



# TRANSPORTATION RESEARCH BOARD

OF THE NATIONAL ACADEMIES

March 12, 2009

Mr. Jeffrey F. Paniati  
Acting Deputy Administrator and Executive Director  
Federal Highway Administration  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

Dear Mr. Paniati:

This is the third 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 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The committee membership has been drawn from the executive and senior professional levels of state highway agencies, private industry, academia, and the highway user community and represents a broad range of expertise in disciplines relevant to pavement materials, engineering, technology transfer, and management. A roster of the committee is attached. The committee held its third meeting on December 11 and 12, 2008, in Washington, D.C. This letter report presents the committee's assessment of the program as developed in a closed session at the end of the meeting and completed through correspondence. As before, the report was reviewed by an independent group of peers in accordance with the policies and procedures of the National Research Council. The assessment and recommendations of this report represent the committee's best collective judgment based on the information provided and discussed at the meeting.

We take this opportunity to acknowledge the dedicated effort of FHWA staff under the leadership of Mr. Peter Stephanos and Mr. Gary Henderson in moving the Pavement Technology Program forward. We particularly appreciated Mr. Stephanos's openness to constructive criticism and comments and his candid self-assessment of where staff had made successful strides and where they had fallen short. In our assessment, the program has made good progress and is moving in the right direction. While some of the issues that the committee had discussed in its earlier meetings are not fully resolved, FHWA staff have continued to work on them and have made noteworthy progress.

## Stakeholders' Involvement

The committee has been discussing the importance of stakeholder involvement since its first meeting and has raised this issue in its previous letter reports. The committee attaches the utmost importance to stakeholders' involvement in the planning, conduct, and implementation of the

Pavement Technology Program. The previous letter report strongly advised FHWA to seek stakeholders' input often and at multiple levels from the outset of an activity under a structured approach. The committee considers this to be crucial, not only in ensuring that the program benefits from the input of all relevant stakeholders but also in facilitating buy-in by all those involved in building, maintaining, and using the pavements. However, even at this stage in the life of the program, the extent and nature of involvement of external stakeholders in program activities remain unclear. On the basis of information presented to the committee at this meeting, the FHWA program office processes still appear to be mostly internal, with little meaningful involvement of external stakeholders. At the technical level, there appears to be more extensive engagement of stakeholders in FHWA's asphalt program through three expert task groups, but there are no such advisory groups for the concrete program, which appears to be handled generally on an ad hoc basis. The only apparent organized stakeholder involvement in the concrete program is an expert task group advising the program on its alkali-silica reactivity project, unless FHWA regards persons involved in various tracks of the Concrete Pavement Road Map activity administered by Iowa State University as providing stakeholders' input to the concrete program. While the committee believes that FHWA has done well in streamlining its internal process, it would like to see more organized and balanced outreach, with transparent linkage to the programs undertaken.

This committee represents only a small part of the highway community with whom FHWA must interact in the conduct of the Pavement Technology Program. We meet only once a year to provide our overall assessment. Annual program review and evaluation, however, are not the same as detailed input at various levels in the program's planning, execution, and implementation activities. A structured approach is needed in which one set of stakeholders helps determine goals and priorities and another assists with project oversight and delivery. Active involvement of relevant stakeholders with needed expertise at each of these levels is paramount. Although briefings to stakeholder groups, such as at an American Association of State Highway and Transportation Officials meeting, are valuable, telling others what is being done is not the same as engaging stakeholders in a dialogue and actively seeking their input. Those who should be involved in the process should have time to review the relevant material so that they come prepared to discuss and not just react to what they have heard. Therefore, a formal process for closer and more frequent involvement of stakeholders than can be provided by this committee is needed at all levels of the program's activities. The committee again urges the program administrators to act quickly to establish a formal mechanism for engaging stakeholders at all important levels. This interaction should be a continuous process over the life of the program's activities.

### **Strategic Direction, Issues, and Gaps**

FHWA's Pavement Technology Program has two overarching goals—protecting investment and building for the future. This simple classification covers all of the program's activities as well as deficiencies that need to be addressed to resolve any issues. The presentation on the program's strategic direction provided a list of gaps and pertinent issues and needs that the Focus Area

Leadership and Coordination (FALCON) teams had identified under each of the two goals.

The committee appreciates the effort of the FALCON teams in preparing the list of issues, needs, and gaps for the program's various focus areas. However, it is not apparent to the committee whether any input from users, other stakeholders, and experts in the relevant fields was sought in identifying these issues and gaps. There also appears to be some disconnect between the needs and gaps. For example, not all key issues identified for Fiscal Year 2009 seem to agree with the gap analysis. The issue of materials prices and supply is not identified in the list provided. Development of multiyear plans for infrastructure research and development strategies, which was identified as a critical issue for Fiscal Year 2009, is also not evident in the list.

The committee agrees that the list of gaps is long and should be prioritized. Given the available resources, not all gaps can be addressed satisfactorily. The issues enumerated by FHWA are important and can be used as input for prioritizing the gaps. To do this properly, FHWA should establish a formal process for setting priorities that are closely aligned with the program's strategic goals. Risk analysis and cost-benefit considerations should also play a part in the process, and expected benefits of proposed activities should exceed their costs. The process should include substantive stakeholders' involvement. Such involvement will help ensure that no issues of importance are left out and that a broad perspective is applied to the strategic assessment. An important issue to include, for example, is evaluation of whether the volume and gross vehicle weights of truck traffic continue to be underestimated in pavement designs.

The information presented at the meeting indicates that there are many more projects under consideration than resources can accommodate. Since not all topics in all areas can be addressed at the same time, priority must be given to projects that address the program's critical issues. FHWA can then devote more effort and resources to those prioritized projects. The priority list will have to be continually reevaluated to ensure that it remains responsive to changing needs. Along these lines, the committee also suggests that gaps pertaining to technology implementation be weighted more heavily than those of a pure research nature, particularly those in the area of basic research. Thoughtful prioritization by a process involving stakeholders and FHWA team members should help advance the implementation of new ideas and improve the record of the transportation industry in making meaningful strides toward putting existing knowledge into practice.

The organizational groups (Infrastructure R&D and Pavement Technology Offices, Resource Centers, and the National Highway Institute, among others) involved in the program at FHWA should maintain good coordination throughout the prioritization process. The most important concerns, rather than the organizational structure or issues, should drive the process, and the structure should not get in the way of addressing the pertinent issues. The priority-setting process should evaluate ongoing projects as well as future projects. FHWA should be prepared to stop current or ongoing projects that are not contributing to achievement of the program's goals rather than consider bending their title, scope, or nature to accommodate them in a realigned program.

Appropriate organizational changes may be considered to achieve a better alignment of the activities with the agency's goals.

On the basis of the broad categories of gaps identified in the list provided, not all gaps appear to be applicable nationwide. For example, for the gap identified on the use of alternative materials and the issue of using or exploring available materials including recycled and new materials, one project would surely not be able to deliver a solution that will be applicable to all states. Such issues and gaps could be better addressed through pooled-fund studies involving the relevant states, and an improved prioritization process should help identify them.

While being apprised of resource allocation for the program's research and deployment activities, the committee learned that FHWA received 157 proposals for the program's six focus areas. This was in response to the FALCON teams' program analysis of gaps and the subsequent solicitation for proposals to address the gaps. The process obviously generated much interest and resulted in a large number of proposals to address a broad range of issues. However, the review process appears to have been internal, with little or no input from outside experts. Benefits come from involving different perspectives in the discussion and decision-making process. An appropriate approach to consider would be one similar to that used by the National Cooperative Highway Research Program (NCHRP), in which a panel representing all relevant stakeholders, including subject-matter experts, evaluates and selects proposals and then provides oversight from the beginning of the research project to its completion.

In the committee's view, the FALCON teams have done well in consulting the industry road maps, which were developed with extensive stakeholder involvement, but whether they examined projects being conducted elsewhere is unclear. Were the FALCON teams aware of work under way in NCHRP and the State Planning and Research Programs? Keeping a formal check of NCHRP activities and transportation research databases such as TRB's Transportation Research Information Service and Research in Progress (RiP) is an easy way to keep informed and avoid duplication. It would be mutually beneficial if FHWA could ensure that its research projects are entered into the RiP database in a timely way.

### **Performance Measures**

The committee believes that targeted performance measures, if developed and applied properly, will help set priorities and drive the success of the program. At its earlier meetings, the committee emphasized the need for developing appropriate measures of performance as part of the process of gauging progress toward the program's goals and milestones. It further stressed that the real measures should be based on outcomes and not on simply keeping track of the use that the states made of a particular technology. These measures should also be helpful to FHWA in improving accountability and effectiveness.

The committee acknowledges the inherent difficulty of developing outcome measures that serve established goals, but an action plan is needed for establishing appropriate measures that are

tightly aligned with the program's goals and critical issues. More specifically, performance measures should address (a) achievement of program goals and milestones, (b) program delivery, (c) outreach efforts for implementation, (d) involvement of stakeholders, and, where possible, (e) adoption by users and outcome effects. If key activities are not truly outcome-based, they are likely to lead to the use of inappropriate performance measures. For activities related to the eight objectives described in the meeting handout "The Office of Infrastructure's Strategic Plan," a number of measures do not appear to be gauging true effectiveness. For example, the measure "hold an asphalt shingle workshop" is not indicative of the associated activity's effectiveness. One needs to know whether holding the workshop did indeed make any difference.

Performance measures should cascade and tie together. There could be interim measures, such as the number of states implementing the mechanistic-empirical pavement design guide, but they should lead or cascade to an overall measure that indicates effectiveness. FHWA staff have the right ideas but have not yet crystallized them. The list of products and results provides evidence of some progress toward establishing performance measures. A recent report of the International Scan Committee on Asset Management, *Transportation Asset Management in Australia, Canada, England and New Zealand* (FHWA-PL-05-019, November 2005), provides some useful information on goal setting, outcomes, performance measures, and decision making associated with pavement systems. Another report of a domestic scan on the same subject, *Domestic Scan Program: Best Practices in Transportation Asset Management* (NCHRP-20-68-01, February 2007), which examined some good state department of transportation programs, also contains information that FHWA may find helpful.

FHWA should also be able to measure the effectiveness and efficiency of the delivery of its program. Indicators such as adoption by states are helpful, but much depends on whether a state has included a new product in one of its projects or endorsed the product more generally. A measure of effectiveness in implementation is needed to track whether a new product is making a difference.

### **Leveraging Earmarked Programs**

At its previous meeting, the committee learned with some surprise that out of \$52 million allocated annually for pavement technology activities in SAFETEA-LU, only \$18 million was subject to the discretion of FHWA, while the remaining \$34 million was either earmarked or designated for specific program areas. About 40 percent of the \$34 million is earmarked, while the remaining 60 percent has been designated for activities being carried out or managed by FHWA. The committee feels rather uneasy about such large earmarks because they divert scarce resources that FHWA could have used in addressing the more pressing needs of the program. In view of the high allocation to earmarked programs, the committee wanted to learn more about the activities being carried out in those programs and what they had delivered.

Two presentations at this meeting briefed the committee on the objectives and accomplishments of various earmarked programs. The major recipients of the earmarked funds have been Western

Research Institute at the University of Wyoming, the Asphalt Research Consortium (a group of four universities and a private asphalt research and development company), and the Concrete Pavement Technology Center at Iowa State University. The committee was informed that the activities being carried out under earmarked programs at these institutions were generally in support of FHWA's strategic pavement road map and were addressing several of its focus areas. The earmarked activities were agreed upon through consultation and negotiations with FHWA, but the process used to decide what activities would be performed and whether any external stakeholders were involved in the process were unclear. It would be helpful if some of the earmarked activities were designed to address specific gaps identified by the FALCON teams and the pavement stakeholders.

The earmark at Western Research Institute is essentially for fundamental asphalt research. Although there is a role for basic research in the asphalt pavement technology program, the committee would have preferred to see this done through an open competition and a merit review-based process rather than through the earmarking of such a large share of funds to a single institution. Western Research Institute appears to have become more responsive to the needs of FHWA's asphalt program. Its polyphosphoric acid work is timely. While there is no formal mechanism for stakeholders' involvement, experts from the three asphalt expert task groups discuss the activities of the institute. The Asphalt Research Consortium uses a similar informal approach involving the three asphalt expert task groups for engaging external stakeholders in its activities. The committee is encouraged by FHWA's efforts to direct this earmarked research to high-priority areas.

The committee was favorably impressed with what it learned about how the Concrete Pavement Technology Center at Iowa State University had involved stakeholders in its research and implementation activities at various levels. The center also appears to have developed and maintained a good working partnership with the states and the private sector. The center owes part of its success to the active involvement of stakeholders and good partnership with the states and private industry. The usefulness of this approach indicates that applying a similar approach to the earmarked asphalt research activities might be worthwhile. Another good example to consider is that of the National Center for Asphalt Technology. Since its inception, the center has used an Application Steering Committee, representing all relevant stakeholders, to develop ideas, prioritize research topics, and oversee the process, with much success and the strong approval of the highway community.

## **Training**

The issue of training highway personnel for technology deployment and implementation was further discussed at this meeting. The presentations on the accomplishments of Fiscal Year 2008 and activities planned for Fiscal Year 2009 highlighted training courses, guides and manuals, workshops, and demonstration projects that had been completed or were being planned. FHWA is striving to ensure that its training activities are responsive to the changing nature of the technology and the need for a competent and trained workforce to use the technology. The

committee was pleased to note the close interaction between FHWA and stakeholders in this activity.

The issues of shortages of trained personnel and budget constraints restricting the number of highway personnel that states can send to training courses are not likely to be alleviated soon, in view of the prevailing economic environment. In addition to what the committee suggested in its previous letter report on this issue, more attention should be directed to training the trainers, who could then help states in training their personnel. There is a large resource in the University Transportation Centers that FHWA could tap for training. In the attempt to overcome a lack of training opportunities for state personnel, care should be taken to avoid any redundancy among individual state training programs.

Another useful but apparently underrecognized training resource is the Technology Transfer Centers across the nation. The committee would like to know more about the interaction of FHWA training staff with various technology transfer programs as well as with university-related training activities (such as the one at the University of Washington). A number of programs related to pavement engineering and technology, in the form of both short courses and self-paced study, are available at these places. Local governments and pavement construction and consulting groups participate extensively in many of these programs.

FHWA should also take full advantage of modern communication technologies for training. Online courses and webinars should become standard training program tools to save highway agencies time and travel costs. Development of creative hands-on manuals would be helpful. The training methodology should be innovative and interesting and appeal to several generations of employees at a state highway agency. Showing a large number of slides may not be effective; the trainee is likely to be lost in the flood of information.

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

The committee discussed the status of the Long-Term Pavement Performance (LTPP) Program with FHWA. In its earlier meetings, the committee had urged FHWA to continue certain important activities of the LTPP Program beyond 2009 to allow extraction of the maximum possible benefits from this investment of more than 20 years. The committee was informed that, although the LTPP Program was mandated to end in September 2009, activities that have been determined to be necessary would continue as part of a larger Long-Term Infrastructure Performance Program. The larger program consolidates resources and includes both pavements and bridges.

The committee is pleased that FHWA recognizes the benefits of the LTPP Program and has committed to continuing to operate and maintain the LTPP database with its own staff, monitor Special Pavement Studies test sections that are expected to provide useful data for the pavement design guide but have yet to reach their expected design life, and maintain the materials reference library through a new contract. Efforts to improve the accuracy and reliability of the data in the

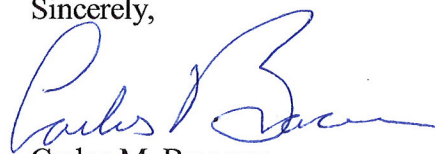


LTPP database will also continue. The LTPP data analysis has been under way for some time. The findings from the vast amount of data that the LTPP Program has generated over the past 20 years should now be made available to the highway community, and specific and implementable results should be brought forth to learn what really works. Some applied research effort may also be directed to determine whether products and technologies based on LTPP data can be developed. The committee understands that the level at which the activities of the LTPP Program will be sustained will depend on the amount of funding available and their levels of priority in the overall scheme, but it encourages FHWA to develop a long-term strategy to better utilize this asset. The committee remains hopeful that adequate resources will be available to sustain all the necessary activities of the program.

### **Concluding Remarks**

As in our previous two meetings, our interaction with FHWA staff was highly productive and beneficial. We commend FHWA staff for their hard work and dedication and for what they have achieved. While much remains to be accomplished, we are encouraged that the program has made notable progress. We will continue to impress upon FHWA that engaging stakeholders at all levels through a formal structured process is the key to the program's success and buy-in, and we have emphasized that point throughout this letter report. We look forward to continuing this dialogue at our next meeting, which is scheduled for early fall 2009. We will schedule a conference call with FHWA staff in July or August to discuss items and topics to be included in the meeting's agenda to ensure that issues important to all those involved in this national endeavor are addressed.

Sincerely,



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



Committee for Pavement Technology Review and Evaluation

Note: Names of members present at meeting are in boldface.

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