



February 23, 2007

Mr. J. Richard Capka  
Administrator  
Federal Highway Administration  
U.S. Department of Transportation  
400 Seventh Street, SW, Room 4218  
Washington, DC 20590

Dear Mr. Capka:

This is the first letter report of the Transportation Research Board's (TRB's) Committee for Pavement Technology Review and Evaluation. The committee was established at the request of the Federal Highway Administration (FHWA) to provide strategic advice and guidance to FHWA in the conduct of its Pavement Technology Program as authorized under the new SAFETEA-LU legislation. The committee's charge includes reviewing FHWA's Pavement Technology Program through an annual public forum (meeting). Specifically, the committee will assess the potential utility of the technologies being investigated by FHWA, provide guidance to enhance the effectiveness of deployment and implementation of successful technologies by users, identify and prioritize additional research needs, and make suggestions for future direction of the Pavement Technology Program. The committee membership has been drawn from the executive and senior professional levels of state highway agencies, private industry, and academia. The members' expertise covers scientific and engineering disciplines relevant to pavement technology ranging from basic materials science of concrete and asphalt to highway construction, maintenance, rehabilitation, and management. A roster of the committee is provided as Attachment 1.

We take this opportunity to acknowledge FHWA's efforts in reaching out to and seeking input from external stakeholders. The committee held its first meeting on December 14 and 15, 2006, in Washington, D.C. Because this was the committee's first exposure to FHWA's Pavement Technology Program, the meeting was essentially a learning experience for the members. Before the committee could comment competently on the program, the members needed to learn more about its basic components. We also needed to gain an understanding of how the program fits within FHWA's overall organizational structure and how various FHWA offices and divisions interact with each other in developing and executing the program's diverse activities. We greatly appreciate the efforts of FHWA staff in gathering the needed information to make this learning process easier. Our initial assessment of the program as presented in this letter report is based on what we learned through the presentations and the discussion that followed at our meeting.

The committee's assessment was developed in a closed session and completed through correspondence. The committee's report was reviewed by an independent group of peers according to policies and procedures of the National Research Council. The assessment and recommendations of this letter report represent the committee's best collective judgment at this

time. We recognize that we need a better understanding of how FHWA's various entities interact with each other in the conduct of this program, how various activities in FHWA's Strategic Pavement Technology Program Roadmap are prioritized, and how input from stakeholders, particularly external stakeholders, is sought in establishing the program's goals and priorities. In general, the committee supports FHWA's approach as a good starting point and considers the program's overarching goals and focus areas to be appropriately formulated. FHWA should continue to reach out to all relevant stakeholders through its Pavements Forum, which makes the program more inclusive, and to build on the forum in further refining the program's goals and strategies.

### **Program Coordination and Stakeholders' Involvement**

The committee recognizes the complex, multifaceted nature of the Pavement Technology Program, which deals with numerous aspects of research and development, technology transfer and deployment, communication, and training and education in the area of pavement technology. Moreover, the diverse range of activities is spread over a number of FHWA offices, divisions, and centers. This complexity raises some concerns about how communication and coordination among all the decentralized players are effectively maintained. It was not clear how various FHWA divisional offices and resource centers are working with the offices at FHWA headquarters and the Turner-Fairbank Highway Research Center in identifying research needs and priorities and developing deployment strategies. How the input of external stakeholders is sought and used in various phases of the process was also unclear. The committee wants to learn more from FHWA about the mechanism it has established for the dialogue between all internal and external participants and stakeholders in the program.

FHWA's Pavements Forum comprises senior officials from various FHWA offices, divisions, and centers and is currently the most important mechanism for guiding and coordinating the program. However, the forum appeared to function informally, and how the forum seeks input from external stakeholders in developing the program's goals, milestones, and strategies was not clear. While we consider the forum a good approach for organizing and coordinating activities within FHWA, the stakeholder input appears to depend on informal interactions among individuals and groups. A more formal process would provide an opportunity for external stakeholders to become involved, as described in the next section. Whereas the TRB Committee for Pavement Technology Review and Evaluation is a good mechanism for seeking strategic external input, it needs to be supplemented by other mechanisms to reach out more broadly to specific stakeholder groups.

### **Pavement Technology Roadmap**

The roadmap is a crucial strategic document that establishes the program's goals as well as milestones to help gauge progress toward reaching those goals. It lists a number of strategies under several focus areas. While the roadmap is an impressive document, it can be improved by making priorities explicit and goals more specific. The roadmap in its present form, for

example, does not provide any information on the priorities of the various strategies listed therein. Furthermore, the number of strategies included appears to make the document excessively broad. The committee suggests assigning priorities to (or weighting) various strategies in the roadmap along with an indication of the level of funding or effort each strategy should receive to achieve positive results over time. The roadmap can be further improved by making its goals and strategies as specific as possible. While some of the strategies are specific, others appear to be stated in general terms. For example, strategies listed in “Optimized Pavement Performance” and “Advanced Quality Systems” are specific, but strategies listed in “Enhanced Surface Characteristics” appear to be general and vague and to be variations of similar statements that cannot be easily measured or assessed. Consistency needs to be improved by developing specific, task-oriented strategies for all areas. This will also allow development of an easier and more reliable way to measure and assess progress.

The committee is uncertain as to whether the state departments of transportation (DOTs) and other stakeholders have a “buy in” to the roadmap. We suggest that FHWA explore mechanisms for giving stakeholders—state DOTs and others—a meaningful role in forming goals and defining focus areas of the roadmap. Because a key function of the Pavements Forum is to approve the roadmap, formal stakeholder input would be useful in engaging stakeholders in the work of the forum. The likelihood of success in implementation will increase considerably if FHWA and external stakeholders share the goals of the program.

The committee is aware that a number of state highway agencies and other organizations have been developing their own roadmaps or similar plans and that related work is being done at universities and in private industry. Consideration by FHWA of those plans and activities as it further develops and refines its strategic plans would be of mutual benefit. Coordination with other agencies and institutions will complement FHWA’s efforts and leverage federal dollars. This coordination could become one of the formal activities of the Pavements Forum.

## **Deployment and Implementation**

The committee discussed at length the implementation and deployment strategies of the Pavement Technology Program. We believe that partnering between FHWA and state DOTs works best to implement pavement technologies. Different states have different needs; therefore, the implementation strategy should allow states to adapt new technologies to their needs and conditions. For example, the state of Illinois has had its own mechanistic-empirical (ME) pavement design procedure for a number of years. The Illinois procedure is less sophisticated than that provided by the new *Mechanistic-Empirical Pavement Design Guide* (MEPDG) and works well for the state. We recognize that the new MEPDG is an AASHTO product and the states ought to benefit from it, in view of the time and money they have invested in its development. It may therefore be helpful at this early stage of implementation efforts if FHWA, in addition to educating the states and others about MEPDG, emphasizes the basic principles of ME pavement design and rehabilitation and

points out that the MEPDG is one model to recommend, albeit a comprehensive one, and that states may adapt the MEPDG to suit their needs or use their own ME design. Emphasizing the basic approach of ME with key technical concepts included in the National Highway Institute course on mechanistic design and other approaches that can be illustrated by using the new design guide may facilitate the adoption of ME pavement design by the states. Furthermore, promoting the adoption of new technologies and procedures is easier when their benefits have been shown through tests and demonstrations.

Our implementation efforts should also benefit from our past experiences. In recent years, much has been accomplished in the implementation of Superpave, a product of the first Strategic Highway Research Program. Superpave represents an advance in pavement technology, and all states are now implementing one or more of its developments. However, there remains a widespread perception that during the early implementation efforts, many states were led into its deployment before all the problems with the new design system were worked out, which resulted in a trial-and-error process for the states that was more costly than necessary. States need incentives to deploy new technologies that carry risks of failure and increased costs and time. The committee is interested in learning about the kinds of positive, not negative, incentives FHWA can provide to help a state implement a new technology.

Deployment efforts may also need to target more than just the technical people. Division administrators, for example, could communicate the benefits of implementing new ideas to top state officials, and it would be helpful to know the extent to which this is being done.

### **Training**

Training must be carried out before an innovation can be adopted. Implementation has a better chance of succeeding if users comprehend and agree with the technology that they are being asked to accept. We learned about training plans for the new MEPDG at the meeting and want to learn more about such plans for other technologies being considered for deployment. We also want to engage FHWA on the general direction for all pavement-related training issues: national direction, who is being trained, who should be trained, typical training content, and how the training is delivered (classroom, online, blended learning). Before the committee makes a recommendation concerning training activities, it might also be useful to learn more about the pavement-related efforts of the National Highway Institute.

### **Measure of Performance**

The committee also sees a need for developing good indicators of success on the part of FHWA. The mere fact that a certain number of states use a particular technology may not suffice. The real measure should be based on the difference that the technology has made. Use of a technology resulting in no net performance gain or cost savings does not establish the success of the technology. Documentation of how a technology has changed some aspect

of the operation of state DOTs and resulted in cost savings, improved performance, greater efficiency, enhanced safety, or other improvements can form the basis of a real measure. As part of this process, it will also be important for FHWA to understand why certain jurisdictions might not choose to use a new technology.

An example of documenting the performance of new technologies is the program in the Office of Asset Management promoting the use by the states of their pavement management systems to evaluate new technology such as Superpave. The committee encourages FHWA to pursue this type of program aggressively with the states as they implement ME pavement design and rehabilitation procedures, such as those provided in the new design guide. This needs to be done so that the benefits of adopting this new technology will be well documented. Moreover, it provides the states with an opportunity to calibrate the new design guide technology to their materials and their specific traffic and environmental conditions.

### **Advanced Highway Research Program**

The committee was briefed on FHWA's initiative on advanced highway research as authorized in the new legislation. The program is funded at a level of \$14 million per year, and a chief scientist has been appointed to manage it at the Turner-Fairbank Highway Research Center. The committee believes that FHWA needs to increase its emphasis on innovative high-risk, high-payoff research with a long-range perspective. This view is supported by the work of the Research and Technology Coordinating Committee in TRB's *Special Report 261*. The advanced research program appears to meet this expectation. The committee is interested in learning more about the status of this initiative and particularly the opportunities for stakeholder input in developing topics and strategies for advanced research in the pavement area.

### **Highway Research and Education Opportunities**

The committee supports FHWA's efforts to attract talented people to highway research and engineering through fellowships, internships, and similar opportunities. It encourages FHWA to continue efforts to attract highly trained and motivated people to innovative work in highway research and engineering and to retain them. The fellowships and postdoctoral programs at the Turner-Fairbank Highway Research Center appear promising. Fellowships, internships, and faculty training opportunities that vary in scope and duration, especially those offered at institutions away from Washington, D.C. (to avoid the high cost of living), may also be useful in attracting new people into the field. Efforts with regard to building technical capability require a broader focus than merely the existing workforce and technician-level personnel. More effort needs to be devoted to bachelor's and master's programs to ensure an engineering workforce with the needed education and expertise. Support may also be extended to K-12 education and recruitment programs to help inspire and nurture young minds in the field of transportation and to produce transportation professionals for the future.

## **Long-Term Pavement Performance Program**

The committee discussed the status of the Long-Term Pavement Performance (LTPP) Program, which, as mandated, is to end in 2009 after completing its expected 20 years' duration. Whereas monitoring of the LTPP pavement test sections over the years has provided an abundance of information related to pavement performance, the time has come to apply that information to fulfill the original goals of the program. Defining pavement performance in terms of traffic, climate, soil and material properties, and layer thickness was the overall intent when the program began. While the program has resulted in numerous useful spin-off products, many important pavement design inputs must still be assumed because of the lack of a definitive answer from research. The analyses should be completed and their results implemented in a practical way to advance pavement design, construction, and management. In addition, a number of test sections, particularly those installed in the late 1990s, will be years away from approaching the end of their design life in 2009. Continued monitoring of these test sections will be most appropriate after a review of the objectives of these experiments and the data available to accomplish them, with priority given to sections that can help further improve pavement design and modeling and thus contribute to designing and building durable pavements. The committee recognizes the strong potential benefits from LTPP data analysis and wants to learn more about FHWA's plans for this activity in the post-2009 period and about the overall status of the program.

## **Suggested Topics for the Next Meeting**

As noted earlier, we greatly valued this opportunity to gain exposure to FHWA's Pavement Technology Program. While we made substantial progress, we need to develop a deeper understanding of several important aspects of the program to help us in future assessments. Further in-depth discussion of the following topics at our next meeting would greatly help us:

- Role of division offices and resource centers in the deployment arena and their interaction with states.
- Communications among all the key players (state DOTs; FHWA headquarters, division offices, and resource centers; industry; and the research community) in implementation of innovation.
- FHWA's efforts in coordinating its roadmap with major highway research programs at state highway agencies, at universities, and in private industry.
- FHWA's ideas on developing better performance measures as they relate to implementing new technologies. What factors (data, models, affordability, etc.) are important in developing that basis?
- Strategies for training and the role of the National Highway Institute.

- Strategies for successful deployment. What models work best for deployment? Is FHWA evaluating several different strategies?
- What are the focus areas of the Advanced Highway Research Program, how extensive is it, and how will external stakeholders be involved in it?
- Overall status of and FHWA's plans for the LTPP program in the post-2009 period.

We found our first meeting to be informative and productive. It provided an excellent opportunity to learn firsthand and exchange views with those who are spearheading this national effort at FHWA. We commend FHWA staff for their work in developing this program and for striving to improve its goals and strategies. We particularly appreciate FHWA's efforts to reach out to stakeholders from all relevant groups to seek their input into the program. We share FHWA's view that only the active participation of all stakeholder groups in all phases, from research to deployment and training, will ensure that this program achieves its ultimate goal of roads that last longer and cost less to build and maintain. We look forward to continuing our dialogue with our FHWA partners on this important national endeavor at our next meeting, which is scheduled for summer or early fall 2007.

Sincerely,

Carlos M. Braceras  
Chairman, TRB Committee for Pavement  
Technology Review and Evaluation