COMMUNITY EXPERIENCE WITH I-275 ROAD NOISE IN MICHIGAN

Presented by

Larry K. Shoup

I. Interstate I-275

- Location: 5.4 mile road surface in Cities of Livonia and Farmington Hills, Michigan (between 5 Mile Road and 10 Mile Road). 25 miles northwest of Detroit.
- I-275 directs north and southbound traffic west of Detroit.
- 3,400 adjacent residential units exposed to road noise.
- Four northbound and four southbound through lanes.
- Average daily traffic volume for year 2000: 182,750 vehicles.
- Traffic Mix: 8.1%.
- Speed limit: 70 mph.
- 85th percentile speed: 75.5 mph.

II. I-275 Historical Overview

- 4 northbound, 4 southbound through lanes.
- 1994: Road surface severely deteriorated; heavy routine maintenance.
- Installed 2-inch asphalt overlay as temporary measure until road could be reconstructed.
- Residents noted an immediate and dramatic decrease in road noise from asphalt.
- 1997: Michigan Department of Transportation (MDOT) announced I-275 would be reconstructed in 1999.
- No increase in through lanes or road re-alignment.
- No environmental impact study required.
- Most recent I-275 road noise analysis conducted in early 1990’s.

1. Larry K. Shoup serves as Team Leader, Families Near I-275, Farmington Hills Michigan. Presented at the 88th Annual Purdue Road School, Stewart Center, Purdue University, Lafayette, Indiana on March 26, 2002. E-mail: lshoup1@aol.com
III. Pro-Active Community Efforts to Prevent Road Noise

- 1996: Michigan State Transportation Commission suspended Type II sound wall funding.
- April 1998: Meadowbrook Hills Homeowners Association requested MDOT to consider using sound walls and/or a bituminous road surface when reconstructing I-275 to reduce road noise.
- January 1999: Meadowbrook Hills Homeowners Association forms Families Near I-275 Road Noise Committee to address road noise concerns in a timely manner.
- February 1999: MDOT holds public meeting to present overview of I-275 reconstruction. Residents raise numerous questions about road noise. I-275 project design consultants have not received any request from MDOT for I-275 noise abatement and have no engineers assigned to environmentally assess road noise.

IV. Residents Request Help from Elected Officials

- City of Farmington Hills hires external consultant to advise how to reduce I-275 road noise. Consultant advises altering the road surface in combination with a traffic noise barrier would provide the greatest relief from road noise.
- Residents develop plans to request Michigan State Transportation Commission to reduce road noise at March 1999 Commission meeting.
- Residents mail a colorful, single page, weekly message to each commissioner starting 6 weeks prior to March meeting to get their attention.
- March 16, 1999: Michigan State Transportation Commission Meeting in Lansing attended by city officials, 60 residents, and state legislative representatives. The Commission was requested to take all reasonable and prudent steps to rebuild I-275 with the goal of reducing all perceivable noise while improving the tonal noise characteristics for all residents that can be helped. Commission gave residents 1.5 hr of presentation time. Presentation was well organized and rehearsed. Commission agreed to look into methods to make quiet road surface.
- April 1999: Commission instructed MDOT to reconstruct I-275 with concrete using transverse, skewed, random tining for the road surface. MDOT pledged to work with residents and agreed to conduct a post construction analysis of I-275 road noise.
V: Post I-275 Reconstruction Noise Levels

- October 1999: I-275 reconstruction completed. However, to our surprise, there was an immediate and dramatic increase in road noise! It was unbearable! We were surrounded by a “living hell”. Something went wrong! Residents now have more road noise misery than existed before I-275 was reconstructed!

- November 1999: MDOT conducted a post reconstruction sound analysis and discovered I-275 road noise to be greater than expected.

<table>
<thead>
<tr>
<th>Location</th>
<th>Measurement Sound Level</th>
<th>Program Verification Calculation</th>
<th>Projected Sound Level at ROW Calculation</th>
<th>Projected DHV1 Sound Level at ROW Calculation</th>
<th>Noise Abatement Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Mile to 6 Mile</td>
<td>81 dBA</td>
<td>81 dBA</td>
<td>74 dBA</td>
<td>77 dBA</td>
<td>67 dBA or above</td>
</tr>
<tr>
<td>6 Mile to 7 Mile</td>
<td>80 dBA</td>
<td>82 dBA</td>
<td>82 dBA</td>
<td>85 dBA</td>
<td></td>
</tr>
<tr>
<td>7 Mile to 8 Mile</td>
<td>75 dBA</td>
<td>73 dBA</td>
<td>71 dBA</td>
<td>75 dBA</td>
<td></td>
</tr>
<tr>
<td>8 Mile to 9 Mile</td>
<td>83 dBA</td>
<td>83 dBA</td>
<td>79 dBA</td>
<td>82 dBA</td>
<td></td>
</tr>
<tr>
<td>9 Mile to 10 Mile</td>
<td>81 dBA</td>
<td>81 dBA</td>
<td>81 dBA</td>
<td>83 dBA</td>
<td></td>
</tr>
</tbody>
</table>

1 Design Hourly Volume
2 7 Mile to 8 Mile was taken out side of a ramp near 8 Mile

VI. Initiating Corrective Action

- January 2000: City of Farmington Hills, residents, and MDOT representatives meet. City offered to hire an external consultant to more completely analyze I-275 road noise north of 8 Mile and provide recommendations for road noise reduction. MDOT and Meadowbrook residents agreed to the proposal. All parties would review/approve the draft methodology prior to data collection. City hires external consultant to conduct an I-275 Traffic Noise Analysis.

- MDOT indicated the December 1999 road noise data was “preliminary in nature” and agreed to work cooperatively with the City and residents in conducting a more thorough sound analysis.

- August 2000: City of Farmington Hills mayor corresponds with Director of MDOT to request his assistance in providing relief from the terrible road noise residents endure. MDOT director indicates there is nothing he can do.

- September 2000: City of Farmington Hills conducts Asphalt Study Group Meeting. Michigan Asphalt Education Foundation representatives report academic studies around the world show certain types of asphalt is 7 to 9 decibels quieter than tined concrete. The Foundation recommended a 2.5 to 3 inch SMA (stone mastic asphalt) overlay for I-275 at a cost of $800,000/mile. This would cut I-275 noise by 7 dBA! A sound wall costs 1.5 million per mile or more, based on the topographical surface adjacent to the roadway. Asphalt is less expensive than sound walls.
Twenty-five residents from City of Livonia attend meeting. Farmington Hills and Livonia residents agree to work together.

October 2000: City of Farmington Hills conducts Concrete Study Group Meeting to review Michigan Concrete Association recommendations on what can be done to further reduce I-275 road noise. Association consultant indicated the concrete road surface could not be altered to reduce road noise. Concrete Association consultant recommends sound walls.

November 2000: Livonia City Council adopts resolution supporting I-275 road noise abatement. Resolution requests MDOT to develop and implement an efficient / effective I-275 noise abatement program.

December 2000: Livonia Mayor and Livonia City Council conduct Livonia Town Hall Meeting to review all pertinent information regarding I-275 road noise. Approximately 200 residents and three legislative representatives attend. All parties agreed to bring citizen issues to MDOT’s attention and seek relief from I-275 road racket.

Residents discover MDOT under reported noise levels by 4.5 decibels! The National Climatic Data Center indicates an average annual mean wind velocity of 8.9 mph from the southwest (220 degrees) at Detroit Metropolitan Airport (14.7 air miles away) for calendar years 1998-1999.

<table>
<thead>
<tr>
<th>NATIONAL CLIMATIC DATA CENTER METEOROLOGICAL DATA</th>
<th>DETROIT METROPOLITAN AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>1998</td>
</tr>
<tr>
<td>Annual average dry bulb temperature (degrees F)</td>
<td>53.5</td>
</tr>
<tr>
<td>Annual mean wind speed (mph)</td>
<td>8.7</td>
</tr>
<tr>
<td>Annual prevailing wind direction (degrees)</td>
<td>220</td>
</tr>
</tbody>
</table>

Wind velocity and direction have a significant impact on road noise. Residents describe good days/bad days based on wind direction and velocity. A 9 mph crosswind increases noise by 4.5 decibels within road right of way. Most residents live east of I-275. MDOT (and FHWA) reports road noise under zero wind conditions. The noise residents hear is 4.5 decibels greater than reported by MDOT due to wind.

VII. Political Environment

January 2001: Residents meet with State elected officials to review road noise issues and requests their help in seeking a solution to I-275 road noise. Meetings established a communication link and common understanding among all parties.

January 2001: Michigan State Transportation Commission Meeting attended by Livonia and Farmington Hills residents. Residents thanked the Commission and MDOT for past efforts to reduce I-275 road noise. Residents briefly explained that something went wrong with the reconstruction of I-275. When I-275 opened to traffic, there was an immediate and dramatic increase in road noise. Residents laid
the groundwork for a more thorough presentation to be made at the February 2001 Commission meeting.

The Commission directed MDOT Director to conduct a deliberate and exhaustive review of existing studies and technologies and identify options to reduce road noise from pavement surfaces, and to report findings to the Commission. The Commission wants to be a good neighbor, but does not want to over commit financial resources to reduce road noise.

- February 2001: Farmington Hills consultant completes I-275 Traffic Noise Analysis. The analysis indicates road noise (north of 8 Mile, east of I-275) exceeds minimum state and federal requirements for noise abatement. The cost of constructing a continuous noise barrier (14 to 20 feet high, adjacent to the road shoulder) between 8 mile and 9 ½ mile roads falls within state and federal funding guidelines. The estimated cost is $3.5 million.

- February 2001: An overflow crowd of 150 residents, Farmington Hills and Livonia city officials, and state legislators met with the Commission to request their help in reducing I-275 road noise pollution. The crowd was very orderly and stated their business case very clearly. For over 2 hours, residents testified how their health and quality of life has suffered. Residents experience sleepless nights, backyards can no longer be enjoyed for gardening, or serve as a playground for children. Entertaining guests usually results in yelling at each other just to be heard. Property values have not kept pace with other neighborhoods. Residents installed new windows and other expensive home improvements in an attempt to reduce noise inside homes. They described how their life long dream for a beautiful home in a peaceful, residential area, with rolling hills and trees, has been shattered. All of this has been taken away by the relentless road noise. Residents described I-275 road noise as an environmental pollutant, a “living hell”! Farmington Hills Mayor presented the Commission with an I-275 Traffic Noise Analysis report developed by the external consultant hired by the City.

The message: “We met with you before I-275 was reconstructed. MDOT did what you said they should do to reduce the noise. It did not work! No one knows why. Now, the Commission needs to do more. We are here today to ask for your help. We ask you to do what we requested of you in March of 1999 and that is to take immediate and aggressive action to allocate all appropriate resources to correct the problem. Please help us”!

MDOT director indicates he will present various options for road noise abatement at the March 22, 2001 Commission meeting. Director reminds Commission that at present, there are no funds allocated for abating road noise.
VIII. MDOT IDENTIFIES OPTIONS TO ABATE ROAD NOISE

- March 2001: MDOT Director presents Commission with 5 options for abating I-275 road noise:
  1. Do nothing at this time.
  2. Longitudinal grinding of pavement surface. ($1.5 million, 3 dBA reduction)
  3. Landscaping (trees and shrubs) outside the ditch area ($1 million, little reduction in noise)
  4. Noise walls or berms ($16 million, approx. 4-8 dBA within 400 feet of wall)
  5. An overlay with Bituminous Pavement ($8 million plus, 5 dBA or more). MDOT director reports 6 to 8 dBA could be achieved with open graded asphalt.

- Commission identifies issues to be addressed at next Commission Meeting: How to evaluate the various options based on cost and benefit. What to do regarding moving I-275 to the top of the MDOT noise sensitive site list. Whatever is done for I-275 may need to be done for other noise sensitive sites.

- March 2001: Legislation introduced mandating MDOT install noise abatement measures along an existing portion of a limited access highway if the noise level at that existing portion of the highway has increased to more than 67 decibels. Legislation applies when noise increased more than 67 decibels due to improvements made on the highway and when residential property is located 100 yards or less from the traveled portion of that highway.

- Residents testified in favor of above legislation to the Michigan House and Senate Transportation Committees. (Legislation never passed.)

- May 2001: Families Near I-275 meet with the Transportation Commission. Public officials and residents requested the Commission to adopt a road noise reduction strategy for I-275. Residents recommend I-275 should be given special consideration, separate from any statewide policy.

IX. Commission Selects Road Noise Solution

- June 2001: Transportation Commission adopts MDOT recommendation to longitudinally grind all I-275 concrete through lanes from 5 Mile to 10 Mile road based on the success of a Colorado grinding test site on state highway 285 (Deer Creek Canyon area). The Colorado Department of Transportation reported a 6 dBA reduction for residents along the roadway. MDOT will negotiate the cost and the materials / workmanship warranty with John Carlo & Sons, the I-275 Contractor. Estimated cost of longitudinal diamond grinding is $1.5 – 2 million. MDOT plans to duplicate the road surface texture used on Colorado SH 285. The state will do another sound study after the pavement is ground down to measure the actual noise reduction.
MDOT indicated it would develop a state wide pavement noise policy for the Commission’s approval, which should be completed by December 31, 2001.

X. Pre Diamond Grind Sound Analysis

- July 2001: MDOT sound engineers conduct a sound analysis from 5 ½ Mile to 9 ½ Mile roads. Measurements were taken at five southbound and five northbound locations within the right of way. An average of 83.1 dBA (A weighted) was recorded. Decibels ranged between 81.5 to 85.3 dBA for the 10 sites.

- August 2001: MDOT reported the current skid coefficient for the transverse random skewed, tined section of I-275 is 0.40+, and 0.35 for the longitudinally ground (road ride quality grind) segments. Longitudinally ground sections require a longer distance to stop a vehicle (less safe).

XI. Post Diamond Grind Sound Analysis

- November 2001: MDOT reported the longitudinal diamond grinding of I-275 resulted in an average 5.4 decibel reduction in road noise over the previous road surface texture. The previous surface texture was random, skewed, transverse tining with longitudinal diamond ground patch areas (profiling) to improve ride quality.

- December 2001: Residents indicate there is little or no road noise reduction benefits from longitudinal diamond grinding in residential areas. A 5.4 decibel reduction in noise would result in a readily perceptible reduction in noise. There is a huge disconnect between the claimed 5.4 decibel reduction and what residents actually hear. However, road noise is significantly reduced inside of vehicles traveling over the longitudinally tined surface. Families Near I-275 filed a Freedom of Information Request with MDOT to review the road noise analysis data.

XII. Relationship Between Vehicle Speed and Road Noise

August 2001: A Federal Highway Administration highway noise specialist analyzed the relationship between vehicle speed and road noise (mean energy level) in residential areas adjacent to I-275. A “TNMLOOK” software analysis was performed. A 20-mph reduction in speed would be required to achieve a barely perceptible difference in road noise (3-3.5 dBA). For any noise abatement measure to be considered feasible (funded by FHWA) it must achieve at least a 5 dBA reduction, which FHWA considers a readily perceptible change. A 30-mph reduction in the speed would be necessary on I-275 to achieve a 5 dBA reduction. FHWA considers speed reduction on an interstate highway not to be a viable noise abatement measure.

XIII. Residential Road Noise Survey Questionnaire

- February 2002: Residents develop plan to survey residential units adjacent to I-275 to: (1) determine if residents who live near I-275 receive any benefit from recent
efforts to reduce I-275 road noise, (2) determine if further noise reduction effort is desired, and (3) assess resident attitudes toward traffic noise barriers.

XIV. Recommendations for state DOT’s:

Road noise is a terrible environmental pollutant. Our residential quiet does not invade the environment of those who travel on the road. The noise from the road invades our residential quiet. Residents may be the victims of road engineers who ignore noise.

1. Adopt a “Good Neighbor” Policy when reconstructing roads in residential areas. Good neighbors keep noise to themselves.
2. Make road noise a road building priority. Build road noise reduction into building roads. It’s more cost effective to use public funds to construct a quiet road than to build the road and then re-construct it later to make it quiet.
3. Citizens who live near a road are the same persons who drive on the road. They are the same customer. When designing roads, treat the resident who lives nearby accordingly. Incorporate their needs, requirements / expectations into construction plans whenever possible.
4. Recommend state DOT’s proactively develop road noise forecasts in developing areas and actively communicate them to citizens. Include road noise associated health risks and potential reduction in property values as traffic volume gradually increases.
5. An informed, educated consumer can make better choices in where they live. Developers will not construct homes in areas in which they will not sell.
6. The FHWA Traffic Noise Model (TNM) software version 1.1 requires all noise levels to be reported at zero wind conditions. When reporting TNM decibel levels, adopt procedures to assure local wind speed and direction are factored in to avoid understating or overstating decibel levels to the public. Including wind speed and direction more accurately reflects noise levels residents actually hear.
7. Proactively keep local governments informed about forecast noise levels to help in planning land use accordingly.

The environment is for everyone to enjoy. We need to protect it for all citizens.