



U.S. Department
of Transportation

**Federal Highway
Administration**

Memorandum

Subject: **INFORMATION:** FHWA Highway Traffic
Noise Prediction Model

Date: MAR 30 1986

From: Director, Office of Environment
and Planning

Reply to: HEP-40
Attn. of:

To: Regional Administrators
Federal Lands Highway Program Administrator

With valuable assistance from the Volpe National Transportation Systems Center (VNTSC), FHWA has developed a new state-of-the-art highway traffic noise prediction model called the FHWA Traffic Noise Model, Version 1.0 (FHWA TNM). Along with a copy of this memorandum, one copy of the TNM "package," which includes the model software, the User's Guide, the Technical Manual (which describes the theoretical basis of the model), and a TNM-tutorial CD-rom, is being distributed directly by the VNTSC to all State Departments of Transportation (DOTs). The FHWA offices may request a copy of the TNM "package" from HEP-40. All State DOTs may make sufficient copies of the TNM "package" for internal use. The McTrans Center at the University of Florida, telephone: (904) 392-3225, fax: (904) 392-3224, World Wide Web: <http://www-mctrans.ce.ufl.edu>, will distribute TNM to all other users at a cost of approximately \$700.

The FHWA TNM is a registered Copyright. The Copyright encompasses the User's Guide, the Technical Manual, and the software source and executable codes. The FHWA TNM is also a registered Trademark. The Trademark encompasses the copyrighted User's Guide, Technical Manual, and software source and executable codes. It provides the FHWA with the exclusive right to use the names "Federal Highway Administration Traffic Noise Model" and "FHWA TNM." The purchase of TNM includes the executable code, the User's Guide, and the Technical Manual. A TNM package must be purchased for each distinct address (site), although copies may be made to permit several individuals at one site to use it. The User's Guide may be photocopied.

Phase-In:

The phase-in period for TNM will be 24 months from the date of this memorandum. During this time, each division office, in consultation with its respective State DOT, should determine which studies and projects will be analyzed using the existing FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and which ones will be analyzed using TNM. The TNM should be utilized for more analyses as knowledge and experience is gained in its use. After the phase-in period, TNM will replace the existing FHWA prediction model and the existing model prediction software, STAMINA 2.0/ OPTIMA.

Accuracy and Program Cost Savings:

The TNM has been validated and has been found to have improved accuracy over the existing FHWA prediction model. Early testing has shown that TNM is at least 1 dB more accurate than the existing model, and sometimes as much as 6 dB more accurate.

Improved accuracy in TNM will allow for more exactness in the identification of highway traffic noise impacts and will also produce greater precision in noise barrier design. A substantial savings in program costs should be realized. Nationwide, noise barriers average approximately 12 feet in height. An improvement in traffic noise prediction accuracy of 1 dB can potentially reduce overall barrier height by 2 feet, affording an overall program cost savings of more than 16 percent. Over the last 5 years, highway program costs for noise barriers, nationally, have averaged more than \$118 million annually, so the potential program savings is more than \$19 million annually.

Run-Time:

The TNM is a Windows-based program (Windows 3.1) with increased capabilities and scientifically-founded, state-of-the-art acoustic algorithms, which have undergone some field validation. The TNM's expanded capabilities include the ability to model both constant- and interrupted-flow traffic, attenuation over/through building rows and vegetation, multiple diffraction, parallel barrier analysis, and contour analysis. However, the model's increased capabilities and theoretical basis result in increased runtimes. TNM will currently run typical studies in between 1 and 2 hours on a state-of-the-art PC, many will run in minutes. Most complex studies (previously unachievable with STAMINA) are expected to take no longer than an overnight run. These runtimes are substantially longer than those of STAMINA 2.0/OPTIMA. However, the notable improvements in accuracy, flexibility, and ease of use should more than compensate for these increases in runtimes. Additionally, the sound theoretical base upon which TNM has been structured will allow for easy incorporation of other acoustical effects, e.g., atmospheric, as future studies are completed, and TNM runtimes will be greatly reduced as computer hardware technology continues to advance.

For TNM to run at its design speed and convenience, the following are recommended:

- Computer: IBM-compatible PC
- Processor: Pentium
- Memory: 16 MB
- Hard drive: 300 MB
- Monitor: Super VGA (1024x768), 16 colors, small fonts
- Operating System: Windows 3.1, Windows NT, or Windows 95

Training:

The TNM-tutorial CD-rom provides immediate hands-on training. It has sound, scanned photography, narration, animation, and simulation to fully interact with the user. It is structured into the following major navigation sections:

- Introduction: It provides an overview of TNM and guides the user on how to use the training CD-rom;
- Virtual Reference: It allows the user to access help on TNM's graphical user interface (menus, tool bar, and status bar). All menu and submenu items are available for selection, each with a brief discussion and links to other areas of the CD-rom;
- Lessons: They demonstrate the use of TNM via "movies" and example tutorials. The lessons emphasize the "smart use" of the model, and provide available keyboard and mouse shortcuts, relevant hints, and pertinent FHWA policies. The lessons include a simple and a complex TNM workflow example, both based on actual highway situations. The simple example takes the user through file creation and setup, object input, sound-level calculations, and a short barrier analysis. The complex example includes everything within the simple example, as well as a brief contour analysis and a parallel barrier analysis;
- Search Engine: It allows the user to search for help on TNM topics, keywords, and concepts;
- Notepad: It establishes a link to the standard Windows Notepad application to allow the user to input notes and memos at any point during the use of the CD-rom; and
- TNM Installation: It is expected that TNM may be installed directly from the CD-rom itself (note that the CD-rom does not run the TNM program). Because the results used in the lessons will be precalculated, the user will have rapid interaction with the CD-rom and will also be able to run TNM separately, upon installation.

Private consulting firms and/or Universities will provide formal training in the use of TNM. A videoconference on TNM is also being planned for State DOT staff; information on the videoconference will be transmitted when available.

The FHWA requests for the TNM "package" or questions and comments on TNM may be directed to Bob Armstrong or Steve Ronning at (202) 366-2073 or (202) 366-2078, respectively.



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Attachment