

December 22, 2004

The Honorable Martin T. Meehan
U.S. House of Representatives
2229 Rayburn Office Building
Washington, DC 20515

Dear Representative Meehan:

This letter responds to your correspondence of June 16 and July 28, 2004, concerning the Massachusetts Highway Department's denial of sound barriers¹ for households in the Main, Leedberg, Twiss and Waterford Neighborhood Association (the Association) near Route 3 in Chelmsford, Commonwealth of Massachusetts.

You questioned whether:

- the denial of sound barriers along the Route 3 North Transportation Improvement Project² was within the "letter and spirit" of Federal guidelines,
- a 1998 noise study measured actual noise levels and actual worst hourly traffic and/or undercounted traffic, and
- a 2003 study for sound barriers for the neighborhood relied on 10-year old data and was done solely to corroborate the previous analyses.

In response to your inquiry, we reviewed the Massachusetts Highway Department's use of Federal policy and guidance³ concerning highway traffic noise analysis and abatement, the 1998 and 2003 noise analysis studies conducted for the project, and the Federal Highway Administration's (FHWA) assessments of these studies. We also spoke with

¹ Sound barriers may be formed from earth berms, but are usually vertical walls built of concrete, metal, masonry, wood, or other materials constructed along highway right-of-way lines to block highway noise from adjacent properties.

² This \$385 million project, authorized in 1999, provides for the construction of an additional travel lane in each direction of a 21-mile corridor from the Route 128/I-95 Interchange in Burlington, Massachusetts, to the New Hampshire state line, which will result in a 6-lane freeway when completed. It also includes improvements to associated ramps and interchanges, a park-and-ride facility, replacement of 47 bridges, and various environmental enhancements (such as work with regulatory agencies in developing an acceptable Wetland Mitigation Plan). Work began in the fall of 2000 and is about 92 percent complete.

³ FHWA Highway Traffic Noise Analysis and Abatement Policy and Guidance, June 1995, establishes criteria for the use of Federal funds for noise abatement, as stipulated in Title 23, Code of Federal Regulations, Part 772.13.

FHWA officials, Massachusetts Highway Department representatives, and the independent noise consultant⁴ who conducted the studies.

We found that the Massachusetts Highway Department's decision that barriers would not be cost-effective was within the "letter and spirit" of Federal guidelines. We also found that Federal guidelines list circumstances (several of which were present in this case) under which it may be appropriate to apply a case-by-case judgment when approving or disapproving sound barriers; however, the Massachusetts Highway Department chose not to deviate from the cost-effectiveness test. Overall, the Commonwealth has adopted a more fiscally conservative formula for calculating cost-effectiveness than required by Federal guidelines.

We also found that: (1) the 1998 and 2003 noise studies used to deny sound barriers to Massachusetts households affected by the Route 3 project were conducted in accordance with Federal guidelines; (2) the two studies used different noise prediction models,⁵ but both were FHWA-approved; and (3) allegations questioning the sufficiency of data used in the two studies were either unfounded or did not accurately characterize the use of the data.

Compliance with Federal Guidance

FHWA published highway traffic noise analysis and abatement guidance in June 1995. The guidance required state-level highway agencies to develop written noise policies and submit them to FHWA for approval. Specifically, the guidance requires state highway agencies to ensure: (1) a traffic noise impact has been identified; (2) the noise abatement measures will reduce the traffic noise impact; and (3) the overall noise abatement benefits are cost-effective and outweigh overall adverse social, economic and environmental effects. Most highway projects easily satisfy the first two requirements. FHWA's third requirement allows states to use one of two cost-effectiveness index methods—the cost/residence index or the cost/residence/decibel⁶ reduction index. The cost-effectiveness index, after applying noise reduction factors⁷, should not exceed FHWA's acceptable range of \$15,000 to \$50,000 per residence.

⁴ According to FHWA officials, Harris Miller Miller & Hanson, Inc. is an expert in the field of highway noise abatement and the use of noise prediction models. The Federal Aviation Administration, U.S. Department of the Interior, and Federal Interagency Committee on Aviation Noise use Harris Miller Miller & Hanson, Inc. services.

⁵ FHWA's STAMINA 2.0/OPTIMA noise prediction model was used for the 1998 study, while the Traffic Noise Model was used for the 2003 reevaluation study. According to FHWA, the newer Traffic Noise Model is more accurate, predicts higher sound levels, and is preferable to the STAMINA 2.0/OPTIMA model.

⁶ The decibel is a logarithmic measure of noise. This measure assigns more weight to frequencies that are heard more easily.

⁷ These are factors ranging between 5 to 10 decibels that state highway departments defined in practice as the range of decibel reduction needed to achieve a substantial noise reduction.

In 1996 the Massachusetts Highway Department selected the cost/residence/decibel reduction method as its cost-effectiveness index and issued Commonwealth guidelines⁸ specifying that the cost of the noise abatement measures should be no more than \$2,700 per decibel of highway noise reduction per protected residence. FHWA approved the Commonwealth's guidelines in April 1996, after determining that the guidelines met the intent of Federal policy and guidance, and because, after applying noise reduction factors to the Commonwealth's \$2,700 threshold, the resulting cost-effectiveness index range was \$13,500 to \$27,000⁹—a fiscally conservative range at the lower limits of the FHWA acceptable cost range. It is important to note that once FHWA approves a state highway agency's noise guidelines, FHWA then makes funding decisions based on compliance with those guidelines. States are also free to revise their noise guidelines at anytime and seek new FHWA approval.

The 1998 Noise Study

In August 1998, FHWA evaluated and approved the Final Environmental Impact Report for the Route 3 Project. This report included a noise study covering 15 areas, among them the Association area. The report concluded that noise barriers for 7 of the 15 study areas¹⁰ met the Commonwealth's FHWA-approved noise analysis and abatement requirements. The remaining eight study areas (including the Association area) met all requirements *except* the Commonwealth's cost-effectiveness limits. The 1998 study found that the Commonwealth would have to spend \$4,829 per decibel of noise reduction per residence for the association area. This was 79 percent greater than the FHWA-approved Commonwealth's cost-effectiveness index threshold of \$2,700.

Concerning the specific criticism of the study cited in your letter, we found the following.

- **Noise Levels.** The Association alleged that actual noise levels were not measured for the 1998 study. It is true that the study used a model to *predict* noise levels instead of measuring actual noise. However, we found that the FHWA-approved noise model used was an acceptable means of determining noise levels. Specifically, the model used for the study predicts noise levels using traffic data¹¹ but also considers the effects of topography, trees, and other factors—rather than relying solely on actual noise measurements. The traffic data used in the 1998 noise model originated from a 1992/1993 study conducted by Fay Spofford and Thorndike Inc. In the 1998 study, actual noise measurements were used to

⁸ The Massachusetts Highway Department Environmental Division Type I Noise Abatement Guidelines, April 1, 1996.

⁹ The Commonwealth's \$2,700 cost-effectiveness threshold multiplied by noise reduction factors of 5 to 10 decibels needed to achieve a substantial reduction ($\$2,700 \times 5 = \$13,500$, and $\$2,700 \times 10 = \$27,000$).

¹⁰ The seven areas include six in Chelmsford and one in Lowell: Scotty Harlow Condominiums, Melrose Street and Edgelawn Avenue, Hitchin Post Condominium and Richardson Road Apartments, Chelmsford High School Athletic Fields, Palm Manor Nursing Home, C and B Streets in Chelmsford, and the Daily School and Marshall Avenue in Lowell.

¹¹ The data included the speed and hourly volume of three separate vehicle types—cars, medium-sized trucks, and heavy trucks.

validate predictions using the 1992/1993 data, as was documented in the study report.

The Association also alleged that jersey barriers behaved as buffers and caused atypically low measures of noise levels. We found that the model used for the 1998 study predicted what noise levels would be without the jersey barriers in place.

- **Time of Worst Hour Traffic Measurements and Traffic Counts.** The Association alleged that the 1998 study used different starting times for recording traffic: 2:17 p.m. for Site 5 (which includes the Association area), 3:51 p.m. for Site 8, and 4:36 p.m. for Site 10. Because the traffic measurements for Site 5 were not close to the rush hour, the Association alleged that the actual worst hourly traffic was not measured for Site 5, which would be contrary to the Code of Federal Regulations.¹²

We found that the 1998 study used traffic data measurements and counts taken in 1992/1993 for every hour of the day to predict traffic growth and the loudest hour in the design year 2018.¹³ We also noted that in addition to traffic volume, vehicle speeds are used to determine road noise.

The Association also alleged that the study undercounted vehicles in the Association area because the count was less than reported for two other areas located on the same stretch of Route 3 that had no exit.¹⁴ We found that although the counts did differ, i.e., they were made at different times and on different days, they still performed their stated purpose of predicting traffic for every hour of the day and loudest hour in design year 2018.

The 2003 Reevaluation Noise Study

Because of complaints received from residents and local legislators, in 2003 the Massachusetts Highway Department asked Harris Miller Miller & Hanson, Inc., to reevaluate the projected noise levels, residential effects of the noise, and the cost effectiveness of sound barrier options identified during the 1998 study, including all the residential areas that previously had not qualified for barriers. Based on the reevaluation study, one additional area¹⁵ qualified for a sound barrier. The other areas, including, the

¹² 23 CFR 772.17 (b).

¹³ Design year 2018 is the future year used to estimate the probable traffic volume for which the highway was designed. A date that is 10 to 20 years from the start of construction is usually used.

¹⁴ The northbound counts were 1,544 for Site 5 (which includes the Association area), 3,810 for Site 8, and 4,116 for Site 10.

¹⁵ The McFarlin Road, Chelmsford area.

Association area, met all the FHWA-approved Commonwealth noise analysis and abatement requirements except the cost-effectiveness requirement.

Concerning the 2003 reevaluation study, the Association specifically alleged that the study: (1) used 10-year old data taken from the 1992/1993 noise study, and (2) was done solely to corroborate the 1998 study. We found the following.

- **Reliance on Old Data.** We found that the 2003 reevaluation study was conducted using the Traffic Noise Model, which more accurately predicts noise than the STAMINA 2.0/OPTIMA model used in the 1998 study.¹⁶ We also found that the 2003 study relied on the same 1992/1993 traffic data that had been used in the 1998 study. However, use of the data was appropriate in both 1998 and 2003 because both of the FHWA-approved noise models included a traffic growth factor for projecting future traffic out to design year 2018.

In addition, we noted that the 2003 study included updated model assumptions. For example, the noise consultant reported on average, that the 2003 study predicted higher noise levels than the 1998 study because assumptions about noise shielding from trees were different, among other factors. The 2003 study found that the trees were not dense enough to qualify as noise-shielding tree zones, so none were included.

- **Corroboration of Prior Study.** The Association alleged that the 2003 study did not provide a “fresh look,” at the 1998 study as promised by the Massachusetts Highway Department. This allegation was based on a May 27, 2004, Commonwealth of Massachusetts letter that communicated the results of the reevaluation. The letter stated, in part, that the purpose of the reevaluation “was to corroborate [the] previous analysis done for potential noise impacts within the project corridor.”

We found the 2003 study was a sufficient reevaluation of the 1998 study. Specifically, the 2003 study addressed all of the residential areas along the project where sound barriers were not previously approved. This included identifying all residence areas within 500 feet of the roadway using updated roadway plans, recent aerial photography, and field inspections. In addition, 14 of 30 areas that were closest to the roadway were selected for detailed analysis based on their potential to fall within the Commonwealth’s \$2,700 cost-effectiveness index criteria. The Association area was among those areas selected for detailed analysis and the modeling of different barrier designs to identify the most cost-effective barrier design.

¹⁶ It is important to note that both these models were approved by FHWA at the time they were used in 1998 and 2003.

We also found that the Massachusetts Highway Department attempted to improve the cost-effectiveness index for the Association area so that it could pass the Commonwealth's cost-effectiveness test. First, the area was reconfigured into two sections for the 2003 study. Second, the 2003 study modeled 18 different barrier designs, including barrier designs that were less costly than previously considered. These actions reduced the Association area cost-effectiveness index to \$3,770¹⁷ for the Waterford Place "Full Length" section and \$3,505¹⁸ for the "Twiss and Leedburg only" section. However, while costs for both these sections were lower than the \$4,829¹⁹ cost-effectiveness index reported for the entire area in 1998, they still exceeded the FHWA-approved Commonwealth threshold of \$2,700 per decibel of noise reduction per protected residence by 40 percent and 30 percent, respectively.

Consideration of Other Circumstances

As noted earlier, under certain circumstances FHWA policy and guidance also allows the Massachusetts Highway Department to approve sound barriers for areas not meeting the Commonwealth's adopted cost-effectiveness index test. Specifically, FHWA's Highway Traffic Noise Analysis and Abatement Policy and Guidance states, in part:

Flexibility is an important element of good noise abatement decisionmaking criteria and procedures. The criteria and procedures should be objective enough to be quantifiable, but they should also be flexible enough to allow the decisionmaker to make meaningful judgments on a case-by-case basis for special circumstances. The criteria and procedures should permit consideration of 'gray areas' and should not always be rigidly applied. There may be instances where abatement should be found to be reasonable and feasible even though it is found to fall outside some of the established criteria and procedures, e.g., it costs more than the reasonable cost index....Barrier cost is an important consideration but only one of a number of factors that need to be considered.

The circumstances under which deviation from the cost-effectiveness index is permitted include those where most of the impacted residents want a noise barrier and at least some of the affected homes were built before the initial construction of the highway causing the noise. We found circumstances like these present in this case.

Massachusetts Highway Department representatives were able to provide documentation showing their consideration of these circumstances. They also advised that their

¹⁷ This equates to a 13 foot high, 2,963 foot long concrete barrier costing \$621,264.

¹⁸ This equates to a 12.5 foot high, 1,627 foot long concrete barrier costing \$324,908.

¹⁹ This equates to a 19.7 foot high, 1,801 foot long concrete barrier costing \$352,000.

principal priority was the construction of highway safety improvement projects, such as the replacement of substandard bridges. They said this priority and their responsibility to ensure public fund expenditures were made in the most appropriate manner caused them to rely heavily on cost-effectiveness when approving or disapproving the noise barriers.

FHWA officials who reviewed this project advised us that they were satisfied that the Commonwealth had provided appropriate consideration to any circumstances possibly warranting a deviation from the approved cost-effectiveness index. FHWA officials also opined that the cost of the barriers exceeded the cost-effectiveness index by such a large margin that any mitigating factors for waiving the index would not have resulted in approval of the barriers. From FHWA's perspective, the 1998 study met all Federal requirements and the 2003 study was not needed. The fact that for the second time, on June 25, 2004, the Governor vetoed spending authorized by the Massachusetts legislature for these barriers, further underscores that the decision to build or not build these barriers is a local one.

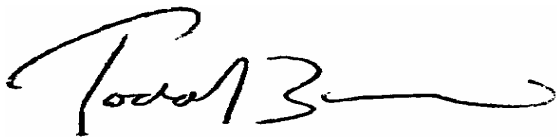
Finally, we noted that FHWA guidelines also allow another alternative for building noise barriers; however, this option is not available to the Commonwealth because the alternative was not included in the Commonwealth's noise abatement guidelines issued in 1996. Specifically, the FHWA guidelines state:

Some state highway administrations are allowing a third party to pay the difference between the actual cost of a traffic noise barrier and the cost that is deemed to be reasonable. There is no prohibition to this in Federal law or regulations, as long as it is done in a nondiscriminatory manner....It is also a method that may provide abatement for traffic noise problems that might otherwise go unmitigated.

We found that although Massachusetts Highway Department officials discussed this alternative during the 2003 reevaluation study, it was not pursued because there is no precedent for partially funding noise barriers in Massachusetts. If the Massachusetts Highway Department were able to pursue this alternative, the Commonwealth would have to fund approximately 72 to 77 percent of the cost of the additional noise barriers, with local government or another non-Federal source funding the remaining cost. Federal funds could not be used to fund these barriers because the cost exceeds the FHWA-approved cost-effectiveness index for Massachusetts. According to FHWA officials, a waiver for Federal funding is possible in situations like this, but unlikely because their decision would be based on state highway department compliance with approved guidelines.

If I can answer any questions or be of further assistance, please feel free to contact me at (202) 366-6767 or Ms. Debra Ritt, Assistant Inspector for Surface and Maritime Programs, at (202) 493-0331.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd J. Zinser", with a long horizontal flourish extending to the right.

Todd J. Zinser
Deputy Inspector General