
Technical Memorandum

Implementation of RTD's Policy for Noise Mitigation Measures for Moderate Impacts

for the
Denver – West Corridor Light Rail Transit Project
Final Design Assessment

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Prepared by:
KM Chng Environmental Inc.
Burlington, MA 01803

Denver West Corridor Project - Noise Assessment Implementation of RTD's Policy for Noise Mitigation for Moderate Impacts

Introduction

As part of the Final Design for the Denver – West Corridor Project, KM Chng Environmental Inc. prepared a detailed noise and vibration assessment for the project corridor. The noise and vibration analyses were performed in accordance with the methodology contained in the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment* (FTA-VA-90-1003-06; revised May 2006). The FTA guidance manual presents the basic concepts, methods and procedures for evaluating the extent and severity of noise impacts from transit projects. The results of this analysis are contained in the *Noise and Vibration Analysis Technical Report* (Final Report – June 2007). The results of this noise analysis indicated that there were 50 severe and 168 moderate impacted receptors along the project corridor. The location of the severe and moderate noise impacts are shown in the figures (aerial photographs) contained in Appendix C of the Technical Report. In addition, Appendix C also contains a summary table of all the impacted receptors with a specific receptor identification number that corresponds to the identification number shown in the figures. In this way, the information contained in the table can readily be referenced to a specific receptor location in the figures. For noise mitigation, a 6-foot high noise barrier was recommended to provide the necessary noise reduction at the impacted receptor locations along the project corridor. The locations of the proposed noise barriers are also shown in the figures in Appendix C of the Technical Report.

However, these noise barrier locations have been further modified by the implementation of RTD's policy for *Noise Mitigation Measures for Moderate Impacts*. The RTD policy contains additional screening requirements for noise barriers. The following sections describe RTD's policy and present the final recommended noise barrier locations along the project corridor that result from the implementation of this policy.

RTD's Noise Barrier Policy

RTD has developed a process for evaluating the need to mitigate for moderate noise impacts for the FasTracks program. RTD is committed to providing noise mitigation to all residential receptors predicted to experience a "severe" noise impact from the project, unless there are extenuating circumstances that may prevent it. RTD is also committed to evaluating reasonable noise mitigation for residential receptors predicted to experience a "moderate" noise impact. The RTD policy addresses the issue of noise mitigation for residential receptors with moderate noise impact. A copy of the RTD noise barrier policy is contained in Appendix A.

The most common noise mitigation is a noise barrier, so the RTD policy is specific to selecting locations for the installation of these noise barriers. The RTD policy contains three main steps that are used to determine if noise barriers will be recommended to provide noise mitigation at moderate impacted receptors. These three steps listed in order of priority are described below:

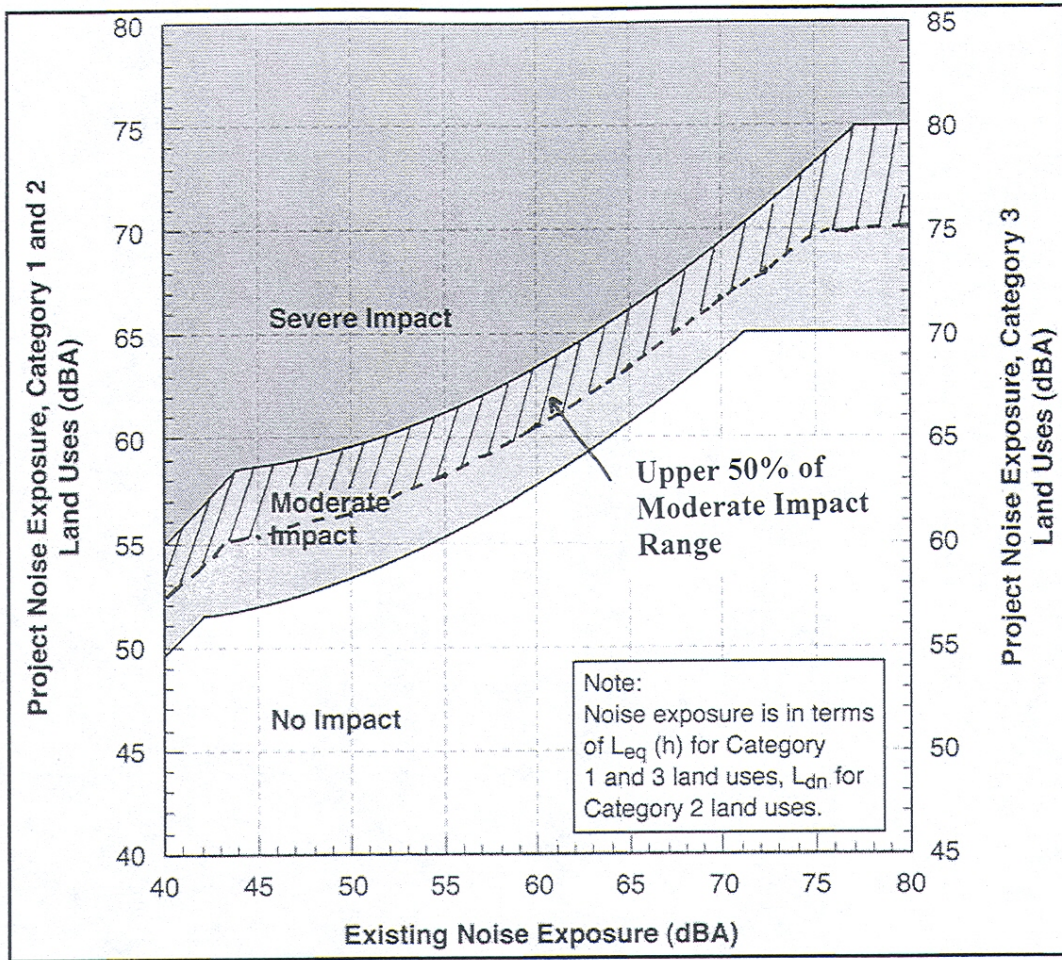
1. Is the noise impact within the top 50% of the FTA's "Moderate" impact range;
2. Is the cost range for the noise barrier within \$20,000 to \$35,000 (2002 dollars) per benefited residence; and
3. Is the minimum number of affected parcels at least ten; or the length of the noise barrier at least 800 feet.

The results of the noise analysis, specifically the information contained in Appendix C of the Noise and Vibration Technical Report was used as the starting point for applying the RTD policy.

Noise Impacts within the top 50% of the FTA's Moderate Impact Range

Step one of the RTD policy is to determine the number of moderate impacted receptors that are within the top 50% of the FTA's moderate impact range. The FTA noise impact criteria are defined by two curves that allow increasing noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone. The FTA noise criteria are delineated into two categories: moderate impact and severe impact. The moderate impact threshold defines areas where the change in noise is noticeable but may not be sufficient to cause a strong adverse community reaction. The severe impact threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. The level of impact at any specific location is determined by comparing the predicted project noise level at the receptor to the existing measured noise level at the receptor. The FTA moderate and severe noise impact criteria curves are shown in Figure 1. In addition, the area representing the upper 50% of the moderate impact range is also shown in Figure 1.

Applying RTD's policy regarding the top 50% of the FTA's moderate impact range means that only moderate impacted receptors with a predicted project noise level of more than 3 dBA above the lower limit of the moderate impact range will be considered for a noise barrier. Applying step one of RTD's policy reduces the number of moderate impacted receptors that are eligible for further consideration for a noise barrier from 168 identified in the Noise and Vibration Technical Report to 91. The remaining 91 moderate impacted receptors are those with noise levels that are more than 3 dBA above the lower limit of the FTA's moderate impact criteria curve (Figure 1). The remaining 77 moderate impacted receptors that are no longer considered eligible for a noise barrier are spread throughout the project corridor and are generally receptors that are located slightly farther from the rail corridor than those in the upper 50% of the moderate impact range.



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, Washington, D.C., May 2006.

Figure 1: FTA Noise Impact Criteria for Transit Projects

The location of the remaining 91 moderate impacted receptors along with all of the 50 severe impacted receptors which are still eligible for noise barriers are shown in the figures (aerial photographs) in Appendix B.

RTD's Proposed Noise Barrier Locations

For the remaining 91 moderate impacted receptors that are still considered eligible for noise barriers, RTD's policy steps 2 and 3 focus on the cost effectiveness of the noise barrier (step 2) and the number of impacted receptors that will benefit from the noise barrier (step 3). Applying RTD's policy steps 2 and 3 result in a total of 26 recommended noise barrier segments along the project corridor between Knox Court and Oak Street.

All 50 severe impacted receptors are eligible for noise barriers. However, one of the severe impacted receptors (receptor ID No. 2005) is expected to be a taking by the project for the construction of the proposed parking garage at the Wadsworth Boulevard Station. In determining the length of each noise barrier, the following criteria were used: a noise barrier cannot cross a through street except over an elevated section of the corridor; for a severe impacted receptor, the noise barrier would extend to include the adjacent receptor, and if there is no adjacent receptor, then the noise barrier would extend approximately 100 feet beyond the property line of the severe impacted receptor. For the cost effectiveness analysis, a barrier cost of \$170 per linear foot of a 6-foot high noise barrier was used.

The description of the locations of these 26 noise barriers is contained in Table 1. This Table also describes the number of affected properties, their receptor identification number, the approximate length of the 6-foot high noise barrier, and the reason why the noise barrier meets the RTD policy requirements. The 26 recommended noise barriers will provide noise mitigation to all 49 remaining severe impacted receptors and to 67 of the 91 moderate impacted receptors within the upper 50% of the FTA's moderate impact range. The total length of the 26 recommended noise barriers is approximately 16,522 feet. The remaining 25 moderate impacted receptors that are in the upper 50% of the FTA's moderate impact range did not qualify for noise barriers under RTD's policy steps 2 and 3.

Table 1: Summary of Proposed Noise Barrier Locations Based Implementation of RTD Policy

Wall #	Detail	Noise Wall Location	Side of Tracks	# of Affected Properties	Receptor Locations	Reason	Approximate 6' Wall Length
B1	1	Knox Court to the west	north	1	13	severe	170
B2	1	Osceola to Perry Street	north	2	29 31	residential adjacent to severe severe	297
B3	2	Sheridan to the west	north	5	1003 108 102 107 104	severe residential adjacent to severe	820
B4	4	Pierce to Teller	north	9	150 149 148 2003 2002 137 136 146 143	over 800', cost effective severe	1287
B5	4	West of Teller	north	2	151 152	severe residential adjacent to severe	156
B6	4	Teller to almost Wadsworth	south	10	154 153 155 161 162 163 1006 170 171 172	more than 10 properties, 800', cost effective	1135
B7	4	Pierce to Saulsbury	south	7	135 138 139 140 141 2004 1005	more than 800', cost effective	920
B8	5	East of Zephyr to Allison	north	2	183 182	severe	363

B9	5	Allison to Ammons	north	2	186 3001	severe	301
B10	5	East side of Balsam to Carr	north	3	201 202 213	severe	675
B11	5	Ammons to Carr	south	5	194 200 203 205 2010	more than 800', cost effective	947
B12	5	East of Ammons to Allison	south	1	2009	severe	195
B13	5	West of Wadsworth to Yarrow	south	2	2008	severe	319
					176	residential adjacent to severe	
B14	6	Spanning Everett Ct.	north	2	246 2011	severe	485
B15	6	East of Garrison	north	1	1009	severe	195
B16	6	West of Estes to Garrison	south	6	239 242 243 247 2015 250	over 800', cost effective	1044
B17	6	Carr to Estes	south	9	220 221 222 223 224 1008 226 231 227	over 800', cost effective	1295
B18	7	Garrison to west of Holland	north	6	251 1010 265 257 2016 266	over 800', cost effective	806
B19	7	Pikeview to Johnson	north	2	2021	severe	320
					281	residential adjacent to severe	
B20	7	Independence to almost Kipling	south	7	270 271 272 273 278 277 279	over 800', cost effective	1270

B21	7	Garrison to Independence	south	11	252 254 259 260 261 262 263 264 265 268 269	over 800', over 10, cost effective	1291
B22	8	Nelson to west of Lee	north	6	300 308 312 320 321 1014	over 800', cost effective	1093
B23	8	West of Nelson to Nelson	north	1	2018	severe	250
B24	8	east of Oak	north	1	336	severe	238
B25	8	Oak to Nelson	south	10	325 326 327 328 329 330 331 332 333 334	10 properties, cost effective	650
B26	8	Nelson to East of Moore	south	3	324 323 322	severe	406
				116			16522

BOLD/RED numbers are severe impacted receptors

Appendix A

RTD Policy:

Noise Mitigation Measures for Moderate Impacts

Noise Mitigation Measures for Moderate Impacts

The following section identifies a process for evaluating the need to mitigate for moderate noise impacts for the FasTracks program. Within each of the corridor's final decision document or environmental evaluation, mitigation measures must be developed for each impact to ensure compliance with Federal, State and Local regulations.

Noise mitigation on the FasTrack corridors will be a very sensitive issue during not only the environmental planning process, but during final design and construction. Any mitigation measures committed to in the final decision document or environmental evaluation must be implemented during final design and construction; therefore, the measures and resulting effectiveness must be carefully evaluated, accepted with the community, and the implementation ensured.

RTD is committed to providing some sort of noise mitigation to all noise locations predicted to experience a "Severe" noise impact, unless there are truly extenuating circumstance which may prevent it. RTD is also committed to evaluating reasonable noise mitigation for areas predicted to experience a "Moderate" noise impacts.

This policy addresses the issue of noise mitigation, specifically "Moderate" impacts, and will provide all corridors with an overall policy or direction for committing to reasonable mitigation measures for "Moderate" impacts. Noise impacts designated as "Moderate" require consideration and adoption of mitigation measures when it is considered reasonable. Because noise mitigation is very site specific, each corridor project team must take every situation and treat it as appropriate. Not every situation will or should result in the same standard mitigation measure. The project team must look at each situation and understand the impacts, the community needs, and balance the costs associated with implementing the measure with the effectiveness of the measure.

Implementing mitigation measures for "Moderate" noise impacts must be reasonable. The most common noise mitigation measure is the noise barrier, so these guidelines are specific to the installation of noise barriers. The following steps, determined to be reasonable, will be used for evaluating the use of noise barriers for a "Moderate" noise impacts:

1. Is the noise impact within the top 50% of the "Moderate" impact range; and,
2. Is the cost range for the noise barrier within \$20,000 to \$35,000 (2002 dollars) per benefited residence; and,
3. Is the minimum number of affected parcels at least 10; or the length of a noise barrier at least 800 feet

Then:

4. Does the community approve of implementation (75% of all affected parties)

Noise Mitigation Measures for Moderate Impacts

Section 4(f) and Section 106 properties with “Severe” or “Moderate” noise impacts will require mitigation and will not be subject to these guidelines, and will be evaluated on a case-by-case basis.

The following guidelines must be utilized during the noise analysis and identification of mitigation measures for “Severe” and “Moderate” noise impacts:

- Mitigation of Noise Impact: *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, May 2006.
- CDOT’s Noise Analysis and Abatement Guidelines, December, 2002.