

HPMS

Reassessment Workshop/ Steering Committee Meeting

Summary

Minneapolis, Minnesota
June 30–July 2, 1997

Department of Transportation
Federal Highway Administration (FHWA)
Office of Highway Information Management
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A national workshop on the Strategic Reassessment of the Highway Performance Monitoring System (HPMS) was held in Minneapolis, MN on June 30 and July 1. The workshop was intended to engage both the providers and users of HPMS data in a dialogue that will provide guidance to FHWA as it charts a course for HPMS in the 21st century. The workshop drew over 95 participants, including representatives from 35 States, MPOs, contractors, TRB committee members, interest groups, academia, and the Federal Government. The workshop was followed on July 2 by a meeting of the HPMS Steering Committee.

Participants engaged in a series of three breakout sessions over two days. The breakout sessions were organized under three themes, each of which was preceded by presentations of background and other information relevant to the discussions that were to take place in the breakout session. For the most part, this "Summary" reflects the presentations made in preparation for the breakout sessions and reports back from each of the breakout groups on session deliberations.

Under Theme #1, "HPMS Mission, Goals, and Objectives," participants reviewed, refined, and validated a statement of HPMS mission and objectives. The mission of HPMS is "to provide a data base and analysis process for assessing and reporting the condition and performance of the Nation's highway systems in the most cost effective manner." The objectives focus on the Federal stewardship role in providing information on the condition and performance of the Nations's highway systems to many customers and partners. The relationship of the HPMS and Clean Air Act requirements was also addressed under this theme. Because of impending changes to clean air standards and regulations, there was a sense among participants that it was too early to determine the impacts of these changes on the HPMS. However, FHWA was encouraged to maintain the HPMS as a tool for tracking VMT, while EPA was encouraged to remain flexible in allowing the use of non-HPMS local data for VMT tracking purposes.

Under Theme #2, "Improving Intergovernmental Partnerships and Data Sharing," participants discussed means to improve Federal, State, and local data sharing and partnerships. Presentations on existing relationships in Michigan and Pennsylvania were followed by breakout discussions on identifying and overcoming barriers to improved data sharing and partnerships. It was observed that many existing relationships appear to be of a more contractual nature rather than true partnerships. It was noted that true partnerships result when each partner adds value to the process and has something to gain from the relationship. Participants were generally supportive of more thoroughly exploring this issue through an NCHRP synthesis of practice followed by implementation of pilot partnership programs in appropriate locations.

Improving data standards and quality were also addressed as possible means of enhancing data partnerships. Participants indicated that more consistent interpretation of existing standards and a renewed emphasis on quality control through better communication and training should be pursued by FHWA in lieu of setting new standards.

Finally, participants were briefed on FHWA's HPMS software development plans which include shifting to an environment that will permit Internet access to the HPMS data base by the user community for analysis purposes. This should enhance the value of the HPMS data base to data providers and users and should help foster more data sharing and partnerships.

Under Theme #3, "Future Scope and Scale of HPMS," participants discussed the form of a future HPMS guided by an options paper previously prepared by FHWA. Participants were asked to consider the pros and cons of the various FHWA options, which ranged from no change to a restriction of HPMS reporting to the National Highway System (NHS). Participants were also asked to weigh the options against the mission and objectives of the HPMS that they discussed in an earlier breakout session. And, participants were asked to consider whether the HPMS should be a national or State scale data system, again considering the HPMS mission and objectives. In general, the participants were able to reach agreement on a recommendation to continue the HPMS as a data base covering all of the Nation's highways. Within the existing framework, however, FHWA was encouraged to assess the need for individual data items and to reconsider the blend of national and State level sampling of HPMS data items.

Inclusion of additional pavement condition and congestion data in the HPMS were also addressed under this theme. In general, participants indicated that the addition of either pavement condition or congestion information to the HPMS per se was premature. Participants also indicated that in the near term, FHWA should use information available from State management systems on a case basis to improve knowledge of pavement condition and service life based on the AASHTO distress protocols outside of the HPMS. Likewise, in the near term, FHWA was encouraged to make use of ITS data available from ITS deployments on a case basis outside of the HPMS.

Finally, in the area of new technology, participants recommended that the FHWA develop a catalog of new technology applications and methods of sharing experiences with equipment used for HPMS data collection.

The workshop was followed by a meeting of the HPMS Steering Committee on July 2. In general, the Steering Committee ratified the workshop recommendations and suggested action steps for FHWA to take in moving forward with the HPMS reassessment process. The Committee provided input to the FHWA on a proposed decision process and evaluation criteria for completion of the data item review recommended by the workshop participants.

In the next step of the strategic reassessment process, the consultant will develop a set of recommendations based upon earlier study findings and the results of the national workshop. This phase of the project is expected to be completed by September 30, 1997. At that time, the final report will be made widely available for review and comment. In parallel, FHWA and the consultant will begin the data item review recommended by the workshop participants and the Steering Committee in accordance with the decision process and evaluation criteria suggested by the Committee.

At the completion of the data item review, FHWA will assemble a prototype replacement to the existing HPMS. The prototype will be evaluated internally for consistency with the expected Federal-aid Highway Program reauthorization legislation. At that time, the technical aspects of the prototype will be subjected to extensive review and comment before any final decision is made by the FHWA.

Other activities suggested by workshop participants will be taken up by FHWA staff in consultation with the HPMS Steering Committee.

Session Welcoming and Opening Remarks

Speaker Gary E. Maring, Director, Office of Highway Information Management, Federal Highway Administration (FHWA)

Mr. Maring welcomed participants to the Highway Performance Monitoring System (HPMS) Reassessment Workshop in Minneapolis, Minnesota. In place for nearly 20 years, HPMS collects and analyzes data used for analyzing and reporting to Congress on condition and performance of the Nation's highways and for data used to apportion highway related funding shares to the States, and so is central to the Reauthorization of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) (NEXTEA). Because the system is aging, it is time for a relook at HPMS. The goals of this reassessment are to:

- Review HPMS in light of contemporary issues and future needs
- Reduce the collection burden wherever possible
- Enhance HPMS's value to providers and other customers
- Consider technological changes

A steering committee was formed to help lead the reassessment process. No final decisions will be made on HPMS until after approval of NEXTEA, the timing of which is uncertain. All levels of government, however, are under pressure to measure performance and show value. The demands for data for the purpose of decision making at the policy level steadily increase, but due to funding constraints, data collection and analysis funding is likely to be cut. Those revenues are constrained at both Federal and State levels.

Mr. Maring noted the technological changes that continue to affect HPMS, particularly in the computing environment. Crucial areas of change have included:

- Mainframe to PC
- Distributed data
- The client server environment
- Intelligent Transportation Systems (ITS)—Potentially revolutionary for data

To date, the progress of reassessment has been as follows:

- Reassessment plans developed with the steering committee
- Options published in the *Federal Register* for comment
- Exposure through Transportation Research Board (TRB) committees and the Irvine data conference
- Consultant's study of critical issues
- State/Metropolitan Planning Organization (MPO) consultation and surveys

The intent of the present workshop is to work through the following issues:

- What is HPMS?
- Working with partners
- Restructuring for the 21st century

The blueprint for the workshop was based on the following three themes:

- Theme 1—Why HPMS?: Mission, objectives, and uses
- Theme 2—How?: Partnerships, integration, quality, and standardization
- Theme 3—What?: Scope—system extent; scale/structure/sampling; and section versus aggregate data

HPMS is a subset of the national highway data base that comprises the following elements:

- Roadway extent, characteristics, and performance
- User characteristics
- Motor fuel use
- Motor vehicle information
- Driver licensing
- Highway finance
- National bridge inventory

All of these elements feed into the national highway data base, which is interrelational with other transportation data bases.

Session Theme #1—HPMS Mission, Objectives, and Goals
Moderator Gloria J. Jeff, Associate Administrator for Policy, FHWA

Ms. Jeff advised participants to deal with the questions “Why” and “What” first, followed by “How.” At no matter what level, FHWA must move forward, be a quality organization, and be customer responsive—it is necessary to know who one’s customers are, understand their needs, and work with them to be sensitive and responsive. And, most of all, data constitute FHWA’s single most important responsibility. Ms. Jeff then introduced the session’s speakers.

Topic A Perspective on Performance Data Systems Across the Government
Speaker Bruce McDowell, President, Intergovernmental Management Associates

Change, said Mr. McDowell, comes through data. Better government is achieved through better data. Mr. McDowell described the 1995 ACIR Report on performance data and management systems as being outcome oriented. Performance management, he said, is difficult because many aspects related to performance may not be controlled or measured. Performance management is more difficult still for intergovernmental programs where management and measurement responsibilities are dispersed.

The question, “Are you better off?,” is central to any outcome-oriented perspective, he emphasized. The ACIR Report focused on the crucial concept of intergovernmental accountability because it is not enough to simply measure whether the air is cleaner and goods are delivered on time. Setting performance targets and holding agencies responsible are also important. But, this should not be done unilaterally by the Federal Government. Mr. McDowell advised participants to become involved in setting the rules for intergovernmental accountability so that the effort would be collaborative.

In examining 13 Federal agencies, the ACIR Report found that 5 used a common approach toward an outcome-oriented management framework. That framework was found to have three parts and to rely on dynamic tensions among those three, which consist of:

- Ambient conditions
- Forces or stresses degrading the system
- Countervailing interventions

The United States Department of Transportation’s (US DOT’s) version of that framework was the most comprehensive system examined in the Federal Government. No agency has a better and longer record in reporting performance to Congress than US DOT and FHWA. ACIR singled out HPMS and performance reporting to Congress as a model for other agencies. Recent editions of DOT’s report put data into a policy context for investment; that is, data should serve as more than mere indicators. Mr. McDowell exhorted his audience to be proud of their achievements and to continue improving on them.

Mr. McDowell called the study commissioned by FHWA from Henry Peyrebrune “really excellent” in that it brings up the right questions and provides a “terrific follow-up” to TRB’s 1996 Conference in Irvine, California, on transportation data needs for the 21st century. Peyrebrune’s study sets a challenging agenda for the present workshop that should be read by all participants.

Next, Mr. McDowell offered perspectives from two of his current projects unrelated to transportation, but involving performance data systems. In the first case, a study by the National Academy of Public Administration is examining the future of Federal mapping, surveying, and charting programs. That study looked at needs and activities in geographic data management and the management of large data bases. A great transformation has overtaken Federal agencies in these areas, leading to the insight that to publish data is to be out of date. Publishing is the main line of business in mapping, surveying, and charting, but the current trend is

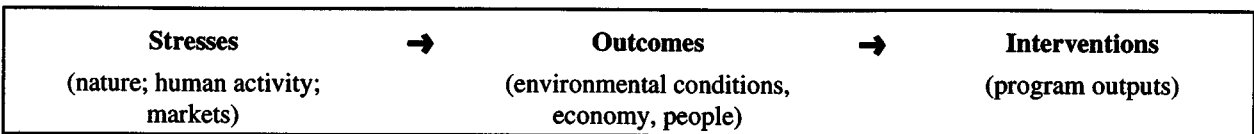
toward accessing, downloading, and printing on demand. To be up to date requires coping with daily data flows that can be accessed and displayed on a close to real-time basis. Mr. McDowell summarized the following concepts:

- Rapid technological advances and the need for more (not less) data for performance management and customer satisfaction (issues of the Federal role, sharing and financing data, and distributed budgets)
- Organizational concept—the National Spatial Data Infrastructure (NSDI) called for by Executive Order 12906 and being promoted by the Federal Geographic Data Committee (FGDC)
- Partnerships for success—both intergovernmental and public/private
 - Get the partnerships right
 - Collect the data once at the level that requires the greatest detail
 - Base the data on the transactions that are occurring
 - Line the data up in partnerships
 - Develop a routine data flow
 - Avoid project batching

The second study results from a State of the Union address by President Clinton, who called for every fourth and eighth grader to be tested nationally, the fourth graders for reading competency and the eighth graders for math. The intent of the effort was to capture achievement scores at those levels and compare them internationally. Transportation is moving in the same direction; the Oregon DOT benchmarking process seeks international benchmarks such as convenience of airport movement and movement of goods, including just-in-time shipping. From the point of view of its competitive status, the US transportation community has a major interest in looking globally.

Currently, the performance of Federal agencies is measured chiefly against arbitrary budget targets. In September, however, the Cabinet Departments reach deadlines set by the Results Act for having strategic plans to measure their performance against. Congress is unhappy with its consultations to date on these plans and is considering sanctions. The General Accounting Office (GAO) has devised a list of questions for Congress to ask those agencies. US DOT has to compete with every other Federal agency for budget. A constantly improving HPMS could serve as a great ally in that competition.

Mr. McDowell discussed the Outcome Improvement Concept, delineated below:



This concept is used to measure the effect on outcomes and results from interventions made possible by budgets and other inputs. This is relevant because HPMS measures interventions and outcomes. In trying to answer the question, "Are you better off?" this model looks at links among measurements of outcomes, interventions, and budgets for the purpose of program evaluation research, which must be done to measure performance. Measuring stresses in a system is also important because they may bear as strongly on outcomes as program interventions. Program evaluations using all these may lead to stress prevention strategies.

Calling this an important workshop at a critical time, Mr. McDowell offered the following conclusions:

- HPMS is a good thing that needs to be worked on and improved lovingly
- HPMS should report real management information—information flows rather than isolated surveys
- HPMS should be used to help get results

Remarks

In introducing the next speaker, Ms. Jeff said that the modification of human behaviors is necessary for the good of society. Data should be provided that is current, reliable, and useful in decision making. FHWA must continue to produce useful data and utilize that data for critical results.

Topic HPMS Study Results
Speaker Henry Peyrebrune, New York State Department of Transportation, Retired

Mr. Peyrebrune's presentation was focused on familiarizing the participants with his HPMS report which was made available to all participants for the Workshop and which would set the stage for discussion of issues during the workshop. The process for developing the report relied on input from a number of outside individuals and organizations. He thanked those who have participated thus far. The outreach process is detailed in the report.

Mr. Peyrebrune reviewed the various sections of the report; describing the content and source of each section. He then highlighted several issues which are not covered in the report. The report does not deal with the elimination of specific data items, there is no discussion on making HPMS a "world class" system, and there is little discussion on private sources of data. These items will be addressed later in the process.

Mr. Peyrebrune offered a disclaimer. While surveys for his study were taken from 50 States, 44 MPOs, and discussions with many individuals and organizations, the views in the report are those of the author.

Mr. Peyrebrune then discussed the 13 key factors affecting the reassessment, which are described in Section 1 of the report:

1. HPMS has an excellent reputation in the transportation and governmental field.
2. Reassessment is occurring at a time of major transition in transportation and HPMS.
3. HPMS is a subset of the National Highway Data System.
4. The highway data set is a subset of a larger transportation data set.
5. HPMS is both a data set and an analytical process.
6. A distinction should be made between the Federal use of HPMS data and the National Highway data base.
7. HPMS serves many purposes at the Federal level, including many which were not originally envisioned when HPMS was established.
8. The collection of HPMS data will always be an intergovernmental activity.
9. The implications of the Government Performance and Results Act on HPMS will not be known for some time.
10. The timeliness of data collection and presentation and the timing of any changes to HPMS are critical parts of the reassessment.
11. One of the most important indicators for policy makers is consistent time series data which show trends.
12. There is a large sunk cost in the current HPMS data collection system--changes should recognize cost implications.
13. A theoretical framework and principles for intergovernmental data collection and sharing can be proposed as a guide.

Finally, Mr. Peyrebrune discussed the mission of HPMS and the 5 objectives which were proposed for HPMS (Section 2). He presented the results of the survey of the States and the MPOs regarding the objectives. The responses were generally favorable to the objectives with some proposed changes suggested as well as some concerns expressed. The responses also suggested two additional objectives which are proposed for discussion in the breakout groups. He stated that Section 2 is the resource for the first breakout sessions.

Remarks

In introducing the next speaker, Ms. Jeff advised participants that, because EPA has not yet grappled with the nuts and bolts aspects of the Clean Air Act (CAA), that agency should be given time.

Topic Current and Future Use of HPMS for CAA Purposes
Speaker Mark Wolcott, EPA

Mr. Wolcott said that confusion or misunderstanding exists about EPA's views on HPMS and its relation to CAA. The relation between CAA and HPMS lies in an agreement between EPA and FHWA that HPMS shall serve as the base for measurement of historical Vehicular Miles of Travel (VMT) as a method for measuring CO nonattainment areas at a time when 13 States had no sample panels.

Subsequent to Section 187 Guidance, a General Preamble was added that extended guidance to all nonattainment areas. This was written with an eye to applications in all areas. Both Mobile Source SIP Guidance and Conformity Guidance deal with handling State implementation plans and apply the same methodology as in Section 187 Guidance. Parts of CAA relevant to this relationship comprise:

- CAA Section 187 Guidance
- General Preamble to CAA
- Mobile Source State Improvement Program (SIP) Guidance
- Conformity amendments While CAA standards have been tightened, time is being allowed for achieving those standards.

The decision to use HPMS as the best historical measure of VMT was made for the following reasons:

- The historical record is available
- The effort did not impose an additional burden on States
- Nationally consistent procedures were used
- The record is updated annually

The relationship between HPMS and travel demand models is as follows:

- HPMS—Historical VMT—
 - Historical VMT
 - Temporal allocation of VMT
- Travel demand models
 - VMT growth factors
 - Spatial allocation of VMT
 - Temporal allocation of VMT

Travel demand models may be updated only once in 5–10 years and do not generally provide annual estimates of VMT; it was useful to encourage States to develop models. HPMS did not provide the resolution needed, but travel demand models can do so through Geographical Information Systems (GIS).

EPA is concerned about underprediction of VMT. Each next turn of events is being missed. What, asked Mr. Wolcott, is being missed today in predicting VMT? Will VMT continue to grow at the same rate as it has been? Each time a decrease is predicted, a trend is missed that causes expansion instead, as for example, increased life span and improved health of drivers, meaning that people continue to drive into old age.

Growing traffic and VMT threaten to reverse improvements achieved through ISTEA. How will agencies deal with more cars on the roads without an increase in highway capacity?

Mr. Wolcott raised the following issues related to proposed National Ambient Air Quality Standards (NAAQS) revisions and conformity amendments:

- Under what conditions could local (non-HPMS) counts be used? This would mean replacement of one counting system with another. If a locally based counting system is used (for example, Chicago), is that a substitute for HPMS in that area? How might systems be made consistent, and should parts of systems be replaced with HPMS systems?

- What are DOT's and EPA's roles? These have not changed:
 - EPA is responsible for SIPs
 - FHWA is responsible for conformity
- What are the consequences of changing methodologies?
- What situations trigger the VMT monitoring requirement?
- What would new NAAQS mean to VMT counting systems? Counting requirements would not change, but an annual estimate and a measurement estimate of VMT would be needed. This cannot be done through the travel demand network because updating it annually is too expensive. System design and funding levels would have to be stable. EPA will entertain this question if appropriate, but it would be necessary to find a way to maintain an equivalent of the historical VMT record.

It would be advisable to consider the meaning of allowing another counting system into the HPMS program. Would that undermine HPMS? HPMS has been shored up through use.

The following addendum includes Mr. Wolcott's prepared remarks.

ADDENDUM to EPA Presentation

The following questions and answers were developed in preparation for the EPA presentation. The questions were prepared by the FHWA to reflect State concerns that were identified through the State surveys and other means. The answers reflect EPA policy on the issues raised. Since the questions and answers were not included in the HPMS Reassessment Notebook, they are being included here for the information of conference participants.

Question: The new regulations indicate that, in ozone and CO nonattainment areas, HPMS is considered the primary measure of VMT but that locally developed count-based programs are permitted subject to interagency consultation procedures. Does this mean that HPMS is not required to be used as long as the State and local governments have a substitute count-based program? Does the change to local count-based programs require Federal approval from DOT and EPA as in the past? The regulations indicate that DOT and EPA are part of the consultative process. What are the DOT and EPA roles? Do EPA and DOT have an approval role as in the past, or is the relationship only consultative?

Answer: In answering the question under what conditions could local (non-HPMS) counts be used, EPA in general has said that if States collect vehicle counts outside of the HPMS system, those counts should meet the same requirements that HPMS counts meet. EPA has also said that it would like a State considering the use of additional counts to submit those counts to the HPMS system. However, this does not mean to imply that all HPMS data elements should be collected for these additional counts, but rather just the information that is normally necessary to estimate VMT assuring that the counts follow FHWA guidance. Further, EPA has asked that States wishing to use an entirely different counting system obtain from the Federal Highway Administration a letter stating that the alternative system produces more accurate estimates of historical VMT than does HPMS.

With respect to the third set of conformity amendments and HPMS, EPA's view is the following: Since transportation plans must be consistent with all SIP elements and since SIPs use HPMS as the measure of historical VMT, it only makes sense to adjust network model VMT so that it is consistent with HPMS VMT in conformity tests. However, this logic turns more on the use of an annual counting program than on HPMS specifically.

If the Federal Highway Administration, States, and Metropolitan Planning Organizations believe that it is appropriate, EPA would be willing to discuss ways that locally-based count programs could be incorporated into SIPs.

Question: Can a substitute count-based program be used even in areas where HPMS was used in the past; for instance, to establish the 1990 baseline?

Answer: The consequences of changing methodologies are addressed in EPA Guidance supporting Section 187 of the Clean Air Act which explicitly allows States to make changes in the way they estimate VMT on local roads, since EPA recognized at the time that local road VMT estimates were not generally based on counted traffic. However, if a State wished to change its local road estimating procedures, then EPA guidance also said that the State needed to re-estimate prior year mobile source emissions and both future year emissions and reduction targets. The purpose of this policy was to make 15 percent and rate of progress plans, as well as conformity determinations and attainment demonstrations, consistent.

An obvious issue is how to create the equivalent of a historical record, at least back to 1990, so that the SIP planning elements are internally consistent. A second issue is how to assure that the statistical design and funding level of a local counting program are stable for an extended period of time. A third issue revolves around frequency. Although conformity determinations may be made every 3 years, the VMT tracking requirements in the CAA seem to indicate that Congress intended these requirements to provide an early warning should history overcome State Implementation Plan assumptions.

In addition, the CAA mandated periodic emission inventories and attainment plans are generally required more frequently than travel demand models are updated with new demographic, land use, and network inputs and validated with actual ground counts. An annual counting program, on the other hand, does not face this problem.

Question: What situations trigger the VMT monitoring requirements?

Answer: Section 182(c)(5) applies to Serious and above nonattainment areas. It states that "beginning 6 years after the date of the enactment of the Clean Air Act Amendments of 1990 and each third year thereafter, the State shall submit a demonstration as to whether current aggregate vehicle mileage, aggregate vehicle emissions, congestion levels, and other relevant parameters are consistent with those used for the area's demonstration of attainment."

Section 182(d)(1) applies to severe and above nonattainment areas. It states that "Within 2 years after the date of enactment of the Clean Air Act Amendments of 1990, the State shall submit a revision that identifies and adopts specific enforceable transportation control strategies and transportation control measures to offset any growth in emissions from growth in vehicle miles traveled or number of vehicle trips in such area"

Section 187(a)(2)(A) applies to moderate and serious CO nonattainment areas with design values above 12.7 ppm at the time of classification. It states that the SIP ". . . shall contain a forecast of vehicle miles traveled in the nonattainment area concerned for each year before the year in which the plan projects the national ambient air quality standard for carbon monoxide to be attainment in the area."

Question: How will changing the ozone and particular standards impact VMT tracking requirements and by extension the HPMS?

Answer: A change in the level or form of the NAAQS will not, of itself, change vehicle counting systems. However, what role counting systems may play and what form those counting systems should take is really at the heart of the issue. For example, it may be that new areas that exceed the proposed ozone standard and for which anticipated regional measures will provide the bulk of the needed ozone reductions can use reporting of VMT as a surrogate for emissions and air quality modeling. This might make particular sense for rural areas without metropolitan planning organizations. Another area in which counting programs may play a larger role is in estimating statewide motor vehicle NOx emissions, since it seems likely that EPA will set statewide total NOx emissions budgets through a SIP call as a way of implementing the OTAG strategies.

Session Charge to Breakout Groups - Theme 1
Speaker Alan Pisarski, Consultant

Mr. Pisarski asked the breakout groups to consider a problem. Administrators, he said, cannot answer the following three questions:

- Are things getting better or worse?
- Can I define "better" and "worse"?
- Did I have anything to do with it?

The breakout groups were to consider the five original and two proposed objectives and ask the following questions about them:

- Do the objectives cover the scope of interest?
- What is missing, redundant, etc.?
- Do they fit together as a set?
- Do we have the data that fit these objectives?
- What uses are not adequately supported by data?

Mr. Pisarski asked participants to take a large view and consider the broader system elements. Then they were to address EPA related issues. He also requested other group observations or recommendations.

Luncheon Speech A Perspective on the Need for Monitoring Condition and Performance
Speaker Gloria J. Jeff, Associate Administrator for Policy, FHWA

The development of a Strategic Plan for FHWA is just good business—and the Federal Government *is* a business, as Ms. Jeff reminded her audience. In the era of the Bureau of Public Roads, travel was chiefly associated with work, and the environment changed slowly. The need for environmental scans was not relevant; the data base seldom changed; and a census every 10 years was sufficient. That era, however, is over. Government, like the private sector, must deal with constant change and stay ahead of the curve.

American travel patterns now change rapidly. A survey of travel patterns every 5 or 10 years is inadequate to the task of anticipating the next set of changes. What, she asked, is the role of government in the face of such change? Is there a need for a national perspective, or ought the States to be relied on? Ms. Jeff believed that neither suggestion is entirely correct. There is a need for the involvement of States and their perspectives, as well as local roles, but there are also overarching needs for the presence of the Federal Government.

The United States market is enormous; the nation serves as a physical land bridge between Europe and Asia. As a result, the United States may not address domestic issues and ignore the rest of the world. We find ourselves in a partnership requiring a national perspective for competitiveness in global markets. The most important issue of all is determining the aforementioned roles, particularly in the areas of translating data into useful statistics and then analyzing those statistics for policy implications. These processes are critical to decision making.

The same is true of the strategic planning process. Because that process is now continuous, an evaluation component is mandatory. We might be lucky once or twice, but we cannot live on luck. We need to know if what we want is happening, and if it happens, is that because we contributed, or is it due to serendipity?

During the strategic planning process it was recognized that data are needed to address the issues that users care about, but what do the Federal Government, States, and local agencies use it for? Such niches must be identified; but it is vital to deliver data to the general citizenry as well, so that they will understand and support the transportation community and its interests. Average citizens are not convinced by the International Roughness Index (IRI) ratings. This raises an interesting dilemma. The transportation community believes that a crying need exists for both capital and non-capital transportation investments, but the populace must be convinced of a need for its funding. The transportation community must be certain of what it delivers—while we have needs, wants, and desires, the general public is concerned that the money used has been used soundly. The value of investments must be demonstrated.

Ms. Jeff raised the issue of private sources of information that might lessen the need for research. A lot of data exists in the private sector, but the difficulty lies in convincing the holders to share it and in a format that all can use; the demands of competition make this difficult. For the private sector, information is a product to be consumed, whether about work forces, travel radii, niche markets, or how the overall transportation system works. Now, however, the American private sector must also compete internationally, raising concerns about international issues and decisions. As a result, transportation partnerships are not only useful and necessary between jurisdictions, but also between jurisdictions and the private sector. It is necessary as well to understand the relationships between data collectors and decision makers. The net result of these processes will be multiple element partnerships.

Performance measurement and reporting are problematic, said Ms. Jeff, but FHWA is up to the task. She expressed concern about the misuse of such data, as in decisions that are good for the States, but not for the country. Nevertheless, such information is needed to help FHWA and the States make decisions.

Issues of how and on what to spend money are tied up in the logistical framework of decision making, and logistics is critical to transportation. FHWA tends to underreport VMT; it is desirable to correlate the money coming into States from outside with overall VMT. The logistical framework is not based on local, State, or regional jurisdictions, but rather must be examined from a national perspective recognizing the importance of geography and the movement of goods and people.

Where, asked Ms. Jeff, does all of that leave FHWA and the highway community? Should all decisions be made at the individual level? Local decisions may have solid reasons, but they cannot account for GM's needs on a national and international level. An inability to guarantee transportation access will bring negative results. It is vital to be able to answer whether we are better off and why. Poor information leads to poor decision making; but good information may lead to good decisions. Good decision making requires the sort of information that comes from systems such as HPMS. The highway community must have good information to demonstrate causes and effects and to answer the question of what is needed next.

Session Reports from Breakout Groups - Theme 1
Moderator Alan Pisarski, Consultant

Group 1
Don Cameron, Reporter

Regarding the proposed mission statement, Group 1 asked if HPMS is just part of the highway data base or part of a larger intermodal transportation data base. In order to clarify this, the group suggested that the mission statement should be changed to refer to HPMS as "a component of a national transportation data base." About the objectives, they offered the following recommendations and comments:

1. The group recommended that this objective should be left alone.
2. In order to focus HPMS on highway transportation issues, the group recommended deleting the end of the objective reading, "and other Federal agencies."
3. In order to focus HPMS on congressional reporting requirements, the group recommended adding a period after "performance report" and deleting the rest of the objective.
4. In regard to providing a data base, the group recommended leaving out the word "comprehensive." Although the data base contains an abundance of material, the word "comprehensive" could imply more than is actually there. While discussing the meanings of "comprehensive" and "publicly accessible," the group questioned whether all data should be accessible to all users.
5. The group recommended no change to this objective; questioned whether HPMS should be designed specifically for this purpose or for wider uses?
6. The comparison of States being controversial, the group recommended deleting this objective.
7. The group found this to be a good objective and recommended leaving it alone.

For performance indicators, the group considered whether to collect data to be statistically significant on a national, State-by-State, or local basis. No consensus was reached, but the group agreed that if the States will use the data collected, then the effort gains credibility.

In the ITS arena, data are not universally available and would be a challenge to those handling them. ITS is not currently part of the analytical process in regard to measuring its impact. Consequently, it will be difficult for HPMS analyses to assess performance changes resulting from ITS investments or to recommend future ITS investment levels. If there is a desire to use HPMS as an analytical tool for this purpose, additional changes will be needed to the HPMS data items as well as the analytical process.

Group 2

Ed Christopher, Reporter

Group 2 discussed the proposed mission statement “full circle” regarding whether it applied to “large caps NHS” or “small caps nhs.” About the objectives, they offered the following recommendations and comments:

1. What is the meaning of stewardship? Is a focus on FHWA the wrong way to approach objectives? Why not focus on users, instead? What can States get from this objective, and does it add value?
2. The group tended toward consensus on this objective, but recognized that the data base has a lot of uses. They expressed concern about best practices (from the steering committee) and recommended going further with non-Federal use of data bases.
3. Is HPMS meeting the needs of performance reporting requirements?
4. Regarding use of the word “comprehensive,” the group asked how comprehensive and timely a result was desirable. The group wanted more goals under each objective and suggested action items.
5. The group recommended removing the emphasis on value if its focus was not on the States. If something were to be provided for the States, then should FHWA provide the tools?
6. Topics of discussion “ran the gamut.” Should this objective be left in for metropolitan comparisons? The group suggested possibly deleting this objective and blending it into objective four, including concepts of consistency. Participants showed resistance to bench marking. Issue was taken with statistical validity, although comparisons from State to State were not excluded in this regard.
7. The group engaged in a lengthy discussion of LRS, with interest in where it is moving.

No other topics were discussed.

Group 3

Pam Lowe, Reporter

Group 3 offered the following recommendations and comments:

1. The group recommended that all wording after “highway stewardship responsibility” be deleted.
2. The group recommended accepting this objective, as is.
3. Concerns were expressed and changes were anticipated for congestion measures, IRI improvements, and (if changes meet congressional requirements) congestion and pavement quality.
4. The group recommended adding a disclaimer regarding truth in data; the key to support for this objective was a national data base.
5. The group recommended accepting this objective, as long as the word “optional” was not removed.
6. The group supported eliminating this objective entirely, not rewording it; the main objection was to State to State comparison.
7. The group expressed support for this objective; the key to support was the idea of evolving toward the listed items. Partnerships should be expanded to include the private and international sectors.

Other issues discussed included:

- What can be done to make HPMS a better measure of performance, especially in regard to pavement quality and IRI? Congestion and customer satisfaction should be tied in.
- The group reached consensus against the use of HPMS data for funding allocations in States or for State to State comparisons.
- On CAA, consensus was reached to leave well enough alone. CAA is “not great,” but changes may be worse. It is critical that EPA remain flexible and use local data.

Group 4**Tim Lomax, Reporter**

Group 4 felt that HPMS does not cover everything; safety, air quality, and mobility are covered, but not in much depth. The highway system should receive better definition. The group then divided the objectives into 2 groups: Groups 1–3 covered issues now under way; groups 4–7 covered proposed handlings. That division was reflected in the group's recommendations and comments, which follow:

1. & 2. The objectives needed identification of scope and impact of related issues; related issues included better definition, identifying resulting burdens placed on State and local agencies, and stewardship or ownership. Issues in objective 2 included ITS and the need for a consistent definition of pavement concerns.
3. Only part of CAA requirements affect HPMS.
4. What is meant by comprehensive? Objectives 4 and 6 showed a lack of consistency. STIP and TIP create transportation needs; participants discussed how they differ in regard to consistency.
5. & 7. Objectives 5 & 7 were combined for discussion of a common approach to both; 5 comprised an analytical process and 7, an evolutionary one.

The group showed consistent concern for comprehensiveness, consistency, and how the data base fits together; they looked for more definition and clarification.

Session Theme #2—Improving Intergovernmental Data Partnerships
Moderator Alan Pisarski, Consultant

Mr. Pisarski summarized the breakouts as coming down to reducing, taking out, and reaching better definitions. Noting apathy toward objective 6 (Use of HPMS for Comparisons among States and for Benchmarking Purposes), he found it odd to tie it to objective 4 (National Data Base); he tied it instead to objective 5 (Optional State and Local Data Base). He also discussed State-to-State comparisons and voiced concern over potential risks in objective 4.

Topic Implications—Irvine Conference and State Data Needs Studies
Speaker Alan Pisarski, Consultant

Noting a consistent tone to concerns around country, Mr. Pisarski reported that the draft of the National Conference on State and Local Data Needs held in Irvine, California, has been completed. Anticipated outcomes of that conference included the following:

- An umbrella for further meetings
- A major role for technology
- A need for more data
- A new data development relationship
- Globalization impacts

Future meetings such as this one, Mr. Pisarski said, will reach back to Irvine for guidance and will be affected by the above umbrella. The major role of technology will be to lead significant changes in the way the highway community does business, with more speed and less cost. That more data will be needed is no surprise; there exists a tight tie between the need for data and the policy demands being made. People expect transportation to do more than ever; that fact drives everything. The enormous impacts of international activity will be felt in areas such as freight movement, just in time shipping and manufacturing, and tourism.

Unanticipated outcomes of that conference included the following:

- The uniformity of views of States and MPOs
- Data cuts linked to policy mandates—How to stop collecting data (data collection results from demands coming from policy)
- Innovative technology as a source of savings, not policy (advances come from technology, not policy)
- A focus on the needs of small populations and small households
- Data transfers leading to a new focus on standardization and quality

Among the technical and institutional issues to be faced in State visits are the following:

- States are cutting personnel dramatically; planning and data areas are being hit hard.
- Many hope that information systems will save the highway community from the loss of skills and corporate memory resulting from staff cuts and retirements; a stage of rising expectations has been reached just before reality testing sets in. Disillusionment should be expected.
- A frustrating period is ahead in regard to data quality.
- Too much faith is placed in the validity of Internet products, with no way to ensure or test quality.
- Survey owners want protection from data abuse; data users want freedom.

Among the content issues to be faced in State visits is the great emphasis being placed on freight issues and freight data needs for both urban and intercity shipping. Economics and transportation are receiving a major focus in areas such as just in time shipping, North American Free Trade Agreement (NAFTA) related patterns and trends, and internationalism in general.

Among the overall issues of concern following the Irvine Conference are performance measurement, use of the Internet, use of management systems, and Federal data relationships.

Topic Changes to the HPMS Computing Environment
Speaker Jim Getzewich, Chief, Highway Systems Performance Division, FHWA

Mr. Getzewich addressed the software development project, which is designed to:

- Provide a user friendly tool set to collect, analyze, and disseminate HPMS data
- Move HPMS operations to a client-server desktop computer environment
- Improve user access to HPMS data and analysis programs
- Add value to HPMS for providers and users

The first phase of the software development process, data submittal, has the following characteristics:

- Creation of HPMS data submittal in a desktop environment
- State updates of supporting HPMS records in a desktop or lap top environment
- Import/export of data to and from State mainframe systems
- HPMS linked to State GIS

The status of data submittal is as follows:

- Submittal software has been fully tested and developed
- Workshops were held in March–April 1997
- 10 States are using the software this year
- Wider use of 1997 data is expected in 1998
- A GIS linking process is under development

The second phase, data manipulation, review, and summary, has the following characteristics:

- Computer aided data review capabilities for cross comparisons, trends, and graphic review (ArcView)
- Master file construction and update in a client server desktop environment
- Creation/maintenance of an electronic highway statistics data base in a client-server desktop environment
- Linked electronic HPMS data base/National Highway Planning Network (NHPN) available via Internet
- An enhanced analytical process for FHWA and States

The status of data manipulation, review, and summary is as follows:

- Partially operational as of calendar year 1997
- HPMS/NHPN link operational by early calendar year 1998 for States with complete networks
- An enhanced analytical process operational by calendar year 1997

The third phase, data base query, has the following characteristics:

- Data base query capability built into a client server desktop environment
- On the fly query capability
- Structured Query Language (SQL) based interface
- Generation of *ad hoc* reports, charts, graphs, multiyear trends, etc.
- User access via Internet

The status of data base query is as follows:

- A completed prototype is expected by calendar year 1997
- Completion and deployment to users by calendar year 1998 (may be overly optimistic)

The fourth phase, expert systems applications, has the following characteristics:

- Heuristic evaluation of HPMS data
- The prototype as an internal application
- Extended capability to data providers

The purpose of expert systems applications is to build soon to retire in-house experience into an expert system. Research is expected to start in calendar year 1999.

Mr. Getzewich posed to the workshop the following related questions:

- How can the HPMS computing environment improve data partnerships and data sharing?
- What should FHWA do differently or in addition to what was presented?

Topic Using Georeferencing to Facilitate Data Sharing in North Dakota
Speaker Tim Horner, North Dakota DOT (NDDOT)

Georeferencing (or GIS) is done widely by many States. North Dakota is one of five States that began working with the HPMS PC pilot software last year and worked to develop a link between that software and ArcView. In North Dakota, the NDDOT is the sole creator of HPMS data since the MPOs do none of the updates. The updates are done by the NDDOT's planning division which also has main oversight over most of the data sets used by the other NDDOT divisions. All of the data sets are built off the same common reference system which allows linkage by ArcView. At present the data sets that have been linked with ArcView are pavement management and bridge management (both PC based) and roadway information management (RIMS - mainframe based). HPMS is viewable with ArcView but it is not linked to the other data sets directly.

Mr. Horner demonstrated the pilot software's section editor by running ArcView to highlight a road map to determine an HPMS section id. After the section id was obtained, it could be inserted into the section editor

and section data could be edited. Ride and distress data could simultaneously be viewed from the Pavement Management System (PMS) and the construction program could be viewed from RIMS.

In North Dakota, HPMS provides the base data set for functional class for all highways. Pavement management is the source for all pavement condition information. RIMS will be the source for all construction history and future project information.

Another topic mentioned was NDDOT's home page which uses ArcView to present maps of the State's load restricted routes and winter road condition reports. Future enhancements may include pavement condition, speed zones and other traveler information. The department's web page is www.state.nd.us:80/dot/.

Topic Panel Discussion: Use of Intergovernmental Data Partnerships
Speaker Joseph McGinnes, Pennsylvania DOT (PennDOT)

Data sharing started in Pennsylvania in 1963–1964, when MPOs were established for the Philadelphia and Pittsburgh areas. Over time, problems of funding and staffing at the State level made data collection difficult. In the 1970's, a new State administration took a new look at the effort and reduced the data collection staff size and encouraged MPOs to take over various functions. Now, MPOs support the State on HPMS, and the State provides traffic data collection equipment to MPOs.

HPMS is now a major element in planning. MPOs verify information for the State, collect and verify extraneous information, collect traffic data, and provide it to the State at year-end. The State provides HPMS training, carries out audits of most counties, and uses local development districts to collect traffic data, as well, through a cooperative agreement. As an adjunct, MPOs collect traffic counts; the collection system was improved through the use of a GIS-based traffic monitoring system for the entire State, which has been used to develop a comprehensive traffic counting system. GIS enhances active information sharing between the State and MPOs.

Currently, the lack of access to data from HPMS is an issue of importance in Pennsylvania. HPMS is driven by the department's roadway management system, programmed on an "antique" mainframe system. Data extract hard-copy reports are generated from roadway management, and little else from HPMS except for historical trends. Further, the use of numerous agencies for data collection creates potential problems of data quality and reliability.

Speaker John Burger, Delaware Valley Regional Planning Commission (DVRPC)

DVRPC comprises 5 counties in Pennsylvania and 4 counties in New Jersey within the environs of Philadelphia, encompassing 5.2 million people, 3,700 square miles in area, and 20,400 miles of roadways. DVRPC's traffic counting and monitoring activities include:

- VMT
- Area system coverage
- Air quality
- HPMS control stations
- City of Philadelphia counts
- Engineering and safety
- Planning and research surveys
- Support activities (including several large cities)

To help the audience gauge the size and complexity of these operations, Mr. Burger provided a list of counts resulting from 1998 traffic counting and monitoring projects, as follows:

Projects/Programs	New Jersey Counts	Pennsylvania Counts
Transportation data collection	600	1,200
HPMS/control sites and Highway Functional Classification System	50	250
City of Philadelphia Traffic Counting Program		500
PennDOT District 6-0 traffic counts		200
New Jersey DOT (NJDOT) manual classification counts	50	
Alternative test	50	100
Vehicle occupancy monitoring	30	
Congestion Management System (CMS) and other	150	150

DVRPC is responsible for 350 HPMS sample sections for PennDOT on a 3-year cycle, with a physical inventory of 50 items. HPMS samples are on State routes mostly, but also local Federal-aid routes. DVRPC transmits all traffic counting and physical inventory to PennDOT through a dedicated terminal. Any data to PennDOT for HPMS can be edited and corrected through terminal transmissions. DVRPC uses a lot of HPMS data and has expanded an HPMS sample to calculate VMT for the area. PennDOT also prepares an estimate. DVRPC uses travel forecasting and compares those data with PennDOT. Mr. Burger expressed support for expanding avenues within HPMS for the sharing of data. DVRPC views itself as a data provider for PennDOT. Much more data could be made available through MPOs and local planning agencies.

Questions

What is your effort's funding arrangement? Each year, we develop a unified annual work statement. Some is State specific and some shared. The funding comes from FHWA's Highway Planning Program, PennDOT, NJDOT, and member governments.

Are you just a contractor providing a service, or would you have done it anyway? Or would you use the State DOTs instead? We are a contractor. Every year, we lay out a specific program, along with other counts. We recently started a large supplemental program of upgrading routes on a 5-10 year basis.

Speaker Joyce Newell, Michigan DOT

The State of Michigan owns only 8 percent of roads in the State; the rest are local. In the 1970's, Michigan DOT started working through local agencies to collect necessary HPMS data; there are 14 planning regions and 16 MPOs in the State. Annual work programs developed with MPOs contain an HPMS line item. Those work programs provide the regions with the flexibility to work with developers and others in localities and to provide information to interested parties. Each region deals with the work plan in slightly different ways, depending on local governments, policies, and issues. Among those different methods are the following:

- Performing counts themselves; contract funding is for equipment
- Purchasing equipment and passing it to agencies below to do the work for a rental fee
- Acting only as a coordinating system and passing tasks to other agencies
- Combining functions

The State has recently moved from a mainframe to a PC based system. This year, the State is targeting data sent from local agencies to be edited for correctness. Each year, the date for receipt of data is December 31; this is a target date, but the State works flexibly with the regions and MPOs. Once received, the data is run through edit checks; the changes must be compatible with local agencies. Field sheets for the following year's data are sent out in March or April.

For the future, Michigan DOT is looking for assistance from local agencies and regions in building a GIS based transportation framework to include all roads with addresses in the State. Systems expected to be tied in include the police, an integrated data system for the entire State, and the office of the Michigan Secretary of State for a qualified voter system.

Speaker Adiele Nwankwo, Southeast Michigan Council of Governments (SEMCOG)

Half of the State's population lives within the boundaries of SEMCOG; this increases the need and desire for partnership between SEMCOG and the State. Mr. Nwankwo humorously characterized the beginnings of HPMS as a traffic counting program unfunded in its first year. Then noted that partnership worked so well that it continued. To constitute a true partnership, an interjurisdictional relationship must move from being mandated to being seen as relevant in addressing each partner's needs or desires. SEMCOG and Michigan DOT continue to seek ways of improving the HPMS partnership to address mutual needs.

To accomplish part of data collection required for HPMS, SEMCOG bought traffic counters and offered to lend the equipment to local agencies on condition that they would be used at specific times and under special conditions to meet SEMCOG's need. The locals are also allowed to use counts to meet other traffic counting needs as long as they are willing to share data collected with SEMCOG. The localities concentrate on volume data, while SEMCOG handles the update of other HPMS data elements. SEMCOG periodically trains students to take counts and also hires consultants for this activity. SEMCOG, at this time, has no interest in being in the business of taking traffic counts; local agencies are encouraged to become responsible for this activity whenever possible. Local agencies routinely take counts and send data to SEMCOG for inclusion into the regional program. Other counts are taken by consultants to augment counts taken at the local agencies or in limited cases to fill in where locals are unable to take counts. SEMCOG takes direct counts only occasionally.

SEMCOG has developed a comprehensive transportation GIS system, including all local roads in Southeast Michigan. The linear reference system used is based on the Michigan Accident Location Index (MALI). Applications are devised according to the desires of the local agencies. The system processes all crash data (a valuable product), and integrates the data with other traffic related data. (This product now allows us to offer a high value service to our members.) Partnerships are formed based on negotiations and are built on the value added. Locals are now convinced that they will gain something on data collection from the strong partnership with SEMCOG.

Session Charge to Breakout Groups - Theme 2
Speaker Alan Pisarski, Consultant

The theme for the afternoon's breakout groups was "How?," with a focus on partnerships, integration (GIS and other tools), quality, and standardization. How, asked Mr. Pisarski, can data be collected for a road belonging to another agency that has no use for that data, and how can it be done in a timely and accurate way? What should each of three government levels do to ensure that data collection is done right?

Session First Day Recap; Second Day Charge
Speaker Alan Pisarski, Consultant

Recapping the first day's discussions, Mr. Pisarski referred to data sharing as a form of socialism in which each receives according to his needs and each gives according to his abilities. Data sharing, he said, is achieved by a variety of methods; there is no single correct path. Almost every possible institutional mechanism is used by States for data sharing activities. Flexibility is needed to engender greater sharing. Data should be collected at the lowest level so that all can make use of it. There is a three-way tradeoff among the need for data, the parties responsible for collecting and analyzing the data, and the skills and resources to make those activities occur. Pilot and case studies should be encouraged. No report was presented to the plenary group from the previous afternoon's breakout groups.

Session Theme #3—Future Scope and Scale of HPMS
Moderator Alan Pisarski, Consultant
Topic Responses to the Surveys
Speaker Henry Peyrebrune, New York State Department of Transportation, Retired

Mr. Peyrebrune summarized the information from his report which dealt with the issues related to Theme 3: "What?: HPMS Scope (system extent); HPMS Scale (sample significance); new information on pavement condition and congestion; and the use of new technology. These issues will be discussed in the next breakout sessions.

HPMS Scope: The report presents the survey results on the four HPMS scope options presented in the Federal Register. Twelve States and 4 outside agencies preferred the minor change or no change option while 7 States and 1 outside agency preferred some combination of NHS and other arterials or State roads. The report and the workshop handouts list the pro's and con's of each option which are to be discussed in each breakout group.

HPMS Scale: The survey results regarding scale were not conclusive with 5 States and 1 outside agency preferring a national sample. Again the pro's and con's of national versus State statistically significant samples are presented for discussion.

Pavement Condition and Congestion: The surveys and interviews revealed a desire to report more comprehensive information on pavement condition and congestion. The report describes in further detail the reasons for more comprehensive information in these areas and the breakout groups are presented with a number of questions regarding the desirability and process for gathering additional information.

New Technologies: Regarding the use of new technologies, the report presents the results of the surveys. Many States and local agencies are trying new equipment and techniques to collect HPMS data. The breakout groups are to discuss how the experience of the different organizations can be shared with other organizations.

Topic Sampling Implications of HPMS Options
Speaker Jim Getzewich, Chief, Highway Systems Performance Division, FHWA

Discussing potential impacts of changes to HPMS sampling characteristics, Mr. Getzewich offered the following background:

- States report that collection of sampled information is the costliest part of providing HPMS data
- Sample data collection costs range from 60 to 70 percent of State HPMS data collection costs
- The objective of this presentation is to present information on the changes in sampling requirements implicit in the HPMS options presented in the *Federal Register*
- This presentation is keyed to the reduced options set contained in the breakout session information

As previously discussed by Mr. Peyrebrune, the options for which sampling requirements have been estimated include those related to HPMS scope/extent of highways covered, as follows:

- Minor changes
- NHS only
- NHS and non-NHS State roads
- NHS and other principal arterials

Mr. Getzewich next defined a number of terms being used, as follows:

- Universally reported data items—Those reported on all roadway sections
- Sampled data items—Those reported on a sample of roadway sections
- Sample significance—Level of statistical significance of a sample
- Nationally significant—Sampled at a rate to represent all States through a statistically significant national sample
- State significant—Sampled at a rate to represent a statistically significant State sample

Discussing the options for sampling requirements, he defined option 1, minor changes to HPMS, as follows:

- Characteristics—Continue to collect HPMS data as currently done at a State level of sampling significance
- Number of existing samples—123,000
- Number of needed samples—80,000
- Even if HPMS remains basically unchanged, the States could reduce their sampling burden by about 30 percent
- Option 1 could be accomplished by—
 - Running sample adequacy software
 - Eliminating extra samples
 - Adding new samples where required

Option 2, NHS only, was defined as follows:

- Characteristics—Collect universally reported data and sampled data on NHS only
- Number of existing samples—123,000
- Number of needed samples—30,000
- Option 2 results in a reduction in the amount of universally reported data by eliminating non-NHS; and requires a restructuring of State sampling systems to add and drop sections

Option 3, NHS and non-NHS State roads, was defined as follows:

- Characteristics—Collect universally reported data and sampled data on NHS and non-NHS State systems only
- Number of existing samples—123,000
- Number of needed samples—60,000
- Option 3 may result in a reduction in the amount of universally reported data by eliminating lower order systems; requires a restructuring of State sampling systems to add and drop sections; and will not reduce State inventory requirements

Option 4, NHS and other principal arterials, was defined as follows:

- Characteristics—Collect universally reported and sampled data on the NHS and other principal arterials only
- Number of existing samples—123,000
- Number of needed samples—40,000
- Option 4 results in a reduction in the amount of universally reported data by eliminating lower order systems; and requires a restructuring of State sampling systems to add and drop sections

Option 5, sample at a national level of significance, was defined as follows:

- Characteristics—Collect all HPMS data at a national level of statistical significance
- Number of existing samples—123,000
- Number of needed samples—15,000
- For option 5, all data are reported at a national level of statistical significance only on a sample basis; option 5 requires a restructuring of State sampling systems to add and drop sections

Option 6, a mix of State and national level sampling, was defined as follows:

- Characteristics—Collect universally reported data items at the State level and sampled data items at a national level of statistical significance
- Number of existing samples—123,000
- Number of needed samples—15,000
- Option 6 results in no reduction in the amount of universally reported data from the current HPMS structure; and requires a restructuring of State sampling systems to add and drop sections; sampled data for all systems are reported at a national level of statistical significance only

Mr. Getzewich summarized his presentation as follows:

- All options require reconsideration of what are universally reported and sampled data items
- All options require development of specific sampling plans beyond these conceptual presentations
- All options require States to invest time and resources in sample system restructuring
- Savings can be gained by reevaluating current sample designs (option 1)
- Under most options, the collection of added data for State use is at the State's options

Mr. Getzewich presented the following questions for participants to consider:

- What are the implications of moving to these options—
 - From the perspective of the workshop participants?
 - In terms of scope of system coverage?
 - In terms of scale of sampling significance?
- What could FHWA do differently or in addition to what has already been presented?

Questions

After saying that, with notification of FHWA, over sampling can be eliminated, Mr. Getzewich took questions.

Where is the greatest over sampling? On lower volume roads. Has there been conscious over sampling? In some States, yes, but not for HPMS by FHWA. We should consider tightening sampling schemes and cutting sampling costs. Paradoxically, cutting volume groups was found to likely increase the number of required samples rather than reduce sampling requirements.

If you reduce the coverage of NHS, then why add samples? Samples may not be represented properly after a reduction and may require choosing the proper locations.

Topic Potential for the Use of Other Data Sources
Speaker Dr. Mike Meyer, Georgia Institute of Technology

Agencies collect data for their own use, with little concern for what other agencies are doing. In such a context, it becomes important to at least develop a data management strategy for similar types of data collected by different agencies. A careful examination of how the existing data base is providing the needed information for important issues is thus an important task in any transportation planning process. Dr. Meyer hesitated to discuss data strategies without talking about decisions first, however. Agencies collect data that are important for decision making; in fact, the data to be collected are determined by what types of decisions must be made. Data and data collection too often cost too much money if a decision structure is not determined first.

Demographic and other trends currently under way in the United States are not quantifiable, but will be faced. Those other trends are:

- Economic growth and goods movement
- International trade
- Transportation investment
- Focus on system operations
- Technology advancements
- Concern for the environment and quality of life
- The possibility of pricing road use

Trends in regional (not local) data collection include the following:

- Accountability
- Performance and condition orientation (improving)
- System operations orientation (part of transportation planning)
- More integration through GIS (slow but sure at regional and State levels, with real potential for connected and comprehensive data bases)
- Piggybacking (related to ITS, with Atlanta as an example of piggybacking on data collection)
- The data "business" (private sector sales of data to agencies and other businesses)
- Technology application opportunities (ITS based systems are increasing; data may be collected and used more easily, but with concern for data overload)
- Perhaps more focus on disaggregate and behavioral issues (the travel modeling community is moving to urbanized travel based models)
- More interest in flows oriented to economic status (*e.g.*, goods)

Alternative methods for data input include:

- Traffic and congestion monitoring—
 - Volume counts
 - Spot speed observations
 - Classification counts
 - Aerial photography
 - Satellite imaging
- Travel time and delay—
 - Videography
 - Global Positioning System (GPS)
 - Queuing studies
 - Floating vehicle studies
 - License plate matching
 - Cellular phones
 - Traffic control device studies
 - Automatic Vehicle Identification (AVI)
 - Instrumented vehicles
- Transit—
 - Boarding and alighting counts
 - Peak load counts
 - Section 15 reporting
- Goods movement—
 - Classification counts
 - Weight measurements
 - Shipment records
 - Average fuel consumption rates
 - Travel logs
 - Vehicle registration and inspection data
- Travel surveys—
 - Roadside interviews
 - Origin-Destination (O-D) surveys
 - On-board surveys
 - Travel diaries
 - Focus group
 - Consumer surveys
- ITS—
 - Smart cards
 - Advanced Transportation Management System (ATMS)
 - AVI
 - Lane occupancy measurements
 - Ramp metering measurements
 - Traveler information systems
- GIS and computerized data bases—Mapping
- Travel demand model systems—
 - Forecasting models
 - Vehicle speed estimation procedures
 - Peak spreading modeling
- Simulation—
 - Traffic simulation models
 - Queuing models
- Sketch planning—
 - Analysis of evaluation data
 - Pivot point applications
 - Hybrid analysis
 - Random sample household enumeration
- Evaluation—
 - Direct observation
 - Before and after surveys
 - Control studies

Dr. Meyer then offered a series of decision issues, which he presented as follows:

- Congestion → measures?
- Pavement condition → life cycle?
- Goods → economic measures?

Are data needed on these issues, he asked, for the types of decisions that must be made nationally and regionally? What measures do they relate to? How likely is it that we will be able to get the data—especially data on markets and service delivery? Are there alternative data collection strategies/technologies available (or soon to be) that will make data collection more feasible and/or less costly (as, for example, ITS technologies)? The key issues for data collection, especially from other sources, are ones of asking who is responsible, what to collect, where and how to collect, and how much time is required.

The overall theme is one of decisions and understanding the nature of decision making. Unless the profession and this conference go beyond what is necessary to support today's decision, it is unlikely that what is required for today will support the changed conditions to be faced in 20 or 50 years. By asking the above questions, however, it may be possible to put into place a data base to support transportation planning and decision making in the 21st century.

Topic State-of-the-Art Traffic Data Collection in Minnesota
Speaker Len Palek, Minnesota DOT (MnDOT)

Mr. Palek discussed operational analysis, with emphasis on data and statistical approaches to sampling. He did so with reference to the recently completed *Field Test of Monitoring of Urban Vehicle Operations Using Non-Intrusive Technologies*, a report documenting a 2-year test of non-intrusive traffic detection technologies initiated by FHWA and conducted by MnDOT.

Mr. Palek discussed the state of traffic data collection in Minnesota by focusing on the Twin Cities Metropolitan Area. The freeway network there is 70 percent instrumented with induction loop sensors for the traffic control system; the network is heading toward 100 percent instrumentation. Full instrumentation has been achieved in ramp metering. The system serves well, but more data are needed for traffic control. MnDOT is adding queue detection at the tops of ramps, upstream of ramp meters, to provide more detailed delay information for their motorist information program. Several redundant information systems have been built into the network for ITS projects, including ICTM and 3M microloop technology. Autoscopes are in use, but the data are not integrated into management systems. On the arterial network, scores of closed loop traffic control systems can record and permit downloading of much data used for setting up or optimizing traffic control.

Statewide, the Traffic Control and Analysis Division downloads census data on a weekly basis for day of the week and seasonal adjustment factors. Short term counts are taken using non-intrusive traffic detection technologies in a 2-year ITS related test sponsored by FHWA and carried out by MnDOT. The goals of the project are to:

- Evaluate the capabilities of the technologies
- Test the technologies under varying conditions
- Identify technologies suitable for use in climatic extremes

Devices must be easily deployable without disrupting traffic. Non-intrusive technologies offer safer deployment than conventional temporary data collection devices. Technologies tested include:

- Passive infrared
- Active infrared
- Passive magnetic
- Radar
- Doppler microwave
- Pulse ultrasonic
- Passive acoustic
- Video

Testing comprised the following stages:

- Initial technology review
- Initial equipment field test
- Extended field test
- Final report

The freeway test site was a location at the Penn Avenue interchange on Interstate 394 in Minneapolis. That effort involved testing vehicle detectors on mixed use and HOV lanes in traffic conditions ranging from free flow to heavy congestion. Another test was conducted in the same general location involving multiple lane approaches with unusual geometry and congested peak periods. Site preparation included testing baseline inductive loops, construction of a device mounting structure, placement of a data collection trailer, and construction of a weather monitoring station.

Categories of equipment for data collection included

- Hardware
 - Computers
 - Television
 - Three VCRs
 - Equipment rack
- Data output—Automatic data recorder
- Serial communications
- Software—Customer interface

Mr. Palek offered the following observations about testing:

- Most devices performed well in varying weather conditions
- Video devices were affected by wind and lighting conditions
- The active infrared device was affected by rain and snow
- Wet pavement caused overcounting
- Snow caused poor vehicle tracking
- The passive acoustic device was affected by low temperature
- Undercounting occurred along the freeway; over counting, at the intersection

The results of testing were successful with the exception of passive acoustic and video technologies. Volume measurement worked well; and speed data collection performed at the baselines. Most technologies were easy to set up, with the exception of passive magnetic devices and video devices. Maintenance was an issue with video devices; and there were related problems with radar, passive acoustic, and ultrasonic devices.

Mr. Palek presented the following conclusions:

- Most technologies were well suited for temporary data collection
- Performance differences were not significant among the technologies
- Most devices can operate in urban traffic
- Devices tend to be more accurate at freeway installations than at arterial locations
- The keys to selecting devices for temporary data collection are:
 - Ease of installation and maintenance
 - Flexibility in mounting
 - Power supply needs

Question

Why were temporary devices used? That was because of the scope of the Federal study. Road tubes might have been less precise, and would have been dangerous to installers. A lot of devices do not have battery systems, but the manufacturer has developed a battery for a week-long count.

Topic State of the Art Pavement Data Collection in Pennsylvania
Speaker Bill Swindall, President and CEO, Roadware Corp.

Roadware Corporation has been in the data collection business since 1969. Its data collection contract with PennDOT involves the collection of data on 52,000 miles for 2 years on mostly local roads. State data collection attributes were determined by PennDOT through a survey of maintenance practitioners, AASHTO protocols, available vendors, and data base needs. A trial, in which several vendors participated, was conducted over a 2-week period to collect data and demonstrate their systems. The tight time frame posed a strong challenge to Roadware's automated vehicle, which was ultimately successful. Automated vehicles, he said, offer the advantages of much lower cost and less danger than the use of college students at the side of a road.

The AASHTO protocols comprise the following elements:

- IRI (2 wheel paths)—Vendor measurements have become standardized
- Rut (hill)—Standards have been difficult to devise, measuring the hill between ruts instead; PennDOT went against the protocol definition
- Faulting (in concrete)—It is not well established whether vendors can measure faulting; it is necessary to be sure that vendors can do what they claim
- Cracking/surface distress and repair—The intent of protocols was to find a way to show cracking that reduces subjectivity; under the Strategic Highway Research Program (SHRP), devising algorithms was difficult; AASHTO protocols lend themselves better to automation; adjustments are expected

The main need in Pennsylvania is measurement of cracking in the right wheel track. Accurate, reliable, and objective road condition information is essential to implementing effective road maintenance strategies. Roadware's automated vehicle, the Automatic Road Analyzer (ARAN), was conceived as a multifunctional device to measure anything in real time at highway speeds. It was designed with the flexibility to allow for technological changes. The first production unit was built in 1985. Since then, Roadware has integrated technologies resulting from all types of research. Currently in its fourth generation, one ARAN can collect data for the entire State of Pennsylvania in a period of 2 years; 19 States are using ARAN. Its features include:

- Laser SDP roughness profilometer—Measures IRI in real time
- Road rutting and transverse profilometer—Measures full lane width transverse profile and rut depths to an accuracy of 1 mm
- Right-of-Way (ROW) Video—Provides continuous windshield, side, adjacent, and/or rear view video of both lanes in real time (allowing slow motion)—1- to 6-camera panoramic views
- PennDOT workstation
- Continuous versus direct to digital disk video—Pennsylvania is moving to direct to disk
- Wisecrux—A fully automated standalone crack detection and analysis system that analyzes and reports cracks by type, severity, extent, and location; summary reports are produced in graphic or tabular formats; data can be uploaded for mapping, visual analysis, and pavement management programs

Pennsylvania has given priority to preserving its huge highway investment in a time of limited funding. Within those constraints, there is a need for accurate and repeatable data. PennDOT currently runs 2 to 3 vehicles for 6 months a year, with 4 to 6 Wisecrux stations running during that time for 24 hours a day.

Questions

What is the cost per mile to collect Pennsylvania's data? With videos, etc., the cost is \$44 per mile. The price is based on time. Relative to other States, Pennsylvania is inefficient to collect. Iowa would be much more efficient to do because of its terrain.

Mr. Maring offered a disclaimer, saying that this vendor presentation was intended only to show what one State is doing and not to advocate a vendor or product.

Luncheon Speech Speaker

Minnesota DOT's Experience with Performance Evaluation
Janet Blacik, MnDOT

There is a close connection between MnDOT's system of performance evaluation (the Family of Measures, in use since October 1992) and HPMS; both systems provide performance data for decision making. After a discussion of MnDOT's structure, which comprises 5,000 people employed in 2 bureaus and 6 divisions, Ms. Blacik offered the following quote from Mark Graham Brown: "Measurement only provides you with data. If the data are not used to make good business decisions and to drive improvement efforts, a good measurement system is of little value." Discussing MnDOT's goal in developing the Family of Measures, she then quoted MnDOT Commissioner James N. Denn: "One of my goals since becoming the Commissioner of Transportation has been to constantly

improve our management practices in the department. An important element of this goal is establishing measures of performance for all our products and services, at all levels in the organization.”

Performance is measured, said Ms. Blacik, for the following reasons:

- To improve performance
- To focus attention on critical areas (focus can bring improvement)
- To keep in tune with changing expectations
- To achieve goals
- To compare performance with others
- To allocate resources
- To determine success

The Family of Measures is concerned with the following ideas:

- Mix and balance of measures for meaning, not just accuracy (“Focus on things that have real meaning.”—W. Edwards Deming)
 - Input, process, output, and outcomes
 - Internal and external measures
 - Balanced scorecard approach
- Critical few—Limit criteria
- Hierarchy—Appropriate measures at all levels of the organization

The plan’s originator began with productivity and then added quality. MnDOT developed a balanced score-card approach that avoided short term measures and focused on vision and strategy through outcomes and measures in four areas: financial, customer, learning and growth, and internal business process. The process of development was carried on from the top down because it concentrated on strategic management; Ms. Blacik described that process as a measurement development feedback loop moving between two poles—“What are we trying to achieve?” and “How will we know?”. The measurement development road map described a process comprising: clarifying outcomes; creating supporting measures; finalizing the Family of Measures; and putting the Family of Measures to work. Achievement of goals should be defined from the point of view of the customer—clear roads, not the number of roads cleared. The way to be certain of outcomes, Ms. Blacik said, is to think in terms of outcome owners who serve as champions of outcomes and measures; and who serve as liaisons among the management team, data expert(s), and the MnDOT Evaluation Section. Champions define the outcomes and measures.

Ms. Blacik defined the criteria for defining performance measures as follows:

- Is there a need to know, or is it merely nice to know?
- Can we influence this?
- How will the data be used?
- Will it indicate progress toward the achievement of the outcome?

Performance measures at all levels of the organization need to be in alignment with overall organizational outcomes and measures.

Finalizing and implementing the Family of Measures depend on:

- Communicating intent, outcomes, and measures
- Establishing data collection and analysis
- Exploring improvement opportunities
- Reinforcing progress (giving credit)
- Continually improving the Family of Measures (three or four iterations)

Regarding data collection and analysis, Ms. Blacik said that data can show if a trend is positive or not. If it is positive, then emphasis should be moved elsewhere, but if not, then analysis is needed.

The data coordination and targets plan comprises:

- Coordinating data collection efforts and beginning to set targets/objectives for measures in the MnDOT and division level families of measures
- Determining data requirements (frequency, format, etc.) and assigning responsibilities for data collection
- Analyzing data and setting targets where appropriate—No single measure; social and economic impacts must be shown

Ms. Blacik quoted Willard Hotchkiss from the *Harvard Business Review*, July 1923: "Due to the complexity of its task, it is necessary for management in most cases to base its action on composite judgments. The data required for action and for checking results must be furnished by specialists."

Families of measures are being used to:

- Give facts on which to base key MnDOT investment decisions
- Better enable customers and stakeholders to communicate with MnDOT about choices to be made
- Guide employees and partners in focusing resources on the most important work
- Define gaps between expectations and performance and help MnDOT target improvement areas

The purpose of the MnDOT Family of Measures, which is currently used in several divisions and one department, is to measure, track, and evaluate whether customer needs and public goals are being met throughout the State with the most efficient use of resources. MnDOT Family of Measures categories comprise the following:

- System performance—
 - Cost
 - Time/directness
 - Safety
 - Quality of ride
 - Infrastructure condition
- Public values and issues—
 - Environment
 - Regional socioeconomics
 - Access
 - Basic levels of service
- Organization performance/ values—
 - Performance/productivity
 - Environment
 - Progress to targeted areas
 - Diversity
 - TQM

Ms. Blacik concluded with the following quote from *The Balanced Scorecard*: "When organizations make the critical transition from vision to action, they experience the real excitement and gain the real value from developing [a performance measurement system]."

Session Charge to Breakout Groups - Theme 3
Speaker Alan Pisarski, Consultant

Mr. Pisarski said that breakout groups would discuss the issue of scope—how much of the highway system to cover. This would relate to other issues such as scale, kinds of data, and level of significance. A second round of questions should be considered related to congestion measurement issues, better pavement information, and promising and cost-effective new technological innovations. He asked for recommendations from the groups related to the above issues, as well as about use of ITS.

Session Reports from Breakout Groups - Themes 2 and 3
Moderator Alan Pisarski, Consultant

Group 1
Mary Lynn Tischer, Reporter

Despite a diversity of backgrounds, there was much agreement in the group. In a discussion of IRI, the group favored long term incorporation of variables that better reflect pavement condition. Counting was acceptable to States and locals as long as they are already doing it; that information should be sent to FHWA. Additional data improve decisions only if the data bear on the decision. Despite the many differences among State pavement management systems, AASHTO/FHWA protocols offer a model appreciated by all. As in the evolution of HPMS, an evolution to consistent measurements among States in all items was preferred.

Participants agreed that what was done in terms of scope was appropriate and required no alteration. In regard to scale issues, there was some agreement that the scale is basically correct; there is no need for all of the samples for data. MPOs need collect only the elements that they themselves need. There was hope that FHWA will settle on what is needed at each level. If changes are made, they should be done slowly; both sets of measurements should be collected at the same time to see whether to change items or the system.

Participants emphasized thinking outside the box and information exchange. Those developments pose an opportunity for States and MPOs, which need to continue developing information on case studies and best practices. FHWA should focus the debate on alternatives and processes. The States have a need for a national level of reports. Information should not be requested that is not needed or available.

Group 2

Kim Hajek, Reporter

Prior to discussing the proposed alternatives for the scope issue, this group discussed what kind of data was needed at the Federal level. The participants asked what are the basic Federal data needs in preparing reports to Congress? Data collection efforts should consider how the data will be used.

Consensus was reached, on the issue of scope, for the "Minor Change" approach. This was a preferable option which would produce less impact on *Highway Statistics*. The minor change approach would maintain VMT support, maintain data for national level studies, and preserve historical trend analyses.

Even though an NHS-option only would have a funding benefit to NHS owners, this option would provide inadequate urban area coverage. It was also noted that in some States, NHS is a political decision. The NHS-only option also does not satisfy congressional requirements on VMT. The NHS-only option would also have a greater impact on *Highway Statistics*. There would potentially be an inconsistency in Federal-aid changes due to NEXTEA.

The option for using NHS and non-NHS State roads would have a high impact on urbanized areas and total VMT. This option was ruled out because of inconsistencies with congressional NHS changes.

Regarding the issue of scale, the participants favored using State samples for higher order routes and national samples for lower order routes. It was noted, however, that the national-only option would rule out State-to-State comparisons. The participants also recommended a clarification of the meaning of State and national coverage.

For all of the options under consideration, it was noted that the data items which are collected for HPMS are much different, in comparison to other systems such as ITS. ITS data is real-time data and HPMS is a static data base. It is important to consider how to add "real-time data" to a static data base.

Regarding the question pertaining to PSR ratings, it was noted that each State has its own methods of determining this. Should this actually be labeled as a report on "remaining service life?" The participants noted that IRI is not objective and an objective measure is needed.

Regarding new technologies, the following use was discussed:

- Wisconsin's pen-based data collection system which allows for collection of data in the field, with input of the data later.
- Ohio—use of radar inputs to replace loops
- Rhode Island—use of video counters

The recommendation was made for the creation of a catalog of new hardware and technology to be made available to the States so that this type of information can be shared with other interested States.

Group 3

Ron Tweedie, Reporter

Group 3 discussed whether standards should be stronger for data. Making standards stronger was of less concern than quality control for existing standards—being sure that the data now being obtained is good data. Regarding the assessment of individual data items for objectives, confidence levels were an issue—if data items were difficult to collect, then they should be thrown out. Bad data are worse than no data. A participant from FHWA felt that all data should be thrown out and that a zero based game should be instituted.

Regarding the matrix, minor changes would have little impact. In the case of NHS plus other State roads, too much variability exists among States; this would place too much burden on the States. The group spent the most time discussing the option of NHS plus arterials. Regarding stewardship and policy analysis, the NHS-only option would lock into NHS and the Federal level; adding arterials would allow flexibility with other programs. In regard to legislation that affected objectives, the NHS-only option would not meet CAA amendments. The group was unclear about estimating VMT; other provisions would have to be made. The NHS-only option would mean a loss to the public data set; the addition of arterials would mean less loss. The NHS-only option would not meet State and local needs; arterials would not meet those needs well either. Federal mandates help to sell data at the State level; it was unclear if this was good or bad; but a Federal mandate pushes people to do what they would not do otherwise.

On the subject of scale, the group felt that a national sample could not meet CAA and would not allow State to State comparisons. State to State comparisons should continue where one can be confident of the data. Sampling, it was said, has two tiers; samples for national data are different from those for State data. It is appropriate to sample more for pavement condition and VMT.

Individual data items and the value of those items must be sorted out over the next few months.

Group 4

Tim Lomax, Reporter

Thinking outside of the box, Group 4's reflections on the previous day's discussion of evolutionary partnerships colored their recommendations. Regarding scope, Group 4 thought this a bad time to consider the issue due to the impacts of so many other issues. The number of items in the HPMS data base becomes a circular argument; it also impacts scope. The group also discussed funding allocations and NEXTEA; performance measures' impact on HPMS; and management systems. It was said that linkages to management systems connect option seven to the issue of scope. Further, integrating local MPO information into the HPMS process and vice versa will determine how HPMS should be configured.

Group 4 noted the following implications: VMT, pavement, and congestion should be looked at as separate elements; minor change should be considered for the amount of VMT information because of EPA requirements for VMT; to prevent too much information, pavement data might be pulled from the pavement management system; and EPA should be forced to talk to local areas where VMT processes are set up.

Because system coverage varies from State to State, if option three is chosen, not much that is useful for comparison will come out of HPMS. The option of NHS and other arterials involves political judgment; it gives States more of what they want from the information and constitutes a functional class system rather than a jurisdictional one.

In regard to scale, tapping existing sources for data elements would mean better reliability and less effort. A great deal of data has already been collected, and the workload would not be reduced by a drop back to a lower level. Much work has to be done, regardless of HPMS.

For pavements, improved HPMS data analysis is needed to keep up with sophistication in pavement analysis; HPMS data can be obtained from other models and will still provide information useful to pavement policy. For congestion, there is a need to focus on urban areas, where the problems are; on what decisions are made; and most importantly, on how to measure congestion.

Among the new technologies discussed were pen-based data, laser range finders, and GPS. Participants discussed concerns about asking workers to do things that are unsafe and changing DOT policies on collecting data.

About EPA and VMT monitoring, it was said that, if those numbers came from HPMS, they were credible, but if not, they were suspect. HPMS data has a mystique about its accuracy. A participant advocated divorcing VMT from HPMS and locating it strictly at the local level to make a clear signal about VMT's origin. The aforementioned

mystique is a perception issue that needs to be broken. Although VMT is associated with the air quality requirement, that use did not exist until 1992. In 1988, it was asked, would the same conclusions be drawn? VMT is important in other contexts. Its use for the air quality requirement was said to be wrong.

A distinction was drawn between the universe of data and sample data. Regarding scope, there was no resistance to universal data, but some resistance to sample data. For scale on pavement condition and traffic data, it was said that State collection locations for the two were not identical; the data may require some alteration, and its value was questioned. A sample transmutes and loses validity over time.

Session	Summary Remarks: What Did We Hear?
Moderator	Alan Pisarski, Consultant
Panelists	Dave Clawson, Program Director for Policy and Planning, AASHTO Henry Peyrebrune, New York State Department of Transportation, Retired Gary Maring, Director, Office of Highway Information Management, FHWA
Speaker	Dave Clawson

A reassessment of HPMS is occurring among States, MPOs, and Federal agencies. Mr. Clawson based his remarks on the three themes that Mr. Maring discussed on opening the workshops. About the first theme, "Why HPMS?: Mission, objectives, and uses," participants were concerned with reduced collection burdens for States and additional time and resources. Regarding objective six, he noted that States have an interest in its deletion due to their opposition to a comparative process.

For the second theme, "How?: Partnerships, integration, quality, and standardization," he noted among participants a need for better quality information, particularly now that a wider audience is tapping in through the Internet. To improve information and its distribution, FHWA should provide additional training and technical assistance. Diversity among MPOs and States must be factored into the HPMS process. Documentation of that process has limits that affect the data as well; better documentation should be produced and provided to users. A TRB synthesis of States would be useful to provide additional information on the present situation and where HPMS is headed. Such a synthesis would offer a base for further information sharing and networking among the States.

Regarding the third theme, What?: Scope—system extent; scale/structure/sampling; and section versus aggregate data," he noted a need to include new technologies such as ITS and the PC based desktop environment. New technologies and other innovations should be looked at in the reevaluation of HPMS. Whatever occurs in reassessment, it must be examined in the light of available and potential funding.

The Irvine Conference's issues came down to money, data, and time, all three of which were covered in the present meeting.

Speaker	Gary Maring
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Mr. Maring said that Mr. Clawson touched on many of his own concerns. He praised workshop participants for their hard work and adherence to the schedule. The workshop provided a lot of useful information for the HPMS Steering Committee and FHWA. He also praised the breakout groups.

For the first theme, he noted consensus on mission and objectives, which should be understood at a national level. Objective number six should be deleted; the other objectives gained buy-in with some fine tuning.

Regarding the second theme, given differences from State to State, there is no one model for data partnerships and sharing. A TRB synthesis will be suggested to summarize experience. Most States dislike standards other than for equipment, but show interest in protocols and AASHTO guidelines. Workshop participants were concerned about data quality, on which States must work together; how to do that is an issue.

Mr. Maring was impressed with participants' ability to deal with theme three's issues of scope and scale, and other problematic aspects of pavement and congestion. FHWA should investigate the production of a catalogue of new technologies. While an item-by-item review of individual data items by the full workshop was not possible, a zero based review to examine necessity was upcoming for the steering committee consideration.

Speaker Henry Peyrebrune

Mr. Peyrebrune said that Mr. Clawson and Mr. Maring anticipated many aspects of his own summary. Regarding theme two, and in particular, partnerships and integration, he warned against overlooking logical opportunities and advocated improved data quality. Participants should watch for opportunities for partnership and sharing, especially in their own agencies. Other parts of those agencies may not collect data or may have use for one's own data that they do not yet know about. A second level of partnership would be among agencies with the same jurisdictions, as for example, motor vehicles, environmental, and police. A third level would be within multilevel organizations, as in traffic systems in New England. Traffic, he said, does not stop at State boundaries. Opportunities for partnerships exist among States. A fourth level would be regional; MPOs collect much data, but only half are asked by States to contribute that data to HPMS. The final level is the local level. After HPMS reevaluation, all five of those levels of partnership should be reexamined.

The HPMS Field Manual should be reviewed or rewritten. A Quality Assurance (QA) process is now in place; if applied uniformly among 50 States, it would constitute a good QA process, but as of now, QA is applied differently from State to State. Although FHWA may be looking at existing HPMS, is HPMS being positioned for its future problems? Mr. Peyrebrune agreed with Dr. Meyer's earlier challenges; FHWA must look to the future to maintain HPMS's reputation as the nation's premier performance measurement system.

Speaker Alan Pisarski

Mr. Pisarski confessed nervousness about performance measures. What, he asked, happens once people find ways to look good by responding to measurements rather than problems? It is unnecessary to fear comparisons due to misuse of data; it is better to replace bad data with good data. Data sets can always be misused. There is no way to prevent misuse. Every State visited compared itself to other States. The issue is who compares and by what method. Mr. Pisarski wanted to avoid measurements from above.

Regarding the need for data and definition, Mr. Pisarski emphasized cost. It is not enough to need; that need must be satisfied at a reasonable cost. He noted that needs may be national in scope and local in application; he warned against applying a local need at all localities. In reference to avoidable costs, if HPMS were abolished, the amount of change in actual spending would vary from State to State; that would provide an indicator of avoidable cost.

Discussion

- I take issue with the assumption that HPMS is a pavement management system for FHWA. States, being implementers, have pavement management systems, and FHWA has no such need. The key to the discussion is monitoring performance at the Federal level.
- There is real support here for the importance of the Federal role. What exists is a need system in which FHWA meets its responsibilities to Congress and legislation. [Pisarski]
- Performance measurement systems are fine when they're your own and they're being operated in the sunshine for the sake of your customer; but if those systems are the result of a Federal mandate, then you're likely to get gaming of the system started.
- A family of measures is necessary; one single measure is not useful. [Pisarski]
- HPMS measurements such as performance, congestion, etc., aren't quite adequate. Are alternatives available in supplemental studies? Case studies, for example, tend to focus on congestion in down-towns. Is it possible to reduce the reporting burden?
- In changes of scale and scope, Congress is unlikely to let FHWA stray far. [Pisarski]

- How many participants think that the next round of individual data items is more important than general topics? Can it be addressed on a broader scale?
- The logic inherent in the data package is not as valid as it was, and by the year 2000 it will not be valid at all. We have to validate the data package to allow for policy decisions.
- There is conflict between what Congress requires and uses for data that aren't required but are nice to have.
- I'm not sure what is nice to have now. What is critical to our task is the immense collection of stuff not legislated, per se, but if we didn't have it, we would cripple our programs. [Pisarski]
- Data items are important at a national level, but when we're conducting analyses, we have to be aware of State plans and policies. Some States have moved away from the idea of the highway as king. The focus is changing, and we have to be careful.

Session Where Do We Go from Here?
Speaker Gary Maring, Director, Office of Highway Information Management, FHWA

Mr. Maring listed the next steps to be taken in HPMS reassessment as follows:

- The current meeting, the goals of which were to assess the results of Henry Peyrebrune's study and to discuss critical issues, will provide input to FHWA in determining future steps
- The meeting of the HPMS Steering Committee, the goals of which were to assess the results of the current meeting and provide feedback to FHWA
- Assess and see completed the Peyrebrune study by September 30, 1997; widely publish the results
- Assessment by FHWA of the results of the Peyrebrune study, outreach, NEXTEA, and emerging needs in the 21st century
- Publication of the final proposal for comment

Discussion

Will this group be informed of what transpires? I'll report back to the Standing Committee on Planning (SCOP) at the AASHTO Meeting, September 26, 1997. [Maring] State representatives are here, and we'll inform them through AMPO and FHWA. We'll try to keep people informed. We'll put much of this out, including the Peyrebrune report, on the FHWA web page: <http://cti1.volpe.dot.gov/ohim>. [Getzewich]

Mr. Maring asked Mr. Peyrebrune to give a summary of the process of completion of his study, as follows:

- The decision process starts with a three-dimensional matrix. It will talk about scope, which delineates broadness or extent of system to be covered. Next, it will deal with scale. Then, for each data item, a list of who uses it. First comes a determination of whether the item is in or out, then who uses it, what analytical process it supports, and if it is in *Highway Statistics*. The survey tells the use of each table. Four or five data items are used to make each decision on in or out, followed by a second level, the level of significance at which it has to be collected—State or national? After a series of *ad hoc* decisions, we will put it back together, look at it, and ask if it's better and if it's cost effective. You don't just emphasize the sum cost, but also the up front cost; there is a need to analyze that. Then we will cycle it back once or twice. My notion is to go down each individual item. Many of you gave indications of which items could be dropped, but there was no consensus. There should also be a list of items collected that are not used by States.

How will you factor in future uses, GPRA, and what Congress will do in Reauthorization. That's hard to handle, but how will you do it? Strategic planning is going on concurrently at the departmental level and within FHWA. Five strategic goals have been identified. Those are mobility, productivity, safety, the human and natural environment, and national defense. There are outreach groups around each goal, and they're providing impact on performance measures and indicators for the FHWA strategic plan for fall 1997. It's evolutionary and has the same time frame as reauthorization. This is a good time to be reconsidering HPMS. These are all things that can contribute to the evolution of a 21st century HPMS. [Maring]

Mr. Pisarski expressed his gratitude to Mr. Jim Getzewich and Ms. Connie Bell, both of FHWA, and especially to the participants for making the workshop a success. The workshop was then adjourned.

THEME 1

Mission and Objectives of the HPMS

The mission and objectives listed on page 18 of the consultant's report will be revised to reflect wording changes suggested by the various breakouts and the Steering Committee. Number 6 will be dropped.

HPMS VMT and the CAA

Because of impending changes to the CAA standards and regulations, implementation of which will be unfolding over the next months and years, the current HPMS will not be changed as it relates to VMT estimation for CAA purposes. However, FHWA and EPA should work on clarifying the administrative processes and issues dealing with the use of HPMS for CAA purposes under current requirements to improve the way the system operates. Issues include such basic activities as making sure a process exists so that all players know which areas are using the HPMS for CAA annual VMT estimates. FHWA policy clarifications will be accomplished in conjunction with FHWA's Environmental Analysis Division, which is now in the process of developing a "Reference Text". FHWA will also review/revise the HPMS Field Manual to include clearer HPMS reporting instructions. Via Mark Wolcott, FHWA will seek EPA review/input to the rewrite of the HPMS Field Manual.

THEME 2

Data Partnerships

Improving data partnerships and data sharing supports the sixth adopted objective (evolving the HPMS...). From the discussions in the workshop and with the Steering Committee, an NCHRP synthesis of practice related to HPMS data collection partnerships appears to be a good first step. Deborah Buchacz, AASHTO, agreed to look into seeing if there would be State support for such a synthesis. There did not seem to be substantial workshop or Steering Committee support for initiating pilot studies at this time; it appears that pilot studies might be more useful after a synthesis is completed and FHWA is in a better position of knowing what's out there. The contractor will be including some additional recommendations on data partnerships in the final report. FHWA will keep the Steering Committee apprised.

FHWA'S Strategic Software Development Plan

The sense of the workshop and Steering Committee was that the FHWA should proceed with its software development program. HPMS will use the FHWA GIS system, as represented by the LRS, as its GIS base; however, FHWA will provide user instructions that will make the submittal software more easily interfaced, to the extent possible, with existing State GIS-based systems to facilitate the data submittal process. FHWA will proceed with attaching State LRS attributes to the NHPN while periodically reevaluating LRS reporting requirements for possible improvement in light of NCHRP Project 20-27(3), the LRS Handbook being developed by FHWA's Office of Technology Applications, and related BTS efforts. FHWA will report back to the Steering Committee on activities in this area.

There were workshop suggestions that the HPMS PC-based system be of open architecture and not proprietary. The strategic plan is to make the system Windows compatible, so it is not now an open platform. Beyond the operating system, the data submittal programs do not require proprietary software to execute. However, software being developed to perform internal data manipulation and evaluation functions are Oracle based and are, therefore, proprietary. FHWA will discuss the implications of this suggestion with the software contractor.

Data Standards and Quality

The sense of the workshop and the Steering Committee seemed to be that there should not be any new standards per se and that the issue is more one of enforcement of existing standards and a ratcheting up of the quality assurance process at the Federal level. Suggestions included:

- Developing clearer data definitions in the HPMS Field Manual as part of the data element review
- Encouraging regional forums of HPMS data providers similar to the annual HPMS meeting in FHWA Region 1 as a way to improve understanding, quality, and data sharing
- Investigating the appropriate application of metadata standards to HPMS data
- Improving HPMS training
- Improving the HPMS quality assurance process now conducted primarily by the FHWA field offices.

The Steering Committee noted that the improved quality message should come from the upper levels of FHWA management.

The training issue has been reviewed by the Steering Committee in the past and an action plan developed. FHWA's current position is to wait until the strategic reassessment is completed and a "new" HPMS fielded before developing a training course. FHWA's strategy focuses on interactive, job site oriented training based upon Steering Committee comments that the training had to be able to reach down to the lowest level of the collection chain and be universally available to a great number of personnel at minimal costs for travel, etc.

FHWA will investigate the implications and possible application of metadata standards to the HPMS.

THEME 3

Scope of a Future HPMS

After much discussion within the breakout groups and workshop in general on the identified HPMS scope options, the facilitators reported back that the scope of the HPMS, that is the extent of system covered, should remain unchanged and should be adopted as the basis for reassessment. The Steering Committee ratified this opinion. FHWA intends to proceed with the remainder of the HPMS reassessment in accordance with this recommendation.

Scale of a Future HPMS

Based upon discussions at the workshop and breakout sessions, FHWA believes that the scale of the HPMS should be evaluated on a data item basis and should include an initial assessment of whether each data item is still needed. If the data item is needed, the evaluation should consider whether it should be collected by section or in aggregate form, and if collected at a section level whether it should be reported for all sections or sampled, and if sampled if it should be sampled at a State or national level of significance. The Steering Committee ratified this general approach.

A proposed decision process reflecting this approach was discussed and input provided to the FHWA. The Steering Committee recommended the application of the decision process to each of the existing data elements, that data item level decisions be documented, and that results shared with the Steering Committee. It was also recommended that at some point the results of the decision process need to be shared with a wider audience including SCOP, user groups, and the MPOs to enhance buy in and ownership among the partners and stakeholders. FHWA agrees.

As a first step in this evaluation process, the FHWA and the contractor have refined the decision process based upon Steering Committee input. The revised draft decision process and the evaluation criteria developed by the Steering Committee follow. The decision process and evaluation criteria will be used for the data item level evaluation of the existing HPMS.

New Data

Pavement Condition Data: Based upon workshop and Steering Committee discussions, FHWA believes that the HPMS should continue to collect the IRI data for the time being. At the time the AASHTO IRI protocols are endorsed by AASHTO, FHWA should adopt them for the HPMS. In the near term, FHWA should use information available from State management systems on a case basis to improve knowledge of pavement condition and service life based on the AASHTO distress protocols. The case-based information can be used as an external input to pavement modeling and national policy assessments. In the longer term, as more States adopt the AASHTO distress protocols, FHWA can consider adding uniform pavement condition information to the HPMS data base.

Congestion Data: The workshop and Steering Committee recommendations for congestion data were similar to the above. FHWA is moving away from V/C as a measure of congestion and is beginning to focus on items such as travel time, travel speed, and delay. Currently these parameters can be modeled from available HPMS data and observed relationships, but are not measured directly. However, these data can be captured by ITS, although there are currently no protocols for retaining, managing, and sharing ITS real time data. As with the pavement congestion data, the workshop and Steering Committee indicated that in the near term FHWA should make use of ITS data available from deployment sites on a case basis. Again, at some future time, as protocols are developed for retaining and managing the real time ITS data, FHWA should reconsider the appropriateness of adding these data to the HPMS data base. In the interim, FHWA will work with the ITS Data Needs group within FHWA to improve access to ITS data and will report back to the Steering Committee as appropriate.

Safety Data: There was some discussion in both the workshop and Steering Committee of the relationships between the HPMS, NHTSA's FARS and GES, and their appropriate linkage with FHWA's safety data needs. This will be discussed within FHWA as a part of the reassessment activity as it relates to existing safety data reporting through the HPMS.

New Technology

There was a general recommendation from the workshop and Steering Committee that FHWA catalog new technology applications and develop methods of sharing experiences with equipment used for HPMS data collection. FHWA will have the contractor look into developing a catalog in cooperation with AASHTO.

Adopted Decision Process for HPMS Reassessment

Step 1 - Screen each data item against criteria

Review each item, stratified by functional system, against each of the screening criteria. Determine which items should continue to be candidates for a revised HPMS data base.

Step 2 - Evaluate section level versus aggregate reporting

Evaluate each remaining data item against the current level of reporting for each of the functional systems. Determine whether the data item should continue to be collected and reported on a section basis or whether the item should be collected and reported on an area wide, or aggregate, basis.

Step 3 - Evaluate statistical significance

Evaluate each data item obtained on a section basis to determine if the data should be collected for all sections or for a sample of sections. For those sections to be sampled, evaluate the appropriate level of statistical significance - national versus State. To meet travel tracking requirements, section length and traffic data will be needed at the urbanized area level of statistical significance.

Step 4 - Review resulting HPMS data base

Evaluate the resulting data collection and reporting process on the basis of:

- Is the new data base consistent with the HPMS mission and objectives
- Is the new data base an improvement over the current system
- What is the cost of change versus the costs saved
- What decisions on individual data items can be reconsidered when they are viewed as a group
- What is the process and timing of change

Step 5 - Public Input and Final Decision

The final step includes internal review and additional outreach to SCOP, AMPO, user and other outside groups and the public through the Federal Register.

Adopted Data Item Evaluation Criteria

Use for Federal decisions - how does the data contribute to decisions made by the Federal government?

- Legislative requirements
- Support key policies
- Preserve historic trend data

Collected by States/locals for own use - would State, regional, and local agencies collect the information for their own uses? Are the data readily available?

Nationally consistent item - Can the data item be obtained on a consistent basis? Is it a measured or subjective item?

Estimable from other relationships with minimal impact - can the data item be generated from other data items or estimated from other relationships without materially affecting the use of the data base? Is the continued collection cost effective if the data item can be estimated or simulated?

Level of use in Highway Statistics - Is the data item used in *Highway Statistics*; in how many tables; what is the level of use based on the DRI-McGraw survey and other indicators of use?

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