



COLORADO
Department of Transportation
Division of Engineering,
Design and Construction

C-470 TOLLED EXPRESS LANES SEGMENT 1
Project No. NHPP 4701-124
18999

May 1, 2015

Mr. Carter Sales, President
Highlands Ranch Neighborhood Coalition
3479 Meadow Creek Way
Highlands Ranch, CO 80126

Mr. Sales and the Highlands Ranch Neighborhood Coalition:

The project team for the C-470 Express Lanes project would like to thank the Highlands Ranch Neighborhood Coalition (HRNC) for the meeting held the evening of April 16, 2015 at the Highlands Ranch Metro District offices. At the meeting, the HRNC presented questions and concerns related to traffic noise along C-470 and what the project team has preliminarily recommended for noise mitigation as part of the 2015 Revised Environmental Assessment (EA). Your presentation and written questions were well formed, direct, and concise, allowing communication between the project team and your Coalition to proceed efficiently.

CDOT has prepared responses to the written questions presented by HRNC at the April 16 meeting, and also to additional questions heard during the meeting discussion (enclosed). Our team of traffic noise specialists, National Environmental Policy Act (NEPA) project managers, and transportation engineers has worked to provide the requested technical responses in a concise and direct form within the context of the overall project. It should be noted that the responses enclosed are based on the current *draft* noise analysis, and that analysis will not be considered final until the Revised EA is signed by CDOT and FHWA. The project team is confident that we have developed, and will complete, the noise analysis consistent with the latest guidance provided by CDOT and FHWA and in accordance with current traffic noise modeling procedures.

The C-470 Corridor Coalition and CDOT have been working together to develop this transportation project since early 2011. The unified support of local governments through this Coalition has contributed greatly to the project receiving the funding necessary for construction, and CDOT is working diligently to maintain fiscal responsibility for this funding as the project moves through multiple stages of development. The C-470 Corridor Coalition and the project team have led many public outreach efforts over the past four years, including multiple public open house meetings and telephone town halls. The meeting held between the project team and HRNC on April 16, 2015, including the HRNC's written questions and CDOT's enclosed responses, is all part of the continued public coordination effort that is essential for this project. This is how the NEPA process is designed to work and we look forward to continuing our coordination with the HRNC. Please don't hesitate to reach out to us with any additional questions or comments related to our response.

Sincerely,

Jerome Estes
CDOT Project Director
C-470 Express Lanes Project



Colorado Department of Transportation Response to the Highlands Ranch Neighborhood Coalition

May 1, 2015

The following Colorado Department of Transportation (CDOT) responses are based on the questions presented to members of the C-470 Project Team by the Highlands Ranch Neighborhood Association (HRNC), which were received at the meeting held on April 16, 2015 at the Highlands Ranch Metro District Offices.

The following questions were provided to CDOT by HRNC in writing at the meeting:

Q1 (written): Was a new Traffic Noise Model prepared for the 2015 update?

R1: Yes. A 2015 traffic noise model was developed for the C-470 corridor in accordance with CDOT Noise Analysis and Abatement Guidelines dated January 15, 2015 using FHWA TNM version 2.5 modeling software. The 2015 traffic noise model is being completed as part of the 2015 Revised Environmental Assessment (EA).

Q2 (written): Why were the "Final Analysis of Traffic Noise Impacts and Recommended Mitigation" presented in February when the EA is still in draft form?

R2: The noise results and information presented at the February 2015 public meetings were, and currently remain, in draft form until the 2015 Revised EA is approved in writing by CDOT and FHWA. Labeling them as "Final" was a mistake by CDOT, and the information presented should have been labeled as "Final Draft" to provide the accurate context. This applies currently to all of the technical reports associated with the 2015 Revised EA.

Q3 (written): Why were the 2013 noise measurements taken over two days vs. a one week duration in 2006?

R3: In 2003 (to support the 2006 EA) noise levels, traffic volumes, traffic speeds and vehicle classification data were collected for one representative 30-minute period at 11 locations to validate the noise model. This methodology was consistent with FHWA noise standards and CDOT Noise Analysis and Abatement Guidelines dated December 1, 2002, which were the current guidelines required by CDOT at that point in time. The one-week duration of noise measurements referenced in your question (associated with the 2006 EA) is related to additional data collected to identify peak noise hours within the context of weekly traffic fluctuations.

In 2013 (in support of the 2015 Revised EA) noise levels, traffic volumes, traffic speeds and vehicle classification data were collected for two representative 10 to 20-minute periods at 15 locations to validate the new noise model. This methodology is consistent with today's FHWA and CDOT Noise guidance as shown in the excerpt below from CDOT Noise Analysis and Abatement Guidelines dated January 15, 2015, page 17:

"A minimum of two (2) existing field measurements are required within the study zone. Field measurements should represent sensitive receptors best illustrating the existing traffic noise environment, as free from the influence of local non-traffic generated noise sources and shielding as practical. Measurements can be taken at any time; however, it is best to measure when traffic is relatively free flowing at or near the posted speed limit. For high-volume roads, a 10-minute sample is usually statistically accurate enough to obtain a good measurement, but sample times of 30 minutes but not more than 1 hour may be needed for measurements along lower volume roads. Two readings are recommended at each site. A directional count of all light duty vehicles, medium truck 2-axle and multi-axle heavy truck traffic should be taken for relevant roadways adjacent to the measurement site. Tabulation of motorcycle and bus counts is also desirable. Determination of the approximate speed that the vehicles were traveling can be determined by either driving a test vehicle through the traffic stream or by use of a radar gun. Posted speed limits may be used if actual travel speed readings are unavailable. "

As stated above, field noise measurements may be taken at any time and any date, provided there is relatively free flowing traffic and all relevant data is collected at the same time as noise measurements are recorded.

No additional "long-term" data was collected in 2013 for the 2015 Revised EA, because the difference between the actual field noise measurements and the modeling results were within the acceptable validation range of 3 dB(A) .

It should be noted that the measurements taken in 2013 are utilized **only** to validate that the traffic noise model is predicting noise levels within an acceptable range as determined by the guidelines. These measurements are not utilized to determine noise levels as it relates to impacts, nor to determine whether a neighborhood will receive mitigation based on any point in time field measurements.

Q4 (written): Were correction factors used when comparing actual noise levels to predicted noise levels similar to the 2006 EA?

R4: No. The 2006 EA utilized a noise model called STAMINA. The STAMINA modeling effort used the best available data at the time. When STAMINA was used as the software to predict noise levels on highway corridors, correction factors (crude sound level adjustments) were occasionally used to address the STAMINA software's input data limitations (e.g. limited ground types, limited terrain features, limited roadway features) in an effort to replicate the surrounding noise environment. The current TNM 2.5 model (used to support the 2015 Revised EA) provides many

more modeling parameters (e.g. ground type, unlimited terrain and roadway features, and building rows) and updated mathematical algorithms which allow the model to more accurately represent the noise environment associated with a project. Correction factors are not commonly used with the TNM 2.5 model because the modeling parameters are expected to be developed until the model conditions adequately match the validation (measured) values, as required by the guidelines.

Q5 (written): Does the updated EA include a full noise analysis for the Highlands Ranch – Broadway to University Boulevard neighborhood as committed to in the 2006 EA?

R5: Yes. Traffic noise analysis was conducted for the neighborhoods south of C-470 between Broadway and University Boulevard because these neighborhoods are within the geographic limits of the 2015 Revised EA.

Q6 (written): a. Has CDOT conducted a technical review of the Noise Report and Traffic Noise Model? b. If so, may we see that technical review?

R6: a. Yes. CDOT staff has worked in close coordination with Wilson and Company in development and analysis of the Traffic Noise Model and the current Draft Traffic Noise Technical Report. CDOT has reviewed multiple draft versions of the traffic noise technical report and will continue to provide feedback as updates are made. FHWA will also review and approve the traffic noise technical report during their document review process.

b. No. The technical review CDOT has conducted, and will continue to conduct, is part of the ongoing document development process. The Final Noise Technical Report released to the public as part of the Final Revised EA will have incorporated the full review and comment process of both CDOT and FHWA.

Q7 (written): What is the technical explanation as to why the 2006 noise mitigation measures have now been eliminated?

R7: Several elements have contributed to the differences between the 2006 and 2015 Noise Technical Reports, as related to determination of noise impacts and recommended noise mitigation. The technical differences include:

1. Advances in Technology – the current TNM software has improved input parameters, mathematical algorithms, and analysis capabilities as compared to the older STAMINA software, and is recognized as providing more accurate results both to replicate the existing noise environment and forecast future noise levels. FHWA spent many years developing this software to provide reliable and consistent traffic noise modeling for all federally funded projects nation-wide. Also see response 4 (R4).

2. Changes to Federal Regulations and State Guidance on required Traffic Noise Modeling software and noise abatement evaluations -
 - a. FHWA mandated use of TNM 2.5 in 2005 through regulation. Although the 2006 EA was within the grace period to continue use of older noise model software, the 2015 Revised EA is required to use the most recent release of TNM, in this case TNM 2.5 as described in responses 1 and 4 (R1 and R4).
 - b. There have been several changes and updates in how noise barrier abatement is evaluated from the 2002 guidance to the 2015 guidance. These include:
 - i. Wall square footage cost (\$30 in 2002 to \$45 in 2015)
 - ii. What is considered a benefitted receptor (3 dB(A) reduction with barrier in 2002 to 5 dB(A) reduction with barrier in 2015)
 - iii. Cost-reasonableness values (\$4,000 per benefitted receptor in 2002 to \$6,800 per benefitted receptor in 2015)
 - iv. Minimum required noise reduction with mitigation (at least one receptor must receive at least 5 dB(A) in 2002 to 7 dB(A) in 2015)

Response 16 below provides a more detailed description as to how these inputs are applied to determine whether mitigation is recommended.

3. Data level of detail – the C-470 project has developed a greater level of project design detail (e.g. topographic survey, roadway design) for use in the current noise modeling effort. This allows the project team to further define the traffic conditions and therefore the traffic noise model.
4. Traffic Data Differences – The process utilized in the 2006 EA compared to the 2015 Revised EA for identifying the loudest noise hour based on forecasted traffic has changed. The January 15, 2015 guidelines, Section 3.4, page 18 provide direct procedures to identify the volume of traffic that would produce the highest noise hour.

Q8 (written): Will CDOT make the 2013 Noise Data gathered in 2013 available to us now?

R8: No. CDOT will not release draft technical reports related to the 2015 Revised EA until the document is considered final. The draft technical reports will be considered final when the 2015 Revised EA is approved and signed by CDOT and FHWA.

The following additional questions were asked by HRNC during the conversation that occurred at the April 16, 2015 meeting:

Q9. Single point of contact(s)?

R9: Highlands Ranch Neighborhood Coalition
Carter Sales, President
3479 Meadow Creek Way
Highlands Ranch, CO 80126

C-470 Express Lanes Project
Jerome Estes, CDOT Resident Engineer
2000 S Holly Street
Denver, CO 80222
jerome.estes@state.co.us
(303) 757-9295

Q10. Related to Q3 above, if CDOT were to agree to additional noise measurements, would it be incorporated into the EA?

R10: Per response 3 to question 3, no additional traffic noise measurements are required.

Q11. What is the approval document?

R11: The Decision Document will be the final approval document of both CDOT and FHWA. This Decision Document, when signed by FHWA, becomes the Federal Action or "approval document".

Q12. How does the public review period work?

R12: After the Revised EA is signed by both CDOT and FHWA, the project typically initiates a standard 30-day public review period of the document and all of its appendices, including all technical reports. The document will be made available online at various websites and also in hard copy for review at CDOT offices and multiple locations along the corridor (potential locations include libraries, recreation centers, and City and County government offices). During the public review period, anyone may read the document and submit written comments to the project team. Comments can be submitted in writing through the CDOT project website or by regular mail. CDOT and the C-470 Corridor Coalition will also hold a Public Hearing during this 30-day public review period, where anyone can attend to learn more about the project and make written comments to the project team. After the conclusion of the 30-day public review period, CDOT will compile all of the comments, address all of the comments, and assemble all into a

Decision Document. If FHWA determines that all comments have been incorporated and addressed, the Decision Document will be signed by FHWA.

Please note that at the April 16, 2015 meeting, CDOT offered to extend the standard 30-day public review period to 45 days (per comments received from HRNC). An official written request to extend the review period to 45 days was received by the project team from Mr. Carter Sales by email on April 20, 2015. FHWA and CDOT have agreed that adequate justification exists for this request, and therefore the review period for all public comment has been extended to 45 days for this project.

Q13. How do I get notified of the EA availability?

R13: The public will be informed that the 2015 Revised EA is available for review and comment through several methods. Examples include:

- CDOT Press Release
- Notifications in local and regional news publications
- CDOT Website
- Local Government Websites such as Douglas County
- Community email lists such as the Highlands Ranch Community Association
- Individual persons that have provided CDOT with their email address and requested information specifically regarding the C-470 Tolled Express Lanes Project will receive an email notice of when the 2015 Revised EA will be available to the public for review.

Q14. What year version is TNM 2.5? When did CDOT require use of TNM on projects?

R14: The original TNM version 1.0 was released for use in 1998, but it wasn't until 2004 when FHWA guidance recommended that the previously approved noise prediction model for highway projects (STAMINA version 2.0/Optima) should be replaced by TNM. At that point in time (2004) TNM had advanced to version 2.5. Officially, TNM 2.5 was mandated as the only approved noise model for use on federal projects in the 2005 revision of noise regulations Procedures for Abatement of Highway Traffic Noise and Construction Noise, 23 CFR 772. The regulation allowed a grace period for highway project noise studies that were already underway at the time of the new (2005) regulation to complete that project analyses using the older STAMINA/Optima model. This was the case with the 2006 EA.

Q15. The TNM User Manual (Traffic Noise Model User's Guide for Colorado DOT Projects November 2006) states that 3-4 days of noise measurements should be collected, and preferably one week of measurements. Why was only 2 days of data collected for the 2015 noise analysis?

R15: As stated in the response to question 3, the methodology used in collecting noise levels, traffic volumes, traffic speeds and vehicle classification data in 2013 (in support of the 2015 Revised EA) is consistent with today's CDOT Noise Analysis and Abatement Guidelines dated January 15, 2015. The language for "Long-Term Measurements" referenced by HRNC is found in the Traffic Noise Model User's Guide for Colorado DOT Projects dated November 2006. This user guide is only considered a reference document and the procedures in the January 15, 2015 guidelines represent the current established process for conducting noise measurements.

Q16. Why do multi-family units get noise mitigation walls and single-family residences do not?

R16: The January 15, 2015 guidelines were followed on a site-by-site analysis along the corridor. It is too general of a statement to say that multi-family units always get noise mitigation and single-family do not. The guidelines were consistently applied across all receptors, regardless of receptor type. Whether noise abatement is recommended for a particular location depends on several factors.

The FHWA approved CDOT Noise Analysis and Abatement Guidelines dated January 15, 2015 describe CDOT policy and program to implement 23CFR772. These guidelines establish noise abatement criteria, design and cost requirements for noise mitigation.

First, it must be determined if a receptor is considered impacted by traffic noise. Traffic noise impacts occur when noise levels, for different categories of land uses and activities, meet or exceed the CDOT Noise Abatement Criteria (NAC) shown in CDOT Noise Analysis and Abatement Guidelines, January 15, 2015, Exhibit 1, page 9. The noise impact threshold for residential (Category B) and recreational outdoor use areas (Category C) receptors is 66 dB(A). The guidelines also state that noise mitigation must be considered for any receptors where predicted noise levels for future conditions are greater than existing noise levels by 10 dB(A) or more (it should be noted that this specific condition does not occur for the proposed project).

Next, it must be determined if noise mitigation is feasible. CDOT guidelines outline a method for determining the feasibility of proposed mitigation measures. Feasibility criteria include:

- Can a 5 dB(A) noise reduction be achieved by constructing a noise barrier or berm?
- Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
- Can a noise barrier or berm less than 20 feet tall be constructed?

Finally, it must be determined if noise mitigation is reasonable. Reasonableness criteria include:

- Has the design goal of 7 dB(A) noise reduction for abatement measure been met for at least one impacted receptor?
- The cost to construct the noise barrier is determined based on length and height and a specific cost provided in the January 15, 2015 guidelines. Is the Cost Benefit Index below \$6,800 per receptor per dB(A) of noise reduction?
- Are more than 50% of benefitted resident/owners in favor of the recommended noise abatement measure? This is the last step and determined by a simple vote of benefitted receptors.

With these criteria in mind, many, but not all, of the multi-family neighborhoods experience a greater number of impacted units per highway frontage exposure than do single-family. This is primarily because of their closer proximity to C-470 and the density of the dwelling units. The density also factors into the reasonableness equation for Cost Benefit.

For a more detailed discussion of the traffic noise process please see CDOT Noise Analysis and Abatement Guidelines dated January 15, 2015

<https://www.codot.gov/programs/environmental/noise/guidelines-policies>).

Q17. With a barrier being recommended on the opposite side of C-470 from our neighborhood (barrier on the north side of the highway), will we have additional reflective noise from that barrier?

R17: CDOT guidelines have the following discussion of reflective noise on page 23:

"The primary purpose of traffic noise barriers is to reduce noise levels at sensitive receptors behind the barrier; however, under some conditions, barriers may reflect traffic noise and negatively affect the noise conditions at other nearby receptors. Generally, this occurs when there are receptors on the opposite side of the subject road from the noise barrier. In these circumstances, the barrier is acting as a secondary noise source because of the reflected sound. It is possible that reflective noise from a noise barrier could increase noise overall levels by as much as 3 dBA, but in practice will normally change noise levels by 1 dBA or less. Some of the more common situations where reflective barriers may be a concern include:

- *Sensitive receptors are present across the subject road from a proposed barrier, but are not being considered for a separate noise barrier.*
- *A frontage road is located between the proposed barrier and the sensitive receptors.*
- *Parallel barriers would be present on each side of a road and the ratio of the distance between the barriers versus the height of the barriers is 10:1 or less (For more information please refer to **Appendix C Traffic Noise Model User's Guide for Colorado DOT Projects**.)*
- *A large building or other man-made reflective surface is immediately across the subject road from a proposed barrier may simulate a parallel barrier effect.*

- *A large rock cut or other natural reflective surface is immediately across the subject road from a proposed barrier may simulate a parallel barrier effect.*

Decisions regarding modeling reflective noise should be made on a case-by-case basis, through consultation with the CDOT Noise Specialist(s)."

The project team has reviewed reflective noise specifically for neighborhoods across the highway from recommended barriers. In the case of the neighborhood on the south side of C-470 between University Boulevard and Colorado Boulevard (the neighborhood referenced in this question), the analysis showed no detectable changes to the noise levels caused by reflective noise. One major contributing factor to the analysis is that the neighborhood is approximately 520 feet from the noise barrier on the north side of C-470 at its closest point, and roughly 700 feet from the noise barrier on average. Utilizing the 10:1 ratio cited above in the guidelines, receptors on the south side of C-470 would need to be within 200 feet of a 20-foot noise wall to experience detectable changes in noise levels based on reflective noise. The actual distance is too great to experience a change to detectable noise levels from reflective noise at this location.

End of CDOT Response