



APPENDIX D

Noise Analysis Abatement Details

*For the C-470 Corridor
Revised Environmental Assessment*

July 2015

PURPOSE AND CONTENTS OF THIS APPENDIX

Table 4-9 in the C-470 Revised Environmental Assessment indicates the results of noise abatement analysis for a number of sites along the corridor. The 17 pages which follow provide additional detail regarding the noise abatement analysis. This information is presented here in concise form for the reader's convenience. Additional technical detail for each site, including predicted future sound levels for individual receptors, is contained in the full Noise Technical Report in **Appendix E**.

The discussion presented in this appendix covers the following analyses in the order listed below.

Location	Exceeds Noise Criterion		Potential Mitigation		
	No-Action	Proposed Action	Feasible	Reasonable	Recommended
RESIDENTIAL AREAS (west to east)					
Redstone Ranch	No	No	n/a	n/a	No
Chatfield Bluffs	Yes	Yes	Yes	No	No
Meadowbrook	Yes	Yes	Yes	No	No
Chatfield Avenue	Yes	Yes	Yes	Yes	YES
Columbine Hills	Yes	Yes	Yes	No	No
Wolhurst	No	No	n/a	n/a	REPLACE
Littleton Commons	Yes	Yes	Yes	Yes	YES
Villas at Verona	Yes	Yes	Yes	Yes	YES
Bluffs Apartments	Yes	Yes	Yes	Yes	YES
Township at Highlands Ranch	No	Yes	No	n/a	No
Highlands Ranch Dad Clark	Yes	Yes	Yes	No	No
Highlands Ranch, Venneford Ranch	Yes	Yes	Yes	No	No
Three Complexes* (listed below)	Yes	Yes	Yes	Yes	YES
Shadow Canyon	Yes	Yes	Yes	Yes	YES
Gleneagles Village	No	Yes	Yes	No	No
Palomino Park	Yes	Yes	Yes	No	No
Crest	Yes	Yes	Yes	Yes	YES
PARKS AND RECREATION AREAS					
16 resources	Please see Noise Technical Report				No
COMMERCIAL OUTDOOR AREAS					
On the Border, LODO, and Brothers	Please see Noise Technical Report				No

* Autumn Chase, Copper Canyon and Copper Ranch apartments

Redstone Ranch

Redstone Ranch is a multi-storied residential complex north of C-470 between Wadsworth Boulevard and Kipling Parkway. Noise levels were predicted at each of 41 receptor locations for both existing and Proposed Action conditions. No receptors equal or exceed CDOT impact criteria for residential properties. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Redstone Ranch Receptor Locations



Note: Impacted receptors are shaded green

Chatfield Bluffs

Chatfield Bluffs is a single-family residential development south of C-470 between Wadsworth Boulevard and Kipling Parkway. Noise levels were predicted at each receptor location for both existing and Proposed Action conditions.

Chatfield Bluffs Receptor Location



Note: Impacted receptors are shaded green

Chatfield Bluffs Noise Impact Assessment

Twenty-four receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,500 feet long averaging and 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$2,081,250	(Cost of wall = 2,500 feet long x 18.5 feet tall x \$45/sf = \$2,081,250)
÷ 165.8	(Total dB(A) reduction for the 24 receptors with equal to or greater than 5 dB(A) reduction)
\$12,553	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wingate

Wingate is a single-family residential development north of C-470 between Wadsworth Boulevard and Kipling Parkway.

No receptors equal or exceed CDOT impact criteria for residential properties. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wingate Receptor Locations



Note: Impacted receptors are shaded green

Meadowbrook

Meadowbrook is a single-family residential development north of C-470 between Wadsworth Boulevard and Kipling Parkway.

Meadowbrook Receptor Locations



Note: Impacted receptors are shaded green

Thirteen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The impacted receptors were grouped in three distinct areas: the western area beyond the existing rise in the topography; the central area between the western rise in topography and the eastern berm; and the eastern area of the community near Wadsworth Avenue.

Western - The optimal wall providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 485 feet long and averaging 18.4 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$401,580	(Cost of wall = 485 feet long x 18.4 feet tall x \$45/sf = \$401,580)
÷ 18.9	(Total dB(A) reduction for the 3 receptors with equal to or greater than 5 dB(A) reduction)
<u>\$21,248</u>	(Cost Benefit Index, cost per dB(A) per receptor)

Central – The optimal wall configuration, providing the greatest noise reduction for impacted receptors per square foot of wall, was a combination of a 485 long wall with an average height of 13.5 feet and 340 foot long wall with an average height of 19.2, and a 410 foot long extension of the existing wall with an average extension of 8 feet. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$294,638	(Cost of 1 st segment of combined wall = 485 feet long x 13.5 feet tall x \$45/sf = \$294,638)
\$293,760	(Cost of 2 nd segment of combined wall = 340 feet long x 19.2 feet tall x \$45/sf = \$293,760)
\$147,600	(Cost of 3 rd segment of combined wall = 410 feet long x 8 feet tall x \$45/sf = \$147,600)
\$735,998	Total
÷ 58.3	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
<u>\$12,624</u>	(Cost Benefit Index, cost per dB(A) per receptor)

Eastern - The optimal wall providing the greatest noise reduction was a combination of filling in the gap between two existing noise walls (68 foot long by 12 feet high) and an extension up of on existing wall (400 feet long by 10 feet high). The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$36,720	(Cost of gap segment of combined wall = 68 feet long x 12 feet tall x \$45/sf = \$36,720)
<u>\$180,000</u>	(Cost of extension segment of combined wall = 400 feet long x 10 feet tall x \$45/sf = \$180,000)
\$216,720	Total
<u>÷ 7.0</u>	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
\$30,960	(Cost Benefit Index, cost per dB(A) per receptor)

In summary, the Cost Benefit Index for walls in each of these area is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Chatfield Avenue

Chatfield Avenue is a single family residential development north of C-470 between Santa Fe Drive and Wadsworth Boulevard.

Chatfield Avenue Receptor Locations



Note: Impacted receptors are shaded green

Chatfield Avenue Noise Impact Assessment

Fourteen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 900 feet long and averaging 13.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$546,750	(Cost of wall = 900 feet long x 13.5 feet tall x \$45/sf = \$546,750)
÷ 83.1	(Total dB(A) reduction for the 14 receptors with equal to or greater than 5 dB(A) reduction)
\$6,579	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Columbine Hills

Columbine Hills is a single-family residential development north of C-470 between Santa Fe Drive and Wadsworth Boulevard.

Columbine Hills Receptor Locations



Note: Impacted receptors are shaded green

Ten receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, which is an extension of the existing wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,200 feet long and 20 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$1,080,000	(Cost of wall = 1,200 feet long x 20 feet tall x \$45/sf = \$1,080,000)
÷ 5.6	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
\$192,857	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wolhurst

Wolhurst is a single family residential development on the northwest quadrant of C-470 and Santa Fe Drive. The Wolhurst community has a pair of overlapping noise walls adjacent to C-470 totaling approximately 1,675 linear feet that were installed as part of the Santa Fe interchange improvements. These existing noise walls will be impacted by the Proposed Action due to the realignment of the westbound on-ramp and will be relocated and replaced in kind as part of this project. Preliminary analysis indicates the need for a single, continuous wall approximately 1,500 feet long and 15.5 feet tall.

Wolhurst Receptor Locations



Littleton Commons

Littleton Commons is a multi-storied residential complex currently under construction, with approved plans from the City of Littleton, north of C-470 between Broadway and Santa Fe Drive.

Littleton Commons Receptor Locations (each site has multiple levels)



Note: Impacted receptors are shaded green

Twenty-seven receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. Much of the complex is well below the grade of the roadway, thus the optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,200 feet long and 7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$$\begin{array}{r}
 \$693,000 \quad (\text{Cost of wall} = 2,200 \text{ feet long} \times 7 \text{ feet tall} \times \$45/\text{sf} = \$693,000) \\
 \div \quad 226.7 \quad (\text{Total dB(A) reduction for the 36 receptors with equal to or greater than 5 dB(A) reduction}) \\
 \hline
 \$3,057 \quad (\text{Cost Benefit Index, cost per dB(A) per receptor})
 \end{array}$$

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Villas at Verona

Villas at Verona is a multi-storied residential complex currently under construction north of C-470 between Broadway and Santa Fe Drive.

Villas at Verona Receptor Locations (each site has multiple levels)



Note: Impacted receptors are shaded green

Fifty-nine receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,720 feet long and 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$$\begin{array}{r}
 \$1,431,900 \quad (\text{Cost of wall} = 1,720 \text{ feet long} \times 18.5 \text{ feet tall} \times \$45/\text{sf} = \$693,000) \\
 \div \quad 647.8 \quad (\text{Total dB(A) reduction for the 74 receptors with equal to or greater than 5 dB(A) reduction}) \\
 \hline
 \$2,210 \quad (\text{Cost Benefit Index, cost per dB(A) per receptor})
 \end{array}$$

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Bluffs at Highlands Ranch

Bluffs at Highlands Ranch is a multi-storied residential complex north of C-470 between Broadway and Santa Fe Drive.

Bluffs at Highlands Ranch Receptor Locations (each site has multiple levels)



Note: Impacted receptors are shaded green

Twenty-eight receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,200 feet long and 17.7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

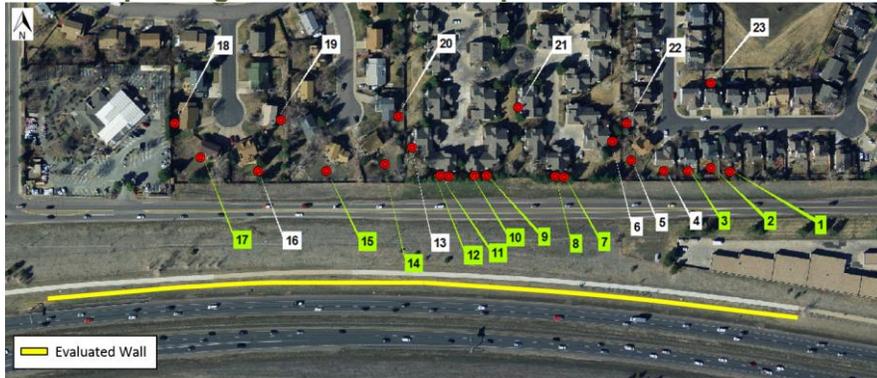
\$955,800	(Cost of wall = 1,200 feet long x 17.7 feet tall x \$45/sf = \$955.800)
÷ 151.3	(Total dB(A) reduction for 28 receptors with equal to or greater than 5 dB(A) reduction)
\$6,317	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Township at Highlands Ranch

Township at Highlands Ranch is a single-family residential development north of C-470 and County Line Road between University Boulevard and Broadway.

Township at Highlands Ranch Receptor Locations



Note: Impacted receptors are shaded green

Twelve receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. A 1,700 feet long and 20 feet tall wall was evaluated along C-470 right-of-way. This wall was predicted to not provide the design goal of 7 dB(A) noise reduction or the minimum of 5 dB(A) of noise reduction (insertion loss) for any receptors. The lack of acoustic efficiency of the wall along C-470 is primarily due to the County Line Road traffic noise generated at a far closer proximity to the residences than C-470. This wall would cost \$1,530,000. Because this wall does not provide the design goal noise reduction to any receptors, there is no Benefit Cost Index for this wall within CDOT ROW. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further need to be evaluated.**

Highlands Ranch Dad Clark

Highlands Ranch Dad Clark area is a single-family residential development south of C-470 between University Boulevard and Broadway. While this is one neighborhood, the existing berm located in the middle of the neighborhood frontage splits these homes from a noise perspective. Thus in an effort to focus on the specific needs of each area the evaluation was split into the western and eastern sections.

Highlands Ranch Dad Clark Receptor Locations



Note: Impacted receptors are shaded green

Western Highlands Ranch Dad Clark Receptor Locations



Note: Impacted receptors are shaded green

Seventeen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,400 feet long and averaging 16.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$$\begin{array}{r}
 \$1,039,500 \quad (\text{Cost of wall} = 1,400 \text{ feet long} \times 16.5 \text{ feet tall} \times \$45/\text{sf} = \$1,039,500) \\
 \div \quad 112.2 \quad (\text{Total dB(A) reduction for the 18 receptors with equal to or greater than 5 dB(A) reduction}) \\
 \hline
 \$9,265 \quad (\text{Cost Benefit Index, cost per dB(A) per receptor})
 \end{array}$$

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Eastern Highlands Ranch Dad Clark Receptor Locations



Note: Impacted receptors are shaded green

Twenty-seven receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, is 1,900 feet long and averaging 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

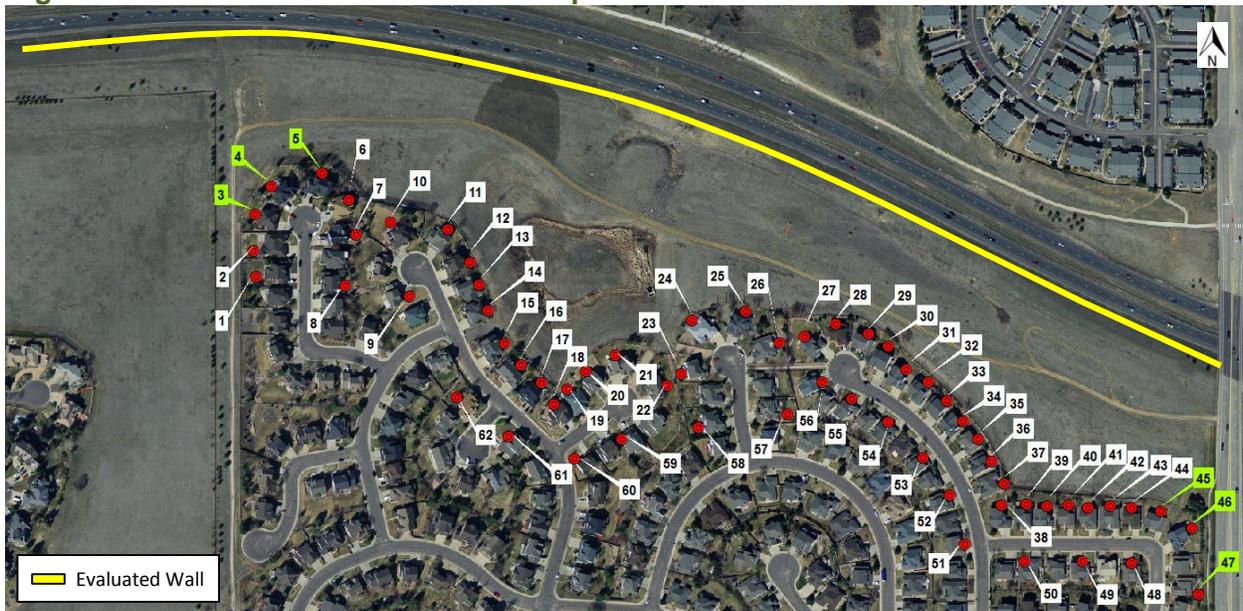
\$1,581,750	(Cost of wall = 1,900 feet long x 18.5 feet tall x \$45/sf = \$1,581,750)
÷ 163.5	(Total dB(A) reduction for the 26 receptors with equal to or greater than 5 dB(A) reduction)
\$9,674	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Highlands Ranch Venneford Ranch

Highlands Ranch Venneford Ranch is a single-family residential development south of C-470 between Colorado Boulevard and University Avenue.

Highlands Ranch Venneford Ranch Receptor Locations



Note: Impacted receptors are shaded green

Six receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. A 3,330 feet long and 20 feet tall wall was evaluated along C-470 right-of-way from Colorado Boulevard west. This wall was predicted to be the optimal wall providing the most positive Cost Benefit Index calculation for the impacted receptors in addition to providing benefits to approximately 20 additional non-impacted residences which improved the Cost Benefit Index calculation. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$2,997,000	(Cost of wall = 3,330 feet long x 20.0 feet tall x \$45/sf = \$2,997,000)
÷ 119.4	(Total dB(A) reduction for the 22 receptors with equal to or greater than 5 dB(A) reduction)
\$25,101	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier and the design goal of 7 dB(A) was not achieved with the 20 foot wall. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Autumn Chase, Copper Canyon, and Canyon Ranch (ACC)

Autumn Chase, Copper Canyon and Canyon Ranch are a series of multi-storied residential complexes north of C-470, extending from Colorado Boulevard approximately 3,800 feet west. Based on the close proximity of these complexes the mitigation for these sites is interrelated and thus they were evaluated together.

Autumn Chase, Copper Canyon and Canyon Ranch Receptor Locations



Note: Impacted receptors are shaded green



Note: Impacted receptors are shaded green

One hundred receptors equal or exceed CDOT Impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal combination of walls providing the greatest noise reduction for impacted receptors per square foot of wall, was a 4,330 feet long and 15.75 feet tall wall north of C-470 and a 390 foot long 8 feet high wall west of Colorado Boulevard all within CDOT ROW. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$3,068,888	(Cost of wall = 4,330 feet long x 15.75 feet tall x \$45/sf = \$3,068,888)
÷ 724.5	(Total dB(A) reduction for the 87 receptors with equal to or greater than 5 dB(A) reduction)
\$4,236	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Shadow Canyon

Shadow Canyon is a multi-storied residential complex south of C-470 between Colorado Boulevard and Quebec.

Shadow Canyon Receptor Location



Note: Impacted receptors are shaded green

Forty-one receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,700 feet long and averaging 18.7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

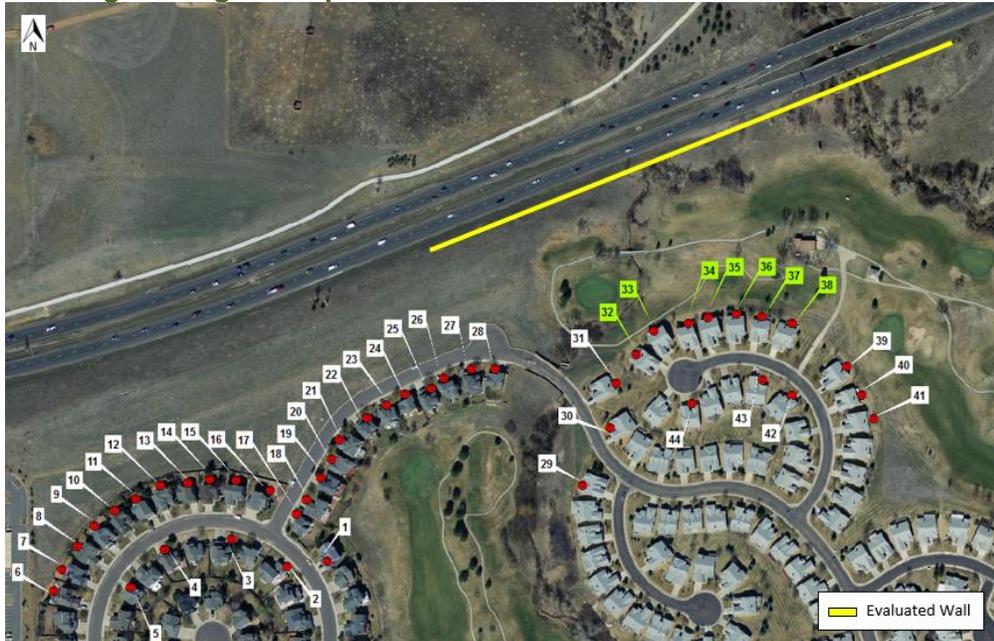
\$1,430,550	(Cost of wall = 1,700 feet long x 18.7 feet tall x \$45/sf = \$1,430,550)
÷ 251.7	(Total dB(A) reduction for the 39 receptors with equal to or greater than 5 dB(A) reduction)
<u>\$5,684</u>	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Gleneagle Village

Gleneagle Village is a single-family residential development south of C-470.

Gleneagle Village Receptor Locations



Note: Impacted receptors are shaded green

Seven receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,100 feet long and averaging 16.9 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$$\begin{array}{r}
 \$836,550 \quad (\text{Cost of wall} = 1,100 \text{ feet long} \times 16.9 \text{ feet tall} \times \$45/\text{sf} = \$836,550) \\
 \div \quad 54.6 \quad (\text{Total dB(A) reduction for the 9 receptors with equal to or greater than 5 dB(A) reduction}) \\
 \hline
 \$15,321 \quad (\text{Cost Benefit Index, cost per dB(A) per receptor})
 \end{array}$$

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Palomino Park

Palomino Park is a multi-storied residential complex south of C-470 between Colorado Boulevard and Quebec.

Palomino Park Receptor Locations



Note: Impacted receptors are shaded green

Eight receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 800 feet long and 17.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$$\begin{array}{r}
 \$630,000 \quad (\text{Cost of wall} = 800 \text{ feet long} \times 17.5 \text{ feet tall} \times \$45/\text{sf} = \$630,000) \\
 \div 42.0 \quad (\text{Total dB(A) reduction for the 8 receptors with equal to or greater than 5 dB(A) reduction}) \\
 \hline
 \$15,000 \quad (\text{Cost Benefit Index, cost per dB(A) per receptor})
 \end{array}$$

The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Crest

Crest is a multi-storied residential complex in the southwest quadrant of C-470 and I-25.

Crest Receptor Locations (each site has multiple levels)



Note: Impacted receptors are shaded green

Seventy-six receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,300 feet long and 18.2 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

\$1,883,700	(Cost of wall = 2,300 feet long x 18.2 feet tall x \$45/sf = \$1,883,700)
÷ 493.0	(Total dB(A) reduction for the 82 receptors with equal to or greater than 5 dB(A) reduction)
<u>\$3,821</u>	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the \$6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Recreational Resources

Recreational resources are distributed across the entire C-470 corridor. These resources include a pool, golf courses, athletic fields, trails, playgrounds, and non-profit institutional offices. One receptor was identified for each location adjacent to C-470 where people congregate, e.g. golfing tee boxes, golfing greens, pools, benches, major path connections, and athletic fields. Noise levels were developed for these outdoor use areas.

Noise mitigation at these location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.

4.8 Noise Sensitive Commercial Properties

This corridor has mix of residential and commercial land uses along the entire length. Four noise sensitive commercial properties were identified. Walls were reviewed for each impacted site. The Cost Benefit Index is over the \$6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at these locations does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Statement of Likelihood and Summary of Recommendations

The feasibility and reasonableness of the mitigation recommendations in this document are based on the preliminary analysis using current level of design and available information. The ultimate feasibility and reasonableness determinations may change due to changes in final project design after approval of the environmental document. The preliminary location and physical description of noise abatement measures determined to be feasible and reasonable are described throughout this document and summarized in the table and figure which follow. The final noise abatement decision will be made during the completion of the project's final design and the public involvement processes.

Summary of Recommended Noise Mitigation

Location	NAC	Type	Mitigation Type	Description (approximate)
Chatfield Avenue	B	Single Family	Wall	900 feet long x 13.5 feet tall
Wolhurst (replacement)	B	Single Family	Wall	1,500 feet long x 15.5 feet tall
Littleton Commons	B	Multi-family	Wall	2,200 feet long x 7 feet tall
Villas at Verona	B	Multi-family	Wall	1,720 feet long x 18.5 feet tall
Bluffs at Highlands Ranch	B	Multi-family	Wall	1,200 feet long x 17.7 feet tall
Autumn Chase, Copper Canyon, and Canyon Ranch	B	Multi-family	Wall	4,330 feet long x 15.75 feet tall
Shadow Canyon	B	Multi-family	Wall	1,700 feet long x 18.7 feet tall
Crest	B	Multi-family	Wall	2,300 feet long x 18.2 feet tall

Location of Residential Sites Analyzed and Recommended Mitigation

