
Highway Performance Monitoring System Reassessment

Final Report
Revised April 1999



**Office of Highway Information Management
Federal Highway Administration
Department of Transportation
December 1998**

Notice:

Subsequent to the publication of the HPMS Reassessment Final Report, the FHWA conducted four implementation workshops attended primarily by FHWA staff and State and MPO data providers. In the process of conducting these workshops, FHWA received valuable input on several of the data items. From this interactive review process, FHWA has concluded that several changes are required. These revisions have been incorporated into this report and are shown in bold italics. This revised Final Report should be used when developing changes to State HPMS reporting systems. HPMS submittal and other software to be used to report 1999 data in June 2000 and the HPMS Field Manual will be adjusted to reflect these changes.

Acknowledgment:

FHWA wishes to acknowledge the contributions of Henry L. Peyrebrune, Transportation Consultant, to this *Highway Performance Monitoring System Reassessment: Final Report*.

Foreword

This report documents the results of a Federal Highway Administration (FHWA) review of the agency's Highway Performance Monitoring System (HPMS). The purpose of the comprehensive review was to assist FHWA in determining an appropriate future form and direction for this major FHWA data system. This report represents the culmination of several serial activities including:

- C the identification and assessment of the impacts of the HPMS on FHWA, its State and other governmental partners, and the many and varied HPMS customers;
- C the results of an extensive outreach program that included a national HPMS workshop held in June 1997; and
- C the subsequent assimilation of inputs from these activities into a set of proposals for the future form of the HPMS.

The HPMS provides essential information on highway condition, performance, and use. It serves many critical functions for both the FHWA and the States, providing investment information for Congress, condition and performance information for the traveling public, and information necessary to make equitable apportionments of highway funds to the States under the Transportation Equity Act for the 21st Century (TEA-21). The reengineering of this valuable data system to reflect business needs for the 21st century has been a high priority for the FHWA. This thorough review of the HPMS was done with input from our partners, stakeholders, and customers, and is an exemplary model of partnership and cooperation.

FHWA welcomes comments on this report. These comments will be useful in guiding the FHWA as it implements changes to the HPMS over the next year. Comments may be forwarded to FHWA's Office of Highway Policy Information (HPPI-20), 400 Seventh Street, SW, Washington, DC, 20590 to the attention of Mr. James Getzewich (jim.getzewich@fhwa.dot.gov).

This report is available in electronic form at <http://www.fhwa.dot.gov/ohim>.

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Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway & Transportation Officials
AMPO	Association of Metropolitan Planning Organizations
AP	Analytical Process
BTS	Bureau of Transportation Statistics
DOD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
GES	General Estimate System
GIS	Geographic Information System
GPRA	Government Performance and Results Act
GPS	Global Positioning System
HERS	Highway Economic Requirements System
HPMS	Highway Performance Monitoring System
HSIS	Highway Safety Information System
IRI	International Roughness Index
LRS	Linear Referencing System
LTPP	Long Term Pavement Performance
ITS	Intelligent Transportation System
MPO	Metropolitan Planning Organizations
NAAQS	National Ambient Air Quality Standards
NCHRP	National Cooperative Highway Research Program
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
PSR	Present Serviceability Rating
SCOP	Standing Committee on Planning
SHRP	Strategic Highway Research Program
SN or D	Structural Number (SN) or Slab Thickness (D)
STRAHNET	Strategic Highway Network
TEA-21	Transportation Equity Act for the 21st Century
TRB	Transportation Research Board
VMT	Vehicle Miles of Travel

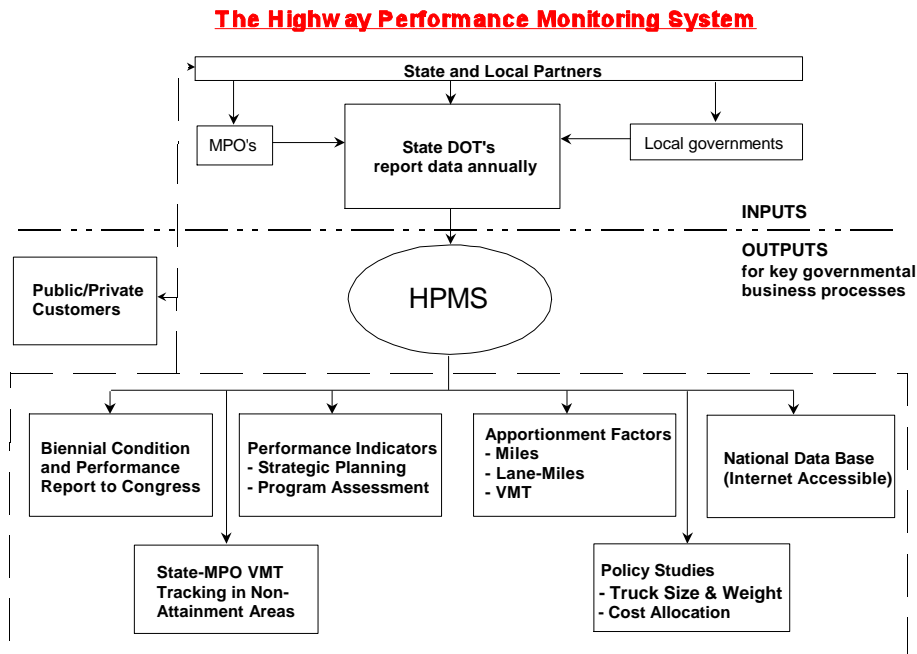
Executive Summary

Introduction

The purpose of this report is to document the outcome of the HPMS strategic reassessment. The reassessment was accomplished over the period beginning in December 1996 to December 1998. The report summarizes the analysis and public outreach steps that were undertaken to develop a consensus on a future HPMS focus, mission, and content. Specific changes to streamline the existing HPMS are proposed, and the use of HPMS to meet FHWA needs for high quality performance and apportionment data under the Government Performance and Results Act (GPRA) and Transportation Equity Act for the 21st Century (TEA-21) are explored. A short term implementation plan is offered, and longer term visions for meeting the agency’s future safety, pavement, and congestion data needs are discussed.

Background

The HPMS was developed in 1978 as a national highway transportation system data base. The HPMS replaced numerous uncoordinated annual State data reports as well as biennial special studies conducted by each State. The HPMS is a principal source of data for *Highway Statistics* and other FHWA publications, the Condition and Performance Report to Congress, strategic performance indicators, and highway program fund apportionment. The following is an input/output schematic representation of the HPMS.



The purpose of the strategic reassessment was to review the HPMS in light of contemporary issues and emerging business needs and to determine what changes were appropriate at this time. The reauthorization of the Federal-Aid Highway Program provided an appropriate opportunity and framework for FHWA to undertake a reassessment of the HPMS. Changing technology, including the development and deployment of Intelligent

Transportation Systems (ITS), requirements of the GPRA, and changing State and local data needs including the increased use of management systems also provided an impetus to the strategic review.

The reassessment was conducted by the FHWA in partnership with the HPMS Steering Committee, which includes members from States, Metropolitan Planning Organizations (MPOs), American Association of State Highway and Transportation Officials (AASHTO), and Association of Metropolitan Planning Organizations (AMPO). These partners have had a continuing role in the process from developing the need for the reassessment to drafting and reviewing various work products and reports, participating in workshops and Steering Committee meetings, and providing insight and support to the results of the reassessment as reflected in this report.

Significant Outcomes and Recommendations

The reassessment has been guided by a longer term vision of an HPMS which builds from the data systems of local, regional and State governments and is connected through a common geo-referencing system thereby minimizing the need for data reporting between agencies. It has produced a number of significant outcomes and recommendations that when implemented will result in an HPMS that effectively meets its mission and objectives, contains only data items having specific uses and customers, can be produced at a lesser cost and provider burden, and offers opportunities for improved data quality. The outcomes and recommendations include:

- C During the HPMS reassessment process, FHWA placed a high value on maximizing public outreach and developing a consensus on recommendations from both data users and providers. Throughout the process, participants voiced strong support for retaining the HPMS as a State-based data reporting system and continuing the HPMS in a form very similar in basic structure to the existing system. A statement of the future HPMS mission and objectives reflecting this support was developed through extensive public outreach to the user and provider communities.
- C FHWA will make substantial changes to the number and detail of the data items in HPMS. The study recommends eliminating 15 data items, changing 21 others, thereby eliminating 90 reported detail lines, and adding one new item. The study identified opportunities for States to reduce the HPMS sample size by 35 percent in the aggregate, and for FHWA to reduce the number of HPMS records by two thirds through grouping. In all, these changes offer an opportunity to reduce provider burden, eliminate unneeded data, and improve data quality. Estimated potential annual costs savings of \$3-\$5 million were identified.
- C FHWA will use the HPMS universe, sample, and areawide data for apportionment purposes with adjustments to sampled data made using universe length as the control value. This moves the data adjustment process totally within the HPMS, and provides a consistent, controlled basis for meeting FHWA's expanded financial stewardship responsibilities under TEA-21. However, this will also require more attention to the use of appropriate sampling techniques and sample management on the part of data providers.
- C FHWA will eliminate the reporting of fatal and injury crash data now provided by the States on a summary basis by functional system. In the short term, the report recommends that FHWA rely on existing safety data systems including the National Highway Traffic Safety Administration's (NHTSA's) Fatality Analysis Reporting System (FARS) and General Estimates System (GES) as well as FHWA's Highway Safety Information System (HSIS) to meet crash data needs. In the longer term, the report recommends that changes to crash data requirements and data sources be made in cooperation with NHTSA and others in the safety community through the mandate to develop model safety data elements under Section 2005 of TEA-

- 21.
- C FHWA will continue to require only International Roughness Index (IRI) data for pavement performance purposes in the HPMS in the near term. In the longer term, the report recommends that FHWA pursue a research program aimed at developing alternative pavement models for policy applications and, as States develop the ability to include other pavement stress data in their pavement management systems, investigate appropriate mechanisms for making such additional data available to the FHWA for pavement analysis purposes.
 - C In the near term, FHWA will continue to require current congestion-related information in the HPMS and investigate better ways to estimate highway congestion using HPMS data. In the longer term, the report recommends that FHWA conduct research directed at better estimating relevant congestion indices and system performance using archived ITS data and other sources of data external to HPMS. This will likely require linking HPMS sections to a common geo-referencing frame.
 - C In the short term, FHWA will continue to implement software improvements to the HPMS that simplify data provider input burden and that add value to the HPMS by improving accessibility to the data base through Internet links and associated analysis software. In the longer term, the report recommends that these HPMS capabilities be appropriately linked to existing geo-referencing systems using the efforts of the Bureau of Transportation Statistics (BTS) to create a national datum.
 - C In the short term, FHWA will work with the National Cooperative Highway Research Program (NCHRP) and other partners to complete the synthesis of best practices--NCHRP Topic 30-07, *Data Sharing and Data Partnerships for Highways*. In the longer term, the report recommends that FHWA, AASHTO, and AMPO use the synthesis results to conduct pilot studies and establish working models of data partnerships and data sharing in several suitable locations.
 - C FHWA will implement short term improvements to the HPMS data system as soon as possible. As a practical matter, the earliest this can be accomplished is with the reporting of 1999 HPMS data in June 2000. This schedule allows data providers a one year lead time to plan for necessary changes to accommodate the HPMS requirements. To the maximum extent possible, changes will be achieved through software conversions of existing data; other changes will be phased in as providers make changes to their existing systems. Since the majority of changes involve a reduction in data collection and reporting, FHWA expects minimal implementation problems.

Conclusion

As a result of the reassessment, the HPMS is better positioned to maximize the use of future new technologies for collecting and reporting data. FHWA believes that the proposed revisions to the HPMS meet the decision process elements and evaluation criteria laid out by the HPMS Steering Committee for this review. Implementing the proposed changes will permit FHWA to better fulfill its HPMS mission and objectives. The new HPMS data base appears to be an improvement over the existing data system and cost estimates suggest that States should be able to save resources with these revisions. The proposed HPMS revisions, when viewed as a whole, appear rational, beneficial, and consistent. FHWA will continue to take steps to meet the future HPMS vision in concert with the HPMS Steering Committee and FHWA's partners, stakeholders, and customers.

Introduction

The HPMS was developed in 1978 as a national highway transportation system data base. It includes limited data on all public roads, more detailed data for a sample of the arterial and collector functional systems, and certain areawide summary information for urbanized, small urban and rural areas. The HPMS replaced numerous uncoordinated annual State data reports as well as biennial special studies conducted by each State. These special studies had been conducted to support a 1965 congressional requirement that a report on the Nation's highway needs be submitted to Congress every two years. The first such Condition and Performance Report was compiled in 1968; the first report to make use of the HPMS data base was the 1980 Condition and Performance Report, which was forwarded to Congress in January 1981.

A major purpose of the HPMS is to provide data that reflects the extent, condition, performance, use, and operating characteristics of the Nation's highways. These data are the source for a substantial portion of the information published in *Highway Statistics* and in other FHWA publications, and form the basis of the analyses that support the Condition and Performance Reports to Congress. In addition, these data are used for assessing highway system performance under FHWA's strategic planning process and for apportioning Federal-aid highway funds under TEA-21. In order to meet these varied needs, the HPMS has gone through an evolutionary process that has recognized over time the changing needs for data related to highway purposes. All in all, the changes to the HPMS over its nearly 20-year life have reflected a process of incremental adjustments to the HPMS data base so that it would be responsive to the needs introduced by changes in legislation and changes in the focus of the Federal-aid highway program. The HPMS has changed over time to keep responsive to the demands placed upon it.

The purpose of the strategic reassessment was to review the HPMS in light of contemporary issues and emerging business needs and determine what changes were necessary and desirable at this point in time. The reassessment has been guided by a longer term vision of an HPMS which builds from the data systems of local, regional and State governments and is connected through a common geo-referencing system thereby minimizing the need for data reporting between agencies. The reauthorization of the Federal-Aid Highway Program has provided an appropriate opportunity and framework for FHWA to undertake a reassessment of the HPMS. Changing technology, including the development and deployment of ITS, requirements of the GPRA, and changing State data needs including the increased use of management systems also provide an impetus to the strategic review. The objectives of the strategic reassessment can be summarized as follows:

- C Conduct a comprehensive analysis of HPMS and its mission
- C Make HPMS a more efficient and user-friendly system
- C Examine more cost-effective methods for collecting data, including new technologies such as ITS
- C Examine ways to create or enhance data partnerships with State, regional, and local governments as well as the private sector and other data source entities
- C Consider the evolving needs of GPRA
- C Ensure that HPMS is the definitive Federal source of information on roadway extent, characteristics and performance
- C Conduct a fully participatory review
- C Review current data entries and consolidate or remove those items which are of marginal use
- C Ensure that HPMS is a "world class" data system

One of the key requirements of the reassessment was to assure that the process was open to participation by the

various stakeholders, customers, and partners. This has been accomplished in part by the extensive use of an HPMS Steering Committee. The Steering Committee includes, among others, State, MPO, AASHTO and AMPO members, and Federal representatives including DOT agencies and the Environmental Protection Agency (EPA). From the beginning, the Steering Committee has been a full partner in the strategic reassessment of the HPMS:

- C It was instrumental in convincing the FHWA that the reassessment was needed.
- C It has been deeply involved in guiding the process by which the reassessment has been conducted.
- C It has reviewed all the analytical work done to support the reassessment.
- C It played a major role in conducting the national HPMS outreach workshop.
- C It has provided its insight, and finally its support, for the proposed changes to the HPMS that are included in this report.

In addition to the Steering Committee and the aforementioned national workshop, other steps to assure an open process have included wide dissemination of interim reports through the Internet, various meetings and presentations to interest groups, involvement of over 450 interested partners, stakeholders, and customers and use of an open Federal Register Docket as a conduit for public comment.

The purpose of this report is to document the outcome of the HPMS strategic reassessment. In the first section of this report, the results of Phase 1 of the study, as previously reported in *Phase 1 Final Report*, September 1997, are summarized. In the second part, the evaluation and review criteria used are documented as are the results of the review in terms of short term changes to existing data items and data summaries. In addition, the use of HPMS data for apportionment and other purposes is discussed along with a proposal to use grouped reporting for lower level functional systems. A summary of proposed changes and the implementation of change are also discussed. In the third part, issues of concern for the future are assessed, including perspectives on pavement, congestion, and safety data and their relationship to the HPMS. Technology sharing, data partnerships and data sharing, and the implications for HPMS of Transportation Research Board (TRB) Conference Proceedings 14, *Information Needs to Support State and Local Transportation Decisionmaking into the 21st Century*, are also assessed. A consultant was retained to assess whether the HPMS met the requirements for a “world class” data system. The results of a limited consultant analysis are reflected in the report *Is HPMS A World Class System?* This report, which generally concluded that the HPMS is in fact a “world class” data system, is included in Appendix A.

Section 1

Summary of Phase 1

Reassessment Process

Phase 1 of the HPMS reassessment was conducted over the period of January to July 1997. An independent consultant was retained to complete this phase of the reassessment in accordance with the objectives previously described in the Introduction section. Work was done with an emphasis on conducting a fully participatory process involving HPMS data partners, stakeholders, and customers. In essence, Phase 1 was intended to be a zero-based reanalysis of the mission, objectives, use, structure and content of HPMS. The consultant and FHWA used a number of strategies for obtaining input to the reassessment including:

- C Interviews were conducted with over 21 Federal employees who are either customers of HPMS data or involved in Federal data and policy analysis activities.
- C A survey of the States was conducted with the assistance of the AASHTO Standing Committee on Planning (SCOP). Forty seven States responded to the survey form and the remaining States were interviewed by phone. Results of the survey and progress on the reassessment have been presented periodically at SCOP meetings.
- C A similar survey of AMPO members was conducted; 44 MPO's responded. Presentations on the reassessment process have been made at several AMPO meetings.
- C An information meeting was held with Washington-based transportation organizations; a follow up survey form was sent to 32 organizations.
- C FHWA has placed benchmark reports in the Federal Register and on the Internet for review and public comment; 50 sets of comments on the reassessment have been placed in the docket. In addition to publication on the Internet, over 450 interested partners, stakeholders, and customers have been provided relevant materials on a continuing basis.
- C A number of information presentations have been made before TRB Committees and other organizations.

The consultant documented the findings of this outreach and analysis in a draft Phase 1 report. The draft report was used as the framework for a national HPMS workshop which was held in Minneapolis, Minnesota, in June 1997. Ninety five participants, including representatives from 35 States, MPOs, consultants, TRB committee members, interest groups, academia, and the Federal Government attended the workshop. The workshop was followed by a meeting of the HPMS Steering Committee. Details of the results of the Phase 1 effort are summarized in this section; additional information can be found in the following reports:

Strategic Reassessment of the Highway Performance Monitoring System - Phase 1 Final Report
Federal Highway Administration, Publication No. FHWA-PL-98-011

HPMS Reassessment Workshop/Steering Committee Meeting Summary
Federal Highway Administration, Publication No. FHWA-PL-98-012

Summary Outcomes of Phase 1

The following discussion highlights a number of the principal outcomes of the consultant study of the existing HPMS, the results of the various surveys and outreach activities, and the national HPMS workshop.

Mission and Objectives of the HPMS: One of the study objectives was to take a fresh look at the mission and objectives of the HPMS, subjecting them to the wide scrutiny of the varied data suppliers and customers. Through the study and accompanying public outreach effort, the following mission statement and objectives were developed, tested, and adopted for the future HPMS:

Mission: It is the mission of the Highway Performance Monitoring System, as an integral part of the National Highway Data base and a component of the National Transportation Data base, to provide a data base and analysis process for assessing and reporting the condition and performance of the Nation's highway system in the most cost-effective manner consistent with the following objectives:

Objective 1: Meet FHWA's highway stewardship responsibilities, including preserving the national interest in the National Highway System (NHS).

Objective 2: Support Federal transportation policy analysis and planning activities.

Objective 3: Meet the various congressional requirements, including the Condition and Performance Report.

Objective 4: Provide a publicly accessible, consistently high quality, objective and timely national highway data base.

Objective 5: Provide, at the State and local government option, an HPMS data base, an analytical process, and FHWA technical support which meets the needs of State, regional and local agencies.

Objective 6: Evolve HPMS to a data system which:

- builds from the data systems of local, regional, and State governments
- is connected with a common geo-referencing system and
- avoids, whenever possible, collecting data which is not used by the collecting agency

Through the use of the surveys, Federal Register responses, and discussions at the national workshop, the mission and objectives were found to have wide support by all groups involved in HPMS. For example, support from the States ranged from a high of 96 percent for Objective 2 to a low of 72 percent for Objective 5. For MPOs, support for these objectives ranged from 95 percent to 78 percent. Objective 6 was added by workshop participants and adopted at the following HPMS Steering Committee meeting.

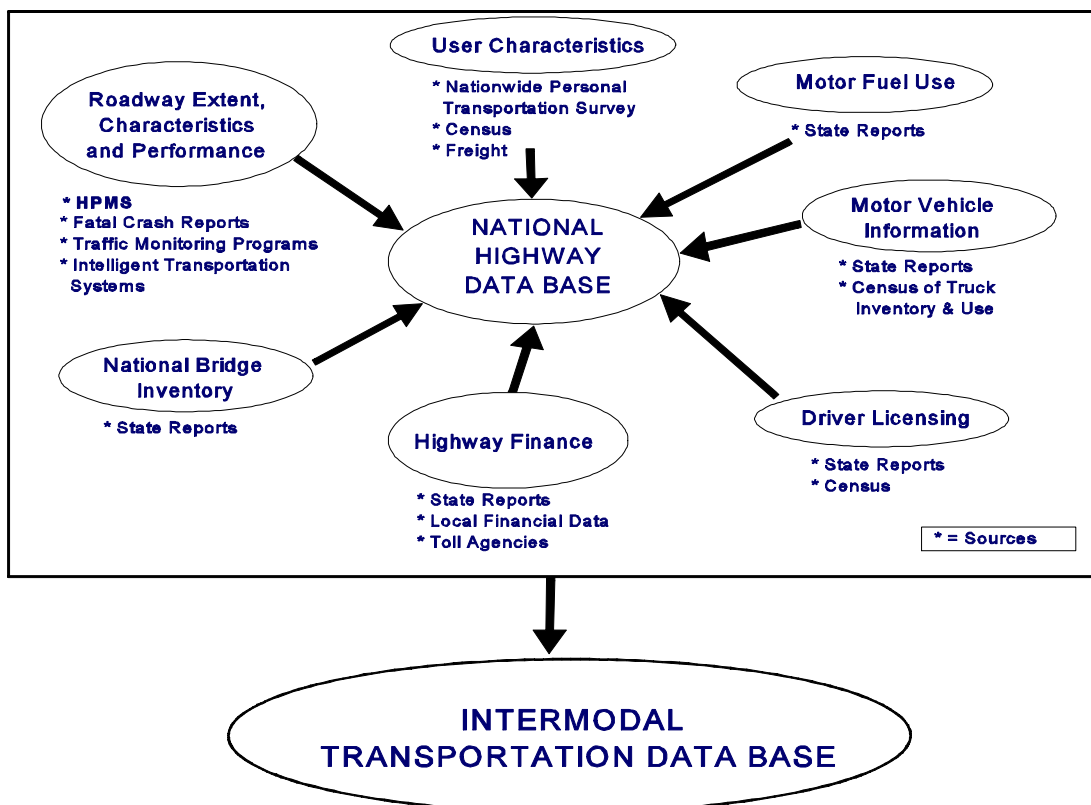
The process of reexamining the mission and objectives, in essence, reestablished the basic purposes of HPMS and demonstrated that the program has strong support among the users and providers of the data and products of HPMS. The addition of Objective 6 was consistent with the results of a previously held TRB Conference on *Information Needs to Support State and Local Transportation Decisionmaking into the 21st Century*. That is, participants at both conferences stressed the need for establishing data partnerships and sharing data among transportation agencies as the major issue for the future direction of transportation data activities. The existence of new technologies such as geographic information systems (GIS), Global Positioning Systems (GPS), and increased Internet accessibility to data and data systems will facilitate progress toward meeting this objective.

Key Factors Affecting the Reassessment: In the process of conducting the study and outreach activities, the consultant identified a number of key factors or basic tenets of HPMS in the course of working with the surveys, interviews and other individual discussions. These factors or tenets were subsequently used to frame the discussions at the national HPMS workshop and have guided the Steering Committee and FHWA in subsequent steps and decisions in the reassessment process. These basic tenets include:

- C HPMS has an excellent reputation in the transportation and governmental field.
- C Data collected through the HPMS is necessary to support decision making.
- C The reassessment is a relevant activity occurring at a time of major transition in transportation and HPMS.
- C HPMS is a subset of a national highway data base which itself is part of a larger intermodal transportation data base (see following figure).
- C HPMS is both a data set and an analytical process.
- C A distinction needs to be made between the Federal use of HPMS and the public use of the national highway data base.

- C As an alternative to expansion, the HPMS data base should continue to be supplemented as necessary with additional external data to better measure condition and performance.
- C HPMS serves many purposes at the Federal level, including many which were not originally envisioned when HPMS was established.
- C The collection of HPMS data will always be an intergovernmental activity.
- C The full demands of the Government Performance and Results Act on HPMS are still evolving.
- C The timeliness of data collection and presentation and the timing of any changes to HPMS are critical parts of the reassessment.
- C One of the most important indicators for policy makers is consistent time series data that can be used to show trends.
- C There is a large sunk cost in the current HPMS data collection system; changes need to recognize cost implications.

**NATIONAL HIGHWAY DATA BASE AND INTERMODAL
TRANSPORTATION DATA BASE**



Scope of the HPMS: Several alternatives which would change the scope of the current HPMS were presented and discussed as part of the study and outreach process. In general, scope can be defined to be related to the extent of the highway system included in the HPMS. As currently configured, the scope of the HPMS involves

the collection of data at three highway system levels:

- C limited length, jurisdiction and identifier data are collected for all sections of all public roads, including local roads and streets;
- C other data are collected for all NHS and other principal arterial roadways; and
- C still other more detailed data are collected for a sample of the arterial and collector functional systems (non-local roads).

Workshop participants recommended that the current scope of the HPMS not be changed and that the future HPMS should continue to have information on all highways. The HPMS Steering Committee supported this recommendation and it was adopted by FHWA.

Further analysis done as part of the reassessment indicated that the number of sampled sections could be reduced from the current level of approximately 124,000 to about 80,000 without impacting the designed statistical reliability of the HPMS. This has the potential of producing significant savings to State and local governments that are in a position to reduce their existing HPMS sample sizes.

Scale and Content of the HPMS: As with the issue of scope, several alternatives which would change the scale and content of the current HPMS were presented and discussed as part of the study and outreach process. In general, scale and content of the HPMS can be related to the types of data and the statistical level of the significance of the data types collected. Workshop participants recommended that FHWA examine each data item against a set of criteria and determine if collection should be continued. A data item decision process was developed and a set of evaluation criteria was recommended to FHWA by the workshop participants and the HPMS Steering Committee. FHWA adopted these recommendations; the results of the evaluation are presented in the following sections of this report.

Other Issues: Several additional issues were developed and discussed at the national workshop and at the following HPMS Steering Committee meeting. This resulted in a number of recommendations and action items for FHWA to address in the reassessment process:

- C Including better and more comprehensive information on pavement condition and congestion in the HPMS: Although FHWA has concluded, with Steering Committee agreement, to continue current pavement and congestion measures in the HPMS at this time, Section 3 of the report presents a vision for making future improvements in these areas.
- C Improving the clarity of the relationship between the HPMS and Clean Air Act requirements in HPMS and other FHWA program guidance: In response to this action item, FHWA will be working with the EPA to improve the instructions in the HPMS *Field Manual*. FHWA is also working internally to include appropriate HPMS references and explanatory material in the *Transportation Conformity Reference Guide*, a document that is now being developed.
- C Improving data partnerships and data sharing as a means of achieving part of HPMS Objective 6: In response to this action item, FHWA, in accordance with recommendations of the workshop participants, and with input from the HPMS Steering Committee, proposed a new topic for NCHRP Synthesis Project 20-5, *Synthesis of Information Related to Highway Problems*. The synthesis topic has been subsequently selected as topic 30-07, *Data Sharing and Data Partnerships for Highways* for the 1998 program.

- C Improving the quality of HPMS data: This action item was discussed at the HPMS Steering Committee meeting in June 1998; the Committee provided a number of general recommendations to FHWA on mechanisms and processes to improve data quality. Using these recommendations as a basis, FHWA is currently developing a new data quality improvement program to be implemented beginning in fiscal year 1999. FHWA believes that streamlining the HPMS data set in accordance with the proposal documented in this report and implementing the action agenda will lead to enhanced data quality. Experience with the 1997 HPMS data that was submitted by the States using the new data submittal software indicates that the new software has already resulted in improvements to data quality and consistency.
- C Increasing the use of new technology to collect HPMS data in a cost effective manner and improving the sharing of this information: FHWA's consultant, in conjunction with AASHTO SCOP, has surveyed the States and prepared an HPMS Catalog, *New Technology and Techniques*, publication no. FHWA-PL-98-045, containing 73 new technology applications and techniques from 30 States. The catalog is also available on the Internet at <http://www.fhwa.dot.gov/ohim>.
- C Improve HPMS training for States and other data collection agencies: In response to this action item, FHWA has included development of a new training program in its research program as a pooled-fund study. Based upon HPMS Steering Committee input and recommendations, FHWA plans to develop an interactive computer-based training program reflecting the revised HPMS as proposed in this report; contract work is to get underway in fiscal year 1999.

Section 2

Decision Process and Review Criteria

At the national HPMS workshop in June 1997 and at the HPMS Steering Committee meeting which followed the workshop, there was a consensus that there needed to be a detailed review of each of the data items currently included in HPMS. A five-step decision process for the data item review was established with input from the workshop participants and the HPMS Steering Committee; FHWA and the HPMS Steering Committee subsequently established a set of seven detailed evaluation criteria to be applied to each data item. The following decision process and review criteria were adopted by FHWA and the Steering Committee for the HPMS reassessment:

Step 1 - Screen each data item against the seven evaluation criteria: Review each item, stratified by functional system, against each of the evaluation criteria; determine which items should continue to be candidates for a revised HPMS data base. The evaluation criteria used were:

- C **Legislative Requirement:** Is the item specifically required to meet a legislative requirement; for instance, is the item used in an apportionment formula?
- C **Policy Decisions:** Is the item used in the various policy decision activities in the Federal Government? The criteria included use in the Analytical Process (AP) and the Highway Economic Requirements System (HERS) which are used for the biennial Condition and Performance Report to Congress as well as internal strategic planning and budget planning activities. Also included in this category are the *Federal Highway Cost*

Allocation Study and the *National Truck Size and Weight Study* which are used as input to executive and congressional decisions. Other policy uses include performance reporting indicators deriving from the GPRA, including pavement roughness (IRI), congestion as represented by volume/service flow, and modeled delay as represented by daily hours of delay per 1000 vehicle miles of travel (VMT).

- C **Historic Trends:** Is the data item necessary to track historic trends in highway condition and performance?
- C **State and Local Use:** Is the item used by State and local governments? Is it an integral part of State or local highway data bases?
- C **Consistency:** Can the data item be collected with consistency? Is it a measured item or a subjective item?
- C **Simulate/Estimate:** Is it possible to simulate or estimate the information rather than have each State collect information on the item?
- C **Part of National Data Base:** How many tables in the publication *Highway Statistics* contain the data item? Is the table a national summary? Is it a State-by-State summary? Based on available surveys of the use of the various *Highway Statistics* tables, what is the frequency of use and relative importance of the table?

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 areawide, 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. It was predetermined that section length and traffic data would be needed at the urbanized area level of statistical significance to meet travel tracking requirements.

Step 4 - Review resulting HPMS data base: Evaluate the resulting data collection and reporting process on the basis of:

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

Step 5 - Public Input and Final Decision: The final step includes internal FHWA review and adoption and additional outreach to SCOP, AMPO, user, other outside groups and the public.

The initial review of data items, Steps 1 through 3 of the decision process, was accomplished during a three- day work session at FHWA Headquarters in September 1997, using the established review criteria. Each data item was reviewed by the working group and a preliminary recommendation made as to whether the data item should be continued in the HPMS data base or whether the item was a candidate for elimination. Items meeting some

or all of the review criteria were designated for retention. For those items recommended for retention, the level of detail within that item was then reviewed for possible reduction, again based on the review criteria. Items needing further study before a decision could be made were specifically identified.

FHWA's consultant consolidated the results of this work session and the results were circulated to the participants in the working session for confirmation. A preliminary review of the results by the FHWA Headquarters members of the HPMS Steering Committee was also completed. In February 1998, the review recommendations were sent to the full HPMS Steering Committee for review; FHWA Region Office staff were also invited to comment on the preliminary recommendations. Changes were made to accommodate the comments received, although for the most part the preliminary recommendations of the working group were generally supported by the Steering Committee and other reviewers.

Subsequently, an evaluation of items needing further study was undertaken. In determining whether the item should be retained, changed, or deleted, the study focused on a number of factors related to the variable under study, including the range of values reported, the reasonableness of reported values, and identifiable reporting patterns. The evaluation also addressed the sensitivity of the analytical models to these data element in terms of the inclusion of the item as well as to the impact within the ranges reported. Recommendations were reviewed by the HPMS Steering Committee; the final recommendations contained in this report reflect the outcome of the additional data item evaluation.

The final step leading to this report occurred with the adoption of the recommended data item changes by the HPMS Steering Committee. Conclusions related to Step 4 of the decision process are discussed in Section 2 of this report. The final step in the decision process, Step 5, is being undertaken with the publication of this report and the subsequent review and comment opportunity.

Data Item Review

This section addresses the results of the data item review process described above. The use of each item is briefly discussed and related to the review criteria; the reason for decision to retain, change or delete is then presented. Each item is discussed separately to provide the reader with an understanding of the use of each item and the reason why FHWA requires the data item to be reported. More detailed information on data items for which change is proposed is included in Appendix B.

Retain: Item 1 - State Control Field

This is a basic administrative and identification data item used by the State. FHWA does not use this data.

Change: *Item 2 - Metric (or English) Reporting Units*

This item is used to indicate the reporting units of the data. A minor change in coding of this data item is needed to meet HPMS software programming requirements.

Change: *Item 3 - Year*

This item identifies the calendar year for which the data apply. It was changed to a 4-digit year code.

Retain: Item 4 - State Code

This item contains the State's FIPS code.

Change: *Item 5 -- Type of Section Identification*

This item is used to indicate whether the data reported are for a single section or for a group of sections.

A minor change in coding of this data item is needed to meet HPMS software programming requirements.

Retain: Items 6-13 are basic administrative and identification data items for universe and sample sections. These include attributes such as Linear Referencing System (LRS), urban/rural classification, functional system, and non-attainment area information. Some items are State reported, while others are software generated and result in no reporting burden; the current identification scheme is functioning satisfactorily.

Retain: Item 14 - National Highway System (NHS)

This item is used to track changes to the approved NHS, including intermodal connectors. This is done to satisfy requirements of the legislation approving the NHS.

Change: Item 15 - Planned Unbuilt Facility

Along with item 14, this item is also used to track changes to the approved NHS, including intermodal connectors. This is done to satisfy requirements of the legislation approving the NHS. However, this item is being reduced in detail to apply to the NHS only; previously, it applied to the NHS and all other principal arterials.

Retain: Items 16-19 are basic system and route identification parameters that are used to support GIS/LRS applications and satisfy customer needs to relate HPMS data to signed routes. The current identification scheme is functioning satisfactorily.

Change: Item 20 - Governmental Ownership

This item is used to identify facility ownership. It is used in cost allocation studies, to track historic data, and in the national highway data base. Many of the categories have seen little use; therefore, FHWA will reduce the data stratifications from 17 to 8.

Change: Item 21 - Special Systems

This item is used to track changes to various Interstate and other system categories. The HPMS is also used to track changes to special Interstate Systems for fund apportionment purposes. As a result of the passage of TEA-21, however, there is no continuing legislative reason for tracking the several Interstate designations and FHWA will delete the unneeded codes for a reduction in the number of stratifications from 14 to 2. FHWA will retain the Strategic Highway Network (STRAHNET) designation because it is used by the Department of Defense (DOD) for identifying strategic deployment routes. The remainder of the categories are not needed in HPMS as a result of TEA-21.

Retain: Item 22 - Type of Facility

This item is used to determine whether a roadway or structure is a one- or two-way operation. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity; estimating roadway deficiency and improvement needs), the cost allocation pavement model, and the national highway data base.

Change: Item 23 - Designated Truck Route

This item is used as an administrative identifier to determine whether a section is on or off a truck route designated under Federal regulatory authority for truck size and weight studies. FHWA will reduce this item to require a yes/no answer only. The remaining detail is not needed for FHWA decision purposes.

Change: Item 24 - Toll

This item is used as an administrative identifier to determine whether a section is on or off a toll road. Toll data are also used for historic trends, policy analysis, and legislation development purposes. This item was used for apportioning Interstate Maintenance funds to the States; however, with the passage of TEA-21, all Interstate

mileage and travel are used in the Interstate Maintenance fund apportionment formula and there is no continuing legislative reason for retaining the same level of detail on toll roads. As a result, future toll road data needs can be met using a reduced data record indicating simply whether or not the section in question is or is not a toll road for a reduction in the number of stratifications from 4 to 2. The remainder of the categories are not needed in HPMS as a result of TEA-21.

Retain: Item 25 - Section Length

This item provides basic inventory information on the amount of public roads. It is extensively used for apportionment, administrative, legislative, analytical, and national highway data base purposes. Ground length public road mileage is used to adjust sampled HPMS data to a universe representation where necessary. This item is intended to be consistent with the certified public road mileage reported to the FHWA.

Retain: Items 26-27 are sample section identifiers needed for administrative purposes in the HPMS data base.

Retain: Item 28 - Annual Average Daily Traffic (AADT)

This item provides basic existing traffic inventory information for selected universe and sample roadway sections. It is extensively used for apportionment, administrative, legislative, analytical, and national highway data base purposes.

Delete: Item 29 - AADT Derivation

An informational data item, this item was originally intended to extend the truth-in-data concept to traffic data; however, it has been largely ignored, subject to misinterpretation, and has proven to be of questionable value to FHWA. In the future, as with other significant HPMS data items, FHWA proposes to handle quality control of AADT reporting through a separate review process.

Change: *Item 30 - Number of Through Lanes*

This item provides basic inventory information on the amount of public road supply. It is extensively used for apportionment, administrative, legislative, analytical, and national highway data base purposes. *With the adoption of HPMS lane-mile data as an apportionment factor under TEA-21, and after reviewing recent lane-mile data derived from the expanded sample, FHWA has decided to extend the requirement for universal reporting of number of through lanes to other functional systems as a means to improve the accuracy of the lane-miles estimate. Therefore, in addition to reporting number of lanes for all Principal Arterials and the NHS, States are asked to also report number of through lanes for all rural minor arterial, rural major collector, urban minor arterial, and urban collector functional systems.*

Delete: Item 31 - Urban Location

This item identifies the general character of the land surrounding each urban section of roadway. Outside of the cost allocation study, this item sees no other use in the national data base or the modeling process. It was judged to be too subjective and difficult to consistently code; FHWA will delete this item.

Change: Item 32 - Access Control

This item is a measure of the degree of access control on selected universe and sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating type of design), truck size and weight studies, and the national highway data base. Consistent with these uses, FHWA will change this item to require it on sample sections only.

Change: Item 33 - Median Type

This item is a characterization of the type of median on selected universe and sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating

capacity, estimating type of design) and for national highway data base purposes. Consistent with these uses, FHWA will change this item to require it on sample sections only.

Change: Item 34 - Median Width

This item is a measure of existing median width on selected universe and sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating type of design) and for national highway data base purposes. Consistent with these uses, FHWA will change this item to require it on sample sections only.

Change: *Item 35 - Measured Pavement Roughness (IRI)*

This item is a measure of pavement surface roughness on selected universe and sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating pavement deterioration, section deficiencies, and needed improvements), cost allocation studies, pavement condition trends and other analysis purposes, and NHS performance indicators. In order to foster more standardized pavement roughness measurement among States, FHWA will largely adopt the AASHTO Provisional Standards for measuring IRI for HPMS reporting purposes. *Because of difficulties in obtaining meaningful IRI data on city streets, the reporting of other than IRI data on urban other principal arterials is permitted. Although IRI data are still preferred on all urban other principal arterials, PSR data may be reported when it is impractical to obtain IRI data on city streets. States are encouraged to use State or local pavement management system data when they are available, are current, and when they meet other HPMS reporting requirements.*

Retain: Item 36 - Pavement Condition (PSR)

This item is a measure of pavement condition on selected universe and sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating pavement deterioration, section deficiencies, and needed improvements), in the cost allocation pavement model, and for national highway data base purposes. It is used in place of missing IRI data for modeling purposes where available. FHWA proposes to retain PSR until it is totally supplanted by IRI or until a better measure of condition can be adopted

Delete: Item 37 - Reserved

This is an unused data field that will be dropped for streamlining purposes.

Delete: Item 38 - Record Type

This is a software coded data item that is no longer used in the new PC-based data system.

Retain: Item 39 is an administrative data item.

Delete: Item 40 - Sample Subdivision

Sample sections are to be subdivided only when significant changes in a sample have occurred; over time, however, sample subdivisions have come to account for a growing number of HPMS samples. In order to reduce the proliferation of samples that result from the subdivision process in the future, FHWA is narrowing the list of reasons for requiring subdivisions. And, when a sample is subdivided, data providers will be asked to select only one of the section splits for reporting as a sample. While this may result in the shortening of sample sections over time, sensitivity analyses done on this proposal for the HPMS Steering Committee indicated that this would not adversely affect the HPMS data set. Appropriate guidance will be included in the HPMS Field Manual.

Retain: Items 41 and 42 are software calculated administrative data items.

Change: Item 43 - Surface/Pavement Type

This item details the type of pavement surface. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating pavement deterioration and loading history), for the cost allocation pavement model and for the national highway data base. Many of the categories have seen little use; therefore, FHWA will reduce this item by collapsing the data stratifications from 15 to 6.

Delete: *Item 44 - Pavement Section*

This item provides general information about the pavement section. *With the change in Item 45 - SN or D to require the reporting of either section specific values or State typical values for all sample sections, Item 44 is no longer required. The determination of whether Item 45 is SN or D can be determined from the pavement type coded in Item 43 - Surface/Pavement Type.*

Change: Item 45 - SN or D

This item provides specific information about the pavement section in terms of SN or D. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating pavement deterioration and loading history) and in the cost allocation pavement model. This item cannot be defaulted without significant impact on pavement deterioration rates. This item will be changed to require the reporting of State specific typical values, by functional system and pavement type, where the actual values are not known.

Delete: Item 46 - Type of Base

This item describes the type of base used. It is not used in either the national data base or the modeling process. While used in the highway cost allocation pavement models, the data for many records are believed unreliable and other data sources are used. No other business purpose has been identified.

Delete: Item 47 - Type of Subgrade

This item describes the type of material used for the subgrade. It is not used in either the national data base or the modeling process. While used in the highway cost allocation pavement models, the data for many records are believed unreliable and other data sources are used. There are no plans to incorporate this item into the pavement models. No other business purpose has been identified.

Delete: *Item 48 - Overlay or Pavement Structure Thickness*

This item is used to identify pavement structure thickness for new or reconstructed pavements and pavement overlay thickness for resurfaced pavements. *After completion of the Final Report, FHWA determined that this data item is not used in the cost allocation pavement model and can be deleted.*

Retain: Item 49 - Year of Surface Improvement

This item is used to identify the year in which the roadway surface was last improved. It is used in the cost allocation pavement model to deteriorate pavement condition.

Delete: Item 50 - Type of Improvement

This item reports improvements completed during the year. It is not used in either the national data base or the modeling process. Pavement improvement history is not tracked; no other business purpose has been identified for this item.

Retain: Item 51 - Lane Width

This item is a measure of existing lane width on sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed improvements, computing a safety index), for cost allocation pavement models, and other policy analysis and national highway data base purposes.

Change: Item 52 - Shoulder Type

This item provides information on the type of existing shoulder on sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating needed improvements). FHWA will reduce this item by collapsing the data stratifications from 8 to 6. HPMS distinguishes between reporting of shoulders and parking lanes for purposes of estimating capacity; clearer instructions will be included in the HPMS Field Manual. *This item has been changed to add back the category "combination" shoulders and the descriptions have undergone minor change. Shoulders behind mountable curbs should be coded as shoulders as if the curbs did not exist. Shoulders in front of barrier curbs should be coded as shoulders while areas behind barrier curbs should not be coded as shoulders - code 6 should be used. Curb types are described in the 1994 AASHTO Design Guide, pp. 344-349. See Appendix B-6.*

Retain: Item 53 - Shoulder Width

This item is a measure of existing shoulder width on sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed improvements).

Retain: Item 54 - Peak Parking

This item provides specific information about the presence of peak parking on urban sample roadway sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity on sections with signals). Parking cannot be defaulted based upon other HPMS data items and it has significant impact on calculated delay. Retention of one side versus two side parking designation facilitates estimating needed capacity improvements in the investment models.

Delete: Item 55 - Right-of-Way Width

This item reports the prevailing right-of-way width for the section. It is not used in either the national data base or the modeling process. No other business purpose has been identified.

Retain: Item 56 - Widening Feasibility

This item provides a subjective measure of whether it is feasible to widen an existing sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating needed capacity improvements). This item will be retained with improved definitions and examples.

Retain: Item 57 - Horizontal Alignment Adequacy

This item provides information about the adequacy of horizontal alignment; it is calculated from curve data, Item 58. If curve data are not entered, the information is entered separately; separately entered data are based on subjective criteria. This data item is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating horizontal alignment deficiencies) and in the truck size and weight analyses. This data item cannot be used to eliminate Item 58 (specific curve information is needed for investment requirement and impact modeling) and is needed when curve data are not entered.

Change: Item 58 - Curves by Class

This item provides specific information regarding the number and length of horizontal curves by degree of

curvature for sample sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating horizontal alignment adequacy, estimating running speed and operating costs). This data item will be reduced from 26 existing detail lines (number of curves and total curve length for 13 curve classes) to 6 (total curve length in 6 curve classes).

Retain: Item 59 - Type of Terrain

This item provides subjective information on the type of terrain through which the section passes. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed capacity improvements) and in the truck size and weight analysis process. Grade information should be used in calculating capacity in lieu of terrain; however, the type of terrain is still necessary for estimating tolerable conditions and construction costs in the investment requirements models.

Retain: Item 60 - Vertical Alignment Adequacy

This item provides information about the adequacy of vertical alignment; it is calculated from grade data, Item 61. If grade data are not entered, the information is entered separately; separately entered data are based on subjective criteria. This data item is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating vertical alignment deficiencies). This data item cannot be used to eliminate Item 61 (specific grade information is needed for investment requirement and impact modeling) and is needed when grade data are not entered.

Change: Item 61 - Grades by Class

This item provides specific information regarding the number and length of vertical grades by percent gradient for sample sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating vertical alignment adequacy, estimating running speed and operating costs) and in the truck size and weight analysis process. This data item will be reduced from 12 existing detail lines (number of grades and total length of grades for 6 classes) to 6 (total length of grade for 6 classes).

Retain: Item 62 - Percent Length with 1500-foot Sight Distance

This item provides specific information on the percent of the sample section meeting the sight distance requirement for passing. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating running speed) and for truck size and weight analysis purposes. FHWA proposes to change the HPMS Field Manual instructions to use “percent length marked for passing” for this value.

Retain: Item 63 - Speed Limit

This item provides specific information on the posted speed limit on sample sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating running speed) and for other analysis purposes, including delay estimation.

Change: *Item 64 - Weighted Design Speed*

This item is a calculated value that provides a design speed weighted by the length of individual horizontal curves and tangents in a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed capacity improvements). *The Item will be retained as a calculated value using curve data or, where curve data are not provided, a default value based upon functional system and facility type. The Item will not require any coding by the State; States will not be able to override the calculated value. When curve data is provided, edit checks will flag whether the coded speed limit exceeds the weighted design speed by 15 mph or more; curve data should be checked for accuracy if the edit check indicates a problem.*

Retain: Item 65 - Percent Trucks

This item provides information on truck use on a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating pavement deterioration, design volumes, and operating speeds), in the cost allocation pavement model, and in

Facility Type	Functional Class								
	1	2	6	7	11	12	14	16	17
Multilane Divided	70	70	70	65	70	70	70	60	55
Multilane Undivided	70	70	70	60	70	70	70	55	45
2/3-Lane	70	70	65	60	70	65	65	55	45

the truck size and weight analysis process. This item will be further evaluated to determine if HPMS can require reporting of average percent trucks only with peak percent trucks estimated from the reported average.

Retain: Item 66 - K-factor

This item provides the design hour volume as a percent of AADT for a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed capacity improvements), in the cost allocation pavement model and for other analysis purposes. Using default K-Factors would significantly alter the results of the capacity needs analysis and the selection of needed capacity improvements.

Retain: Item 67 - Directional Factor

This item provides the percent of design hour volume flowing in the peak direction on a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating needed capacity improvements), in congestion and other analyses, and in the cost allocation pavement model. Using default D-Factors would significantly alter the results of the capacity needs analysis and the selection of needed capacity improvements.

Retain: Item 68 - Peak Capacity

This item provides existing peak hour capacity for a sample section. It is computed by the HPMS software using Highway Capacity Manual (HCM) 1994 procedures. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity), in the cost allocation pavement model, and in congestion and other analyses.

Retain: Item 69 - Volume/Service Flow Ratio

This item is a computed value reflecting peak hour congestion for a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating needed capacity improvements), in the national highway data base, and for congestion and other data analyses.

Retain: Item 70 - Turning Lanes

This item provides information on the presence of turning lanes at a typical intersection on a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity) and in congestion analyses.

Retain: Item 71 - Prevailing Type of Signalization

This item describes the predominant type of signal system on the sample section. Recently completed research recommends its use in the investment requirements modeling process to calculate capacity and estimate delay.

Retain: Item 72 - Percent Green /Time

This item provides information on the typical percent green time in effect at intersections on a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity) and in congestion analyses. Percent green time results in significant variation in individual section capacity and delay calculation and cannot be defaulted or eliminated.

Retain: Item 73 - Future AADT

This item provides forecast AADT information for a sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimating deficiencies and future improvement needs), in the cost allocation pavement model and in other analytical studies. This item is used to determine pavement and capacity needs on a sample section basis due to projected traffic growth impacts.

Retain: Item 74 - Future AADT Year

This item provides the year for which the AADT has been forecast. It is used to normalize the forecast AADT to a consistent 20-year horizon.

Retain: Item 75 - Climate Zone

This item is a calculated value locating the sample section in one of 9 climate zones. It is used in the cost allocation pavement model.

Delete: Item 76 - Drainage Adequacy

This item is a subjective assessment of the adequacy of pavement drainage for the sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (evaluation of pavement condition) and in the cost allocation pavement model. The reported data are strongly related to pavement type; FHWA will develop a default based upon pavement type from existing HPMS data.

Delete: Item 77 - Type of Development

This item is a subjective assessment of the predominant type of development in which the sample section is located. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity, estimating operating speed and needed capacity improvements). The data item is subjective with no clear definition or apparent reporting patterns; it impacts only a very few rural sections, and the reality of its impacts are speculative. FHWA will estimate this variable within the investment model from other reported data.

Delete: Item 78 - Number of Grade Separated Interchanges

This item provides a count of the number of interchanges on the sample section. It is not used in either the national data base or the modeling process. No other business purpose has been identified.

Retain: Item 79 - Number of At-Grade Intersections

This item provides a count of the number of traffic controls on the sample section. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity).

Delete: Item 80 - Number of At-Grade Railroad Crossings

This item is a count of the number of grade crossings on a sample section. It is not used in either the national data base or the modeling process. The Federal Railroad Administration (FRA) has a complete inventory of these

data.

Change: Item 81 - HOV Operations

This item provides information on 26 categories of HOV operational activity. They have not been used in the national data base or in the models in the past. FHWA will change this data item to a universe inventory item and reduce the level of detail by eliminating all but one of the 26 categories and collapsing the 8 detail lines into 4. The reduced data will be incorporated into the national data base.

Change: Item 82 - Surveillance Systems

This item provides information on 7 categories of highway surveillance systems. FHWA will change this data item to a universe data item to provide information on deployment of ITS technologies. The number of detail lines is being increased to 9. The data will be used by FHWA and others to track deployment of ITS technologies. *This item has been changed to reflect a minor change in coding detail. New subitem 82G, "free cellular phone" is intended to apply to limited area cell phone systems related to specific Intelligent Transportation System (ITS) deployment sites. Do not include statewide DUI numbers or similar statewide or regionwide cell phone services in this item.*

Add: Item __ - Number of Peak Lanes

FHWA will add a new sample data item to be used to provide better information on the number of lanes used in the peak hour direction of flow. In many cases this number exceeds the off peak directional lanes derived from item 30 and leads to incorrect capacity calculations. It will be used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating capacity) and in congestion analyses, including the estimates of delay used as a performance indicator. *Software coding of peak lanes will only apply in the transition year(s) as existing HPMS sections are automatically coded based upon the value in item 30. This item will have to be coded if a new section is added. For rural 2- or 3-lane facilities, number of peak lanes must be coded as the number of through lanes in both directions in the peak period.*

In summary, FHWA will make significant changes to the basic data items included in the HPMS. These changes were arrived at through a consultative process using criteria established by the HPMS Steering Committee and FHWA. The changes will result in the elimination of 15 data items and 90 detail lines, and the addition of one new sample data item. Three data items will be moved from universe reporting to sample reporting consistent with FHWA use of these data. Changes in these data items are expected to reduce the reporting burden on the States and result in a more streamlined data base that will be of more utility to a wide variety of users. At the same time, FHWA believes its business needs and those of its customers will continue to be adequately served.

Areawide Data Review

There are seven areawide data summaries submitted by the States and one provided by the Territories. These summaries are used to supplement the HPMS data by providing information not otherwise reported on either a universe or sample section basis. Each of the summaries has a specific purpose and each was evaluated considering the review criteria. The review process for the areawide summaries generally followed the data item review process described previously. Each data summary report is briefly discussed and related to the review criteria; the reason for a decision to retain, change or delete is presented.

Retain: Areawide Summary 1 - System Length and Daily Vehicle Travel

This summary report provides statewide subtotals of length and travel for urbanized, urban, and rural portions of the State. The length summary for all systems is software generated from the HPMS data base. Travel for

the principal arterials is software generated from the universe HPMS data, while travel for the minor arterials, rural major collectors and urban collectors is generated from the HPMS sample data. Aggregate travel data for the local and rural minor collector functional systems are input by the State from inventory records. This summary is the only source for travel data for the local and rural minor collector functional systems and is used for apportionment, administrative, legislative, analytical, and national highway data base purposes.

Change: Areawide Summary 2 - System Length and Daily Vehicle Travel by Individual Urbanized Area

This summary report provides subtotals of length and travel for individual urbanized areas, including vehicle occupancy. The length summary for all systems is software generated from the HPMS data base. Travel for the principal arterials is software generated from the universe HPMS data, while travel for the minor arterials and collectors is generated from the HPMS sample data if urbanized areas have not been grouped for sampling purposes. The State can override the sample calculated data with data from other sources or travel records. Aggregate travel data for the local functional system are input by the State from inventory or other records. The summary is the only source for travel data for the local functional system; if the State has grouped urbanized areas in the HPMS data, the summary is the only source of travel for the lower systems. The summary data are used for administrative, legislative, analytical, and national highway data base purposes. FHWA will retain all data with the exception of the data on vehicle occupancy; the quality of the data is suspect and the data are not used in either the national data base or the modeling process or for any other known decision purposes. The usefulness of aggregate occupancy values by functional system for an urbanized area is questionable. While more useful occupancy data may be needed by the transportation community, it ultimately should be obtained outside of the HPMS using a system more suitable for the collection of occupancy information.

Change: Areawide Summary 3 - System Length and Daily Vehicle Travel - Donut Area Data

This summary report provides travel data for the donut areas of individual urbanized nonattainment areas. Data for higher level systems are software generated from the HPMS data base. They are compiled from HPMS link level statistics for all principal arterials and from samples for minor arterials, rural major collectors, and urban collectors in the donut area. Aggregate data for the local and rural minor collector functional system travel are input by the State from its own or local government records; they are developed using State or locally determined procedures. The data provided to FHWA are used in apportionment-related estimation models. FHWA will change Summary 3 to retain the aggregate data for the local and rural minor collector system travel; the remainder can be generated from the HPMS data set.

Change: Areawide Summary 4 - Minor Collector and Local Functional System Length

This summary report provides information on public road length by surface type and volume group. These data are primarily used for national data base and historical purposes. FHWA will change this summary to simplify data reporting by collapsing the pavement types to paved and unpaved and by eliminating the volume groups. The deleted data are of limited use in the national highway data base and their loss is viewed as inconsequential.

Delete: Areawide Summary 5 - Fatal and Injury Motor Vehicle Crashes

This summary report provides fatal and injury vehicle crash data by functional system. The data are primarily used to support development of the Section 207 Safety Report to Congress; limited fatality and injury data are also included in the national highway data base. Aggregate fatality and injury data are input by the States from their own or local government records; they are developed using State or locally determined procedures. The crash data that are reported are not extensively used. The Section 207 Safety Report is required by legislation for FHWA and the Department. Although the fatality information reported in this summary is redundant to NHTSA's FARS data, a census of injury data is not compiled by anyone else. Even though all States collect fatal and injury data, it is difficult and expensive to report crash data by functional system; FHWA will develop alternative methods to compile injury data as this HPMS summary is phased out.

The safety community and FHWA have expressed the need for improved location specific crash data to permit

them to conduct research into crash causation and countermeasure development; however, the data provided by this summary does not meet those needs. The functional system level data provided by this summary report is not being used; its deletion has been recommended and supported by the HPMS Steering Committee. While more useful crash data are needed by the transportation community, the specific data needed and the appropriate sources of these data have not as yet been defined. See Section 3, Measuring Safety Parameters, for further discussion of safety data needs.

Retain: Areawide Summary 6 - Travel Activity by Vehicle Type (Basic)

This summary report provides travel by various vehicle types by functional system. The standard for reporting calls for the use of 13 vehicle types. These travel data stratifications are used for legislative, analytical, and national highway data base purposes including cost allocation study activities and the truck size and weight study. Alternatives to the current vehicle classification scheme are being evaluated in conjunction with efforts to update the *Traffic Monitoring Guide*. An alternative that would provide for collapsing the 13 into fewer vehicle types is currently under consideration.

The existing 13 categories in the summary report will be retained until such a time as an appropriate alternative is fully developed and explored with the States and other partners, stakeholders, and customers, including EPA. FHWA expects to eliminate the need for this summary on a State-by-State basis as soon as FHWA is able to develop the summary directly from raw data provided by the States. A few States will be able to make this change easily; most will need to make improvements to raw data reporting before this change can be effected.

Change: Areawide Summary 7 - Travel Activity by Vehicle Type (Supplemental)

This summary report provides additional information on travel activity data collection techniques. These data are used for legislative, analytical, and national highway data base purposes including cost allocation study activities and the truck size and weight study. Although FHWA is making a minor redesign of this summary report for clarification and streamlining purposes for the short term, FHWA expects to eliminate the need for this summary on a State-by-State basis as soon as FHWA is able to develop the summary directly from raw data provided by the States. A few States will be able to make this change easily; most will need to make improvements to raw data reporting before this change can be effected.

Retain: Areawide Summary 8 - U.S. Territory Information

This summary report provides a variety of information for the U.S. Territories. The information is reported from territorial inventory records and is the only source of these data. These data are used for analytical and national highway data base purposes; they have minimal reporting burden and have current use and historical value.

Using HPMS Data for Apportionment and Other Purposes

HPMS data are used by FHWA and others for a wide variety of purposes. The HPMS is an integrated data base that relies on the States and others to annually furnish complete, high quality data including areawide data, universe data, standard sample data, and "donut" area sample data. The following definitions are offered to set a perspective for the discussion in this section.

Areawide data consist of statewide summaries. The summaries include information for travel, system length, crashes and vehicle classification by functional system and area type, plus land area and population by area type. The area types include rural, small urban, individual urbanized and the donut area of air quality nonattainment areas.

The term universe data refers to a limited set of data items reported for the entire public road system. The public road system includes those roads owned by States, local governments and Federal agencies.

Sample data (standard or donut area) consist of data items added to the universe data that are reported for a small portion, or sample, of the total highway length. The sampled sections form sample panels of highway sections that are monitored from year to year. They are used to represent the full functional system upon which they are located. The sample, if selected following the sampling guidelines, is fully representative of the functional system

it is intended to represent. As a result, the more detailed information collected for a sample section is used to represent similar conditions on the associated functional system after expansion. Sample data include items related to the physical characteristics, condition, performance, use, and operation of the sampled sections of highway. These sample data provide detailed information which is used as the basis for evaluating change over time, and provides the basic input to the HPMS simulation models--AP and HERS.

Donut area samples are unique in that their sole purpose is to enhance the precision of travel estimates outside of the adjusted urbanized area boundary but within the National Ambient Air Quality Standards (NAAQS) nonattainment areas designated by the EPA. Consequently, donut sample data item additions are limited to sample identification, AADT, and an expansion factor.

HPMS sources of select data factors are shown in the following table. These data factors are shown because they represent those data factors used for apportionment purposes under TEA-21 legislation and they are at the same time of great interest for other purposes. Note that any given HPMS derived data factor shown in the left column of the table can be a composite of universe, sample, and areawide data. In order to develop any one of these data factors, FHWA uses the universe and areawide portions as reported to the HPMS by the States. However, data factors derived from samples need to be adjusted from the expanded sample value to fully reflect the known universe total.

FHWA will adopt a uniform procedure to adjust expanded sample data using length as the known universe total. The simple proportional equation is shown in the following figure. The net effect of this procedure is to move the adjustment process totally within the HPMS reporting process. To accomplish this, the mileage reported to the HPMS on a universe basis will become the control to which other variables are adjusted. This is a break from past practice when States sometimes provided areawide control totals developed outside of the HPMS to adjust various HPMS sample values. Under the new procedure, for example, expanded sample travel, as represented by VMT, will be adjusted using reported universe length; under the old procedure, it may have been adjusted to an areawide travel value provided by the States from sources outside of the HPMS.

Among others, the move to a uniform adjustment process internal to the HPMS has been necessitated by legislated demands to provide apportionment data factors using HPMS data. Using externally provided control totals is not considered appropriate under these conditions. In making this change, FHWA also considered the need for greater consistency between the data reported to the HPMS by the States and that used for FHWA modeling, the national data base, and apportionment purposes. In the past, a less consistent sample adjustment process has been used; different adjustments may have been made to data used for modeling purposes than were made to data used for national data base purposes. As the HPMS data sees greater use in an on-line environment, the move to a uniform sample adjustment procedure is seen as needed to assure consistency between the various uses of the HPMS data. A change to a uniform adjustment procedure also supports truth-in-data objectives.

With the adoption of HPMS lane-mile data as an apportionment factor under TEA-21, and after reviewing recent lane-mile data derived from the expanded sample, FHWA has decided to extend the requirement for universal reporting of number of through lanes to other functional systems as a means to improve the accuracy of the lane-miles estimate. Therefore, in addition to reporting number of lanes for all Principal Arterials and the NHS, States are asked to also report number of through lanes for all rural minor arterial, rural major collector, urban minor arterial, and urban collector functional systems. This change is reflected in the following table.

Summary of HPMS Data Sources

HPMS Data Sources	Rural Functional Systems					
	Interstate	Other Principal Arterials	Minor Arterial	Major Collector	Minor Collector	Local
Interstate Lane Miles Interstate VMT	Universe Universe					
Non-Interstate PAS Lane Miles Non-Interstate PAS VMT		Universe Universe				
FA Highway Lane Miles 1/ FA Highway VMT 1/	Universe Universe	Universe Universe	<i>Universe 2/ Sample 3/</i>	<i>Universe 2/ Sample 3/</i>		
NHS Lane Miles	Universe	Universe	Universe	Universe	Universe	Universe
Miles Lane Miles VMT	Universe Universe Universe	Universe Universe Universe	Universe <i>Universe 2/ Sample 3/</i>	Universe <i>Universe 2/ Sample 3/</i>	Universe Universe 4/ Areawide 5/	Universe Universe 4/ Areawide 5/
Total Public Road Miles	Certified Mileage -----					
HPMS Data Sources	Urban Functional Systems					
	Interstate	Other Freeways & Expressways	Other Principal Arterial	Minor Arterial	Collector	Local
Interstate Lane Miles Interstate VMT	Universe Universe					
Non-Interstate PAS Lane Miles Non-Interstate PAS VMT		Universe Universe	Universe Universe			
FA Highway Lane Miles 1/ FA Highway VMT 1/	Universe Universe	Universe Universe	Universe Universe	<i>Universe 2/ Sample 3/</i>	<i>Universe 2/ Sample 3/</i>	
NHS Lane Miles	Universe	Universe	Universe	Universe	Universe	Universe
Miles Lane Miles VMT	Universe Universe Universe	Universe Universe Universe	Universe Universe Universe	Universe <i>Universe 2/ Sample 3/</i>	Universe <i>Universe 2/ Sample 3/</i>	Universe Universe 4/ Areawide 5/
Total Public Road Miles	Certified Mileage -----					

- 1/ Universe data will be used to estimate lane-miles & VMT for the few miles of NHS that are on the minor collector & local functional systems.
- 2/ *Universe data will be used; where not available, expanded sample data will be used.*
- 3/ Expanded sample data will be used. Expanded sample data will be adjusted to universe length control totals.
- 4/ Universe miles times 2 (lanes) will be used. States are not required to report number of through lanes on these systems.
- 5/ Areawide data will be used because States are not required to report section level AADT on these systems.

Definitions: Universe: Data required by HPMS to be reported for all roadway links in the system.
 Sample: Data required by HPMS to be reported for a randomly selected sample of roadway links in the system.
 Areawide: Data required by HPMS to be reported in aggregated form by functional system.
 PAS: Principal arterial system made up of Interstate, Other Freeways & Expressways, and Other Principal Arterial systems.
 VMT: Vehicle miles of travel.
 FA: Federal-aid.
 NHS: National Highway System.

When necessary, lane miles and VMT will be adjusted for the functional systems where sample data are used if the universe and expanded sample length do not equal. The total expanded sample segment lengths will be compared to the universe length. A percent difference will be calculated. This percent difference will be used to adjust the total lane miles and VMT obtained from the sample data.

$$\% \text{ Difference} = \frac{\text{Universe Mileage} - \text{Sample Mileage}}{\text{Universe Mileage}}$$

This change clearly will have impacts upon the State and other data providers. It will require greater attention than in the past to HPMS sample selection and maintenance practices at the State level in order to achieve an expanded sample needing minimal adjustment by FHWA.

Grouping Data

Approximately eighteen HPMS universe data items for the three lower functional systems (urban local and rural minor collector and local) are reported on either a link level or grouped to some extent by political subdivision level by the States; currently, nearly 40 States group these records to some extent. These data are estimated to comprise about two-thirds of the 3.4 million section records in the HPMS on an annual basis. The primary use of these data is to report length of facility by jurisdiction and several other related parameters such as STRAHNET length, toll road length, nonattainment and donut area length, as well as urban, rural, and individual urbanized area length. In general, with the exception of the NHS, the information is not used otherwise at the section level; historic data have already been compressed.

Since the data are not used at the section level by FHWA and others, and are available for the most part only in varying degrees of aggregation at the present time, FHWA believes it would be more efficient to replace the approximately 2.4 million annual non-NHS section records with similarly grouped records for **all** States with no significant loss of analytical capability. FHWA will do this using the existing record grouping scheme contained in the HPMS Field Manual operating within the FHWA software package. As a result, States maintaining a link level data base for their own purposes will not be adversely impacted by the change.

FHWA believes that the change will make the HPMS more user friendly in the future as a significantly smaller data base is opened up to a wider audience and will result in a far more consistent HPMS data set for the lower order systems. However, grouping HPMS data for these lower functional systems means that link data will not be available for future GIS applications.

Despite this drawback, FHWA will structure the HPMS to:

- C collapse the lower level section records into grouped records on a uniform basis
- C use the HPMS software applications to minimize impacts on States using other data storage schemes
- C use the existing grouping guidelines in the HPMS Field Manual

Implementing Change

FHWA has gone through an extensive participatory process to establish a mission and objectives for a revised HPMS, has evaluated the basic structure of the HPMS using this same process, and has completed an extensive technical review of the 82 data items and 8 summary reports included in the HPMS. The technical review was completed by an FHWA team using a consultant as a facilitator and the results have been documented in the preceding text. The review was conducted in accordance with guidelines developed by participants at the national HPMS workshop in June 1997 and the HPMS Steering Committee. Results of the technical review have been evaluated and endorsed by the HPMS Steering Committee.

As a result, of the existing HPMS data items, 46 will be retained as is, 15 will be deleted, and 21 will be changed, typically to reduce the level of detail required. The “change” category includes the shift of 3 data items from

universe to sample, and 13 where a reduction in detail of 90 detail lines results; one new data item will be added. For data provided in 8 areawide data summaries, 3 are recommended for retention, 1 for deletion, and 4 for change. Retained data summaries will be further collapsed to consolidate report detail.

The decision process established in conjunction with the HPMS Steering Committee calls for further reviewing of proposed HPMS technical changes against five criteria, evaluating the resulting data collection and reporting process on the basis of:

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

The results of that evaluation follow:

Is the new data base consistent with the HPMS mission and objectives?

The *Phase I Final Report* recommended a mission and six objectives for the HPMS. FHWA believes the proposed technical changes to the HPMS data base are consistent with the mission and the six HPMS objectives. Restructuring the data base to require fewer samples, reducing the number of records by two-thirds, eliminating 15 data items which are not currently used and reducing detail in a number of items is consistent with the cost-effective part of the mission. Concentrating data collection efforts on fewer items should permit providers to improve the quality and consistency of the remaining items reported to the data base. FHWA will continue to have available the information items necessary to meet its responsibilities.

Is the new data base an improvement over the current system?

FHWA believes the fact that the objectives are all met with a smaller data base which can be collected at a lower cost and with higher quality and consistency would make the answer to this question “yes”.

What is the cost of change versus the costs saved?

Provider cost savings are difficult to estimate since much of the data is already collected by the States for their own purposes. As indicated in the *Phase I Final Report*, there is a large sunk cost in the current system. In the survey of the State Departments of Transportation, each State was asked to estimate the annual incremental cost of the HPMS. The costs reported in those surveys are estimates since many States do not track costs in this manner; it is difficult to separate out the incremental cost of HPMS from other data collection efforts since the data may have multiple uses. Even with these caveats, a rough estimate of cost savings was constructed.

States reported that the estimated annual cost of HPMS is about \$15,000,000 per year. States further estimated that 13 percent of the effort is for areawide data, 24 percent for universe data, and 63 percent for sample data. Some cost savings should come from economies introduced if States address over-sampling and reduce the number of HPMS samples to the minimum needed--from 123,000 to 80,000, a 35-percent reduction. Using the annual cost estimate from the HPMS survey information, estimated savings could approach \$3.3 million per year if sampling can be reduced by 35 percent. Since some of the over-sampling is done intentionally to provide additional information for State use, even reducing the number of sub-section samples, numbering nearly 18,000, could result in a 15 percent sampling savings of \$1.4 million per year.

Similar estimates of savings from other recommendations include:

- C Cutting areawide data summaries by 30 percent could yield a savings of \$500,000 per year,
- C Cutting universe data does not involve significant savings in data collection efforts, so little or no savings can be attributed to this action,
- C Deleting the number of sample data items by about 15 percent could yield savings of about \$1.4 million per year.

Estimating the savings from cutting the number of records from 3.4 million to about 1 million by reporting lower functional class highways as grouped records is less clear. In the first years, there may be a slight increase in costs to the States to reformat the data with a savings to FHWA in checking for validity and processing. However, this change should bring savings to both FHWA and the States in terms of a reduction in data storage and processing time and costs. Larger unmeasurable savings to users of the smaller resulting data system are envisioned as HPMS is migrated to the Internet in the future.

However, one can reasonably conclude that the potential savings could range from \$3.2 to \$5.1 million per year when the technical recommendations are fully implemented.

What decisions on individual data items can be reconsidered when they are viewed as a group?

FHWA believes that when the individual recommendations are viewed as a whole, the decisions appear rational and will result in a streamlined data base which meets the mission and objectives of the HPMS. None require reconsideration.

What is the process and timing of the changes?

In general terms, FHWA proposes to have a final decision made on the form and content of a revised HPMS by the end of calendar year 1998. Implementation workshops are targeted for the first quarter of 1999; new requirements would be put in place for 1999 HPMS data reported in June 2000. In order to be sensitive to problems associated with change among the States and other data providers, FHWA intends to make the transition as easy as possible. For instance, nearly all data items being marked for change collapse data into fewer categories than in the past and will have conversions built into the HPMS software package. Existing data using old codes in State data bases or inventory files can be retained but should be easily transferred to the new format when generating the HPMS report to FHWA. FHWA expects that stretching out the transition over time will allow change to be accomplished more easily if it is phased into State-initiated change cycles.

Based upon the assessment of the data item technical review, FHWA believes that the proposed revisions meet the decision process elements and evaluation criteria laid out by the HPMS Steering Committee. The changes will permit FHWA to better fulfill its HPMS mission and objectives; the new data base appears to be an improvement; cost data from the State surveys suggests that the States should be able to save resources with these revisions; and the data item revisions viewed as a whole appear rational, beneficial, and consistent.

Section 3

Future Perspectives

When implemented, the recommendations and restructuring proposals for the HPMS presented in the preceding discussions are expected to result in a data system which meets the HPMS mission and objectives, contains data items having specific uses and customers, can be produced at a lower annual cost, and provides new opportunities to improve data quality. However, the reassessment process also identified a number of issues where immediate solutions were not evident or possible. This section of the report deals with the future of HPMS and presents recommendations for not only resolving these outstanding issues but also for positioning HPMS for future technological changes. The approach suggested by the HPMS Steering Committee was to put forward a “vision for the future” for these remaining items and to suggest certain tasks over the next 5 to 10 years to meet or approach this vision. Consistent with this suggestion, the recommendations are nominally targeted for FHWA action and resolution within the 10-year vision of the current FHWA Strategic Plan.

Measuring Current Pavement Condition and Estimating Future Pavement Requirements

Discussions and comments on pavement conditions during the reassessment process recognized that HPMS uses only one measure of pavement condition, roughness, as measured by the International Roughness Index (IRI). Other principal measures of pavement condition such as rutting, cracking and faulting are not reported in HPMS although some States have complete inventories of these conditions on at least the State highway system. While one can conclude that all States have a form of a pavement management system, it is with the recognition that these systems are all different. The *Phase I Final Report* highlighted the apparent disconnect between the level of information on bridges as opposed to pavements versus the differences in expenditure levels. While there is a complete, comprehensive and consistent national inventory of all bridge conditions, HPMS only has IRI data to represent pavement conditions. However, annual expenditures on pavement related projects are about twice the expenditure for bridges. The impediments to having additional pavement condition information in HPMS include a lack of uniformity between the States, a lack of detailed pavement condition information for roads that are not on highway systems under State jurisdiction, and the different approaches by the States to policy planning, programming and project development.

Looking to the future, FHWA has been working with AASHTO and the States to establish standards for measuring roughness, cracking, rutting and faulting. One of FHWA’s Pavement Technology Program goals is to have these pavement condition measurement standards implemented in 30 States by the end of 2001. Data from these condition measurements can be used to estimate remaining service life of pavements. In the longer term, the Pavement Technology Program anticipates demonstrating a rolling wheel deflectometer by the end of 2000. When implemented, data from this dynamic condition measurement device can be used to estimate the remaining structural life of pavements. In view of these program directions, FHWA and the HPMS Steering Committee have recommended that further HPMS changes be deferred until additional pavement information requirements can be more clearly identified.

In a future vision, the HPMS will contain uniform information on standard pavement distresses, and remaining service and structural life for at least the National Highway System and all other arterials. Research will have been completed on probabilistic pavement models directed at predicting future conditions based on remaining service and/or structural life; such pavement condition models will be less data-rich than those currently in use.

There are a number of steps that will need to be taken to achieve the vision outlined above. Research and study steps include:

1. Completion of a pilot research study directed at determining the feasibility and impact of including data related to standard distresses and remaining service life from State pavement management systems in FHWA's current policy pavement models.
2. Completion of research on less data-rich probabilistic models for predicting pavement condition, including a detailed examination of using information available from the Strategic Highway Research Program/Long Term Pavement Performance (SHRP-LTPP) and State pavement management systems obtained outside of HPMS.
3. Completion of prototype development and testing of a rolling wheel deflectometer to measure and calculate remaining structural life.

Coordination and agreement steps include:

4. AASHTO adoption of standards for cracking, roughness, rutting and cracking.
5. Achieving MPO, local government, and State agreement on using AASHTO standards for measuring pavement condition.
6. Implementation of distress measurement standards by States and others for State highway system routes as well as for non-State routes in all rural and urban areas.
7. Achieving agreement on the uniform estimation of remaining service life.

Measuring Congestion Parameters and Estimating Congestion Levels and Trends

Congestion is measured in HPMS primarily by using the volume-to-service level ratio, a highway capacity manual based method. This method produces an estimate of average conditions on the system. Changes in this condition are tracked over time to estimate if congestion is worsening or improving. HPMS Steering Committee members, participants in the reassessment process, and many others in the transportation community have expressed concern about the adequacy of this measure of congestion for some time. The transportation community, however, has not developed a universally accepted single measure substitute that meets the many needs and uses for congestion information. Criticisms of the volume/service flow relationship include:

- C The current measure does not include non-recurring congestion which by many estimates accounts for about 50-60 percent of congestion.
- C The measure is a peak hour average and does not capture the duration and extent of congestion.
- C The calculation requires over 20 HPMS data items. Many of the data items required to make the calculation are generally not routinely included in State and local data systems, so much of the information is collected for HPMS purposes only.

FHWA is currently completing research on using the ratio of AADT to capacity as a measure of 24-hour congestion; it is also using a modeled value of hours of daily delay per 1000 VMT as a measure of congestion for performance reporting purposes. Both of these measures, however, rely on the same HPMS data items and the Highway Capacity Manual procedures in the calculation of capacity and do not address the criticisms noted above.

The *Phase I Final Report* recommended that further analysis be conducted on the potential use of information from Intelligent Transportation System (ITS) deployments for measuring congestion. Similar recommendations have come to FHWA from other sources and studies. FHWA has moved forward in this area and has actively promoted the concept that archived ITS data should be a user service in the National ITS Architecture. What this

means is that data collected for operational purposes by ITS deployments will be retained and made available for planning and policy analysis purposes. New ITS projects will be required to include data archiving in the design of ITS projects, and States, MPOs and local governments will be able to obtain considerable information on the location, extent, duration and causes of congestion from ITS. While consistent information from a number of ITS locations should be available for establishing trends on the performance of the highway system in terms of various measures of congestion, it is doubtful that in the next 10 years such information will be uniformly available for inclusion in the HPMS data base. In view of these constraints, FHWA and the HPMS Steering Committee have recommended that further HPMS changes be deferred until additional congestion information requirements can be more clearly identified.

In a future vision, research will have been conducted using the ITS archived data user service to develop consistent information on the extent, duration and causes of congestion on a sample of systems to provide consistent measures of congestion to track the performance of the highway system. Subsequently, HPMS will begin to transition from the Highway Capacity Manual approach for congestion calculation to a system which includes information from ITS on monitoring of actual conditions. Models which predict future levels of congestion and delay from relationships developed between monitored conditions and other highway attributes will be developed.

There are a number of steps that will need to be taken to achieve the vision outlined above. Research and study steps include:

- C Using a subcommittee of the HPMS Steering Committee and an outside consultant, develop measures of system performance that would be most meaningful to report through HPMS.
- C Participate in the revision of the National ITS Architecture to ensure that appropriate congestion information is available from the archived data user service.
- C Identify, with the ITS Joint Program Office, a sample of areas where ITS information is or will be available and initiate a pilot study to collect and analyze the information to monitor and measure congestion on a continuous basis.
- C Revise FHWA's analytical models to use the information and relationships from the pilot studies to predict the future performance of the highway system.
- C Transition the data collection in HPMS to drop data items used solely to calculate capacity by the Highway Capacity Manual method.
- C Estimate changes in congestion and system performance from highway and area attributes obtained from archived ITS data and other data sources external to HPMS.

Measuring Safety Parameters

Safety on the highway system is acknowledged by FHWA as the number one priority of its many programs. The FHWA strategic safety goal is to continually improve highway safety with the objective of reducing the number of highway-related fatalities and injuries by 20 percent in 10 years. National crash information currently comes from several sources including the HPMS, FHWA's Highway Safety Information System (HSIS), NHTSA's Fatality Analysis Reporting System (FARS) and NHTSA's General Estimate System (GES); current performance indicators are derived from existing NHTSA data systems. The GES estimates the number of non-fatal injury crashes and property-damage-only crashes. This estimate is based on a random sample of crash reports taken

at 60 sites across the States. It does not provide an estimate of non-fatal injury crashes by State by functional system class. The HPMS is the only DOT source of counts of non-fatal injury crashes, non-fatally injured persons, “most serious” injuries, and non-fatally injured pedestrians.

Throughout the reassessment process and within the HPMS Steering Committee, there has been a consensus on the importance of meeting FHWA’s strategic safety goal, but there have been differing opinions on the future role of HPMS. Those in the highway safety community want to be able to accurately link information on fatalities and serious and other crashes to highway locations and location attributes in order to determine the characteristics of the highway at crash locations. The purpose is to assist in eliminating high crash locations by improving the highway conditions at that point as well as establishing causal relationships between highway conditions and crash rates for highway design and operational standard modification.

Various types of analyses of high crash locations and related factors are done routinely by most States and in many urban areas, generally not using HPMS data but using locally available information. Crash data definitions, thresholds, and formats are not consistent within and across States, making compilation of the resulting information difficult to use on a national basis. HPMS crash data provided by the States on a functional system basis does not meet the States’ needs. Further, these data have been erroneous and can be misleading. While the value of accurate crash information to DOT, FHWA, NHTSA and others is recognized, the HPMS data system does no justice to those needs by providing data of questionable accuracy. Consequently, FHWA and the HPMS Steering Committee have concluded that the current crash data should be dropped from HPMS while FHWA and others in the safety community undertake an effort to reassess safety data needs and to develop other sources of crash data with location information.

The reassessment of crash data needs will be accomplished cooperatively with NHTSA, the States, and others in the safety community. Section 2005 of TEA-21 provides a new incentive grant program for States to improve highway safety data. It also requires the Department to be involved in the determination of necessary data items to assess national trends in crashes, rates, outcomes, and circumstances based upon a Model Minimum Uniform Crash Criteria. FHWA will coordinate with NHTSA and others with safety and safety information responsibilities to evaluate safety data needs for the Department.

The FHWA has initiated a partnership with NHTSA and AASHTO to develop the Crash Records Information System (CRIS) proposed by the Texas Department of Transportation. The CRIS will streamline the collection, management and dissemination of timely and accurate data to those who need it to improve safety of roadways. This project recognizes that data are needed on crash-involved highways, vehicles, and drivers to effectively analyze highway crashes and make recommendations for countermeasures.

While the HPMS requirement for reporting summary data to FHWA by functional system will be phased out, the States’ data bases and other existing FHWA and NHTSA safety data reporting systems will remain in place as these new sources of data are developed.

In a future vision, activities called for in Section 2005 of TEA-21 will have been completed and FHWA, the States, and others in the safety community will have a better idea of their crash data needs and requirements. The appropriate role of the three existing safety data systems within FHWA and NHTSA in meeting these data needs will have been assessed and, consistent with the ONE DOT concept, an integrated approach to meeting those needs will have been developed. Subsequently, HPMS will assess changes appropriate to support the identified crash data system.

There are a number of steps that will need to be taken to achieve the vision outlined above. Research and study steps include:

1. Complete the activities called for in Section 2005 of TEA-21.
2. Determine with BTS a common geo-referencing frame which could be used to link crashes to highway characteristics.

Coordination and agreement steps include:

3. Determine if there is a need for reporting to the Federal level a national roll up of locally collected crash information linked to highway conditions on top of the systems used and maintained by State and local governments.
4. If a Federal data roll up is desired, determine the specific items of data required and identify their uses.
5. Evaluate HSIS, FARS, GES, ITS, and HPMS as potential sources of information; compare requirements to the currently collected HPMS universe and sample items and make decisions on the need to supplement or modify HPMS or to use other data sources.

The Future HPMS Operating Environment

At the Conference on Information Needs to Support State and Local Transportation Decision Making into the 21st Century, Bruce McDowell put forth the following vision for information systems of the future:

“It is the year 2027. The U.S. Department of Transportation (DOT), State Departments of transportation and metropolitan planning organizations are all linked by a common performance-based geographic information system (GIS). Each of these agencies uses the system to manage its own programs for peak performance. Data reporting between agencies is no longer necessary: any report an agency needs can be designed and downloaded from the common GIS the same day.”

First steps toward that vision were essentially adopted at the HPMS national workshop and by the HPMS Steering Committee and incorporated into Objective 6:

- C To evolve HPMS into a data system which:
 - builds from the data systems of local, regional and State governments,
 - is connected with common geo-referencing system,
 - avoids, whenever possible, collecting data which are not used by the collecting agency.

Steps to move toward this future vision of HPMS include:

- C Implement the recommendations in this report to streamline the data set and system; lower costs, reduce the data burden, and improve quality.
- C Complete the improvements to the HPMS computing environment outlined in the *Phase 1 Final Report*, including submittal software, data manipulation software, and Internet access to HPMS data.
- C Establish the linkages between various existing geo-referencing systems using the efforts of BTS to create a national datum.
- C Complete the synthesis of best practices on data partnerships and data sharing, NCHRP Topic 30-07. Select

several promising models and in conjunction with AASHTO and AMPO conduct pilot studies to establish working models of data partnerships and data sharing. Modify HPMS and other FHWA procedures to incorporate data partnerships and data sharing into HPMS on a uniform basis.

- C Under the leadership of BTS, evaluate the potential for private data sources or private-public partnerships to supplement or replace current HPMS data and enhance knowledge of intermodal passenger and freight issues.
- C Increase the electronic collection and distribution of data with the objective of reducing the current data cycle time.
- C Complete a study with BTS and other modes on the need to include operational performance and the user perspective of transportation performance in the national transportation data base. Determine the appropriate role of HPMS in this larger data reporting system.



U.S. Department of Transportation
Federal Highway Administration

Is HPMS a “World Class” System?

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March 1998

IS HPMS A “WORLD CLASS” SYSTEM?

INTRODUCTION

A. What is the HPMS Reassessment purpose and status?

In the winter of 1997, the Federal Highway Administration (FHWA) embarked on a comprehensive reassessment of the Highway Performance Monitoring System (HPMS). The Phase 1 Report of this effort provides:

1. A brief summary of the reassessment purposes and process,
2. A description of what HPMS is and isn't,
3. How HPMS products are used by the various levels of government, and
4. The conclusions and recommendations of Phase 1 of the reassessment.

A review of the Phase 1 document, especially the Executive Summary, is necessary to understand the context for addressing the question of “world class.”

B. What is HPMS?

The following statement is put forth as a summary statement of HPMS; it is subsequently used for making the “world class” comparison.

HPMS is a curb-to-curb highway information system on the extent, use, condition and performance of all roads in the country. HPMS provides limited information on lower classified roads and more detailed information for the higher classified roads. HPMS is used for many different purposes at the Federal, State and local level. Data collection is an intergovernmental activity involving State, regional and local agencies. The national HPMS data base is a highly aggregated data base of universe and sample section data where information is generally obtained from more detailed State, regional and local data bases. Some information, basically on sample sections, is collected for HPMS purposes only. HPMS is a subset of a larger national highway data base. HPMS is used by FHWA and the U.S. Department of Transportation (DOT) for policy and strategic planning activities through the use of several analytical models. Two of the primary uses of HPMS are: Highway Statistics and the biennial Condition and Performance Reports to Congress.

C. Context for Question on “World Class”

As part of the reassessment of the HPMS, one of the questions to be addressed was: Is HPMS a “world class” system? HPMS serves the objectives of the Federal Government under the current legislative and jurisdictional distribution of responsibility for highways. The system also serves State and local governments and relies on these governments for the collection of data for the HPMS data base. Therefore, answering the question of “world class” first requires an understanding of the legislative and jurisdictional responsibilities for highways in other countries. Some of the questions explored included:

1. Are there any countries that have a structure similar to the United States for highway funding, planning, project development, etc?
2. Do these countries have highway data systems similar to HPMS?

3. Do they perform national policy analyses similar to the models used to prepare the biennial Condition and Performance Reports?
4. Do they have reports similar to Highway Statistics and the Condition and Performance Reports?
5. How do countries deal with lower levels of government in terms of data collection and analysis to create a national data base and conduct national level policy analyses?
6. If countries do not have a similar structure for highways as the United States, are there components of their highway data bases, intergovernmental data collection, or policy analysis systems which can be compared to the United States?

The sources readily available for this analysis were two reports from the Organization for Economic Cooperation Development (OECD), a wide variety of reports from the Permanent International Association of Road Congresses (PIARC), results of previous international scans, proceedings from the third International Conference on Pavement Management, and several other documents obtained at the World Road Congress. In addition, there were numerous discussions with individuals involved in international activities.

D. Comparison of HPMS Mission and Objectives to Other Countries

As part of the reassessment, a mission and a set of objectives were established for HPMS. They were reviewed extensively as part of the outreach program and modifications were made before the mission and objectives were approved. For this international comparison, the HPMS objectives are used as a framework for comparing how systems in other countries would meet the United States objectives.

1. Objectives 1, 2, and 3

Objective 1: Meet FHWA's highway stewardship responsibilities, including preserving the national interest in the NHS.

Objective 2: Support transportation policy analysis and planning activities.

Objective 3: Meet the various congressional requirements, including the Condition and Performance Reports.

DISCUSSION: The OECD Report, *Road Maintenance and Rehabilitation: Funding and Allocation Strategies*, concludes: "administrative/organization structures for resource allocation and distribution reflect the governmental structures prevailing in each country." Similarly, the policy analysis systems in each country reflect the legislative, financial and jurisdictional structure for highways in each country. The search of the literature shows that the system in the United States is unique in several aspects.

First, the Federal highway agency in the United States does not have jurisdiction (project development, design, construction, operation, maintenance, etc.) over national or regional roads; rather, the responsibility is assigned to States and local governments. Other country's Federal highway agencies have jurisdiction for these national roads; therefore, their policy analysis and data systems are very detailed with regard to roads under their jurisdiction. These organizations are more analogous to our State Departments of Transportation, and their highway information systems are more like State pavement management systems which are used for policy planning, programming and project development.

Second, while the United States makes Federal road funds available to other levels of government, this is not the case in most other countries where Federal funds are spent on Federal roads. As a result, the United States requires detailed information from all levels of government. For instance, the United States requires estimated travel [vehicle-miles of travel (VMT)] as a basis for fund allocation; only Great Britain has a similar system but a different method of obtaining VMT.

Third, the PIARC report, *Highway Performance Monitoring Systems Workshop*, compares HPMS systems in five countries. While these systems are basically pavement management systems, the policy analysis portions described in the report are not as comprehensive as the Analytical Process and HERS models used in the United States HPMS.

Fourth, HDM-4, the World Bank project to develop the most advanced road maintenance and investment analysis system, uses one of the HPMS analytical models--HERS.

CONCLUSION: Since the current HPMS system meets the first three objectives for HPMS and the United States highway funding and jurisdiction system is unique, the question of "world class" is not very relevant to these three objectives. There is evidence from the literature that HPMS for national policy analysis is, in fact, "world class".

2. Objective 4

Objective 4: Provide a publicly accessible, consistently high quality objective and timely national highway data base.

DISCUSSION: The national HPMS data base is a highly aggregated curb-to-curb set of information covering all roads in the country. The data bases in other countries appear to be more detailed for national highways (highways under the jurisdiction of the Federal highway agency) and less detailed and/or less comprehensive for systems under regional and local jurisdiction. There are several references to HPMS being a "world class" system in this regard.

The OECD report, *Performance Indicators for the Road Sector*, states: "Several OECD countries have developed and used analytical systems of the type described (the U.S. HPMS). The road data bank of the HPMS has been in use for two decades. The inventoried data items are the same or very similar in all OECD countries."

The International Scanning Tour on European Traffic-Monitoring Programs and Technologies concluded: "Overall, the European countries visited do not have counting or monitoring programs that are as extensive or sophisticated as those usually found in the United States."

Reviewing the summary tables on data systems of 15 countries in the OECD performance indicators report shows that the United States is the only country which attempts to measure congestion in a systematic basis for multi-jurisdictional road systems.

The United States data base is less comprehensive with regards to pavement condition information; a conclusion also of the reassessment process. The United States data base does not include asset value information while other countries tend to include this information in their data bases, at least for highways in their jurisdiction. Many countries have extensive information outside the curb lines in their data bases, but this information is not within the current purposes of HPMS.

CONCLUSION: The United States highway data base is a “world class” system in its comprehensiveness, traffic information, congestion analysis, and in meeting the national objectives for a national highway data base. The weaknesses in the United States HPMS data base when compared to other countries have also been identified in the reassessment process and are currently under evaluation.

3. Objectives 5 and 6

Objective 5: Provide, at the State and local government option, an HPMS data base, an analytical process, and FHWA technical support which meets the needs of State, regional and local agencies.

Objective 6: Evolve HPMS to a data system which:

- builds from the data systems of local, regional and State governments,
- is connected with a common geo-referencing system, and
- avoids, whenever possible, collecting data which is not used by the collecting agency.

DISCUSSION: These two objectives deal with the intergovernmental aspect of HPMS. Referring back to the discussion under the first three objectives, the intergovernmental nature of highway responsibility in the United States is unique and therefore the intergovernmental objectives are also unique. The literature does refer to some intergovernmental activities in France, Great Britain, and Germany which would need to be studied through visits. The scanning tour on traffic monitoring discovered two techniques relating to intergovernmental data collection which they recommended for possible use in the United States--purchasing data rather than funding general collection programs and contracting with private companies for traffic data collection. Cooperation among operating agencies was found to be better in the countries visited than in the United States. Data aggregation and storing and the use of control systems for data collection [Intelligent Transportation Systems (ITS)] was also better in the European countries.

CONCLUSION: The intergovernmental aspects of the United States HPMS are evolving as technological advances allow easier sharing of data. This area, which was also highlighted in the Transportation Research Board (TRB) Conference on State and Local Data Needs into the 21st Century, is still a major effort in the continuing reassessment. The HPMS workshop participants recommended a synthesis of the best practices in this country as the next step to improve meeting the two intergovernmental objectives. While the United States HPMS is certainly a “world class” system in including all governmental level highways in a comprehensive data system, there are certainly intergovernmental arrangements and techniques in other countries which could add to the synthesis of best practices. These are not reported well in the literature and visits to several countries or face-to-face discussions would be helpful.

4. Summary Statement

From this limited analysis, one can conclude that HPMS is a “world class” system. The current HPMS will be improved when the recommendations of the reassessment are implemented. The reassessment process revealed that there is strong support for HPMS from the users and providers of information, and that the system meets the stated mission and objectives. Currently, there are no equivalent HPMS systems in use in other countries which would meet all the objectives of the United States HPMS. The United States should continue to learn from other countries about data collection techniques and intergovernmental arrangements through specifically focused international scans or mini-scans on specific subjects similar to the traffic monitoring scan including additional information on intergovernmental arrangements for data sharing and partnerships.

Detailed Information on Data Items for Which Change is Proposed

Add: Item 2 -- Metric (or English) Reporting Units

A minor change in coding of this data item is needed to meet HPMS software programming requirements.

Old Code	New Code	Description
1	<i>0</i>	This file of section data is coded using the English system of unit measurement (miles, feet, inches, etc.).
2	<i>1</i>	This file of section data is coded using the modernized metric system of unit measurement known as the SI (kilometers, meters, millimeters, etc.).

Add: Item 5 -- Type of Section Identification

A minor change in coding of this data item is needed to meet HPMS software programming requirements.

Old Code	New Code	Description
1	<i>0</i>	Section Identifier: A countywide unique identifier for section records.
2	<i>1</i>	Grouped Length: A countywide unique identifier for grouped length (kilometers or miles) records only.

Change: Item 15 - Planned Unbuilt Facility

This item is used to track changes to the approved NHS, a requirement of the legislation approving the NHS, including intermodal connectors. The item is being reduced to apply to the NHS only.

Old Code	Description	New Code	Description
0	Section is not on the applicable (PAS/NHS) systems, and is open to public travel .	0	This section is not on the NHS
1	PAS/NHS section is built and open to public travel.	1	This section is on the NHS and is open to public travel
2	PAS/NHS section is not yet built, but is part of an approved or adopted plan of a short range improvement program which has a good probability of being under construction in the near future (up to 6 years). This code shall include those sections that are built but were not yet open to traffic for the reporting year.	2	This section is on the NHS, but is not yet built

Change: Item 20 - Governmental Ownership

This item is used to identify facility ownership. It is used in cost allocation, to track historic data, and in the national highway data base. This item is being reduced by collapsing the data stratifications from 17 to 8. *The “New Code” changed to one digit as italicized below.*

Old Code	Description	New Code	Description
01	State Highway Agency	<i>1</i>	State Highway Agency
02	County Highway Agency	<i>2</i>	County Highway Agency
03	Town or Township Highway Agency	<i>3</i>	Town or Township Highway Agency
04	Municipal Highway Agency	<i>4</i>	Municipal Highway Agency
11	State Park, Forest, or Reservation Agency	<i>5</i>	Other State Agency
12	Local Park, Forest, or Reservation Agency	<i>6</i>	Other Local Agency
21	Other State Agency	<i>5</i>	Other State Agency
25	Other Local Agency	<i>6</i>	Other Local Agency
26	Private	<i>8</i>	Other
31	State Toll Authority	<i>5</i>	Other State Agency
32	Local Toll Authority	<i>6</i>	Other Local Agency
60	Other Federal Agency (Not Listed Below)	<i>7</i>	Federal Agency
62	Bureau of Indian Affairs	<i>7</i>	Federal Agency
64	U.S. Forest Service	<i>7</i>	Federal Agency
66	National Park Service	<i>7</i>	Federal Agency
68	Bureau of Land Management	<i>7</i>	Federal Agency
70	Military Reservation/Corps of Engineers	<i>7</i>	Federal Agency

Change: Item 21 - Special Systems

This item has been used to track changes to various Interstate and other system categories. In addition, the HPMS was selected to track changes to special Interstate Systems for fund apportionment purposes. As a result of the passage of TEA-21, there is no legislative reason for tracking the several Interstate designations and the item is being reduced to delete the unneeded codes. A reduction in the number of stratifications from 14 to 2 is proposed. The STRAHNET designation is proposed for retention because of its use by the DOD for identifying strategic deployment routes. The remainder of the categories have become irrelevant to FHWA business purposes as a result of TEA-21. *(All Interstate System open-to-traffic coded as STRAHNET)*

Old Code	Description	New Code	Description
00	Not on a Special System	0	Not on a Special System
01	Addition to the Interstate System [23 U.S.C. 139(c)]	1	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])
02	Addition to the Interstate System [23 U.S.C. 139(a)] approved prior to March 9, 1984	1	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])
03	Addition to the Interstate System [23 U.S.C. 139(a)] approved on or after March 9, 1984	1	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])
04	Future addition to the Interstate System [23 U.S.C. 139(b)]	0	Not on a Special System
05	Section 332 Interstate System that meets the Interstate System design standards	1	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])
06	Designated future Section 332 Interstate System	0	Not on a Special System
08	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])	1	Strategic Highway Network (STRAHNET) (includes Interstate System [23 U.S.C. 103])
11	Appalachian Development Highway	0	Not on a Special System
13	Indian Reservation Roads and Bridges	0	Not on a Special System
15	National Forest Highway System	0	Not on a Special System
16	National forest Development Roads and Trails	0	Not on a Special System
18	National Park Service Parkway	0	Not on a Special System
19	National Park Roads and Trails	0	Not on a Special System

Change: Item 23 - Designated Truck Route

This item is used as an administrative identifier to determine whether a section is on or off a truck route designated under Federal regulatory authority for truck size and weight studies. This item is being reduced to require a yes/no answer only.

Old Code	Description	New Code	Description
1	Designated truck route under Federal authority in 23 CFR 658.	1	Designated truck route under Federal authority in 23 CFR 658.
2	Designated truck route only under State authority and fully available to both types of trucks described below. ¹²	0	Not on a designated truck route
3	Parkway -- not on a designated truck route.	0	Not on a designated truck route
4	Not a Parkway -- not on a designated truck route.	0	Not on a designated truck route

Change: Item 24 - Toll

In the past, this item has been used as an administrative identifier to determine whether a section is on or off a toll road. In addition, the HPMS was selected to track changes to toll roads meeting selected legislative criteria for the primary purpose of apportioning Interstate Maintenance funds to the States. Toll data have also been used for historic trends, policy analysis, and legislation development purposes.

With the passage of TEA-21, all Interstate mileage and travel are used in the apportionment formula and there is no legislatively mandated reason for retaining the same level of detail on toll roads. As a result, future toll road data needs can be met using a reduced data record indicating simply whether or not the section in question is or is not a toll road. A reduction in the number of stratifications from 4 to 2 is proposed. The remainder of the categories have become irrelevant to FHWA business purposes as a result of TEA-21.

Old Code	Description	New Code	Description
1	Non-toll	0	Non-toll
2	Toll	1	Toll
3	Interstate toll section under Secretarial Agreement	1	Toll

4	Interstate toll section under Secretarial Agreement, now free of tolls	0	Non-toll
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Change: Item 43 - Surface/Pavement Type

This item details the type of pavement surface. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (estimate pavement deterioration and loading history), for cost allocation pavement model and national highway data base purposes. This item is being reduced by collapsing the data stratifications from 15 to 6.

Old Code	Description	New Code	Description
20	Unimproved Road	1	Unpaved
30	Graded and Drained	1	Unpaved
40	Soil, Gravel or Stone	1	Unpaved
51	Bituminous Surface-Treated	2	Low type
52	Mixed Bituminous	3	Intermediate Type
53	Bituminous Penetration	3	Intermediate Type
61	High Flexible	4	High Type Flexible
62	Composite; Flexible over Rigid	6	High Type Composite
71	High Rigid; Plain Jointed	5	High Type Rigid
72	High Rigid; Reinforced Jointed	5	High Type Rigid
73	High Rigid; Continuously Reinforced	5	High Type Rigid
74	Rigid over Rigid; Bonded or Partially Bonded	5	High Type Rigid
75	Rigid over Rigid; Unbonded	5	High Type Rigid
76	Rigid over Flexible	5	High Type Rigid
80	Brick, Block or Other Combination	4	High Type Flexible

Change: Item 52 - Shoulder Type

This item provides information on the type of existing shoulder on sample roadway sections. It is used in investment requirements modeling to support the C&P report to Congress (needed improvements). This item is being reduced by collapsing the data stratifications from 8 to 6. Enter the code for the type of shoulder on the section. *Item 52 has been changed to add back the category “combination” shoulders and the descriptions have undergone minor change. Shoulders behind mountable curbs should be coded as shoulders as if the curbs did not exist. Shoulders in front of barrier curbs should be coded as shoulders while areas behind barrier curbs should not be coded as shoulders - code 6 should be used. Curb types are described in the 1994 AASHTO Design Guide, pp. 344-349.*

Old Code	Description	New Code	Description
1	None: No Shoulders or Curbs Exist.	1	None: No shoulders or curbs exist
2	Surfaced with Bituminous Material	2	Surfaced shoulder exists
3	Surfaced with Portland Cement Concrete (not Tied)	2	Surfaced shoulder exists
4	Surfaced with Tied Portland Cement Concrete	2	Surfaced shoulder exists
5	Stabilized	3	Stabilized shoulder exists
6	Combination	4	<i>Combination shoulder exists</i>
7	Earth	5	<i>Earth shoulder exists</i>
8	Curbed: No Shoulders Exist; Section is Curbed.	6	<i>Barrier Curbs; no shoulders exist in front of curb</i>

Change: Item 58 - Curvey by Class

This item provides specific information regarding the number and length of horizontal curves by degree of curvature for sample sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating horizontal alignment adequacy, estimating running speed and operating costs). This data item will be reduced from 26 existing detail lines (number of curves and total curve length for 13 curve classes) to 6 (total curve length in 6 curve classes).

Old Code	Number of Curves	Length of Curves	New Code	Description
a	&&	&&	a	&&
b	&&	&&	a	&&
c	&&	&&	a	&&
d	&&	&&	a	&&
e	&&	&&	b	&&
f	&&	&&	b	&&
g	&&	&&	c	&&
h	&&	&&	c	&&
i	&&	&&	d	&&
j	&&	&&	d	&&
k	&&	&&	e	&&
l	&&	&&	e	&&
m	&&	&&	f	&&

Change: Item 61 - Grades by Class

This item provides specific information regarding the number and length of vertical grades by percent gradient for sample sections. It is used in investment requirements modeling to support the Condition and Performance Report to Congress (calculating vertical alignment adequacy, estimating running speed and operating costs) and in the truck size and weight analysis process. This data item will be reduced from 12 existing detail lines (number of grades and total length of grades for 6 classes) to 6 (total length of grade for 6 classes).

Old Code	Number of Grades	Length of Grades	New Code	Length of Grades
a	&&	&&	a	&&
b	&&	&&	b	&&
c	&&	&&	c	&&
d	&&	&&	d	&&
e	&&	&&	e	&&

f	&&	&&	f	&&
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Change: Item 81 - HOV Operations

This item provides information on 26 categories of HOV operational activity. Change to a universe inventory data item and reduce the level of detail by eliminating all but one (81G) of the 26 subitems. Although not used in the modeling process, the reduced data will be incorporated into the national database.

Old Code	Description	New Code	Description
0	Nonapplicable	0	Section does not have HOV lanes
1	Exclusive HOV Lane(s) or Roadway (Not Reversible)	1	Exclusive HOV lane(s)
2	Exclusive HOV Lane(s) or Roadway (Reversible)	1	Exclusive HOV lane(s)
3	Normal through lane that is signed for exclusive HOV use in specified time periods (concurrent flow, same direction as other traffic)	2	Normal through lane(s) used for exclusive HOV in specified time periods
4	Normal through lane that is signed for exclusive HOV use in specified time periods (contra flow, opposite direction to other traffic)	2	Normal through lane(s) used for exclusive HOV in specified time periods
5	Shoulder used during specified period by HOV	3	Shoulder/parking lane(s) used for HOV in specified time period
6	Shoulder used during specified period by general traffic	3	Shoulder/parking lane(s) used for HOV in specified time period
7	All through lanes used by HOV vehicles during specified periods	2	Normal through lane(s) used for exclusive HOV in specified time periods
8	Other; Describe in submittal correspondence	0	Section does not have HOV lane(s)

Change: Item 82 - Highway Surveillance Systems

This item provides information on 7 categories of highway surveillance systems. Change to a universe data item to provide information on deployment of ITS technologies. The number of subitems is being increased to 9. The data will be used by FHWA and others to track deployment of the ITS technologies. *This item has been changed to reflect a minor change in coding detail. New subitem 82G, "free cellular phone" is intended to apply to limited area cell phone systems related to specific Intelligent Transportation System (ITS) deployment sites. Do not include statewide DUI numbers or similar statewide or regionwide cell phone services in this item.*

Sub-item (Old)	N O	Y E S	Description (Old)	Sub-item (New)	Description (New)
82A	0	1	Manned Central Control Center that collects/receives data and information via cameras, detectors (lane counts and speed), etc. in real-time and relays the information to motorists using the facilities and/or police, emergency and other such vehicles	82A	Section is under electronic surveillance to collect real-time traffic data to monitor traffic flow
82B	0	1	Ramp Metering	82B	Section has metered entrance ramps
82C	0	1	Ramp Metering with bypass lane(s) for certain (permissible) vehicles	82B	Section has metered entrance ramps
82D	0	1	Variable message signs to advise motorists of hazards, incidents and/or congestion ahead, route diversion, etc.	82C	Section is covered by permanent variable message signs
82E	0	1	Restricted visibility (fog, dust, etc.) and/or ice/snow detection system	82C	Section is covered by permanent variable message signs
82F	0	1	Exclusive fixed frequency radio traffic condition reports (AM or FM) to alert motorists of roadway conditions, incidents, possible route diversions, etc.	82D	Section is covered by highway advisory radio
82G	0	1	Other systems [Intelligent Vehicle Highway Systems (IVHS) operations, etc.]. Describe in submittal correspondence	N/A	Dropped
N/A	0	1	N/A	82E	Section is covered by surveillance cameras
N/A	0	1	N/A	82F	Section is covered by incident detection technology algorithms
N/A	0	1	N/A	82G	Section is covered by free cell phone to dedicated number other than 911
N/A	0	1	N/A	82H	Section is covered by publicly sponsored on-call service patrol or towing service
N/A	0	1	N/A	82I	Section has the hardware needed to provide in-vehicle signing information to equipped vehicles