A encompasses the residences and businesses located on the north side of US 24 between I-25 and Limit Street. Two commercial properties are impacted by traffic noise from I-25 and two residences are impacted by traffic noise from Colorado Avenue and 8th St. No residences are predicted to be impacted by US 24 traffic noise.

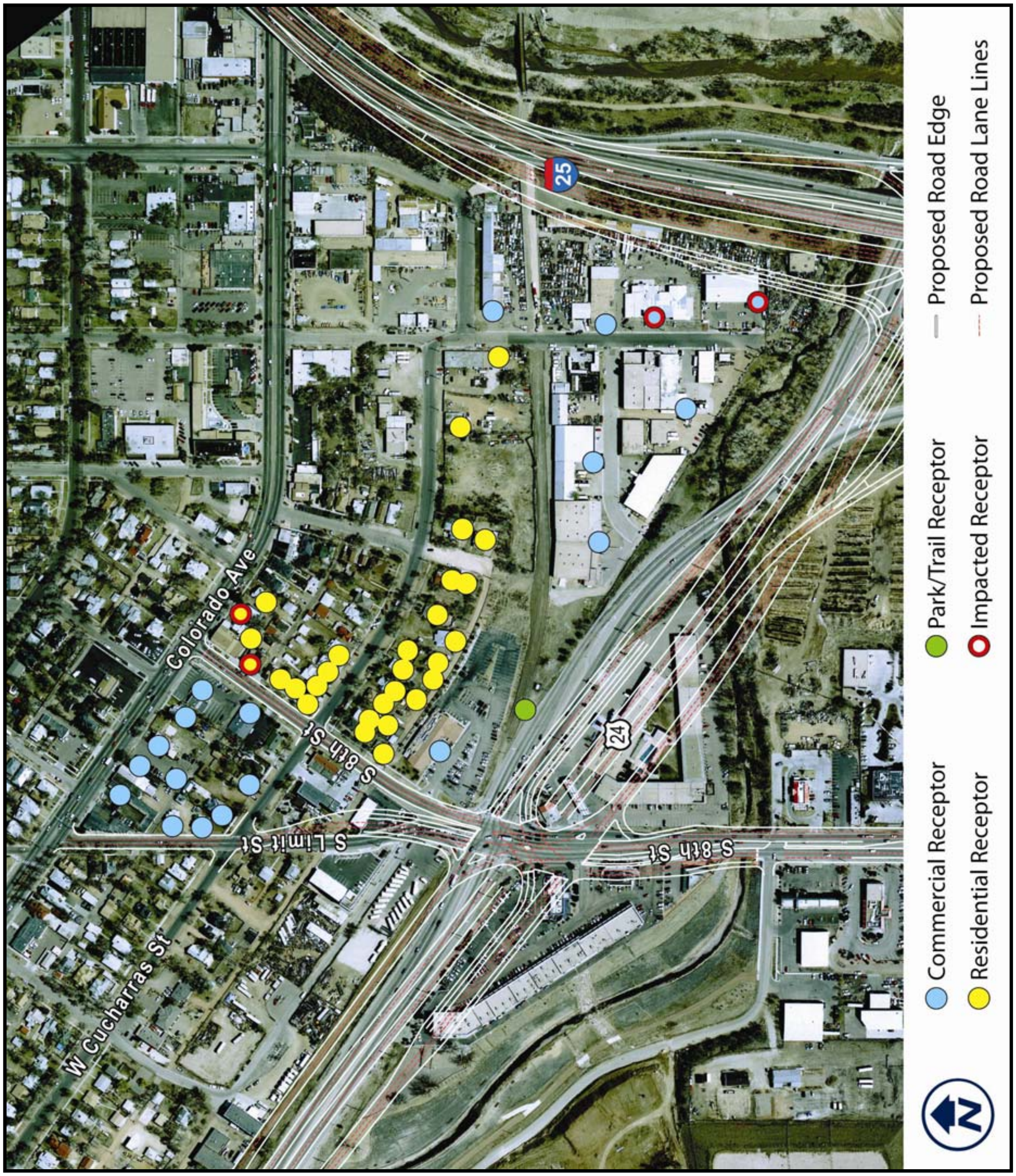


Figure 5-2: Noise Analysis Area "A"

Area B

As shown in Figure 5-3, Area B encompasses the residences and businesses located on the north side of US 24 between 8th Street and 15th Street. Three residences are predicted to be impacted by traffic noise from US 24.

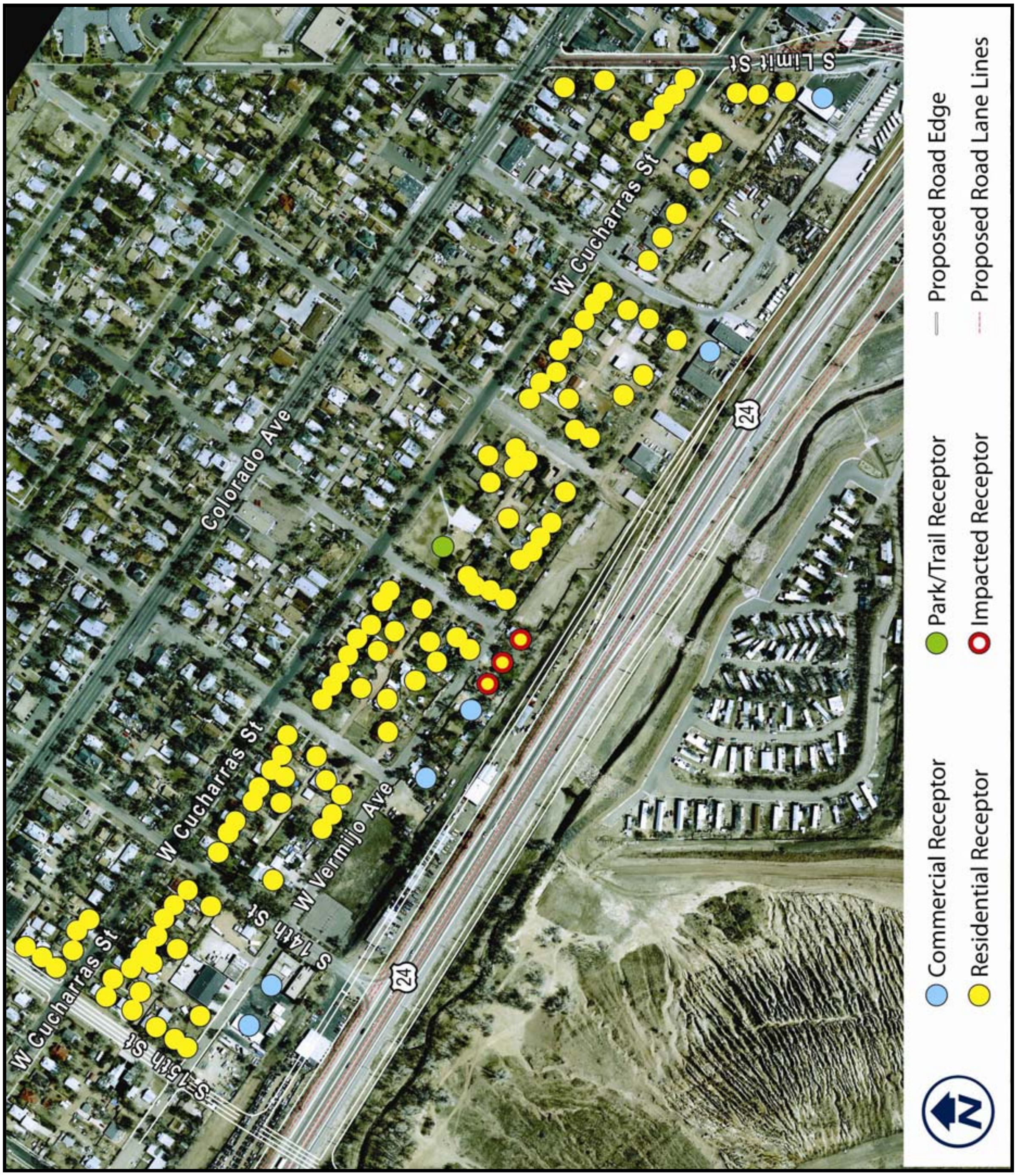


Figure 5-3: Noise Analysis Area "B"

Area C

As shown in Figures 5-4a and 5-4b, Area C encompasses the residences located on the south side of US 24 from Interstate 25 to east of 21st street. One residence located in the A-1 Mobile Home Park is impacted by noise from US 24.

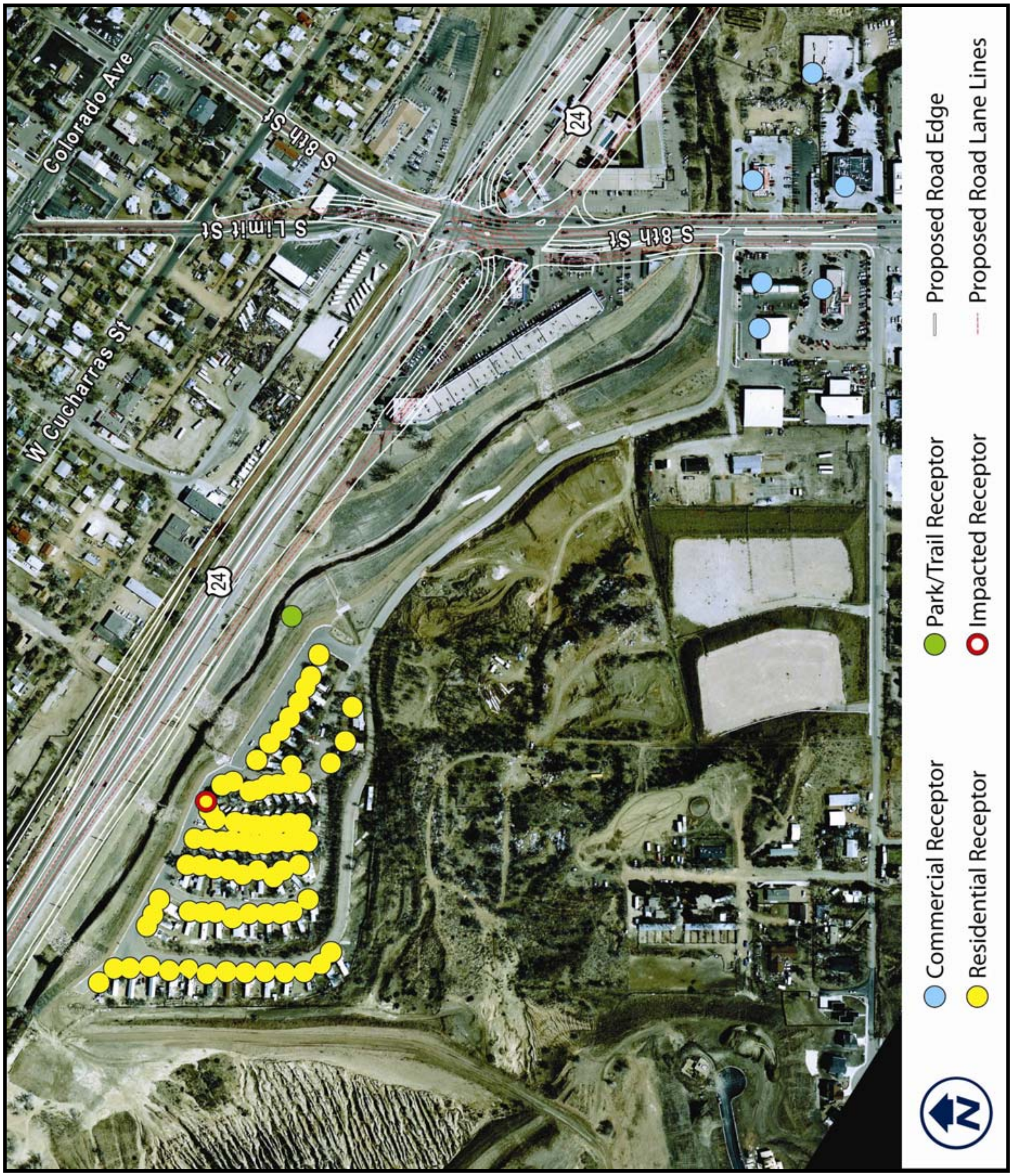


Figure 5-4a: East Section of Noise Analysis Area "C"

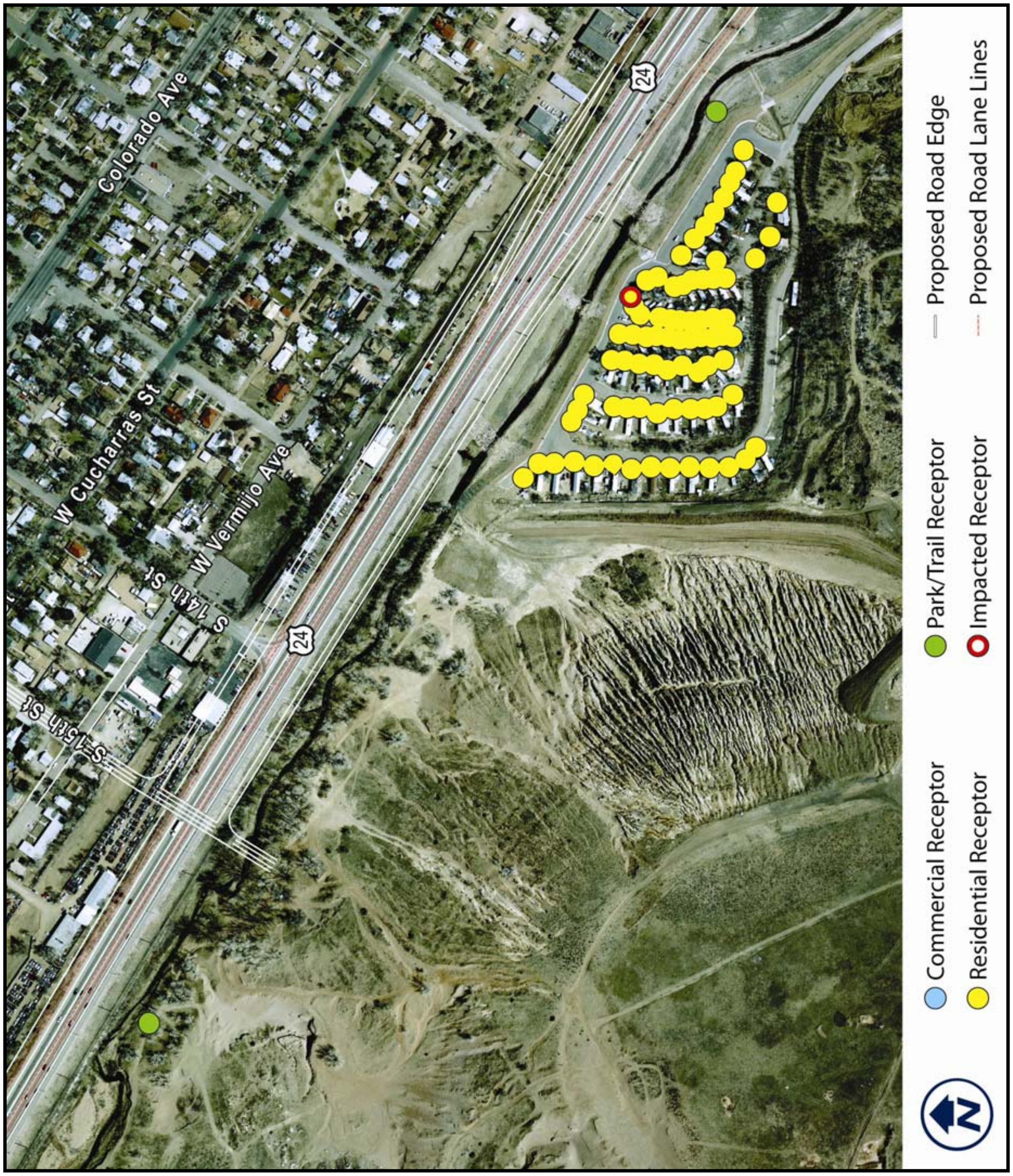


Figure 5-4b: West Section of Noise Analysis Area "C"

Area D

As shown in Figure 5-5, Area D encompasses the residences located on the north side of US 24 between 15th Street and 21st Street. One residence located off Sheldon Ave. is impacted by noise from US 24.

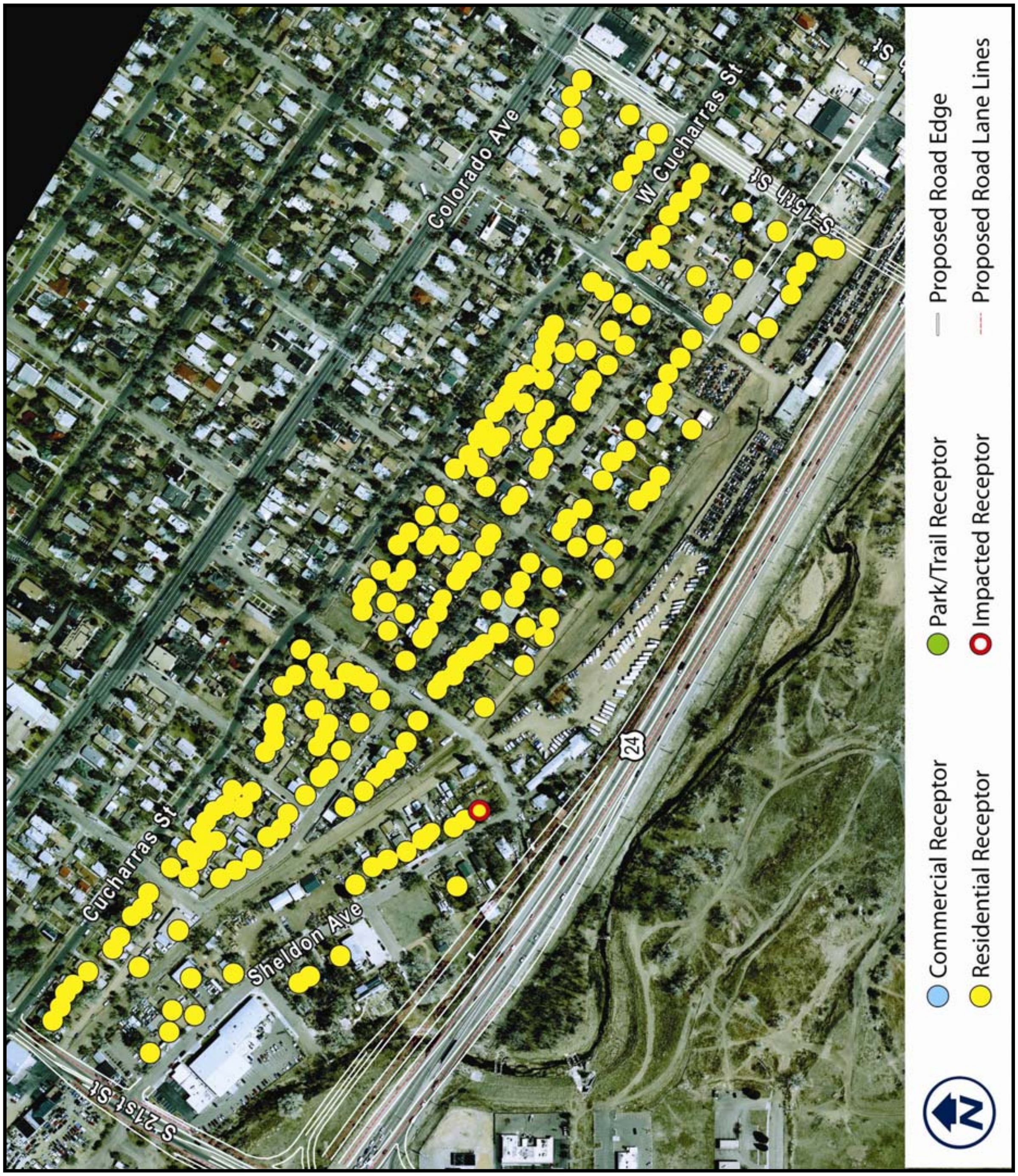


Figure 5-5: Noise Analysis Area "D"

Area E

As shown in Figures 5-6a and 5-6b, Area E encompasses the residences located on the north side of US 24 between 21st Street and 31st Street. One residence located along 21st Street is impacted from traffic noise from 21st (not US 24). Vermijo Park and one residences located near 26th Street are impacted by noise from US 24.

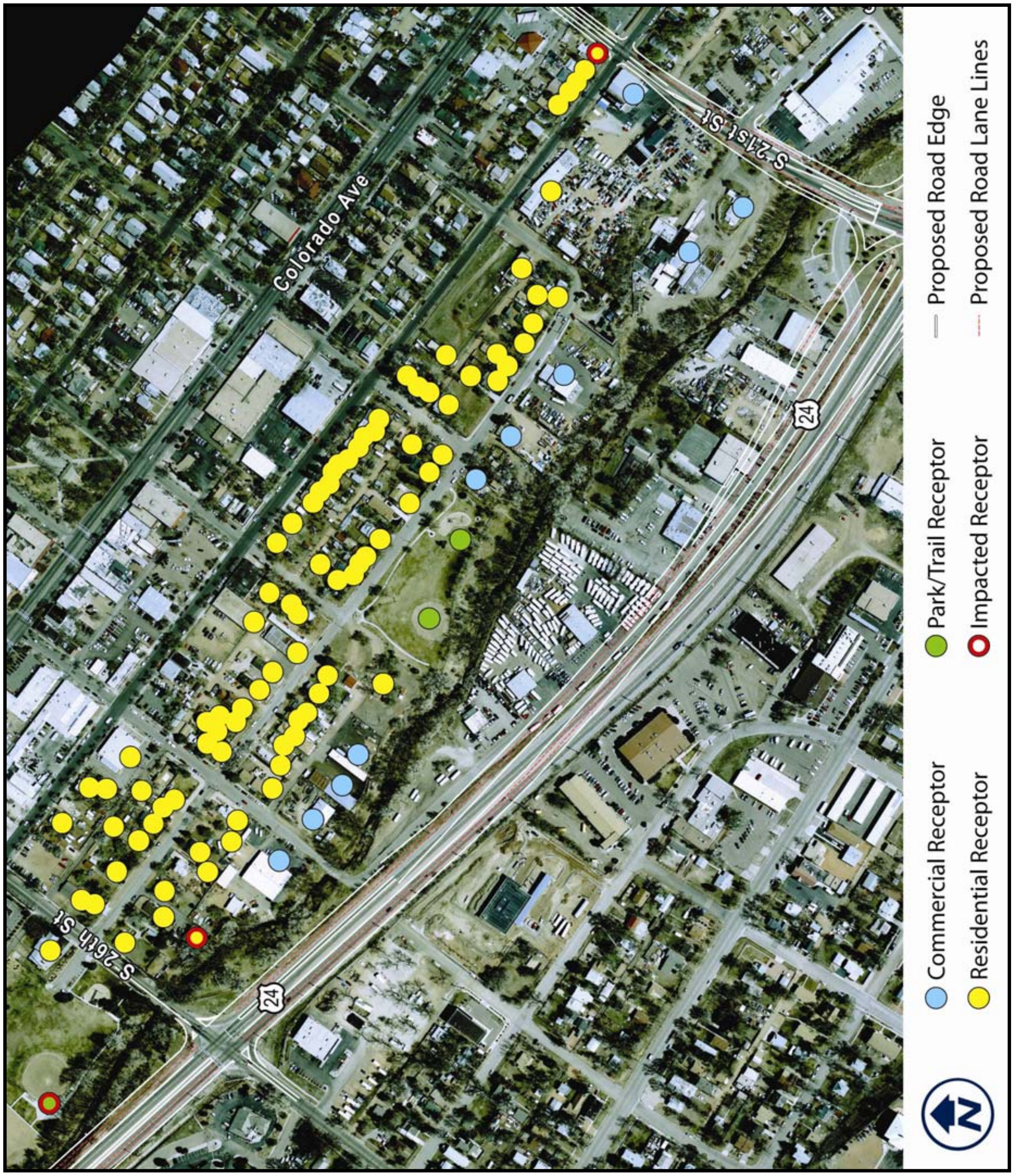


Figure 5-6a: East Section of Noise Analysis Area "E"

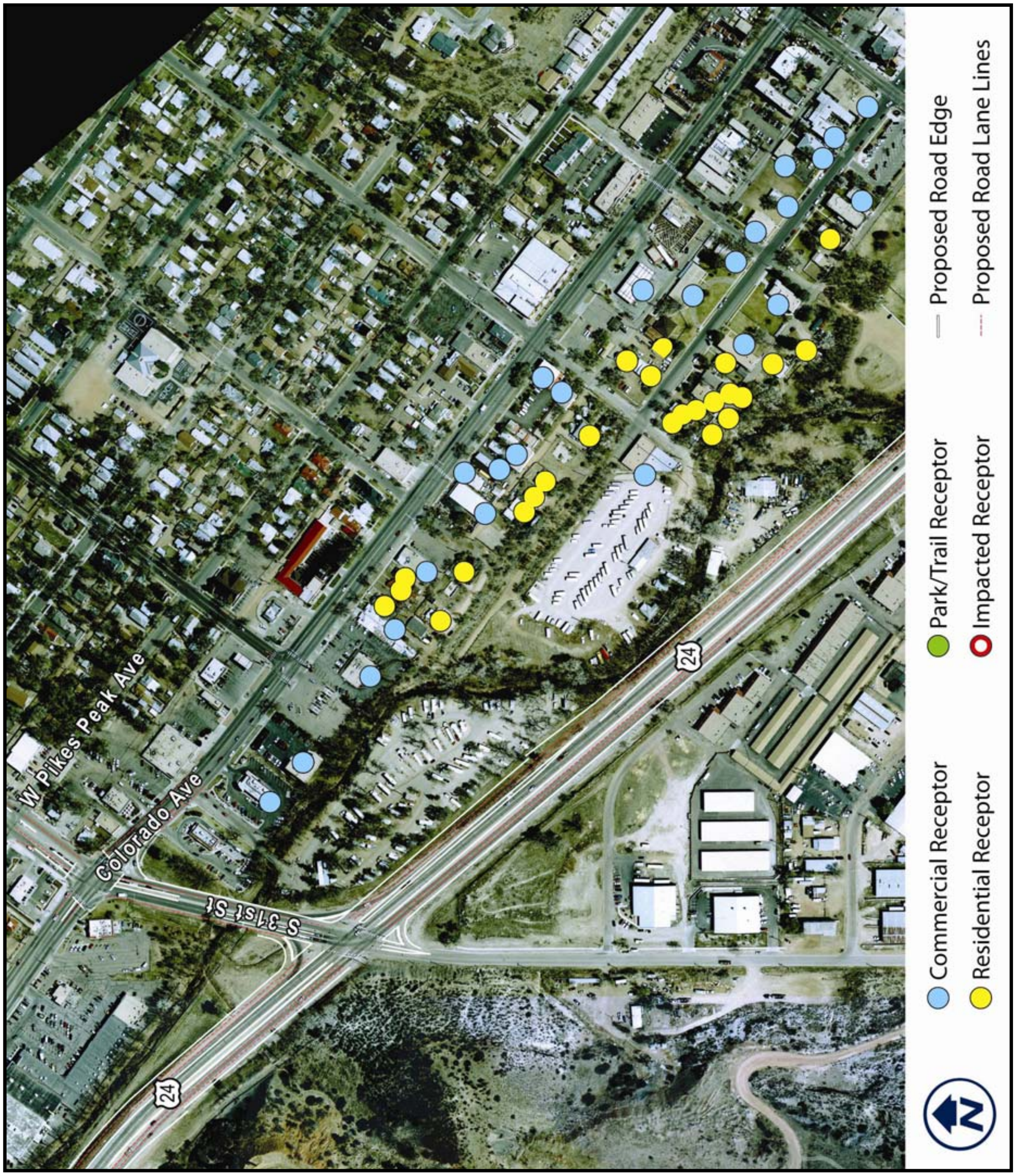


Figure 5-6b: West Section of Noise Analysis Area “E”

Area F

As shown in Figures 5-7a and 5-7b, Area F encompasses the residences located on the south side of US 24 between 21st Street and 31st Street. The Childhood Development Center (Figure 5-7a) is impacted by noise from US 24. A hotel (two buildings - Figure 5-7b) near 26th Street is impacted by noise from US 24.

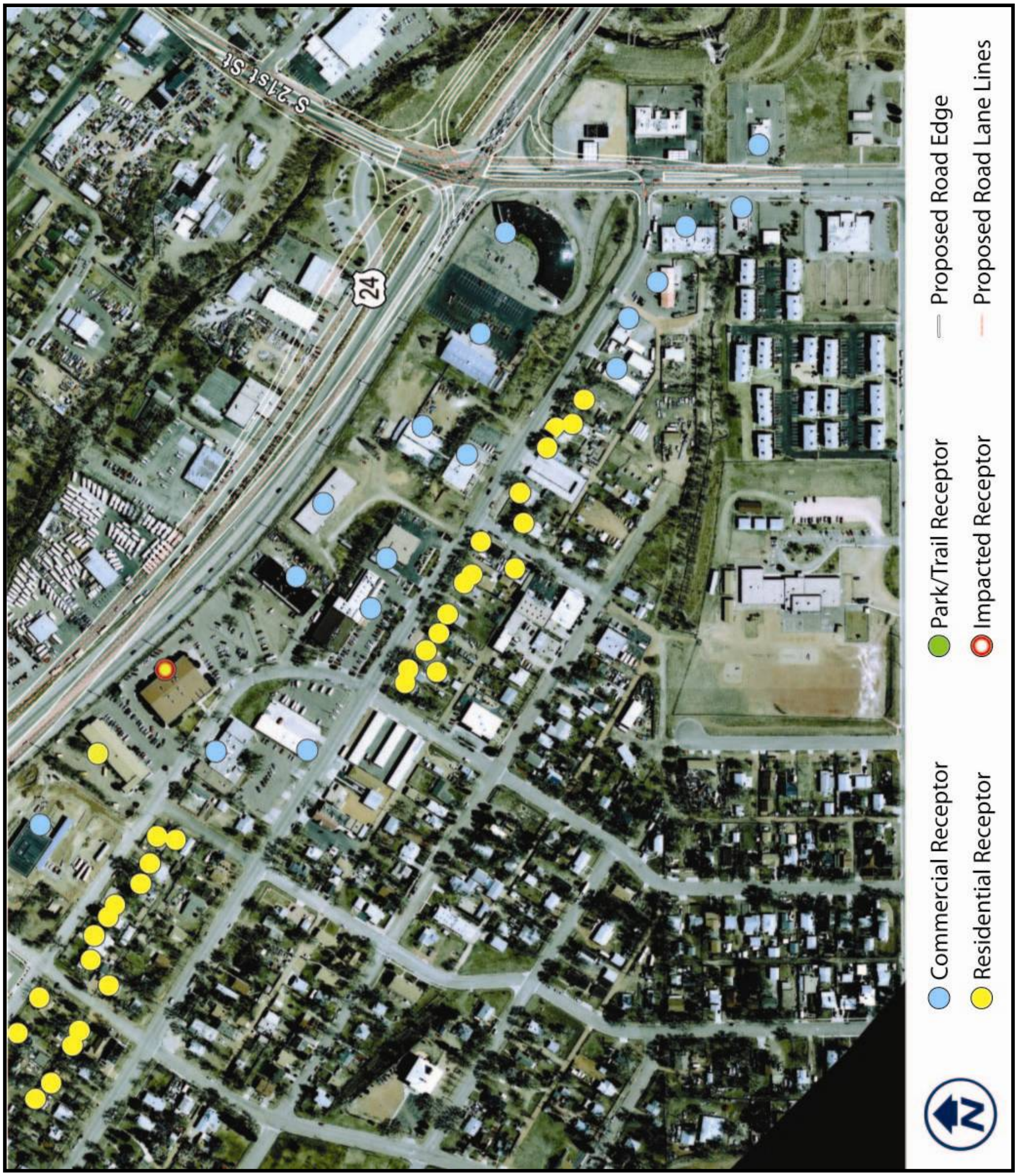


Figure 5-7a: East Section of Noise Analysis Area “F”

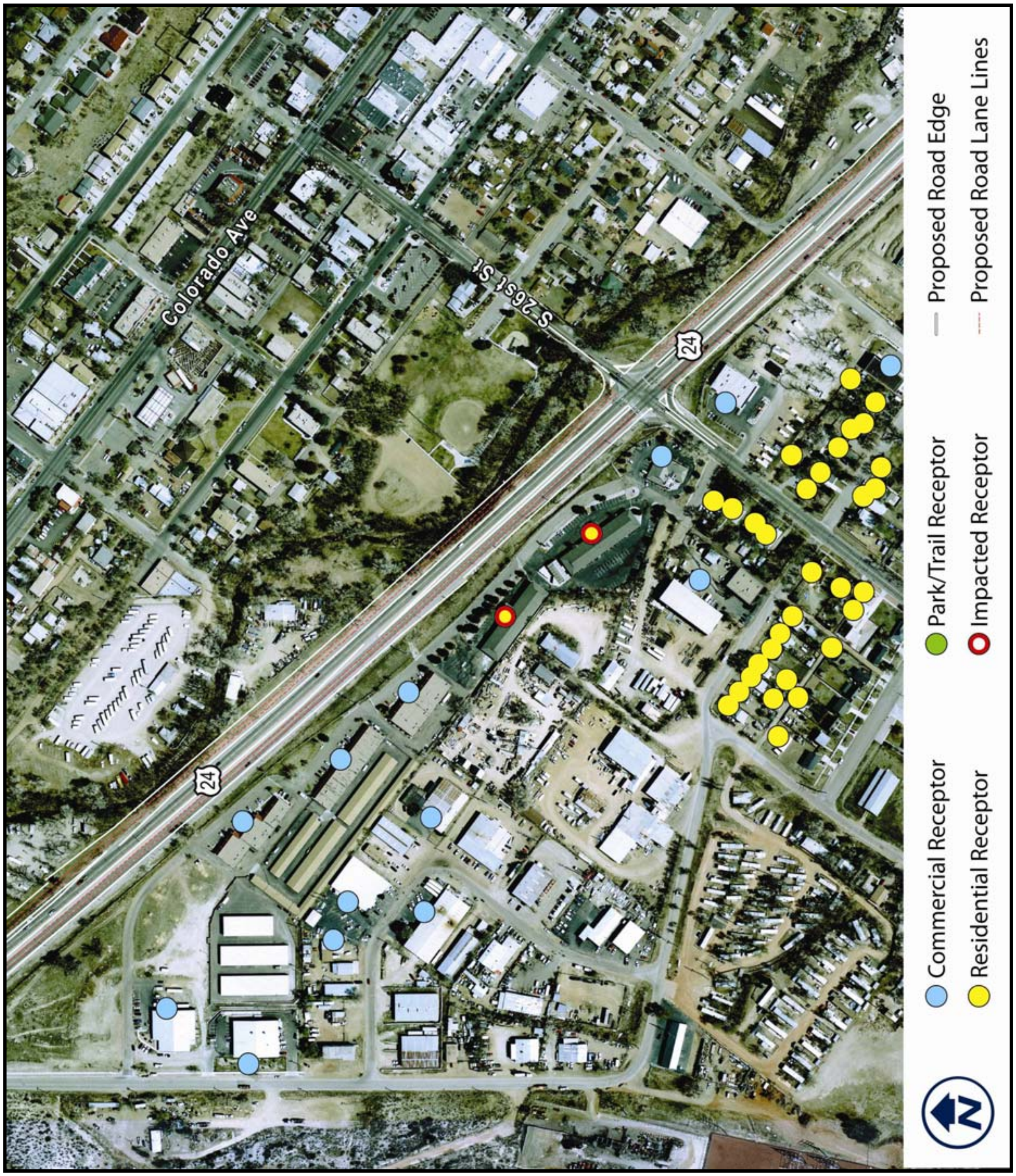


Figure 5-7b: West Section of Noise Analysis Area “F”

Area G

As shown in Figures 5-8a, 5-8b, and 5-8c Area G encompasses the residences located on the north side of US 24 between 31st Street and Manitou Avenue. No receptors in this area are predicted to be impacted by noise from US 24.

Figure 5-8a: East Section of Noise Analysis Area "G"

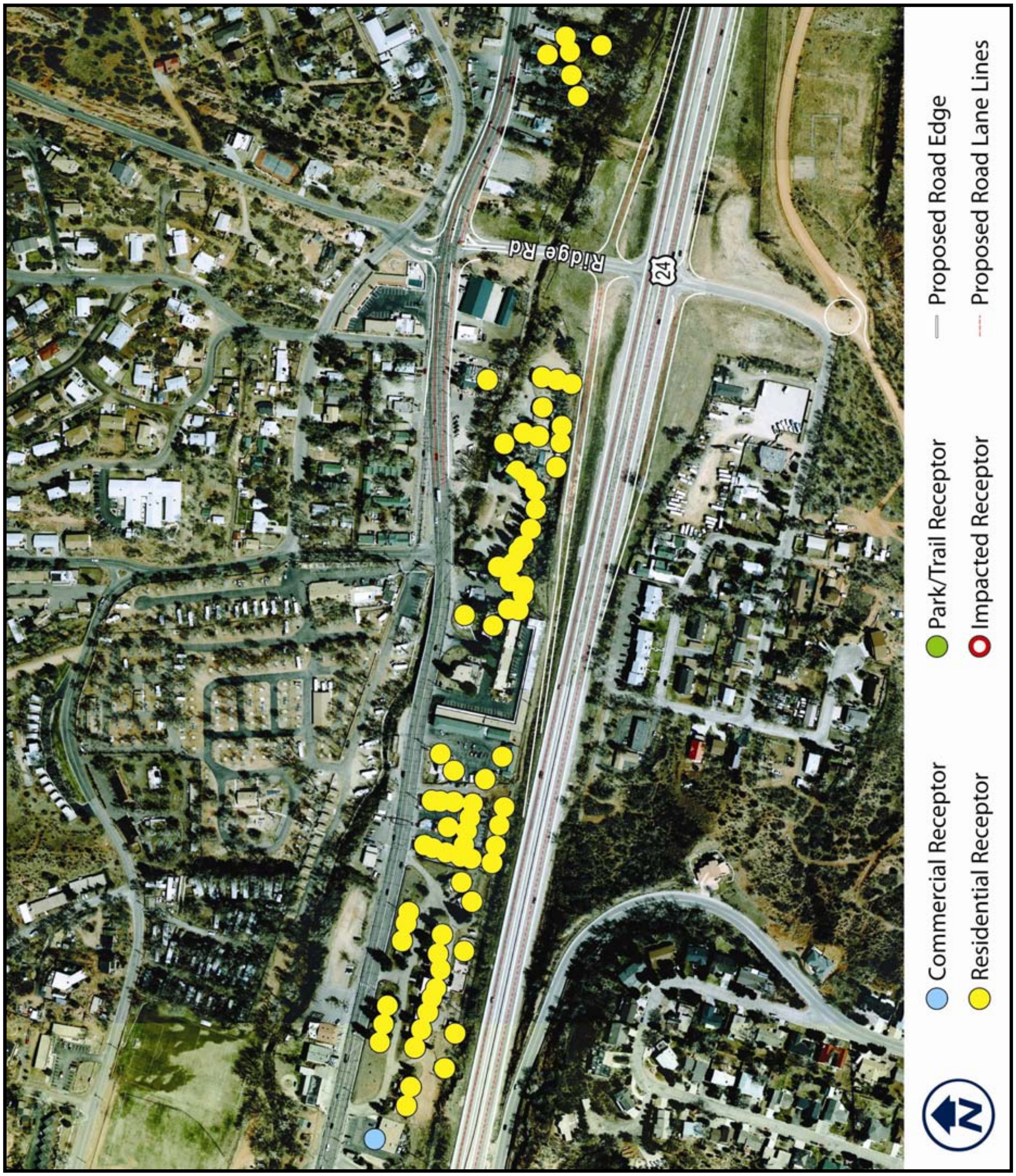


Figure 5-8b: Center Section of Noise Analysis Area "G"

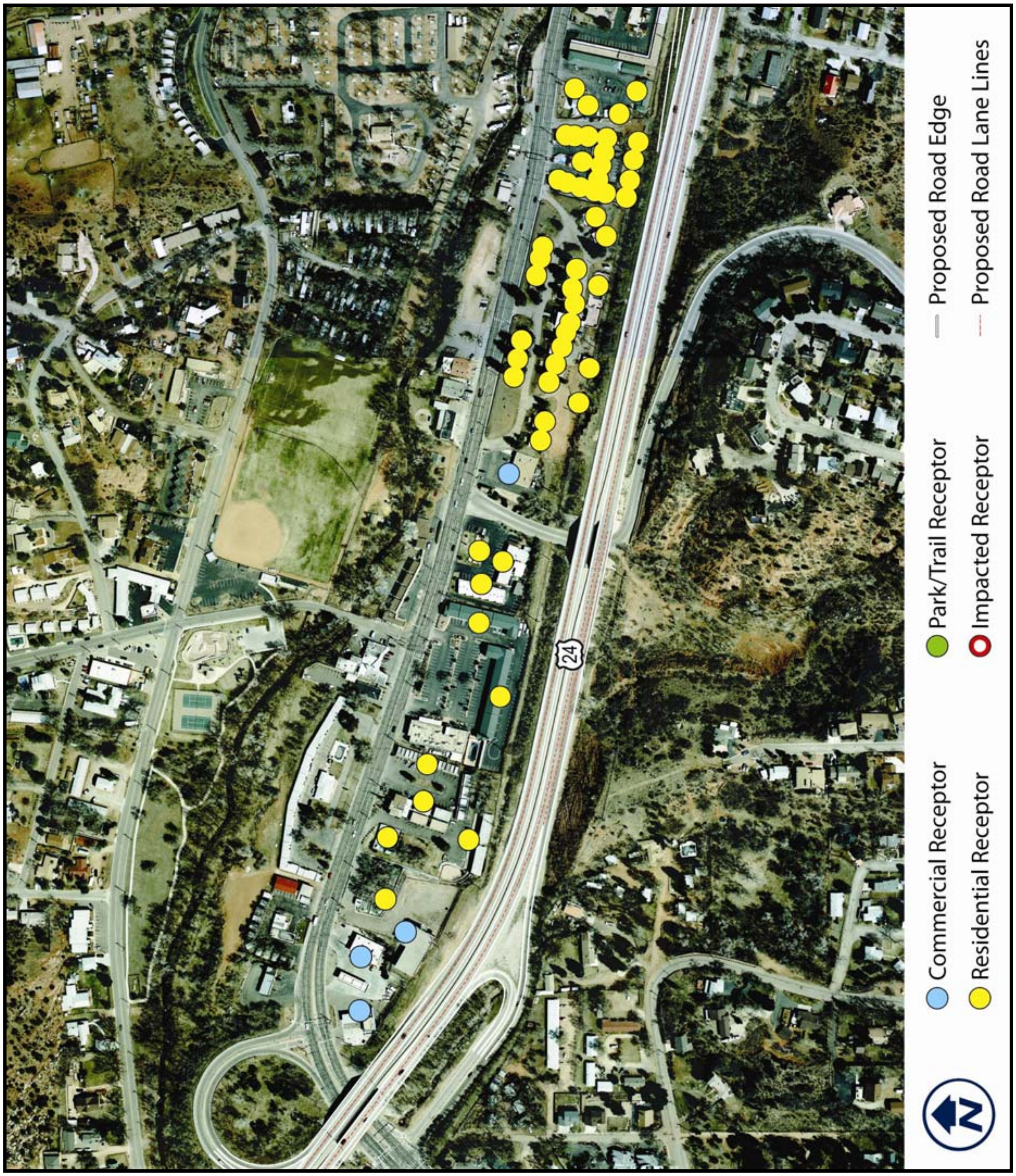


Figure 5-8c: West Section of Noise Analysis Area "G"

Area H

As shown in Figures 5-9a and 5-9b, Area H encompasses the residences located on the south side of US 24 between Ridge Street and Manitou Avenue. Six of the front row buildings (16 living units) in the Red Canyon Place condominiums are impacted by noise from US 24. Along Palisade Circle, two residences are impacted by noise from US 24. In the Crystal Park Road area three residences are predicted to be impacted by noise from US 24.

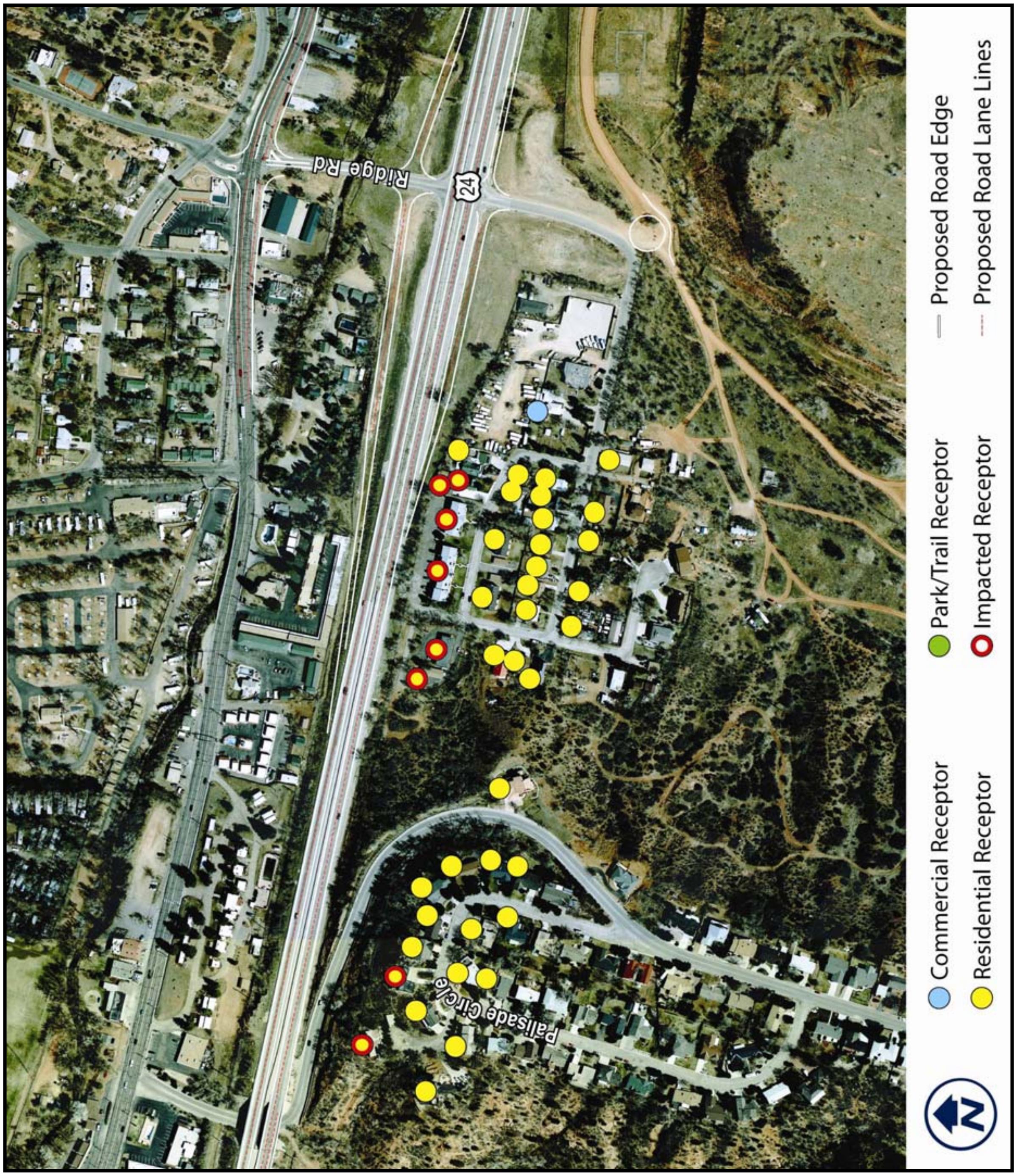


Figure 5-9a: East Section of Noise Analysis Area "H"

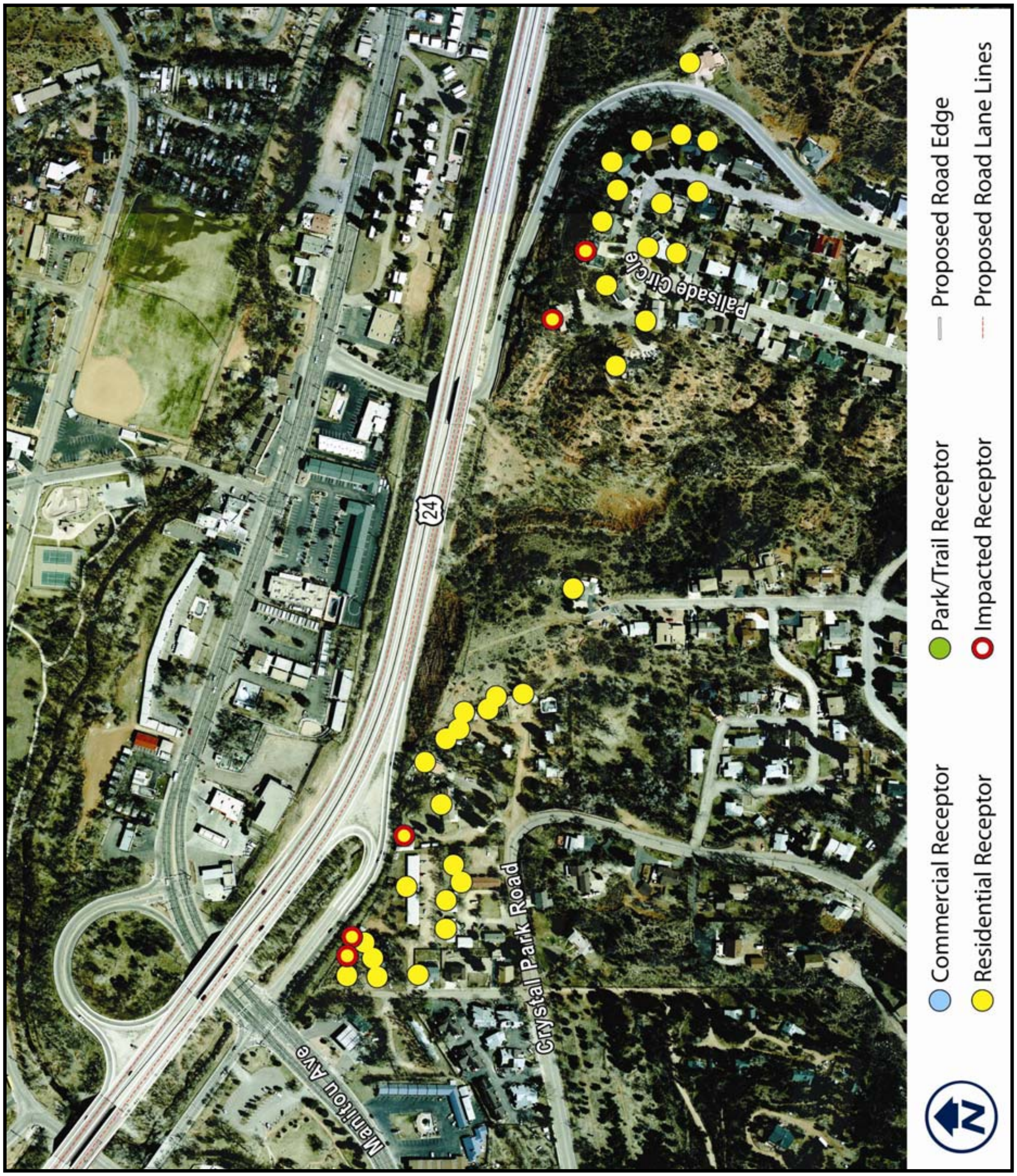


Figure 5-9b: West Section of Noise Analysis Area "H"

Area I & J

As shown in Figure 5-10, Area I encompasses the residences located along El Paso Boulevard north of US 24, and Area J encompasses the residences located along Rockledge Road between Manitou Ave. and US 24. These residences are not predicted to be impacted by traffic noise.

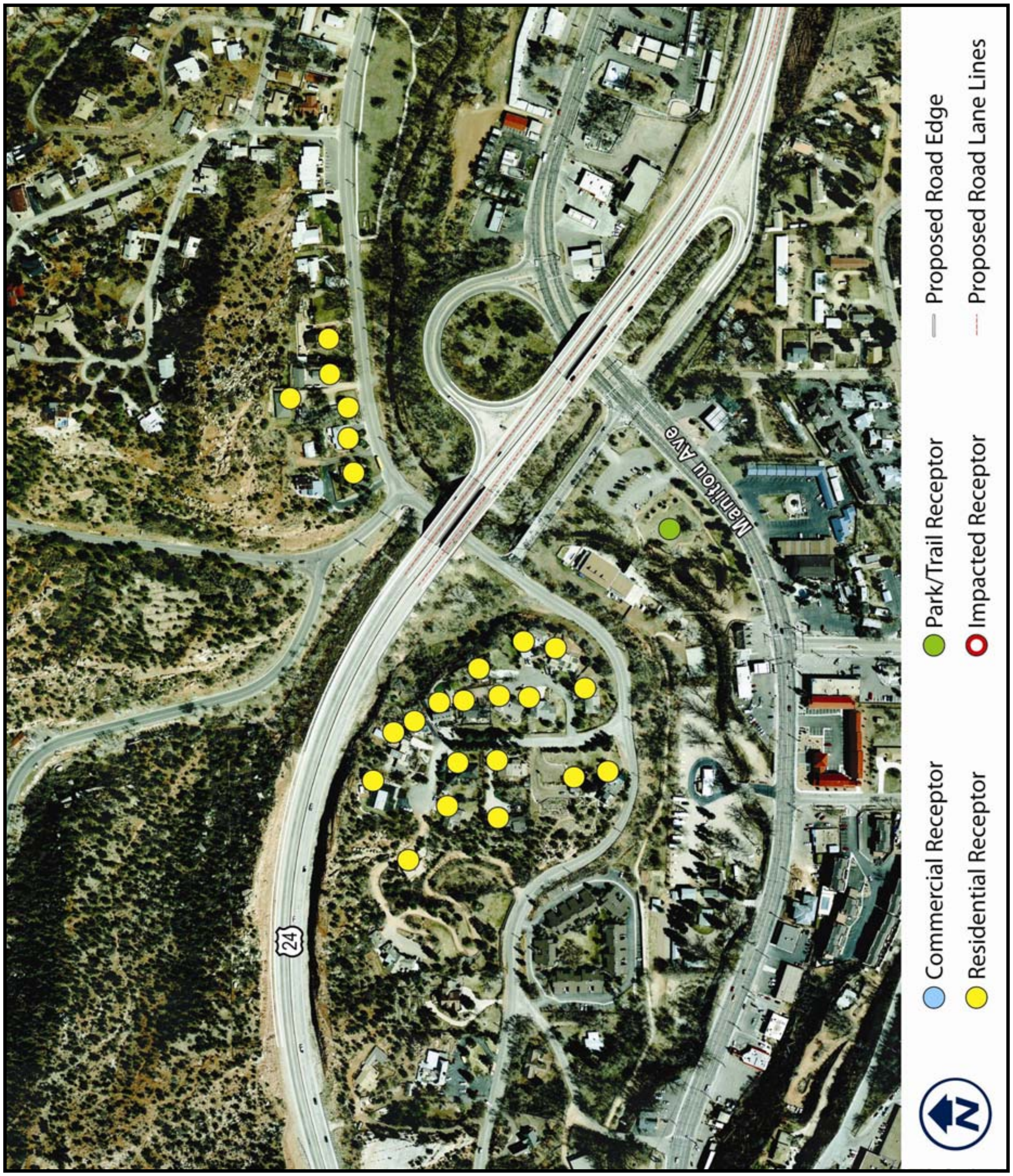


Figure 5-10: Noise Analysis Areas "I" &"J"

Area K

As shown in Figure 5-11, Area K encompasses the trails in the Red Rock Canyon Area, south of US 24. There is no traffic noise impact predicted in this area.

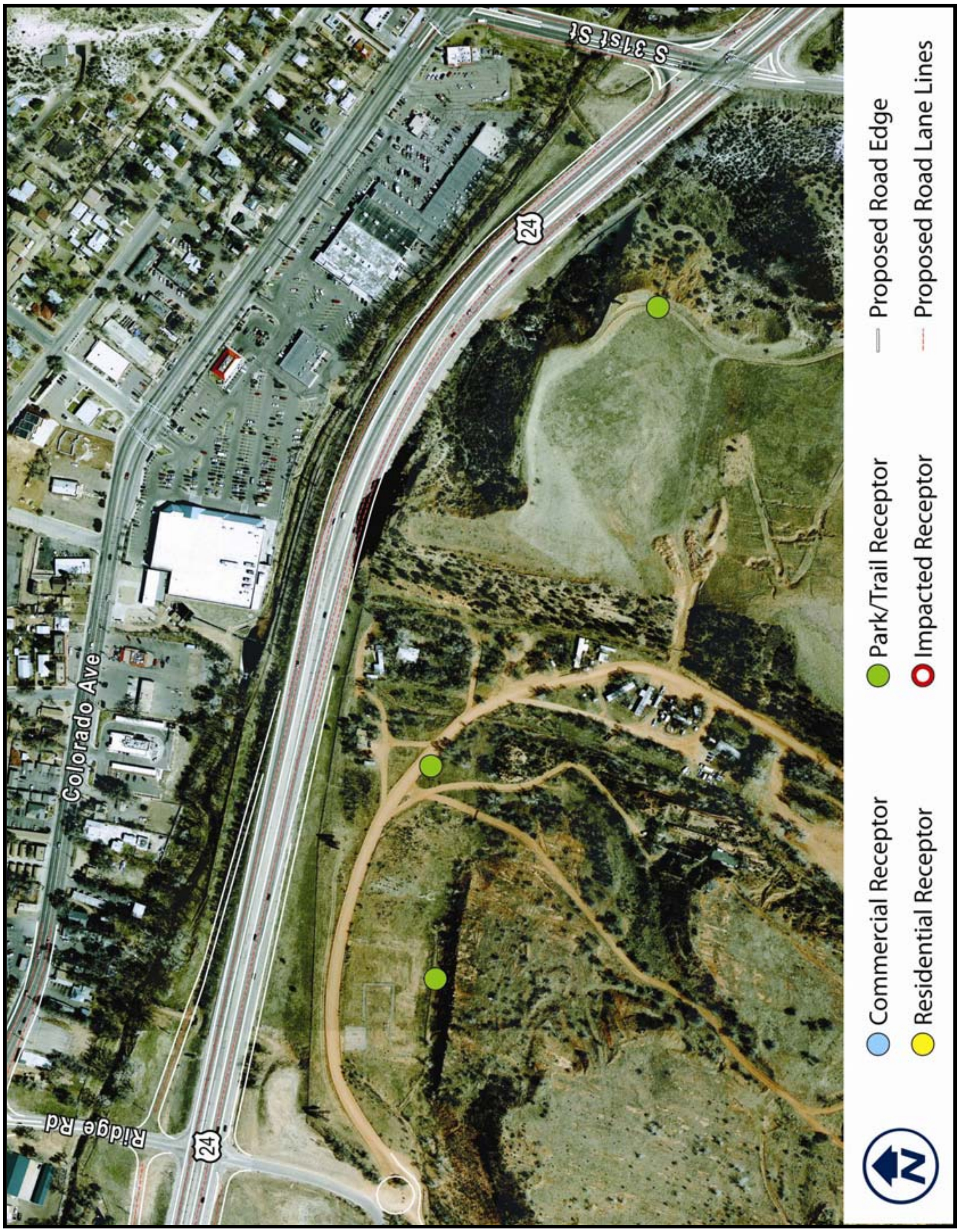


Figure 5-11: Noise Analysis Area "K"

Noise Impact At Commercial Receivers

Noise levels were predicted at each of the businesses adjacent to US 24 within the study area, as shown in Figures 5-2 through 5-11. Two businesses in Area A have predicted noise levels equal to or greater than CDOT's 71 dBA Noise Abatement Criterion for commercial receivers. The noise is from I-25, however, not US 24. Noise levels are not predicted to increase by 10 dBA or more at any of the commercial receivers. Therefore, noise mitigation was not considered for any commercial receptors.

6.0 NOISE MITIGATION

Noise mitigation was analyzed at each of the receivers predicted to be impacted by noise according to CDOT guidelines. There are a number of methods available to reduce traffic noise levels. As described in the first subsection, below, most of them do not apply to this project and are considered infeasible according to CDOT's noise guidelines. The one mitigation measure that is deemed feasible and reasonable is the construction of noise walls. The analyses conducted to determine this, and the noise reduction that the walls are predicted to provide, is described in the second subsection below.

Noise Abatement Measures Deemed Infeasible on This Project

Restricting Access to Heavy Trucks

Restricting heavy trucks from operating on US 24 would provide only a moderate reduction in traffic noise, due to the relatively low percentage of trucks (<2%). Also, if prohibited, trucks would likely seek other local roads, thus only shifting impact onto others. As a result, this is not considered a viable noise mitigation measure on this project.

Acquisition of Property to Form Buffer Zone

Generally, this mitigation measure is a viable alternative only for undeveloped lands where noise impact *prevention* is the goal. Land along both sides of US 24 within the study area is almost completely developed, under development, or consists of dedicated park land. As a result, this is not considered a viable noise mitigation measure on this project.

Alteration of Horizontal Alignment

In order to provide significant noise reduction (at least 5 dBA), the distance that currently exists between a receptor and the highway would need to be doubled. For example, if a residence were currently 100 feet from the highway, the highway would need to be shifted another 100 feet away. This is not a viable mitigation alternative on this project given that there is significant development along both sides of US 24.

Alteration of Vertical Alignment

Changing the vertical alignment of US 24, by depressing it into the ground, could provide a significant noise reduction. This option was not recommended for design implementation due to its extremely high cost and complexity.

Reducing Speed Limits

The posted speed limit in the western portion of the study area is being reduced from 50 mph to 45 mph, which should result in a decrease in noise levels of approximately 1 dBA.

Noise Insulation of Buildings

CDOT guidelines state that applying sound insulation to private residences can be considered where there is a severe impact (absolute noise levels of 75 dBA or an increase of 30 dBA over existing levels) and where other exterior noise mitigation measures are found to be infeasible. There are no such instances on this project.

Using a Low-noise Pavement

FHWA *Highway Traffic Noise Analysis and Abatement Policy and Guidance* (June 1995) states that: "Pavement is sometimes mentioned as a factor in traffic noise. While it is true that noise levels do vary with changes in pavements and tires, it is not clear that these variations are substantial when compared to the noise from exhausts and engines, especially when there are a large number of trucks on the highway. Additional research is needed to determine to what extent different types of pavements and tires contribute to traffic noise. It is very difficult to forecast pavement surface condition into the future. Unless definite knowledge is available on the pavement type and condition and its noise generating characteristics, no adjustments should be made for pavement type in the prediction of highway traffic noise levels. Studies have shown open-graded asphalt pavement can initially produce a benefit of 2-4 dBA reduction in noise levels. However, within a short time period (approximately 6-12 months), any noise reduction benefit is lost when the voids fill up and the aggregate becomes polished. The use of specific pavement types or surface textures must not be considered as a noise abatement measure." Therefore, at this time, asphalt is not viewed as a noise mitigation measure in and of itself. However, if concrete pavement is selected for use on this project, the type of surface texture applied shall be coordinated with CDOT Region 2 environmental staff with regard to noise impacts.

Analysis of the Feasibility and Reasonableness of Noise Walls

Noise barriers, either in the form of walls or earthen berms, are the most commonly employed highway noise mitigation measure. Noise walls are more common than berms, particularly in developed areas such as the US 24 West Corridor, because they require less space. Noise walls achieve between 5 and 15 dB of reduction, depending on height, topography (less reduction is achievable for receptors located above the highway), and proximity (barriers are most effective for receptors located within approximately 300 feet of the barrier).

As listed in Table 5-1, above, noise impact was predicted in Areas A, B, C, D, E, F, and H. The feasibility and reasonableness of providing noise walls for each of these areas is described below. Note that a summary of predicted noise level reductions is provided in this section. The noise level reductions predicted at each individual residence are provided in Appendix D.

Feasibility

Noise walls need to meet three primary Feasibility criteria. First, they must be able to be built in a continuous manner (i.e. no or limited gaps for direct access). Secondly, they must provide at least 5 dBA of noise reduction at front row receivers. Thirdly, they must provide at least 10 dBA of noise reduction at at least one front row receiver (unless this is not reasonable due to excessive wall height). The following paragraphs describe the feasibility of providing noise walls in each impacted area.

- Area A: Impacts include two commercial receptors near I-25, and two residences (one along 8th Street and one along Colorado Avenue). Noise walls are not recommended for the commercial receptors as part of the US 24 West Corridor Project, as the noise impact is the result of I-25 traffic (and therefore placing noise walls along US 24 would not provide any noise reduction). Noise walls are not feasible at the residences either, as they have direct access to the street from which they would need shielding (8th Street or Colorado Avenue). Therefore, noise walls are considered infeasible in Area A and are not recommended.
- Area B: The noise wall shown in Figure 6-1 was modeled in TNM. As can be seen in the figure, a continuous wall is possible at this site. The wall is 1,630 feet long and 18 feet tall. As shown in Table 6-1, the wall is predicted to provide an average of 10 dBA of noise reduction at front row receivers, and a maximum reduction of 10 dBA. Therefore, this wall is considered feasible. The reasonableness of providing a wall for this area is described in the following subsection.
- Area C: The noise wall shown in Figure 6-2 was modeled in TNM. As can be seen in the figure, a continuous wall is possible at this site. The wall is 1,430 feet long and 15 feet tall. As shown in Table 6-1, the wall is predicted to provide an average of 8 dBA of noise reduction at front row receivers, and a maximum reduction of 10 dBA. Therefore, this wall is considered feasible. The reasonableness of providing a wall for this area is described in the following subsection.
- Area D: The noise walls shown in Figure 6-3 were modeled in TNM. At this interchange US 24 passes over 21st Street and it is necessary to use two walls: one along the edge of the off ramp and one along the edge of US 24. The off ramp allows traffic to exit US24 at 21st Street. The off ramp wall begins around South 18th Street and runs westward for approximately 400 feet. The US 24 wall begins approximately in the middle of the off ramp wall and runs westward approximately 800 feet. Both walls are 18 feet tall. As shown in Table 6-1, the wall is predicted to provide an average of 6 dBA of noise reduction at front row receivers, and a maximum reduction of 6 dBA. CDOT noise guidelines state that if a wall is not predicted to provide 10 dBA of reduction at at least one receiver at a wall height of 25 feet or less, then the analysis may proceed at a lower height. At a height of 25 feet this wall was predicted to provide only 7 dBA of noise reduction. Therefore, this wall is considered feasible even though it does not achieve 10 dBA of reduction. The analysis of reasonableness described in the following subsection was conducted using a wall height of 18 feet.
- Area E: Impacts include one residence along 21st Street, one residence along US 24 near 26th Street, and Vermijo Park. Noise walls are not feasible at the 21st Street residence, as it has direct access to 21st Street. To protect the impacted residence along US 24, as well

as Vermijo Park, the noise walls shown in Figure 6-4 were modeled in TNM. The intersection of US 24 and South 26th Street requires the noise wall for this area be split into two walls. The eastern wall begins at South 25th Street and runs westward 530 feet to South 26th Street. The western wall begins at South 26th Street and runs 1,230 feet westward to around South 28th Street. Both walls are 12 feet high. As shown in Table 6-1, the wall is predicted to provide an average of 9 dBA of noise reduction at front row receivers, and a maximum reduction of 9 dBA. CDOT noise guidelines state that if a wall is not predicted to provide 10 dBA of reduction at at least one receiver at a wall height of 25 feet or less, then the analysis may proceed at a lower height. At heights of 15 and 18 feet this wall was predicted to provide a maximum of 9 and 10 dBA of noise reduction. However, the cost benefit of both these wall heights was 'unreasonable'. Therefore, for this analysis, the 12 ft wall is considered feasible. The reasonableness of providing a wall for this area is described in the following subsection.

- Area F: There is no outdoor use at the impacted hotel or at the impacted Childhood Development Center building. Therefore, mitigation is not recommended at these locations. There is an outdoor playground at the building directly west of the Center. However, the predicted level there is 64 dBA and therefore there is no impact.

- Area H: Impacts include the Red Canyon Place condominiums, the residences along Palisade Circle, and the residences along Crystal Park Road. Each of these areas is described separately below.

    - Red Canyon Place Condominiums: The noise wall shown in Figure 6-5 was modeled in TNM. As can be seen in the figure, a continuous wall is possible at this site. The wall is 870 feet long and 15 feet tall. As shown in Table 6-1, the wall is predicted to provide an average of 11 dBA of noise reduction at front row receivers, and a maximum reduction of 14 dBA. Therefore, this wall is considered feasible. The reasonableness of providing a wall for this area is described in the following subsection.

    - Palisade Circle: These residences are located on a ridge approximately 100 feet above US 24. The only feasible place for a wall would be along the backyards of the residences themselves. Such a wall was modeled at heights ranging from 6 feet to 14 feet. None of the walls benefited (provide at least 3 dB of reduction) more than 3 residences. The 12 foot tall wall provided the best cost benefit at $10,654 (roughly $6,000 more than considered reasonable in terms of cost). Therefore this wall is not recommended.

    - Crystal Park Place: The noise wall shown in Figure 6-6 was modeled in TNM. As can be seen in the figure, a continuous wall is possible at this site. The wall is approximately 710 feet long and 15 feet tall. As shown in Table 6-1, the wall is predicted to provide an average of 7 dBA of noise reduction at front row receivers, and a maximum reduction of 10 dBA. Therefore, this wall is considered feasible. The reasonableness of providing a wall for this area is described in the following subsection.

TABLE 6-1: PREDICTED NOISE LEVEL REDUCTIONS FROM WALLS*

Area	Row	Project Average (dBA)	Mitigated Project Average (dBA)	Maximum Decrease (dBA)	Average Decrease (dBA)
B	1st	67	57	10	10
	2nd	63	59	7	4
	3+	59	57	7	2
C	1st	65	57	10	8
	2nd	64	56	9	8
	3+	62	55	9	7
D	1st	62	56	6	6
	2nd	63	58	6	5
	3+	59	56	5	3
E	1st	66	57	9	9
	2nd	62	60	8	2
	3+	61	58	7	3
H – East Red Canyon Place	1st	68	57	14	11
	2nd	60	56	5	4
	3+	58	56	5	2
H – West Crystal Park Place	1st	67	60	10	7
	2nd	64	60	7	4
	3+	60	59	5	1

*Note: Table includes all modeled receptors, not just those receiving 3 dB of reduction from walls

Other CDOT Feasibility criteria include safety (sight distances, shadowing/icing) and maintenance (room for adequate snow and debris removal). The exact endpoints of the walls may need to be refined during final design to ensure adequate sight distances, particularly on the US 24 ramps. There are no significant icing or debris removal issues that we are aware of at this point in the design process.

The final CDOT Feasibility criterion is Constructability. The proposed walls do not appear to offer any engineering or cost challenges over that which is typical and reasonable for such structures, and the walls can be built in a continuous manner.

<u>Reasonableness</u>

CDOT's Reasonableness criteria were applied to each of the noise walls found to be "Feasible". The results of this analysis are described below and are recorded on the Noise Abatement Determination Worksheets shown in Appendix E.

1. *Cost Benefit*
   Table 6-2 lists the cost-benefit calculated for each of the noise walls found to be feasible. The cost for each wall was calculated by multiplying the wall's area by CDOT's standard sound wall unit cost of $30 per square foot. The number of benefitted receptors was calculated as the number of receptors where the wall was predicted to provide a noise level reduction of 3 dB or more. The noise level reduction used in the calculations was the average reduction at the benefitted receptors. All of the proposed walls have a cost-benefit rating of "marginally reasonable" or better.

2. *Build Noise Level*
   Referring to Table 5-1 (above), the predicted design-year loudest hour noise levels at the front row of receivers in the six noise wall areas range from 66 to 70 dBA. All of these level rank as "Reasonable" according to CDOT criteria.

3. *Impacted Persons Desires*
   No specific survey of resident's desires was conducted as part of this project. For the purposes of this analysis, it is assumed that at least 50% of area residents approve of the wall, which ranks as "Reasonable" according to CDOT criteria.

4. *Development Type*
   The development behind the proposed noise walls is over 75% residential, which ranks as "Extremely Reasonable" according to CDOT criteria. During Final Design, affected residents will be consulted regarding noise impact and noise wall design.

5. *Development Existence*
   More than 75% of the residences located behind the proposed noise walls have been in place for at least 15 years old, which ranks as "Extremely Reasonable" according to CDOT criteria.

6. *Build Noise Level Versus Existing Noise Level*
   Referring to Table 5-1 (above), the predicted increases in noise levels between existing and design-year conditions range from 2 to 5 dBA (in the noise wall areas). This ranks as "Marginally Reasonable" according to CDOT criteria.

7. *Special Consideration for Severe Impacts*
   Special consideration is given to residences where predicted noise levels exceed 75 dBA, and where other abatement measures are not feasible or reasonable. Predicted noise levels on this project do not exceed 75 dBA, therefore, special consideration for mitigation is not applicable on this project.

8. *Special Consideration for Non-Profits*
   Special consideration is given to schools, churches, etc. on a case by case basis. There are no such receivers located within the project study area.

TABLE 6-2: PROJECT COST BENEFIT ANALYSIS BY SECTION							
Area	Length (ft)	Area (sqft)	Cost Per Sqft ($)	# of Benefited Receptors	Avg. Noise Reduction At Benefited Receptors (dBA)	Cost Benefit	Reasonableness
B	1,630	29,350	$30	51	5	$3,730	Reasonable
C	1,430	21,440	$30	76	7	$1,300	Extremely Reasonable
D*	1,220	21,960	$30	44	4	$4,090	**Marginally Reasonable
E*	1,760	21,130	$30	34	5	$3,890	Marginally Reasonable
H – East Red Canyon Place	870	13,020	$30	25	10	$1,635	Extremely Reasonable
H – West Crystal Park Place	710	10,680	$30	17	5	$3,680	Marginally Reasonable

*Two walls

**Considered "Marginally Reasonable" given the margin of error of the analysis process

Summary of Noise Mitigation Analysis

Table 6-3 lists the results of the feasibility and reasonable analysis for each impacted area.

TABLE 6-3: SUMMARY OF FEASIBILITY AND REASONABLE ANALYSIS

Area	Location	Feasible	Reasonable	Recommended
A	Commercial Receivers	No	-NA-	No
	Residential Receivers	No	-NA-	No
B	11th St. to 14th St.	Yes	Yes	Yes
C	A-1 Mobile Home Park	Yes	Yes	Yes
D	18th St. to 21st St.	Yes	Yes	Yes
E	21st Street Receiver	No	-NA-	No
	26th St. to 28th St.	Yes	Yes	Yes
F	Hotel	No	-NA-	No
	Child Development Center	No	-NA-	No
H	Red Canyon Place	Yes	Yes	Yes
	Palisade Circle	Yes	No	No
	Crystal Park Place	Yes	Yes	Yes

Figure 6-1: Proposed Noise Wall Location for Area B – 11TH St. to 14th St

Figure 6-2: Proposed Noise Wall Location for Area C – A-1 Mobile Home Park

Figure 6-3: Proposed Noise Wall Locations for Area D – 18th St. to 21st St.

Figure 6-4: Analyzed Noise Wall Locations for Area E – 26th St. to 28th St.

Figure 6-5: Proposed Noise Wall Location for East Section of Area H – Red Canyon Place

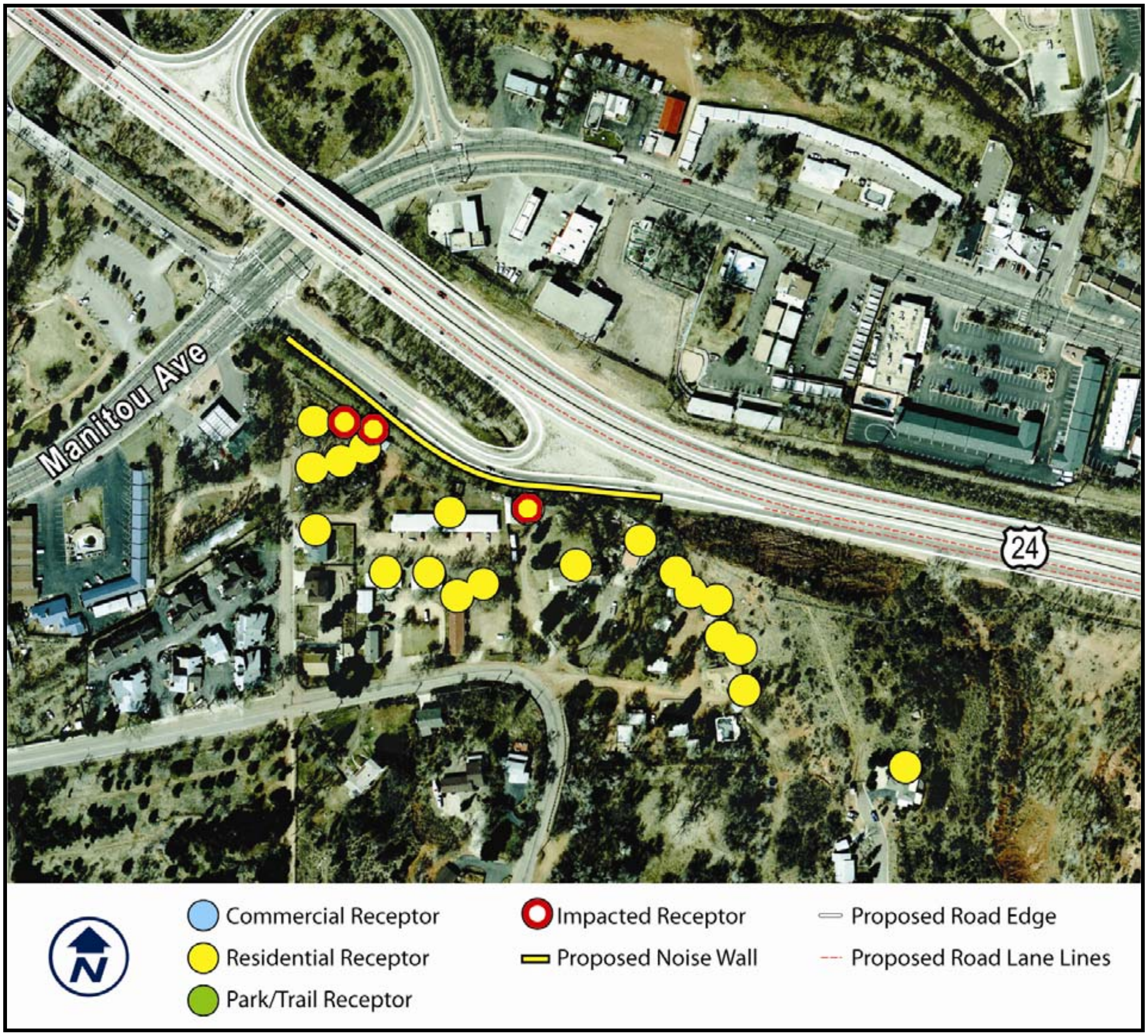


Figure 6-6: Proposed Noise Wall Location for West Section of Area H – Crystal Park Place

7.0 NO ACTION ALTERNATIVE

Traffic noise is loudest when there is a significant amount of traffic traveling at relatively high speeds. This is referred to as Level-of-Service C (LOS C) conditions. When more traffic is added to the flow, noise levels will increase as long as there is no decrease in speed. At some point, the capacity of the highway will be exceeded, resulting in a decrease in speeds and noise levels. Therefore, the loudest hour occurs just before and just after periods of congestion.

Loudest hour noise levels along US 24 will not change appreciably between existing and 2035 No-Action conditions, because the highway is already at capacity during at least part of the typical day and because the No Action alternative adds no additional capacity to either roadway.

As the No Action Alternative does not include any construction, no noise mitigation will be provided under this Alternative.

8.0 CONSTRUCTION NOISE IMPACTS

Construction for the build alternatives will generate noise from diesel-powered earth moving equipment such as dump trucks and bulldozers, back-up alarms on certain equipment, compressors, and pile drivers (near bridge abutments and retaining walls, if necessary). Construction noise at off-site receptor locations will usually be dependent on the loudest one or two pieces of equipment operating at the moment. Noise levels from diesel-powered equipment range from 80 to 95 dBA at a distance of 50 feet. Impact equipment such as rock drills and pile drivers can generate louder noise levels. Construction noise impacts, while temporary, can be mitigated by limiting work to daylight hours and requiring the contractor to use well-maintained equipment (particularly with respect to mufflers).

CDOT will coordinate with and acquire any necessary permits from the City of Colorado Springs per Colorado Springs Noise Ordinance (2004) Sec.9.8.107, Construction Projects, which states:

> *Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority, or if no time limitation is imposed, then for a reasonable period of time for completion of project. (Ord. 96-41; Ord. 01-42).*

ATTACHMENT A

Relevant Noise Terminology

A-Weighted Sound (dBA) - A-weighting network was developed and is applied to either measured or predicted noise levels to mimic the ear's varying sensitivity to frequency. Resulting noise levels are expressed in dBA. Table A-1 shows the A-weighted noise levels of some common noise sources.

TABLE A-1: TYPICAL NOISE LEVELS

Noise Source	Noise Level (dBA)
Amplified rock band	115 – 120
Commercial jet takeoff at 200 feet	105 – 115
Community warning siren at 100 feet	95 – 105
Busy urban street	85 – 95
Construction equipment at 50 feet	75 – 85
Freeway traffic at 50 feet	65 – 75
Normal conversation at 6 feet	55 – 65
Typical office interior	45 – 55
Soft radio music	35 – 45
Typical residential interior	25 – 35
Typical whisper at 6 feet	15 – 25
Human breathing	5 – 15
Threshold of hearing	0 – 5

Decibel (dB) – A decibel is one-tenth of a Bel. For sound pressure levels, it is a measure on a logarithmic scale, which indicates the squared ratio of sound pressure to a reference sound pressure.

Equivalent Sound Level (L_{eq}) - The equivalent steady state sound level which in a stated period of time would contain the same acoustical energy as the time-varying sound level during the same period. The time period used for highway noise analysis is one hour. All noise levels described in this report are hourly, A-weighted L_{eq}'s.

Frequency (f) - The number of oscillations per second of a periodic wave sound expressed in units of Hertz (Hz). The value is the reciprocal (1/x) of the period of oscillations in seconds. The human ear is, in general, capable of detecting frequencies between 20 to 20,000 Hertz. The human ear is more sensitive to high frequency sounds than to low frequency sounds.

Noise – Unwanted sound, usually loud or unexpected.

Noise Receptors - Areas in which people are typically located, which include places such as residences, hotels, commercial buildings, parks, etc. Usually, one noise receptor location is used to analyze an area unless the area is quite large and covers various distances from the roadway. The noise receptor is typically located on the façade of a structure that faces the noise source or roadway.

Pascal (Pa) – A unit of pressure (in acoustics, normally RMS sound pressure) equal to one Newton per square meter (N/m2). A reference pressure for a sound pressure level of 0 dB is 20 μPa (20 micro Pascal).

Sound – Caused by pressure fluctuations in the air. The range of sound pressures, which the human ear is capable of detecting, is very large (0.00002 to 200 Pascals). To facilitate easier discussion, sound pressures are described on a decibel (dB) scale.

Sound Absorption – This typically occurs when sound is converted to heat or another form of energy. A common sound absorptive material is fiberglass insulation.

Sound Pressure Level (SPL) – Sound pressure level in dB is equal to $10Log_{10}(p^2/p_o^2)$ where p is the instantaneous sound pressure and p_o is the reference sound pressure of 0.00002 Pa. This results in a scale of 0 dB (threshold of audibility) to 120 dB (threshold of pain).

Sound Reflection – The reflection of sound occurs when an object is able to significantly increase the impedance when compared to the surrounding air. This would require an object to be non-porous and to have enough density, stiffness and thickness.

Sound Transmission Loss (STL or TL) – The conversion of sound energy to another form of energy (usually heat) from one side of a barrier to the other.

ATTACHMENT B

TNM Traffic Data

TABLE B-1: TRAFFIC VOLUMES AND SPEEDS USED TO PREDICT VALIDATION NOISE LEVELS

Roadway Name	Automobiles (one-hour volume)	Medium Trucks (one-hour volume)	Heavy Trucks (one-hour volume)	Speed (mph)
14th St	1	1	1	25
21st St N of US 24	1	1	1	25
21st St S of US 24	1	1	1	25
31st St N of US 24	1	1	1	25
31st St S of US 24	1	1	1	25
8th St N of US 24	580	4	4	35
8th St S of US 24	628	8	4	35
EB 24 14th to 8th	988	20	20	45
EB 24 21st to 14th	988	20	20	45
EB 24 31st to 21st	988	20	20	45
EB 24 8th to I-25	988	16	20	35
EB 24 hills to Manitou	1	1	1	25
EB 24 Manitou Off Ramp	1	1	1	25
EB 24 Manitou On Ramp	1	1	1	25
EB 24 Manitou to Ridge	948	40	20	60
EB 24 Ridge to31st	948	40	20	50
I25 NB On Ramp	1	1	1	25
I25 NB	1	1	1	25
I25 SB On Ramp	1	1	1	25
I25 SB	1	1	1	25
Limit St	1	1	1	25
Manitou Ave	1	1	1	25
Ridge Rd N of US 24	1	1	1	25
Ridge Rd S of US 24	1	1	1	25
W Colorado 14th to Limit	1	1	1	25
W Colorado 21st to 14th	1	1	1	25
W Colorado 8th to I25	1	1	1	25
W Colorado Ridge to 31st	1	1	1	25
W Colorado US24 to Ridge	1	1	1	25
WB 24 14th to 8th	868	12	16	45
WB 24 21st to 14th	868	12	16	45
WB 24 31st to 21st	868	12	16	45
WB 24 8th to I-25	772	12	20	35
WB 24 hills to Manitou	1	1	1	25
WB 24 Manitou Ave Off Ramp	1	1	1	25
WB 24 Manitou Ave On Ramp	1	1	1	25
WB 24 Manitou to Ridge	932	16	8	60
WB 24 Ridge to 31st	932	16	8	50

TABLE B-2: TRAFFIC VOLUMES AND SPEEDS USED TO PREDICT EXISTING NOISE LEVELS

Roadway Name	Automobiles (one-hour volume)	Medium Trucks (one-hour volume)	Heavy Trucks (one-hour volume)	Speed (mph)
14th St	113	1	1	35
21st St N of US 24	965	10	5	35
21st St S of US 24	1576	16	8	35
31st St N of US 24	1334	14	7	35
31st St S of US 24	123	1	1	35
8th St N of US 24	502	5	3	35
8th St S of US 24	2467	25	13	35
EB 24 14th to 8th	1169	8	8	45
EB 24 21st to 14th	1169	8	8	45
EB 24 31st to 21st	877	9	9	45
EB 24 8th to I-25	1746	12	12	35
EB 24 hills to Manitou	685	5	5	50
EB 24 Manitou Off Ramp	30	1	1	35
EB 24 Manitou On Ramp	162	2	1	35
EB 24 Manitou to Ridge	818	6	6	50
EB 24 Ridge to31st	798	6	6	45
I25 NB	2730	120	150	60
I25 NB On Ramp	478	21	26	35
I25 SB	2730	120	150	60
I25 SB On Ramp	746	33	41	35
Limit St	611	6	3	35
Manitou Ave	995	10	5	35
Ridge Rd N of US 24	133	1	1	35
Ridge Rd S of US 24	64	1	1	35
W Colorado 14th to Limit	1443	15	7	35
W Colorado 21st to 14th	1374	14	7	35
W Colorado 8th to I25	1808	18	9	35
W Colorado Ridge to 31st	1798	18	9	35
W Colorado US24 to Ridge	1059	11	5	35
WB 24 14th to 8th	1904	13	13	45
WB 24 21st to 14th	1904	13	13	45
WB 24 31st to 21st	1690	15	15	45
WB 24 8th to I-25	1896	12	12	35
WB 24 hills to Manitou	1683	6	6	50
WB 24 Manitou Ave Off Ramp	212	2	1	35
WB 24 Manitou Ave On Ramp	79	1	1	35
WB 24 Manitou to Ridge	1803	6	6	50
WB 24 Ridge to 31st	1833	6	6	45

TABLE B-3: TRAFFIC VOLUMES AND SPEEDS USED TO PREDICT 2035 NOISE LEVELS

Roadway Name	Automobiles (one-hour volume)	Medium Trucks (one-hour volume)	Heavy Trucks (one-hour volume)	Speed (mph)
15th St	399	4	2	35
21st St N of US 24	1502	15	8	35
21st St S of US 24	2246	23	11	35
31st St N of US 24	2152	22	11	35
31st St S of US 24	295	3	2	35
8th St N of US 24	738	8	4	35
8th St NB S of US 24	1015	10	5	35
8th St SB S of US 24	1502	15	8	35
EB 24 15th to I-25	2160	15	15	45
EB 24 21st St Off Ramp	359	4	2	35
EB 24 21st St On Ramp	591	6	3	35
EB 24 21st to 15th	2456	17	17	45
EB 24 31st to 21st	2213	21	21	45
EB 24 Frontage	1276	13	6	35
EB 24 hills to Manitou	1917	14	14	45
EB 24 Manitou Off Ramp	147	2	1	35
EB 24 Manitou On Ramp	394	4	2	35
EB 24 Manitou to Ridge	2165	15	15	45
EB 24 Ridge to31st	2165	15	15	45
I25 NB	5096	224	280	60
I25 NB On Ramp 12th to 8th	1260	17	18	35
I25 NB On Ramp 8th to I25	1688	74	93	35
I25 SB	4914	216	270	60
I25 SB Off Ramp	1815	24	26	35
Limit St	872	9	4	35
Manitou Ave	1152	12	6	35
Ridge Rd N of US 24	473	5	2	35
Ridge Rd S of US 24	473	5	2	35
W Colorado 15th to Limit	1818	18	9	35
W Colorado 21st to 15th	2093	21	11	35
W Colorado 8th to I25	2329	24	12	35
W Colorado Ridge to 31st	1586	16	8	35
W Colorado US24 to Ridge	886	9	5	35
WB 24 15th to I-25	1495	10	10	45
WB 24 21st St Off Ramp	660	7	3	35
WB 24 21st St On Ramp	483	5	2	35
WB 24 21st to 15th	3060	20	20	45
WB 24 31st to 21st	2870	25	25	45
WB 24 Frontage 15th to 8th	896	9	5	35
WB 24 Frontage 8th to I-25	1719	17	9	35
WB 24 hills to Manitou	2517	9	9	45
WB 24 Manitou Ave Off Ramp	483	5	2	35
WB 24 Manitou Ave On Ramp	354	4	2	35
WB 24 Manitou to Ridge	3003	11	11	45
WB 24 Ridge to31st	3003	11	11	45

ATTACHMENT C

Existing and Proposed Action Noise Levels at Individual Locations

TABLE C-1: EXISTING AND PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD “A”

Receptor	Existing	Proposed Action	Increase
A-T01	68	65	-3
A-C02	64	75	11
A-C04	61	65	4
A-C07	61	62	1
A-C08	62	72	10
A-C09	60	63	3
A-C10	63	63	0
A-C11	64	68	4
A-C12	62	70	8
A-C13	61	64	3
A-C14	62	65	3
A-C16	61	69	8
A-C17	60	63	3
A-C18	62	64	2
A-C19	64	66	2
A-C20	63	65	2
A-C21	64	66	2
A-C22	61	63	2
A-C23	64	66	2
A-C24	63	65	2
A-C25	63	65	2
A-C26	64	65	1
A-C27	64	66	2
A-C28	59	67	8
A-R02	60	65	5
A-R03	60	64	4
A-R04	60	64	4
A-R05	57	63	6
A-R06	60	64	4
A-R07	59	64	5
A-R08	59	64	5
A-R09	59	63	4
A-R10	59	64	5
A-R12	59	63	4
A-R15	61	64	3
A-R16	60	64	4
A-R17	63	65	2
A-R18	61	64	3
A-R19	62	64	2
A-R20	59	63	4
A-R21	60	63	3
A-R22	61	64	3
A-R23	63	65	2
A-R24	62	65	3

TABLE C-1: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "A" (CONT.)

Receptor	Existing	Proposed Action	Increase
A-R25	62	65	3
A-R26	63	65	2
A-R27	63	65	2
A-R28	64	66	2
A-R29	65	67	2

TABLE C-2: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "B"

Receptor	Existing	Proposed Action	Increase
B-P01	56	59	3
B-C09	63	64	1
B-C10	63	67	4
B-C11	63	65	2
B-C12	52	53	1
B-C13	56	54	-2
B-R01	62	64	2
B-R02	61	64	3
B-R03	61	64	3
B-R04	58	62	4
B-R05	57	61	4
B-R06	57	61	4
B-R07	63	65	2
B-R08	62	64	2
B-R09	57	60	3
B-R10	61	63	2
B-R11	60	62	2
B-R12	56	60	4
B-R13	59	61	2
B-R14	57	62	5
B-R15	56	60	4
B-R16	61	64	3
B-R17	58	61	3
B-R18	56	60	4
B-R19	60	64	4
B-R20	64	65	1
B-R21	56	59	3
B-R22	56	59	3
B-R23	58	63	5
B-R24	56	59	3
B-R25	58	62	4
B-R26	56	59	3
B-R27	57	61	4
B-R28	60	64	4
B-R29	64	65	1
B-R30	56	59	3
B-R31	56	60	4
B-R32	60	65	5
B-R33	60	65	5
B-R34	56	59	3
B-R35	60	65	5
B-R36	56	59	3
B-R37	57	61	4
B-R38	60	64	4

TABLE C-2: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "B" (CONT.)

Receptor	Existing	Proposed Action	Increase
B-R39	57	60	3
B-R40	57	60	3
B-R41	58	62	4
B-R42	61	65	4
B-R43	56	60	4
B-R44	59	64	5
B-R45	56	59	3
B-R46	58	62	4
B-R47	60	64	4
B-R48	58	61	3
B-R49	59	63	4
B-R50	58	63	5
B-R51	58	61	3
B-R52	57	60	3
B-R53	58	62	4
B-R54	56	59	3
B-R55	55	59	4
B-R56	58	61	3
B-R57	57	60	3
B-R58	55	58	3
B-R59	56	59	3
B-R60	55	58	3
B-R61	56	59	3
B-R62	55	58	3
B-R63	55	58	3
B-R64	58	59	1
B-R65	55	58	3
B-R66	58	59	1
B-R67	55	58	3
B-R68	57	58	1
B-R69	55	58	3
B-R70	58	59	1
B-R71	56	58	2
B-R72	55	57	2
B-R73	55	57	2
B-R74	55	57	2
B-R75	56	57	1
B-R76	58	56	-2
B-R77	55	57	2
B-R78	55	57	2
B-R79	55	56	1
B-R80	55	56	1
B-R81	55	56	1
B-R82	56	56	0

TABLE C-2: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "B" (CONT.)

Receptor	Existing	Proposed Action	Increase
B-R83	57	56	-1
B-R84	56	57	1
B-R85	57	56	-1
B-R86	57	60	3
B-R87	55	56	1
B-R88	56	60	4
B-R89	56	56	0
B-R90	55	56	1
B-R91	54	56	2
B-R92	55	60	5
B-R93	54	57	3
B-R94	54	56	2
B-R95	54	57	3
B-R96	54	58	4
B-R97	54	60	6
B-R98	54	57	3
B-R99	53	59	6
B-R100	53	60	7
B-R101	54	57	3
B-R102	54	58	4
B-R103	54	59	5
B-R104	54	62	8
B-R105	55	62	7
B-R106	57	62	5
B-R107	64	67	3
B-R108	64	67	3
B-R109	63	67	4

TABLE C-3: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "C"

Name	Existing	Proposed Action	Increase
C-T01	59	63	4
C-T02	64	64	0
C-C07	58	62	4
C-C08	63	65	2
C-C09	63	65	2
C-C10	59	62	3
C-C11	61	64	3
C-C12	61	64	3
C-R01	59	62	3
C-R02	59	61	2
C-R03	56	58	2
C-R04	58	61	3
C-R05	56	58	2
C-R06	62	65	3
C-R07	62	64	2
C-R08	57	59	2
C-R09	58	60	2
C-R10	62	64	2
C-R11	56	58	2
C-R12	59	61	2
C-R13	58	60	2
C-R14	58	60	2
C-R15	61	64	3
C-R16	58	60	2
C-R17	57	59	2
C-R18	60	63	3
C-R19	61	64	3
C-R20	59	62	3
C-R21	58	61	3
C-R22	58	60	2
C-R23	57	59	2
C-R24	58	60	2
C-R25	61	64	3
C-R26	57	59	2
C-R27	60	63	3
C-R28	59	61	2
C-R29	59	61	2
C-R30	58	61	3
C-R31	62	64	2
C-R32	60	63	3
C-R33	58	60	2
C-R34	59	62	3
C-R35	59	61	2
C-R36	57	59	2

TABLE C-3: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "C" (CONT.)

Name	Existing	Proposed Action	Increase
C-R37	61	63	2
C-R38	59	62	3
C-R39	62	64	2
C-R40	60	62	2
C-R41	59	62	3
C-R42	61	64	3
C-R43	58	60	2
C-R44	60	63	3
C-R45	58	60	2
C-R46	60	62	2
C-R47	59	62	3
C-R48	61	64	3
C-R49	62	65	3
C-R50	59	61	2
C-R51	61	63	2
C-R52	60	63	3
C-R53	58	60	2
C-R54	63	65	2
C-R55	61	64	3
C-R56	62	65	3
C-R57	59	62	3
C-R58	61	63	2
C-R59	63	65	2
C-R60	62	64	2
C-R61	59	61	2
C-R62	63	66	3
C-R63	60	62	2
C-R64	62	64	2
C-R65	63	65	2
C-R66	61	63	2
C-R67	60	62	2
C-R68	62	65	3
C-R69	60	62	2
C-R70	63	65	2
C-R71	62	64	2
C-R72	61	63	2
C-R73	62	64	2
C-R74	62	64	2
C-R75	62	64	2
C-R76	63	65	2

TABLE C-4: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "D"

Receptor	Existing	Proposed Action	Increase
D-R01	62	65	3
D-R02	61	64	3
D-R03	60	63	3
D-R04	60	63	3
D-R05	60	63	3
D-R06	57	60	3
D-R07	58	61	3
D-R08	58	61	3
D-R09	55	58	3
D-R10	55	60	5
D-R11	54	57	3
D-R12	54	57	3
D-R13	53	60	7
D-R14	53	56	3
D-R15	54	58	4
D-R16	53	59	6
D-R17	58	63	5
D-R18	55	59	4
D-R19	53	58	5
D-R20	53	57	4
D-R21	55	59	4
D-R22	55	59	4
D-R23	53	56	3
D-R24	53	56	3
D-R25	58	63	5
D-R26	55	60	5
D-R27	54	62	8
D-R28	58	63	5
D-R29	53	56	3
D-R30	54	59	5
D-R31	53	56	3
D-R32	58	62	4
D-R33	52	56	4
D-R34	55	59	4
D-R35	54	58	4
D-R36	57	62	5
D-R37	55	60	5
D-R38	53	57	4
D-R39	52	56	4
D-R40	54	58	4
D-R41	58	63	5
D-R42	55	59	4
D-R43	52	56	4
D-R44	53	57	4
D-R45	52	56	4
D-R46	59	63	4
D-R47	55	60	5

TABLE C-4: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Existing	Proposed Action	Increase
D-R48	57	61	4
D-R49	52	56	4
D-R50	53	57	4
D-R51	52	56	4
D-R52	53	57	4
D-R53	55	60	5
D-R54	62	64	2
D-R55	53	57	4
D-R56	56	60	4
D-R58	61	63	2
D-R59	62	64	2
D-R60	60	62	2
D-R61	55	59	4
D-R62	53	57	4
D-R63	52	56	4
D-R64	55	59	4
D-R65	53	57	4
D-R66	53	56	3
D-R67	56	60	4
D-R68	57	61	4
D-R69	53	56	3
D-R71	53	56	3
D-R72	52	57	5
D-R73	52	56	4
D-R74	57	61	4
D-R75	53	57	4
D-R76	52	56	4
D-R77	53	57	4
D-R78	52	57	5
D-R79	53	57	4
D-R80	55	59	4
D-R81	52	56	4
D-R82	56	60	4
D-R83	52	56	4
D-R84	57	61	4
D-R85	55	59	4
D-R87	53	57	4
D-R88	55	59	4
D-R89	53	56	3
D-R90	53	57	4
D-R91	53	56	3
D-R93	53	56	3
D-R94	52	56	4
D-R95	55	59	4
D-R96	53	56	3
D-R97	52	56	4
D-R98	54	58	4
D-R99	53	57	4

TABLE C-4: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Existing	Proposed Action	Increase
D-R100	53	56	3
D-R101	53	57	4
D-R102	56	60	4
D-R103	53	56	3
D-R104	55	59	4
D-R106	61	66	5
D-R107	53	56	3
D-R108	52	56	4
D-R109	55	59	4
D-R110	53	57	4
D-R112	53	56	3
D-R113	60	65	5
D-R114	55	58	3
D-R115	53	57	4
D-R116	55	58	3
D-R117	63	62	-1
D-R118	53	57	4
D-R119	53	56	3
D-R120	60	65	5
D-R121	55	58	3
D-R122	53	57	4
D-R123	52	56	4
D-R125	53	57	4
D-R126	55	58	3
D-R127	53	57	4
D-R128	55	58	3
D-R129	53	56	3
D-R130	53	56	3
D-R131	59	63	4
D-R132	53	57	4
D-R133	53	56	3
D-R134	53	56	3
D-R135	59	63	4
D-R136	53	57	4
D-R137	55	59	4
D-R138	53	56	3
D-R139	59	62	3
D-R140	55	59	4
D-R141	53	56	3
D-R142	53	57	4
D-R143	53	57	4
D-R144	53	56	3
D-R145	53	56	3
D-R146	56	59	3
D-R147	53	57	4
D-R148	58	61	3
D-R149	53	56	3
D-R150	56	59	3

TABLE C-4: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Existing	Proposed Action	Increase
D-R151	53	56	3
D-R152	53	58	5
D-R153	56	59	3
D-R154	57	60	3
D-R155	53	57	4
D-R156	53	56	3
D-R157	56	59	3
D-R158	53	56	3
D-R159	53	56	3
D-R160	54	58	4
D-R161	53	57	4
D-R162	56	59	3
D-R163	53	57	4
D-R164	56	59	3
D-R165	54	58	4
D-R166	58	60	2
D-R167	53	57	4
D-R168	53	57	4
D-R169	54	58	4
D-R170	53	57	4
D-R171	53	57	4
D-R172	54	58	4
D-R173	53	58	5
D-R174	53	57	4
D-R175	53	57	4
D-R176	58	60	2
D-R177	54	58	4
D-R178	54	57	3
D-R179	59	60	1
D-R180	53	57	4
D-R181	54	58	4
D-R182	53	57	4
D-R183	55	59	4
D-R184	53	57	4
D-R185	53	57	4
D-R186	53	57	4
D-R187	55	58	3
D-R188	53	57	4
D-R189	55	59	4
D-R190	54	58	4
D-R191	54	58	4
D-R192	55	59	4
D-R193	55	57	2
D-R194	54	58	4
D-R195	54	58	4
D-R196	55	59	4
D-R197	54	58	4
D-R198	54	58	4

TABLE C-4: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Existing	Proposed Action	Increase
D-R199	54	58	4
D-R200	54	58	4
D-R201	54	58	4
D-R202	54	58	4
D-R203	53	56	3
D-R204	53	58	5
D-R205	54	58	4
D-R206	54	58	4
D-R207	55	59	4
D-R208	54	58	4
D-R209	54	58	4
D-R210	55	58	3
D-R211	58	59	1
D-R212	54	58	4
D-R213	55	59	4
D-R214	55	60	5
D-R215	55	59	4
D-R216	55	59	4
D-R217	55	59	4
D-R218	56	60	4
D-R219	57	61	4
D-R220	59	61	2
D-R221	60	62	2
D-R222	63	65	2

TABLE C-5: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "E"

Receptor	Existing	Proposed Action	Increase
E-P01	60	63	3
E-P02	58	62	4
E-P03	65	68	3
E-C08	62	65	3
E-C09	62	66	4
E-C10	62	65	3
E-C11	60	63	3
E-C14	59	62	3
E-C15	55	59	4
E-C16	54	60	6
E-C17	55	60	5
E-C18	56	61	5
E-C19	56	60	4
E-C20	58	61	3
E-C21	58	62	4
E-C22	57	61	4
E-C23	63	65	2
E-C24	53	58	5
E-C25	53	57	4
E-C26	53	57	4
E-C27	53	57	4
E-C28	53	57	4
E-C29	54	58	4
E-C30	54	58	4
E-C31	55	59	4
E-C32	55	59	4
E-C33	53	57	4
E-C34	53	57	4
E-C35	52	57	5
E-C36	54	58	4
E-C37	54	58	4
E-C38	55	59	4
E-C39	53	58	5
E-C40	56	60	4
E-C41	57	61	4
E-C42	58	62	4
E-C43	59	63	4
E-C44	60	63	3
E-R01	65	67	2
E-R02	61	63	2
E-R03	60	62	2
E-R04	58	61	3
E-R05	53	58	5
E-R06	57	60	3

TABLE C-5: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "E" (CONT.)

Receptor	Existing	Proposed Action	Increase
E-R07	52	57	5
E-R08	52	58	6
E-R09	52	58	6
E-R10	52	57	5
E-R11	53	58	5
E-R12	53	58	5
E-R13	52	57	5
E-R14	52	58	6
E-R16	53	58	5
E-R17	52	56	4
E-R18	54	59	5
E-R19	52	57	5
E-R20	54	59	5
E-R22	52	56	4
E-R23	53	58	5
E-R24	54	60	6
E-R25	51	56	5
E-R26	60	64	4
E-R27	54	59	5
E-R28	52	56	4
E-R29	52	56	4
E-R30	54	59	5
E-R31	51	56	5
E-R32	54	59	5
E-R33	52	56	4
E-R34	54	59	5
E-R35	52	56	4
E-R36	51	56	5
E-R37	54	59	5
E-R38	51	56	5
E-R39	51	56	5
E-R40	57	62	5
E-R41	53	58	5
E-R42	51	56	5
E-R43	57	62	5
E-R44	52	56	4
E-R45	58	62	4
E-R46	57	62	5
E-R47	53	58	5
E-R48	55	59	4
E-R49	58	62	4
E-R50	52	56	4
E-R51	53	57	4
E-R52	57	62	5

TABLE C-5: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "E" (CONT.)

Receptor	Existing	Proposed Action	Increase
E-R53	58	62	4
E-R54	51	56	5
E-R55	54	59	5
E-R56	59	63	4
E-R57	52	56	4
E-R58	55	59	4
E-R59	53	57	4
E-R60	55	59	4
E-R61	58	62	4
E-R62	55	59	4
E-R63	58	61	3
E-R64	55	60	5
E-R65	54	59	5
E-R66	54	59	5
E-R67	60	63	3
E-R68	54	59	5
E-R69	54	58	4
E-R70	59	62	3
E-R71	63	66	3
E-R72	55	60	5
E-R73	60	63	3
E-R74	61	64	3
E-R75	55	60	5
E-R77	56	61	5
E-R78	54	59	5
E-R79	56	61	5
E-R80	53	57	4
E-R81	61	64	3
E-R82	57	62	5
E-R83	55	60	5
E-R84	53	58	5
E-R85	58	62	4
E-R86	53	57	4
E-R87	57	62	5
E-R88	54	58	4
E-R89	57	62	5
E-R91	57	61	4
E-R92	61	64	3
E-R93	60	63	3
E-R94	60	63	3
E-R95	60	63	3
E-R96	60	64	4
E-R97	58	62	4
E-R98	59	63	4

TABLE C-5: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "E" (CONT.)

Receptor	Existing	Proposed Action	Increase
E-R99	60	63	3
E-R100	59	62	3
E-R101	59	62	3
E-R102	58	61	3
E-R103	56	60	4
E-R104	56	60	4
E-R105	55	59	4
E-R106	55	59	4
E-R107	55	60	5
E-R108	56	60	4
E-R109	56	60	4
E-R110	57	61	4
E-R111	59	62	3
E-R112	56	60	4
E-R113	56	60	4
E-R114	56	60	4

TABLE C-6: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "F"

Receptor	Existing	Proposed Action	Increase
F-C02	66	64	-2
F-C03	61	61	0
F-C04	60	62	2
F-C05	66	67	1
F-C06	63	65	2
F-C07	65	66	1
F-C08	61	64	3
F-C09	63	67	4
F-C10	62	66	4
F-C11	65	68	3
F-C12	65	68	3
F-C13	65	68	3
F-C14	66	69	3
F-C16	57	61	4
F-C17	55	58	3
F-C18	48	50	2
F-C19	54	58	4
F-C20	57	60	3
F-C21	53	56	3
F-C22	51	54	3
F-C23	50	52	2
F-C24	53	56	3
F-C25	58	61	3
F-C26	63	65	2
F-C27	64	65	1
F-C28	62	64	2
F-C29	58	61	3
F-C30	56	60	4
F-C31	54	59	5
F-C32	54	57	3
F-C33	50	53	3
F-C34	54	57	3
F-R01	54	59	5
F-R02	54	59	5
F-R03	54	59	5
F-R04	54	59	5
F-R05	52	57	5
F-R06	53	58	5
F-R07	50	55	5
F-R08	52	56	4
F-R09	50	55	5
F-R10	50	55	5
F-R11	50	54	4
F-R12	49	53	4

TABLE C-6: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD “F” (CONT.)

Receptor	Existing	Proposed Action	Increase
F-R13	49	53	4
F-R14	49	53	4
F-R15	50	53	3
F-R16	50	53	3
F-R17	54	57	3
F-R18	54	57	3
F-R19	53	56	3
F-R20	53	56	3
F-R21	53	56	3
F-R22	52	55	3
F-R23	54	56	2
F-R24	54	56	2
F-R25	54	56	2
F-R26	52	55	3
F-R27	51	55	4
F-R28	51	55	4
F-R29	54	57	3
F-R30	51	55	4
F-R31	54	57	3
F-R32	54	57	3
F-R33	56	59	3
F-R34	53	56	3
F-R35	56	59	3
F-R36	49	54	5
F-R37	53	56	3
F-R38	49	53	4
F-R39	56	59	3
F-R40	58	61	3
F-R41	50	54	4
F-R42	56	59	3
F-R43	48	52	4
F-R44	55	58	3
F-R45	51	55	4
F-R46	55	58	3
F-R47	47	51	4
F-R48	49	53	4
F-R49	57	60	3
F-R50	48	52	4
F-R51	49	53	4
F-R52	46	50	4
F-R53	47	51	4
F-R54	48	52	4
F-R55	54	57	3
F-R56	48	52	4

TABLE C-6: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "F" (CONT.)

Receptor	Existing	Proposed Action	Increase
F-R57	55	58	3
F-R58	48	52	4
F-R59	48	52	4
F-R60	56	59	3
F-R61	48	52	4
F-R62	57	60	3
F-R63	64	67	3
F-R64	64	67	3

TABLE C-7: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "G"

Receptor	Existing	Proposed Action	Increase
G-T01	63	61	-2
G-C01	63	64	1
G-C02	64	64	0
G-C03	63	64	1
G-C04	61	62	1
G-C05	64	64	0
G-C06	61	62	1
G-C07	62	63	1
G-C08	62	63	1
G-C09	61	62	1
G-C12	62	62	0
G-C13	61	62	1
G-C14	62	62	0
G-C15	61	61	0
G-R01	59	60	1
G-R02	61	62	1
G-R03	59	60	1
G-R04	59	60	1
G-R05	62	59	-3
G-R06	60	61	1
G-R07	60	61	1
G-R08	61	62	1
G-R09	61	62	1
G-R10	61	62	1
G-R11	60	58	-2
G-R12	59	58	-1
G-R13	61	60	-1
G-R15	57	58	1
G-R19	62	62	0
G-R20	60	60	0
G-R21	60	60	0
G-R22	60	60	0
G-R23	60	59	-1
G-R24	60	59	-1
G-R25	57	58	1
G-R26	59	59	0
G-R27	60	60	0
G-R28	61	60	-1
G-R29	60	60	0
G-R30	59	59	0
G-R31	61	61	0
G-R32	61	60	-1
G-R33	60	59	-1

TABLE C-7: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "G" (CONT.)

Receptor	Existing	Proposed Action	Increase
G-R34	60	60	0
G-R35	59	60	1
G-R36	60	60	0
G-R37	60	60	0
G-R38	57	57	0
G-R39	61	61	0
G-R40	61	61	0
G-R42	60	60	0
G-R43	62	62	0
G-R44	62	62	0
G-R45	60	60	0
G-R46	62	62	0
G-R47	61	61	0
G-R48	62	62	0
G-R49	61	61	0
G-R50	61	61	0
G-R51	60	61	1
G-R52	62	62	0
G-R53	61	61	0
G-R54	60	61	1
G-R55	60	60	0
G-R56	64	63	-1
G-R57	60	60	0
G-R58	62	62	0
G-R59	62	62	0
G-R60	60	61	1
G-R61	61	61	0
G-R62	62	62	0
G-R63	61	61	0
G-R64	60	60	0
G-R65	60	60	0
G-R66	61	61	0
G-R67	62	63	1
G-R68	64	63	-1
G-R69	62	62	0
G-R70	62	62	0
G-R71	62	63	1
G-R72	62	62	0
G-R73	62	62	0
G-R74	62	62	0
G-R75	64	63	-1
G-R76	62	62	0
G-R77	64	63	-1
G-R78	62	62	0

TABLE C-7: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "G" (CONT.)

Receptor	Existing	Proposed Action	Increase
G-R79	62	62	0
G-R80	62	62	0
G-R81	64	64	0
G-R82	62	62	0
G-R83	64	64	0
G-R84	64	64	0
G-R85	64	64	0
G-R86	64	64	0
G-R87	64	64	0
G-R88	60	60	0
G-R89	59	58	-1
G-R90	61	62	1
G-R91	63	63	0
G-R92	60	60	0
G-R93	57	58	1
G-R94	60	60	0
G-R95	59	59	0
G-R96	62	62	0
G-R97	61	61	0

TABLE C-8: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "H"

Receptor	Existing	Proposed Action	Increase
H-C01	59	61	2
H-R01	55	56	1
H-R02	55	56	1
H-R03	55	56	1
H-R04	55	56	1
H-R05	55	56	1
H-R06	57	58	1
H-R07	56	58	2
H-R08	56	58	2
H-R09	56	58	2
H-R10	56	58	2
H-R11	59	61	2
H-R12	59	61	2
H-R13	59	61	2
H-R14	56	59	3
H-R15	56	59	3
H-R16	57	59	2
H-R17	56	58	2
H-R18	58	61	3
H-R19	57	59	2
H-R20	56	58	2
H-R21	59	60	1
H-R22	57	59	2
H-R23	60	63	3
H-R24	58	60	2
H-R25	57	59	2
H-R26	57	60	3
H-R27	58	60	2
H-R28	67	65	-2
H-R29	66	68	2
H-R30	58	61	3
H-R31	58	60	2
H-R32	61	63	2
H-R33	67	69	2
H-R33	67	69	2
H-R33	67	69	2
H-R33	67	69	2
H-R34	69	70	1
H-R35	66	68	2
H-R35	66	68	2
H-R35	66	68	2
H-R35	66	68	2
H-R35	66	68	2
H-R35	66	68	2

TABLE C-8: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "H" (CONT.)

Receptor	Existing	Proposed Action	Increase
H-R35	66	68	2
H-R35	66	68	2
H-R36	63	66	3
H-R37	62	63	1
H-R38	60	62	2
H-R39	64	65	1
H-R40	65	68	3
H-R41	62	64	2
H-R42	63	64	1
H-R43	64	66	2
H-R44	59	61	2
H-R45	65	67	2
H-R46	55	58	3
H-R47	57	59	2
H-R48	57	59	2
H-R49	57	59	2
H-R50	53	55	2
H-R51	58	60	2
H-R52	55	58	3
H-R53	51	54	3
H-R54	60	61	1
H-R55	57	59	2
H-R56	61	64	3
H-R57	62	65	3
H-R58	60	62	2
H-R59	63	65	2
H-R60	65	68	3
H-R61	62	62	0
H-R62	63	63	0
H-R63	64	65	1
H-R64	65	67	2
H-R65	65	66	1
H-R66	64	64	0

TABLE C-9: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "I"

Receptor	Existing	Proposed Action	Increase
I-R01	56	57	1
I-R02	55	57	2
I-R03	55	56	1
I-R04	54	56	2
I-R05	54	56	2
I-R06	54	56	2
I-R07	55	57	2

TABLE C-10: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "J"

Receptor	Existing	Proposed Action	Increase
J-P01	59	59	0
J-R02	52	54	2
J-R03	53	55	2
J-R04	52	54	2
J-R05	58	60	2
J-R06	54	56	2
J-R07	62	64	2
J-R08	59	61	2
J-R09	54	56	2
J-R10	56	58	2
J-R11	63	64	1
J-R12	61	63	2
J-R13	58	60	2
J-R14	56	58	2
J-R15	63	65	2
J-R16	61	63	2
J-R17	53	55	2
J-R18	63	65	2
J-R19	59	61	2

TABLE C-11: EXISTING VS. PROPOSED ACTION NOISE LEVELS – NEIGHBORHOOD "K"

Receptor	Existing	Proposed Action	Increase
K-T01	60	64	4
K-T02	59	61	2
K-T03	57	58	1

ATTACHMENT D

Noise Level Reductions From Proposed Walls at Individual Locations

TABLE D-1: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "B"

Receptor	Row	Proposed Action	W/Walls	Reduction
B-R107	1st	67	57	10
B-R108	1st	67	57	10
B-R109	1st	67	58	9
B-R08	2nd	64	64	0
B-R16	2nd	64	64	0
B-R19	2nd	64	63	1
B-R23	2nd	63	60	3
B-R28	2nd	64	59	5
B-R32	2nd	65	59	6
B-R33	2nd	65	59	6
B-R35	2nd	65	59	6
B-R38	2nd	64	58	6
B-R42	2nd	65	58	7
B-R47	2nd	64	57	7
B-R50	2nd	63	56	7
B-R53	2nd	62	56	6
B-R56	2nd	61	54	7
B-R64	2nd	59	54	5
B-R66	2nd	59	54	5
B-R70	2nd	59	54	5
B-R76	2nd	56	53	3
B-R14	3rd	62	61	1
B-R18	3rd	60	60	0
B-R21	3rd	59	59	0
B-R22	3rd	59	59	0
B-R24	3rd	59	59	0
B-R25	3rd	62	59	3
B-R26	3rd	59	58	1
B-R27	3rd	61	59	2
B-R30	3rd	59	58	1
B-R31	3rd	60	58	2
B-R34	3rd	59	58	1
B-R36	3rd	59	58	1
B-R37	3rd	61	58	3
B-R39	3rd	60	57	3
B-R40	3rd	60	57	3
B-R41	3rd	62	57	5
B-R43	3rd	60	57	3
B-R44	3rd	64	57	7
B-R45	3rd	59	57	2
B-R46	3rd	62	57	5
B-R48	3rd	61	57	4
B-R49	3rd	63	57	6
B-R51	3rd	61	56	5
B-R52	3rd	60	56	4

TABLE D-1: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD “B” (CONT.)

Receptor	Row	Proposed Action	W/Walls	Reduction
B-R54	3rd	59	55	4
B-R55	3rd	59	55	4
B-R57	3rd	60	55	5
B-R58	3rd	58	55	3
B-R59	3rd	59	55	4
B-R60	3rd	58	55	3
B-R61	3rd	59	55	4
B-R62	3rd	58	55	3
B-R63	3rd	58	55	3
B-R65	3rd	58	55	3
B-R67	3rd	58	55	3
B-R68	3rd	58	54	4
B-R69	3rd	58	54	4
B-R71	3rd	58	54	4
B-R72	3rd	57	54	3
B-R73	3rd	57	54	3
B-R74	3rd	57	54	3
B-R75	3rd	57	54	3
B-R77	3rd	57	54	3
B-R78	3rd	57	54	3
B-R79	3rd	56	54	2
B-R80	3rd	56	54	2
B-R81	3rd	56	54	2
B-R82	3rd	56	53	3

TABLE D-2: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "C"

Receptor	Row	Proposed Action	W/Walls	Reduction
C-R06	1st	65	59	6
C-R07	1st	64	59	5
C-R10	1st	64	58	6
C-R15	1st	64	58	6
C-R19	1st	64	57	7
C-R25	1st	64	57	7
C-R31	1st	64	57	7
C-R39	1st	64	56	8
C-R54	1st	65	56	9
C-R59	1st	65	56	9
C-R62	1st	66	56	10
C-R65	1st	65	56	9
C-R68	1st	65	56	9
C-R70	1st	65	55	10
C-R71	1st	64	55	9
C-R73	1st	64	55	9
C-R75	1st	64	56	8
C-R76	1st	65	57	8
C-R49	2nd	65	56	9
C-R56	2nd	65	56	9
C-R60	2nd	64	55	9
C-R64	2nd	64	56	8
C-R74	2nd	64	56	8
C-R01	3+	62	58	4
C-R02	3+	61	57	4
C-R03	3+	58	55	3
C-R04	3+	61	56	5
C-R05	3+	58	55	3
C-R08	3+	59	55	4
C-R09	3+	60	55	5
C-R11	3+	58	55	3
C-R12	3+	61	56	5
C-R13	3+	60	55	5
C-R14	3+	60	55	5
C-R16	3+	60	55	5
C-R17	3+	59	55	4
C-R18	3+	63	56	7
C-R20	3+	62	56	6
C-R21	3+	61	55	6
C-R22	3+	60	55	5
C-R23	3+	59	55	4
C-R24	3+	60	55	5
C-R26	3+	59	55	4

TABLE D-2: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "C" (CONT.)

Receptor	Row	Proposed Action	W/Walls	Reduction
C-R27	3+	63	56	7
C-R28	3+	61	55	6
C-R29	3+	61	55	6
C-R30	3+	61	55	6
C-R32	3+	63	56	7
C-R33	3+	60	55	5
C-R34	3+	62	55	7
C-R35	3+	61	55	6
C-R36	3+	59	55	4
C-R37	3+	63	56	7
C-R38	3+	62	56	6
C-R40	3+	62	55	7
C-R41	3+	62	55	7
C-R42	3+	64	56	8
C-R43	3+	60	55	5
C-R44	3+	63	55	8
C-R45	3+	60	56	4
C-R46	3+	62	55	7
C-R47	3+	62	55	7
C-R48	3+	64	55	9
C-R50	3+	61	55	6
C-R51	3+	63	55	8
C-R52	3+	63	55	8
C-R53	3+	60	56	4
C-R55	3+	64	55	9
C-R57	3+	62	55	7
C-R58	3+	63	55	8
C-R61	3+	61	56	5
C-R63	3+	62	55	7
C-R66	3+	63	55	8
C-R67	3+	62	56	6
C-R69	3+	62	56	6
C-R72	3+	63	56	7

TABLE D-3: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "D"

Receptor	Row	Proposed Action	W/Walls	Reduction
D-R117	1st	62	56	6
D-R106	2nd	66	60	6
D-R113	2nd	65	59	6
D-R120	2nd	65	59	6
D-R166	2nd	60	55	5
D-R176	2nd	60	55	5
D-R179	2nd	60	56	4
D-R131	3+	63	58	5
D-R135	3+	63	58	5
D-R139	3+	62	57	5
D-R148	3+	61	57	4
D-R154	3+	60	56	4
D-R162	3+	59	55	4
D-R183	3+	59	55	4
D-R189	3+	59	55	4
D-R192	3+	59	55	4
D-R137	3+	59	56	3
D-R140	3+	59	56	3
D-R146	3+	59	56	3
D-R150	3+	59	56	3
D-R152	3+	58	55	3
D-R153	3+	59	56	3
D-R157	3+	59	56	3
D-R160	3+	58	55	3
D-R164	3+	59	56	3
D-R165	3+	58	55	3
D-R169	3+	58	55	3
D-R172	3+	58	55	3
D-R173	3+	58	55	3
D-R177	3+	58	55	3
D-R181	3+	58	55	3
D-R187	3+	58	55	3
D-R190	3+	58	55	3
D-R191	3+	58	55	3
D-R193	3+	57	54	3
D-R194	3+	58	55	3
D-R195	3+	58	55	3
D-R196	3+	59	56	3
D-R197	3+	58	55	3
D-R198	3+	58	55	3
D-R199	3+	58	55	3
D-R200	3+	58	55	3
D-R207	3+	59	56	3
D-R213	3+	59	56	3
D-R102	3+	60	58	2

TABLE D-3: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Row	Proposed Action	W/Walls	Reduction
D-R147	3+	57	55	2
D-R155	3+	57	55	2
D-R161	3+	57	55	2
D-R163	3+	57	55	2
D-R167	3+	57	55	2
D-R168	3+	57	55	2
D-R170	3+	57	55	2
D-R171	3+	57	55	2
D-R174	3+	57	55	2
D-R175	3+	57	55	2
D-R180	3+	57	55	2
D-R182	3+	57	55	2
D-R184	3+	57	55	2
D-R185	3+	57	55	2
D-R186	3+	57	55	2
D-R188	3+	57	55	2
D-R201	3+	58	56	2
D-R202	3+	58	56	2
D-R204	3+	58	56	2
D-R205	3+	58	56	2
D-R206	3+	58	56	2
D-R209	3+	58	56	2
D-R212	3+	58	56	2
D-R214	3+	60	58	2
D-R215	3+	59	57	2
D-R216	3+	59	57	2
D-R78	3+	57	56	1
D-R84	3+	61	60	1
D-R95	3+	59	58	1
D-R104	3+	59	58	1
D-R109	3+	59	58	1
D-R114	3+	58	57	1
D-R116	3+	58	57	1
D-R121	3+	58	57	1
D-R122	3+	57	56	1
D-R125	3+	57	56	1
D-R126	3+	58	57	1
D-R127	3+	57	56	1
D-R128	3+	58	57	1
D-R132	3+	57	56	1
D-R136	3+	57	56	1
D-R141	3+	56	55	1
D-R142	3+	57	56	1
D-R143	3+	57	56	1
D-R145	3+	56	55	1

TABLE D-3: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "D" (CONT.)

Receptor	Row	Proposed Action	W/Walls	Reduction
D-R149	3+	56	55	1
D-R151	3+	56	55	1
D-R156	3+	56	55	1
D-R158	3+	56	55	1
D-R159	3+	56	55	1
D-R178	3+	57	56	1
D-R203	3+	56	55	1
D-R208	3+	58	57	1
D-R210	3+	58	57	1
D-R217	3+	59	58	1
D-R218	3+	60	59	1
D-R219	3+	61	60	1
D-R222	3+	65	64	1

TABLE D-4: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "E"

Receptor	Row	Proposed Action	W/Walls	Reduction
E-R71	1st	66	57	9
E-R40	2nd	62	61	1
E-R43	2nd	62	61	1
E-R45	2nd	62	62	0
E-R46	2nd	62	61	1
E-R49	2nd	62	62	0
E-R52	2nd	62	61	1
E-R53	2nd	62	62	0
E-R56	2nd	63	62	1
E-R61	2nd	62	60	2
E-R63	2nd	61	60	1
E-R67	2nd	63	59	4
E-R70	2nd	62	59	3
E-R73	2nd	63	57	6
E-R74	2nd	64	56	8
E-R81	2nd	64	57	7
E-R26	3+	64	63	1
E-R48	3+	59	59	0
E-R55	3+	59	58	1
E-R58	3+	59	58	1
E-R60	3+	59	58	1
E-R62	3+	59	59	0
E-R64	3+	60	59	1
E-R66	3+	59	58	1
E-R68	3+	59	58	1
E-R72	3+	60	58	2
E-R75	3+	60	57	3
E-R77	3+	61	57	4
E-R78	3+	59	55	4
E-R79	3+	61	57	4
E-R82	3+	62	57	5
E-R83	3+	60	56	4
E-R85	3+	62	56	6
E-R87	3+	62	56	6
E-R89	3+	62	55	7
E-R91	3+	61	55	6
E-R92	3+	64	58	6
E-R93	3+	63	58	5
E-R80	3+	57	54	3
E-R84	3+	58	54	4
E-R86	3+	57	54	3
E-R88	3+	58	54	4
E-R94	3+	63	59	4
E-R95	3+	63	58	5
E-R96	3+	64	59	5

TABLE D-4: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD “E” (CONT.)

Receptor	Row	Proposed Action	W/Walls	Reduction
E-R97	3+	62	57	5
E-R98	3+	63	58	5
E-R99	3+	63	59	4
E-R100	3+	62	58	4
E-R101	3+	62	58	4
E-R102	3+	61	57	4
E-R103	3+	60	56	4
E-R104	3+	60	56	4
E-R105	3+	59	55	4

TABLE D-5: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "H" – EAST WALL

Receptor	Row	Proposed Action	W/Walls	Reduction
H-R34	1st	70	56	14
H-R33	1st	69	57	12
H-R33	1st	69	57	12
H-R33	1st	69	57	12
H-R33	1st	69	57	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R35	1st	68	56	12
H-R29	1st	68	58	10
H-R36	1st	66	56	10
H-R40	1st	68	58	10
H-R28	1st	65	58	7
H-R23	2nd	63	58	5
H-R26	2nd	60	55	5
H-R22	2nd	59	55	4
H-R19	2nd	59	56	3
H-R16	2nd	59	57	2
H-R13	3+	61	56	5
H-R18	3+	61	56	5
H-R07	3+	58	55	3
H-R09	3+	58	55	3
H-R10	3+	58	55	3
H-R14	3+	59	56	3
H-R15	3+	59	56	3
H-R02	3+	56	54	2
H-R03	3+	56	54	2
H-R04	3+	56	54	2
H-R05	3+	56	54	2
H-R06	3+	58	56	2
H-R08	3+	58	56	2
H-R01	3+	56	55	1
H-R12	3+	61	60	1

TABLE D-6: PROPOSED ACTION VS. MITIGATION NOISE LEVELS – NEIGHBORHOOD "H" – WEST WALL

Receptor	Row	Proposed Action	W/Walls	Reduction
H-R60	1st	68	58	10
H-R57	1st	65	56	9
H-R64	1st	67	61	6
H-R65	1st	66	62	4
H-R56	2nd	64	57	7
H-R59	2nd	65	60	5
H-R63	2nd	65	61	4
H-R54	2nd	61	59	2
H-R66	2nd	64	63	1
H-R52	3+	58	53	5
H-R51	3+	60	58	2
H-R62	3+	63	61	2
H-R50	3+	55	52	3
H-R28	3+	65	63	2
H-R46	3+	58	57	1
H-R48	3+	59	58	1
H-R49	3+	59	58	1
H-R53	3+	54	52	2
H-R55	3+	59	58	1
H-R58	3+	62	61	1
H-R61	3+	62	61	1
H-R47	3+	59	58	1

ATTACHMENT E

NAD Forms

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area A Residences

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? . . N/A
   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). . N/A	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level . . . . N/A	☐ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires . . . . N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*) . . . . N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more) . N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level . N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

E. DECISION:

1. Are noise mitigation measures feasible? . . . ☐ YES ☑ NO
2. Are noise mitigation measures reasonable? . . . N/A ☐ 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

Noise walls are not feasible at the residences, as they have direct access to the street from which they would need shielding (8th Street or Colorado Avenue). Therefore, noise walls are considered infeasible in Area A and are not recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area A Commercial Receptors

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 N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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

There is no outdoor use at the affected commercial receivers that would significantly benefit from noise mitigation. Also, noise from I-25 is the primary source here, and that is not part of this project. In consideration of these factors, noise mitigation is not recommended.

Completed by:	Date:
Hankard Environmental Inc	*March 11, 2010*

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area B, 11th St. to 14th St.

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 . . assumed	☑ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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

A continuous wall is possible at this site. The wall is predicted to provide an average of 10 dBA of noise reduction at front row receivers, and a maximum reduction of 10 dBA. Therefore, this wall is considered feasible. There would be 51 benefited receptors and the wall would provide a cost benefit of $3,730. Therefore the wall would be reasonable.

Completed by:	Date:
Hankard Environmental Inc	*March 11, 2010*

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area C, A-1 Mobile Home 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 . . assumed	☑ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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

A continuous wall is possible at this site. The wall is predicted to provide an average of 8 dBA of noise reduction at front row receivers, a maximum reduction of 10 dBA, and a cost benefit of $1,300. Therefore, this wall is considered feasible and reasonable and is recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION

NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area D, 18th St. to 21st St.

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 assumed	☑ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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 wall is predicted to provide an average of 6 dBA of noise reduction at front row receivers, and a maximum reduction of 6 dBA. CDOT guidelines state that if a wall is not predicted to provide 10 dBA of reduction at at least one receiver at a wall height of <25 feet, then the analysis may proceed at a lower height. At a 25 foot height this wall is predicted to provide 7 dBA of reduction. Therefore, this wall is considered feasible even though it does not achieve 10 dBA of reduction. Further, it provides 44 receptors an average reduction of 4 dB with a cost benefit of $4,090 which is considered "Marginally Reasonable" given the margin of error of the analysis process. This wall is recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area E, 21st Street Receiver

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? N/A
   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) N/A	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level N/A	☐ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

E. DECISION:

1. Are noise mitigation measures feasible? ☐ YES ☑ NO
2. Are noise mitigation measures reasonable? N/A ☐ 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

Impacts include one residence along 21st Street. Noise walls are not feasible as it has direct access to 21st Street.

Completed by:	Date:
Hankard Environmental Inc	*March 11, 2010*

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area E, 26th St. to 28th St.

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 assumed	☑ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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

Impacts include one residence along US 24 near 26th Street, and Vermijo Park. The intersection of US 24 and South 26th Street requires the noise wall for this area be split into two walls, both walls are 12 feet high. The walls are predicted to provide an average of 9 dBA of noise reduction at front row receivers, and a maximum reduction of 10 dBA. Therefore, this wall is considered feasible, however with a cost benefit of $4,700 the walls are considered unreasonable.

Completed by:	Date:
Hankard Environmental Inc	*March 11, 2010*

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area F

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) N/A	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level N/A	☐ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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

There is no outdoor use at either the Childhood Development Center or the hotel that would significantly benefit from noise mitigation. Therefore, noise mitigation is not recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area H, Crystal Park Place

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 . . assumed	☑ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

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 proposed noise wall is 712 feet long and 15 feet tall. It is predicted to provide an average of 9 dBA of noise reduction at front row receivers, and a maximum reduction of 11 dBA at a cost-benefit of $3,680. Therefore, this wall is considered feasible and reasonable and is recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area H, Palisade Circle

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) N/A	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level N/A	☐ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
4.	Development Type (Category B*) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
5.	Development Existence (15 years or more) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

E. DECISION:

1. Are noise mitigation measures feasible? ☐ YES ☑ NO
2. Are noise mitigation measures reasonable? N/A ☐ 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 residences are located on a ridge approximately 100 feet above US 24. The only feasible place for a wall would be along the backyards of the residences themselves. Such a wall was modeled at heights ranging from 6 feet to 14 feet. None of the walls benefited (provide at least 3 dB of reduction) more than 3 residences. The 12 foot tall wall provided the best cost benefit at $10,654 (roughly $6,000 more than considered reasonable in terms of cost). Therefore this wall is not recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02

COLORADO DEPARTMENT OF TRANSPORTATION
NOISE ABATEMENT DETERMINATION

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

Project # NH 0242-040	Project code (SA#) 187824	STIP #	Project Location: US 24 Corridor - Area H, Red Canyon Place

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? N/A
   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) N/A	☐ Less than $3000	☐ $3000-$3750	☐ $3750-$4000	☐ More than $4000
2.	Average Build Noise Level N/A	☐ 70 dBA or More	☐ 66 - 70 dBA	☐ 63 - 66 dBA	☐ Less than 63 dBA
3.	Impacted persons' desires assumed	☑ 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) N/A	☐ More than 75%	☐ 50% - 75%	☐ 25% - 50%	☐ Less than 25%
6.	Build Noise Level vs. Existing Noise Level N/A	☐ 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:

The noise mitigation decision described herein was made using the best data avaiable at the time. This decision should be re-visited during Final Design, and based on up to date information, including traffic data, roadway design, and land use.

E. DECISION:

1. Are noise mitigation measures feasible? ☑ YES ☐ NO
2. Are noise mitigation measures reasonable? N/A ☐ 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 proposed noise wall is 870 feet long and 15 feet tall. It is predicted to provide an average of 11 dBA of noise reduction at front row receivers, and a maximum reduction of 14 dBA at a cost-benefit of $1,635. Therefore, this wall is considered feasible and reasonable and is recommended.

Completed by:	Date:
Hankard Environmental Inc	***March 11, 2010***

CDOT Form #1209 12/02